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Tahmoor Coal Pty Ltd

SIX MONTHLY SUBSIDENCE IMPACT REPORT

Western Domain Longwalls West 1 – West 4

1 July 2023 – 31 December 2023

Report 9 – March 2024

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Document Control

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Executive Summary

This report is the ninth six-monthly report to be submitted since the commencement of extraction in the Western Domain, in accordance with the requirements of the Longwall West 1 and West 2 (LW W1-W2) Extraction Plan and the Longwall West 3 and West 4 (LW W3-W4) Extraction Plan.

Extraction of coal from Longwalls West 1 to West 4 was completed on 6 November 2020, 17 June 2021, 21 March 2022 and 13 September 2022, respectively. Subsidence impacts discussed in this report are for those observed after the extraction of LW W4. This is the final six-monthly report to be prepared for the monitoring of subsidence in the Western Domain.

The maximum observed vertical subsidence relating to the extraction of LW W4 was 897 mm recorded along the LW W1-W4 crossline survey.

There were seven (7) environmental aspects that were associated with Trigger Action Response Plans (TARPs) triggers. All triggers have been reviewed by the Environmental Response Group / Structural Response Group / specialists to determine if any further actions are required. These TARP triggers included:

- Pool Water Level TARP – Level 2 triggered due to pool water level reduction at monitoring site CB on Cedar Creek. During the periods of water level decline the water level did not decline atypically, and occurred during a period of generally below average rainfall. No further actions are required;
- Natural Drainage Behaviour TARP – Level 3 triggered due to laminar fracturing at SR17 Rockbar from November 2021 onwards, and fracturing at SR20 Rockbar from August 2022 onwards. A Level 3 TARP trigger was associated for both locations as the rockbar fracturing was formed during mining (was not present during baseline inspections), and there was no reduction in pool water level, drainage or overland connected flow (taking into account climatic conditions and observations during the baseline monitoring period). No further actions are required;
- Surface Water Quality TARP – Level 2 triggered due to elevated dissolved aluminium at monitoring site SD in December 2023, and elevated pH at monitoring sites SC and SD in December 2023. These elevated results were attributed to prevailing climatic conditions and an increase in algae growth, respectively. No further actions are required;
- Groundwater Bore Level TARP – Level 2 triggered at P12C and P16C during the reporting period, however a trend in groundwater recovery was evident. No further actions are required;
- Shallow Groundwater Pressures TARP – Level 2 triggered during the reporting period, however this trigger was resolved in December 2023. No further actions are required;
- Deep Groundwater Pressures TARP – Level 2 triggered during the reporting period, however this trigger was resolved in August 2023. No further actions are required; and
- Groundwater Quality TARP – Level 2 triggered during the reporting period. No further actions are required.

During previous reporting periods, cracking on sandstone culverts at 88.400 km and 88.980 km resulted in an exceedance of subsidence performance measure for 'other Aboriginal and heritage sites'. Tahmoor Coal notified DPE (now DPHI) and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.*

Tahmoor Coal completed remediation of the two sandstone culverts in May 2023, and DPE were notified of this completion on 19 May 2023. A site inspection of the culverts with Transport Heritage NSW was completed on 2 May 2023, and a letter was received from Transport Heritage NSW after the site inspection stating they were satisfied with the repairs completed. DPE were notified of this completion on 19 May 2023 and a site inspection of the culverts with DPE was undertaken on 6 June 2023. Correspondence was received from DPE on 23 June 2023 acknowledging the works have been undertaken.

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1 Introduction

1.1 Background

Tahmoor Coal Mine (Tahmoor Mine) is an underground coal mine located approximately 80 kilometres (km) south-west of Sydney between the towns of Tahmoor and Bargo, New South Wales (NSW) (refer to **Figure 1-1**). Tahmoor Mine produces up to three million tonnes of Run of Mine coal per annum from the Bulli Coal Seam. Tahmoor Mine produces a primary hard coking coal product and a secondary higher ash coking coal product that are used predominantly for coke manufacture for steel production. Product coal is transported via rail to Port Kembla for Australian domestic customers and export customers.

Tahmoor Mine has been operated by Tahmoor Coal Pty Ltd (Tahmoor Coal) since Tahmoor Mine commenced in 1979 using bord and pillar mining methods, and via longwall mining methods since 1987. Tahmoor Coal is a wholly owned entity within the SIMEC Mining Division of the GFG Alliance group.

Tahmoor Coal has mined 36 longwalls to the north and west of Tahmoor Mine's current pit top location. The 'Western Domain' is a mining area located north-west of the Main Southern Rail between the townships of Thirlmere and Picton (**Figure 1-1**). The Western Domain is within the Tahmoor North mining area and is within Mining Lease (ML) 1376 and ML 1539.

Extraction Plan approval for the third and fourth longwalls in the Western Domain (LW W3-W4) was granted by the then NSW Department of Planning, Industry and Environment (DPIE, now NSW Department of Planning, Housing and Infrastructure (DPHI)) on 13 September 2021. A copy of this Project Approval is available on the Tahmoor Coal website (http://www.simec.com/mining/tahmoor-coking-coal-operations/). The Study Area for this extraction plan is provided in **Figure 1-2**.

Extraction of coal from Longwalls West 1 to West 4 were completed on 6 November 2020, 17 June 2021, 21 March 2022 and 13 September 2022, respectively.

Extraction Plan approval for Tahmoor South Domain A Series was granted on 20 September 2022, and extraction in the Tahmoor South Domain commenced 18 October 2022. Subsidence Impact Reporting for Tahmoor South Domain is reported separately to that of the Western Domain.

1.2 Purpose

1.2.1 Six-Monthly Subsidence Impact Report Requirements

The purpose of this report is to address the requirements for six-monthly reporting on impacts and environmental monitoring results associated with the extraction of LW W3-W4. These requirements are outlined in Section 6.1.4 of the LW W3-W4 Extraction Plan, which are derived from the Section 6 of the DPE *Draft Guidelines for the Preparation of Extraction Plans V5* (DPE, 2015). It is noted that an updated version of the Guidelines was published in October 2022.

This report provides with a summary of subsidence and environment monitoring results, subsidence impacts and management actions undertaken during the reporting period. The reporting period for this report is defined in **Section 1.3**. In light of the completion of the post-mining monitoring period, this report will be the last Six Monthly Subsidence Impact Report prepared for the monitoring of subsidence in the Western Domain.

In addition, a letter from the NSW Department of Planning and Environment (DPE, now DPHI) dated 19 December 2022 provided three additional reporting requirements for future Six-Monthly Subsidence Impact Reports for the Western Domain. Similar additional reporting requirements for future Six-Monthly Subsidence Impact Reports for the Western Domain were also requested in a letter from DPE dated 5 April 2023.

Reporting requirements are listed in **Table 1-1** below, together with the cross-reference where the requirements are addressed in this report.

Table 1-1 Six Monthly Subsidence Impact Report Requirements

Requirement No.	Requirement Description	Section Addressed
Reporting Requirements as per Section 6.1.2 of the LW W3-W4 Extraction Plan		
1	A comprehensive summary of all impacts, including a revised characterisation according to the relevant TARP(s);	Section 3.1
2	Any proposed actions resulting from triggers being met in the TARP, or other actions;	Section 3.2
3	An assessment of compliance with all relevant performance measures and indicators; and	Section 4
4	A comprehensive summary of all quantitative and qualitative environmental monitoring results, including landscape monitoring, water quality data, water flow and level data, piezometer readings.	Section 2
Reporting Requirements as requested by DPE on 19 December 2022		
1	Continue to include an assessment against performance measures and performance indicators, and any recommendations in relation to ongoing monitoring or corrective actions;	Section 3.2, Section 4
2	Continue to include a review and update on the status of recommendations made in previous reports; and	Section 2.2.6 and Section 2.3.5
3	Include an update on the progress of remediation of the two sandstone culverts impacted by mining of LW W1-W4.	Section 2.6
Reporting Requirements as requested by DPE on 5 April 2023		
1	An update on the status of recommendations made in previous six-monthly monitoring reports;	Section 2.2.6 and Section 2.3.5
2	A review of recommended further surface water and groundwater monitoring against performance measures and performance indicators; and	Section 3.2, Section 4
3	An update on the progress of remediation of the two sandstone culverts impacted by mining of LW W1-W4.	Section 2.6

This report will be distributed to the stakeholders listed in **Section 5.4**.

1.2.2 Three-monthly Reporting Requirements

This report forms part of three-monthly reporting for surface water and groundwater following an investigation of Level 4 TARP triggers relating to depressurisation of groundwater aquifers and water level at surface water monitoring site CB (Pool CR14). This reporting requirement was requested by NSW Department of Planning and Environment (now NSW Department of Planning, Housing and Infrastructure) following the notification of these TARP triggers.

This report includes a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and a summary and progress of any recommendations in relation to ongoing monitoring or corrective actions (refer to **Section 2.2.6** and **Section 2.3.5, Appendix B,** and **Appendix C**).

In light of the completion of the post-mining monitoring period, this report will be the last three-monthly report for surface water and groundwater for the monitoring of subsidence in the Western Domain.

1.2.3 Annual Review Requirements

An Annual Review for Tahmoor Mine operations during the previous calendar year is required in accordance with Condition E13 (SSD 8445) and Condition 45 of DA 67/98, and is submitted by 31 March annually to Department of Planning, Housing and Infrastructure (DPHI) and other stakeholders, as well as upload to the Tahmoor Coal Website. This Six-Monthly Subsidence Impact Report will assist with the completion of the 2023 Annual Review, and will be provided as an appendix to the Annual Review.

1.3 Scope

1.3.1 Reporting Period

This report is the ninth six-monthly report to be submitted since the commencement of extraction of LW W1, in accordance with the requirements of the LW W1-W2 Extraction Plan and LW W3-W4 Extraction Plan. The reporting period of this report is from 1 July 2023 to 31 December 2023, and covers subsidence impacts observed following completion of LW W4 extraction.

Table 1-2 summarises the monitoring and reporting completed during the reporting period, as well as the timeframe of data reviewed for each monitoring component.

1.3.2 LW W3-W4 Study Area

The Extraction Plan Study Area for LW W3-W4 is defined as the surface area that is likely to be affected by the extraction of LW W3-W4 from the Bulli Coal Seam. This Study Area has been calculated by combining the areas bound by the following limits:

- The predicted limit of vertical subsidence, taken as the 20 millimetre (mm) subsidence contour resulting from the extraction of LW W3-W4; and
- A 35° angle of draw line from the limit of proposed extraction for LW W3-W4.

The Study Area is illustrated in **Figure 1-2**.

1.3.3 LW W3-W4 Extraction Plan Context

The LW W3-W4 Extraction Plan is part of the Tahmoor Coal Environmental Management Structure, which is illustrated in **Figure 1-3**. As part of the LW W3-W4 Extraction Plan, a set of management plans was prepared to manage particular environment or built features with the LW W3-W4 Study Area, which consisted of the following:

- Water Management Plan;
- Land Management Plan;
- Biodiversity Management Plan;
- Heritage Management Plan;
- Stonequarry Creek Rockbar Management Plan;

- Built Features Management Plan, with a number of sub-plans to manage potential environmental consequences to infrastructure and specific building structures as a result of secondary extraction; and
- Public Safety Management Plan.

The overall framework for subsidence monitoring and management of impacts of the LW W3-W4 Extraction Plan is provided in the relevant Subsidence Monitoring Programs. Monitoring of environmental and built features has been completed by Tahmoor Coal in accordance with management plans listed above.

It is noted that the management requirements for public safety are covered in the Built Features Management Plan and the Land Management Plan.

Monitoring of features from the LW W1-W2 Extraction Plan as part of post-mining monitoring has been either completed or incorporated into the LW W3-W4 Subsidence Monitoring Programs.

Subsidence monitoring results and any impacts for the Tahmoor South Domain will be reported separately to that of the Western Domain.

Table 1-2 Monitoring and Reports Reviewed for this Reporting Period

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Reference
Subsidence Monitoring Program	Subsidence	General subsidence	• SMEC	• Mine Subsidence Engineering Consultants (MSEC)	• Post-mining report for 1 July 2023 to 31 December 2023	Appendix A
Water Management Plan	Surface Water	Stonequarry Creek flow	• WaterNSW	• ATC Williams	• 6-Monthly report for 1 July 2023 to 31 December 2023	Appendix B
		Pool water level	• ALS			
		Stream water quality				
		Flooding	NA	NA	(No reporting required in this monitoring period. End of Panel flood study for LW W4 completed and reported on in previous reporting period)	NA
		Natural drainage behaviour	• Tahmoor Coal	• Tahmoor Coal	• Post-mining reports for August/September and December 2023 (monitoring required on a 3-monthly basis during the post-mining period till September 2023)	Available on request, summarised in Appendix B
	Groundwater	Groundwater quality	• CES	• SLR	• 6-Monthly report for 1 July 2023 to 31 December 2023	Appendix C
		Groundwater bore level	• CES			
		Shallow groundwater pressures				
		Deep groundwater pressures	• SLR • Tahmoor Coal			
		Groundwater Inflow	• Tahmoor Coal			
Land Management Plan	Landscape	Cliff lines	• Douglas Partners	• Douglas Partners	Post-mining reports for September 2023 (monitoring required on a 3-monthly basis during post-mining period till September 2023)	Available on request
		Steep Slopes				
		Surface cracking				
		Dams				

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Reference
Land Management Plan	Agricultural Land	Agricultural Land	• BIS	• BIS	• Post-mining report for September 2023 (monitoring required on a 3-monthly basis during post-mining period till September 2023)	Available on request
Biodiversity Management Plan	Aquatic Ecology	Macroinvertebrates	NA	NA	(No inspections required in this reporting period. 12 months post-mining monitoring completed and reported on in previous reporting period)	NA
	Terrestrial Ecology	Amphibians	NA	NA	(No inspections required in this reporting period. 12 months post-mining monitoring completed and reported on in previous reporting period)	NA
		Riparian Vegetation				
Heritage Management Plan and Stonequarry Creek Rockbar Management Plan	Aboriginal heritage	Grinding Grooves	• SMEC	• MSEC	• Post-mining report for 1 July 2023 to 31 December 2023	Appendix A
			NA	NA	(No inspections required in this monitoring period. End of Panel for LW W4 completed and reported on in previous reporting period)	NA
		SR17 Rockbar	NA	NA	(No inspections required in this monitoring period. End of Panel for LW W4 completed and reported on in previous reporting periods)	NA
	Historical heritage	Railway culverts	NA	NA	(No inspections required in this monitoring period. End of Panel for LW W4 completed and reported on in previous reporting periods)	NA
Built Features Management Plan	Built Features	Electricity Infrastructure	• SMEC	• MSEC	Post-mining report for 1 January 2023 to 30 June 2023	Appendix A
		Gas Infrastructure				
		Potable Water				
		Sewerage Infrastructure				
		Telecommunications				
		Local roads, bridges and culverts				
		Built Structures				
		Picton-Mittagong Loop Line	NA	NA	(No inspections required in this monitoring period. End of Panel for LW W4 completed and reported on in previous reporting periods)	NA

Management Plan	Aspect	Feature	Monitoring Completed By	Monitoring Reported by	Monitoring Reports Completed during this Reporting Period	Reference
Built Features Management Plan	Built Features	Transport for NSW (TfNSW) Infrastructure	• SMEC • Southern Rail Services • BIS	• MSEC	• Quarterly Victoria Street Status Reports during post-mining period.	Available on request
		Main Southern Railway (MSR)	• SMEC • Southern rail Services • Bloor Rail • BIS • Comms Network Solutions • Newcastle Geotech	• MSEC	• Monthly MSR Status Reports during post-mining of LW W4.	Available on request

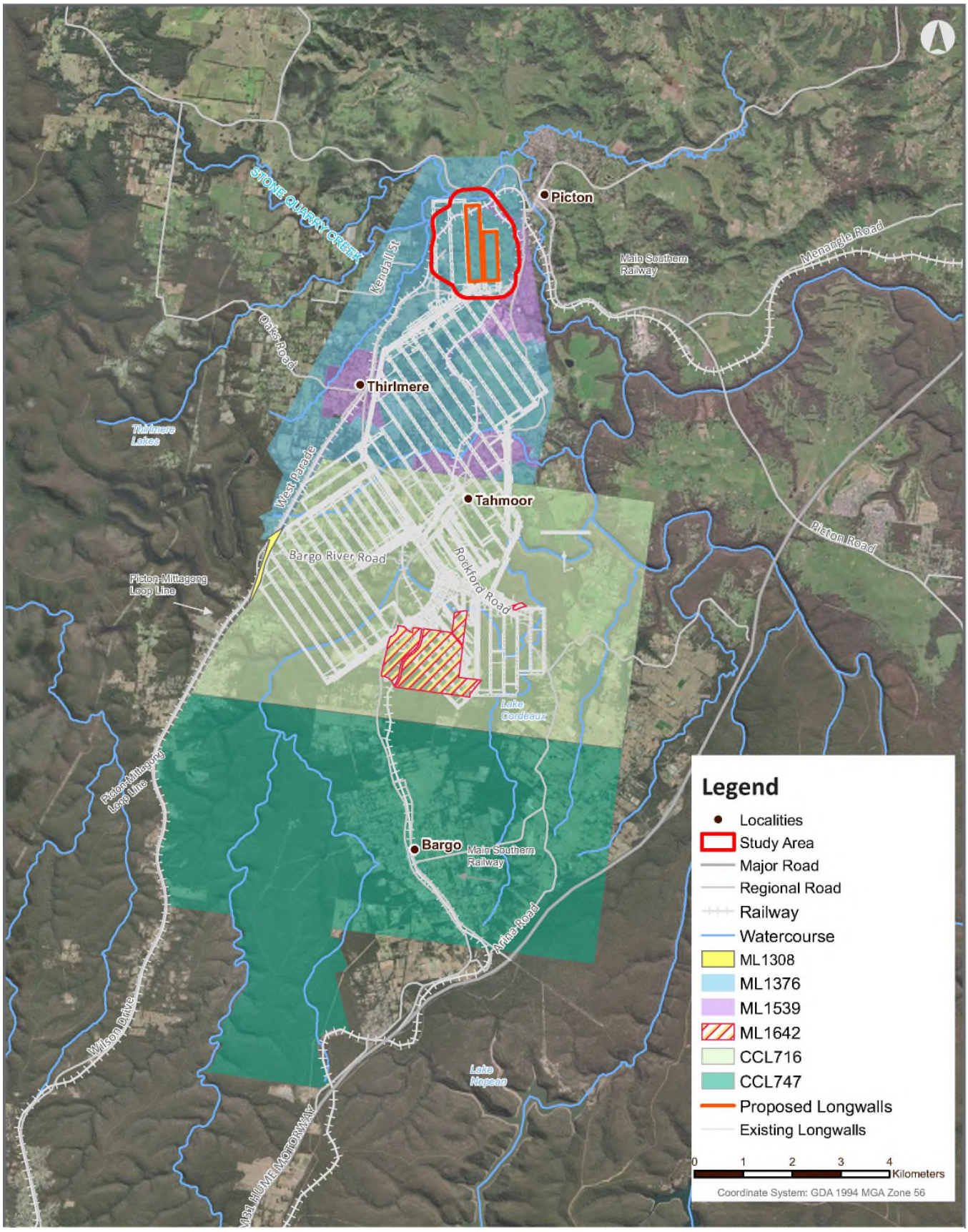

Figure 1-1 Tahmoor Mine Area and Tenure (source: LW W3-W4 Extraction Plan)

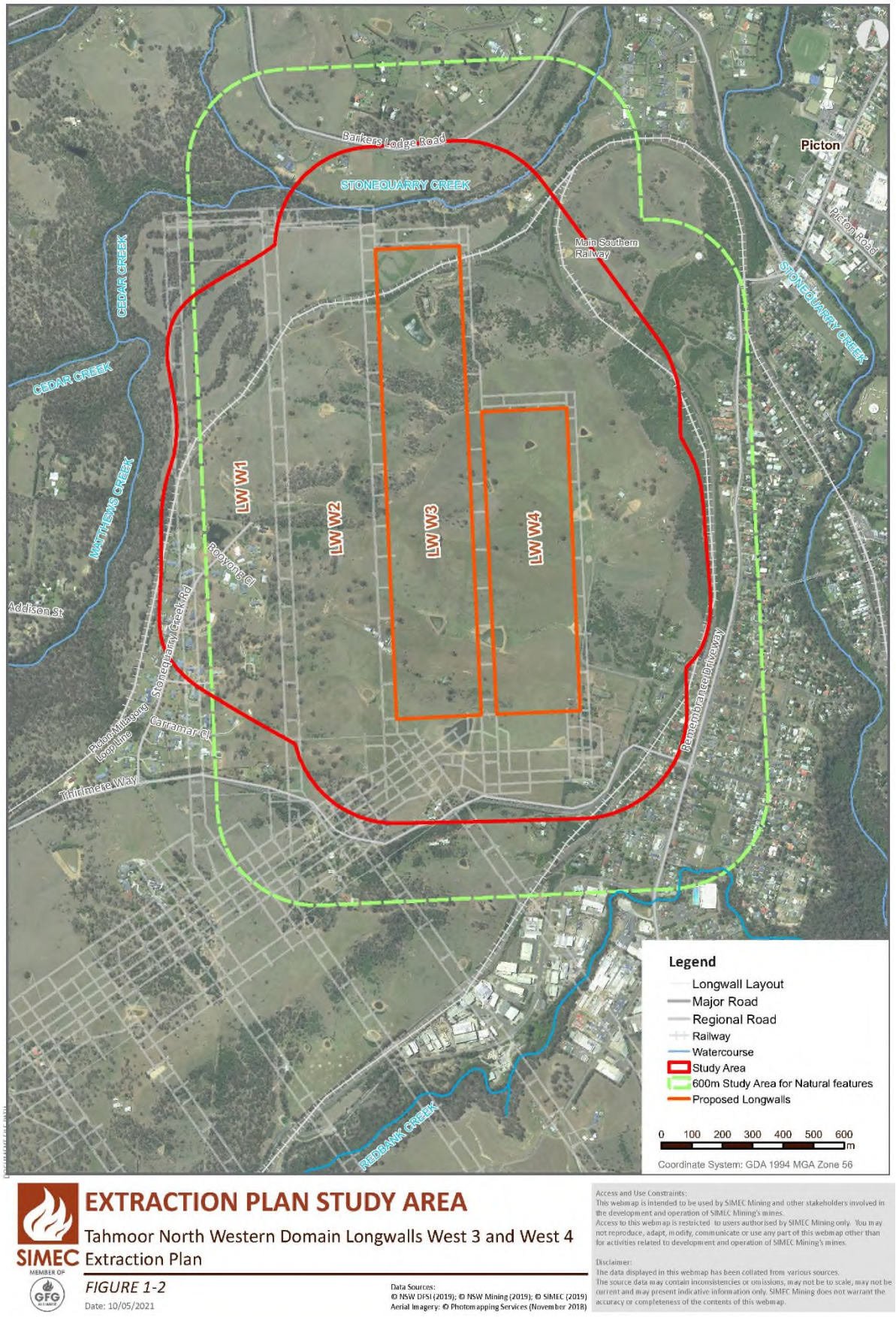

Figure 1-2 LW W3-W4 Extraction Plan Study Area (source: LW W3-W4 Extraction Plan)

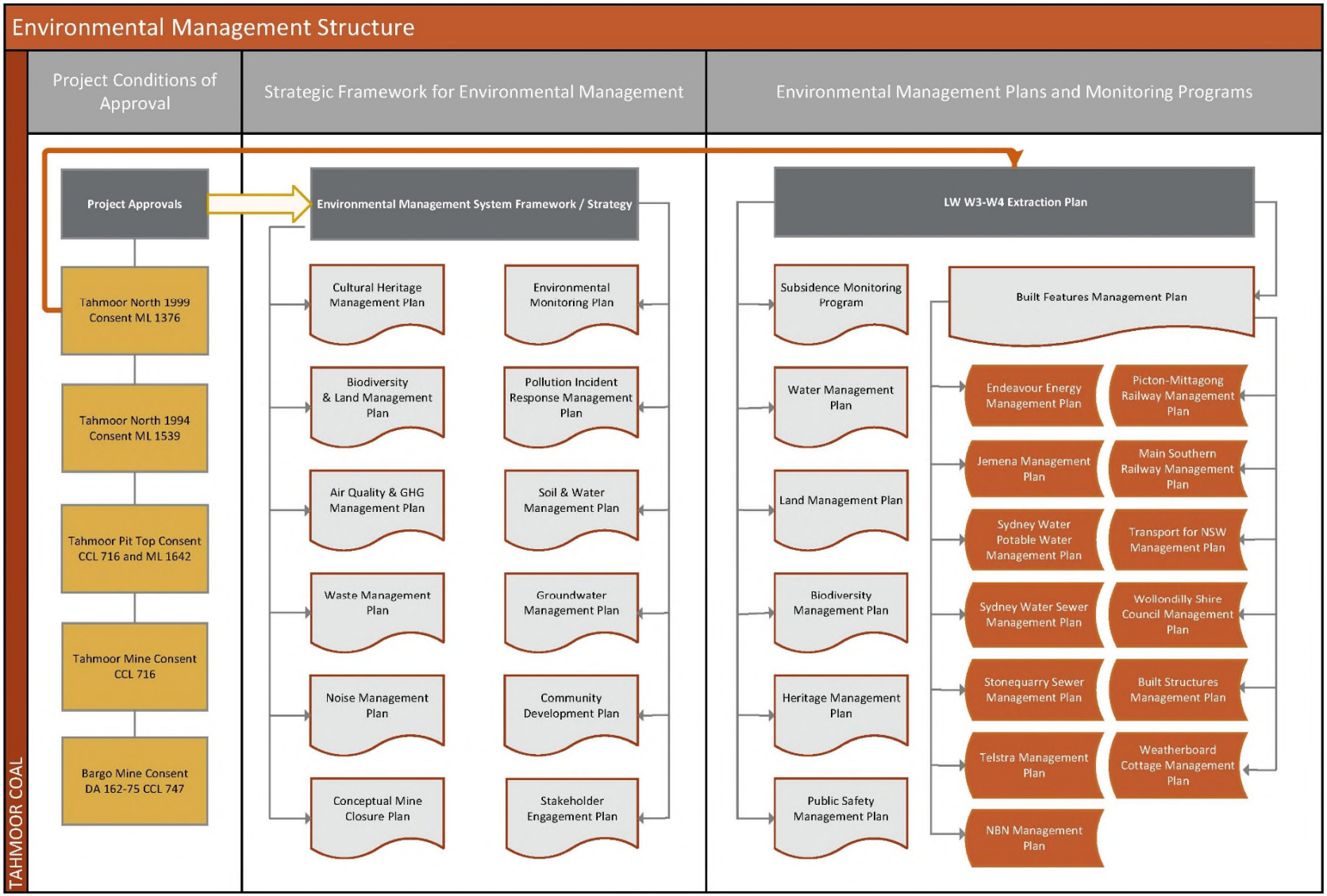

Figure 1-3 Overview of Environmental Management Structure for Tahmoor Coal (source: LW W3-W4 Extraction Plan)

2 Summary of Environmental Monitoring Results

2.1 Subsidence Monitoring

During the reporting period, the LW W3-W4 Subsidence Monitoring Program was implemented to monitor subsidence impacts within the Study Area. The details of the Subsidence Monitoring Program are illustrated in **Figure 2-3**. The Subsidence Monitoring Program included seventeen (17) Global Navigation Satellite System (GNSS) units measuring absolute horizontal and vertical positions in real time installed directly above and adjacent to LW W3-W4. Nine GNSS units have been removed from privately owned properties in July 2023.

A summary of all surveys and inspections completed during the reporting period is provided in MSEC1263 LW W4 Subsidence Monitoring Report 22 (refer **Appendix A**).

Longwall West 4 (LW W4) extraction was completed on 13 September 2022.

Table 2-1 summarises the maximum observed ground movements within the active subsidence zone at the start and end of this reporting period. During the reporting period, a maximum of 897 mm of vertical subsidence relating to the extraction of LW W4 was recorded along the LW W1-W4 crossline survey. Very minor subsidence movements have been observed during the post-mining period of LW W4.

Table 2-1 Subsidence Monitoring Observations during this Reporting Period (source: Appendix A)

	Report 22 (MSEC1263) for LW W4	
Monitoring Period	1/7/2023 – 31/12/2023	
Progress of extraction	LW W4 completed on 13 September 2022	
Observed Ground Movement Parameters	**Maximum Observed Total**	**Location**
Subsidence (mm)	897	LW W1-W4 Crossline
Tilt (mm/m)	9.8	LW W1-W4 Crossline
Hogging Curvature (km^{-1})	0.35	LW W1-W4 Crossline
Sagging Curvature (km^{-1})	-0.33	LW W3 Centreline
Tensile Strain (mm/m)	1.3	LW W2 Centreline
Compressive Strain (mm/m)	-5.6	LW W4 Centreline

2.1.1 Ground Survey Results

The development of subsidence at pegs and GNSS units located on the LW W4 centreline that have been mined directly beneath by LW W4 are illustrated in **Figure 2-1**.

GNSS Site 24 is located directly above the centreline of LW W4, approximately 200 metres from the commencing end. The unit has recorded approximately 680 mm subsidence and has also moved to the east and south. Rates of change have reduced to very low levels. GNSS Site 24 recorded an additional 9 mm of vertical subsidence in the reporting period, which is in the normal range of ground movement related to climatic conditions.

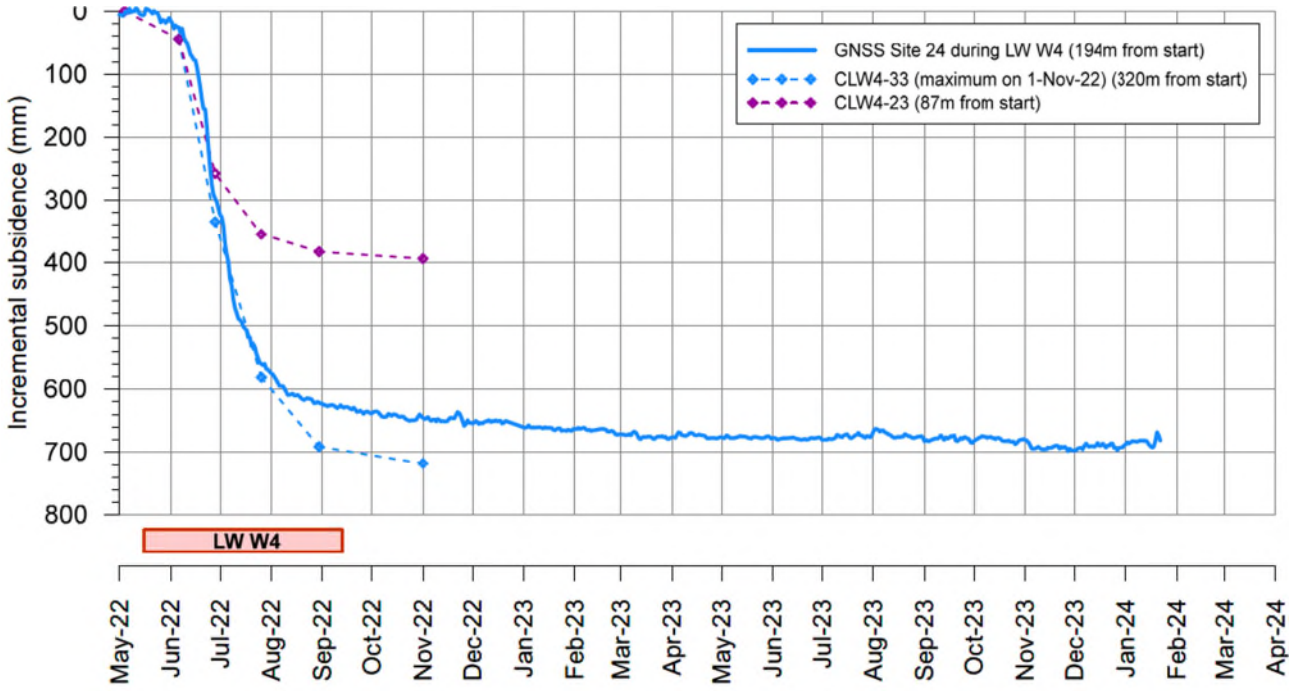

Figure 2-1 Development of subsidence along centreline of LW W4 (source: MSEC, Subsidence Monitoring Report 22, Appendix A).

2.1.2 Valley Closure in Creeks

Survey marks installed across rockbars in Stonequarry Creek, Cedar Creek and Matthews Creek are illustrated in **Figure 2-2**.

During the extraction of LW W3, valley closure was measured to develop across Stonequarry Creek at SQ104 and SQ105, which are located near the confluence of Stonequarry Creek and Cedar Creek. Minor closure was developing across SQ104, SQ105, SQ106 and SQ107 up to 3 November 2021. The survey pegs for SQ101 to SQ109 were removed following the survey on 3 November, as requested by the landowner.

Survey completed at the end of LW W4 noted minor changes in horizontal distances both along and across Rockbar SR17. Minor ground shortening was also observed in the south-east corner of the rockbar. Very little change in closure along Cedar Creek and Matthews Creek was observed during the mining of LW W4.

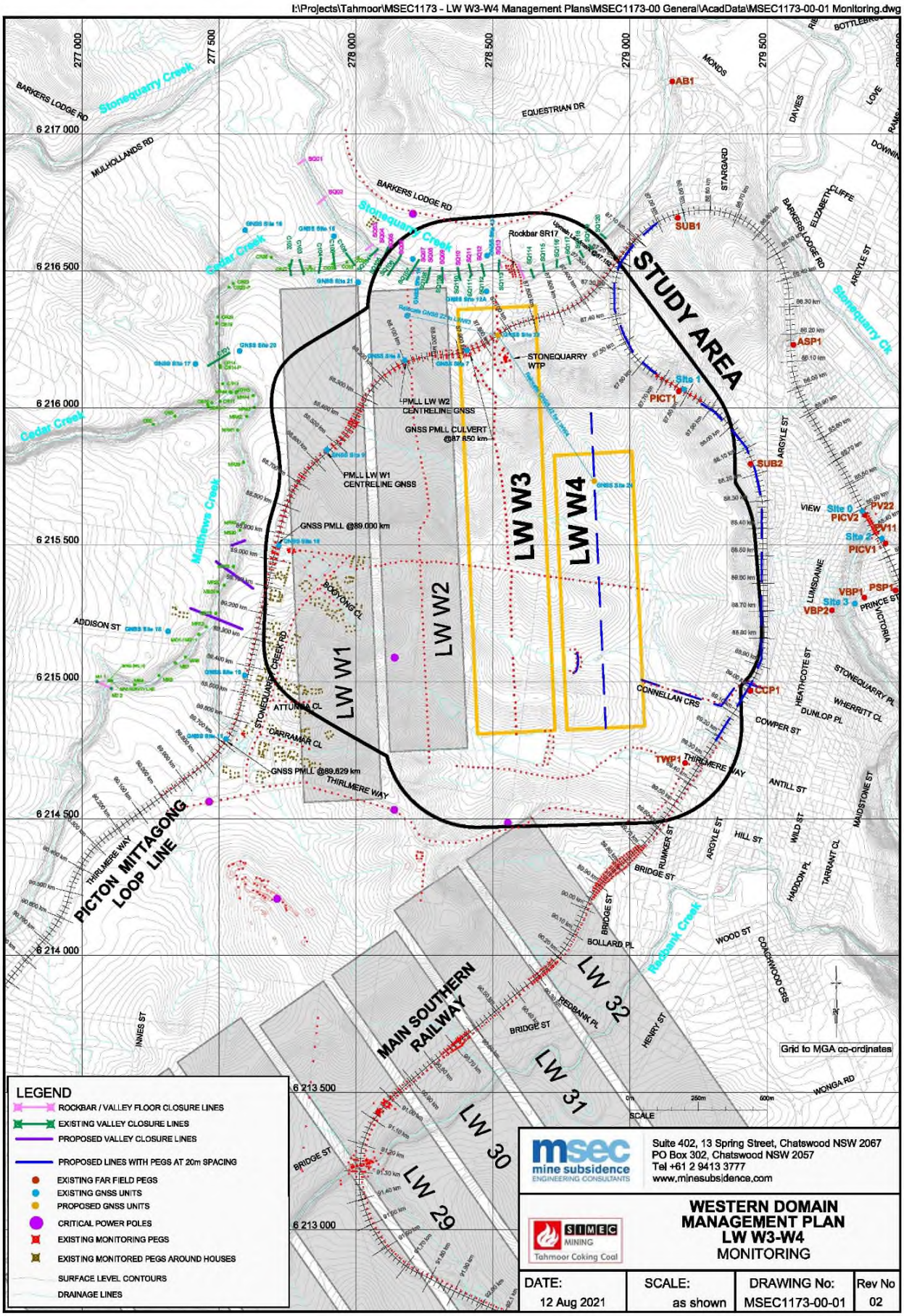

Figure 2-2 LW W3-W4 Subsidence Monitoring Program (source: LW W3-W4 Subsidence Monitoring Program)

2.2 Surface Water Monitoring

The LW W3-W4 Water Management Plan were prepared to manage the potential environmental consequences of LW W3-W4 extraction on surface water in accordance with Condition 13H(vii)(c) of DA 67/98.

During this reporting period, the LW W3-W4 Water Management Plan have been implemented to monitor surface water:

- Flow, pool water level and surface water quality monitored for Stonequarry Creek, Cedar Creek and Matthews Creek – monthly monitoring data reviewed and reported by ATC Williams on a monthly basis during the post-mining phase (refer to **Appendix B**); and
- Creek monitoring for natural drainage behaviour – visual inspections and reporting by Tahmoor Coal completed in August/September and December 2023 during the post-mining phase.

The following sections summarise the observations made during the reporting period for each surface water category. Performance against all Surface Water Management Plan TARPs for the reporting period are summarised in **Table 3-3**, and actions and responses completed relating to any TARP triggers are discussed in **Section 3.2**.

2.2.1 Stonequarry Creek Flow

The assessment of downstream reduction in catchment flow rate recorded at the WaterNSW gauging station Stonequarry Creek at Picton (GS212053) relies on a calibrated streamflow model which enabled comparison of modelled and monitored streamflow rates. The locations of GS212053 is illustrated in **Figure 2-3**.

The rating curve for Stonequarry Creek at Picton (GS212053) was revised by WaterNSW in July and November 2020 and, as such, the streamflow records for the site have changed thereby invalidating the previous model calibration. Despite attempts to recalibrate the streamflow model, challenges were encountered due to the limitations of the gauging station at Stonequarry Creek at Picton (GS212053), the limitations of catchment rainfall records, water extraction from Stonequarry Creek catchment and the inability to adequately match the monitored and modelled flows. As such, the assessment method, and subsequently assessment of TARP triggers in relation to catchment flow rate in Stonequarry Creek at Picton, have been discontinued.

2.2.2 Pool Water Level

Surface water level data has been recorded at the pool monitoring sites on Matthews Creek, Cedar Creek and Stonequarry Creek as shown in **Figure 2-3**. Continuous surface water level data has been recorded at three pool monitoring sites on Matthews Creek, seven monitoring sites on Cedar Creek and four monitoring sites on Stonequarry Creek. Manual water level measurements have also been undertaken monthly at the sites shown in **Figure 2-3**.

With the exception of monitoring site CB Cedar Creek (discussed further below), water levels at monitoring sites on Matthews Creek, Stonequarry Creek, and Cedar Creek remained above minimum baseline levels and/or were consistent with baseline conditions during the reporting period.

Charts illustrating monitored pool water level hydrographs for pools on Matthews Creek, Cedar Creek and Stonequarry Creek are presented in the Surface Water Monitoring Report (refer to **Appendix B**).

Further discussion of the reduced water level occurrences and related TARP triggers is provided in **Section 3.2.1**.

2.2.2.1 Monitoring Site CB (Pool CR14)

The water level at monitoring site CB (pool CR14) was recorded below the CTF level and below the baseline minimum between 1 July to 5 July, 8 July to 14 August, 21 August to 5 October, 7 October to 17 November, 19 November to 28 November and 18 December to 19 December 2023.

The water level decline during the review period was considered negligible, with a maximum of 2 cm decline below the baseline minimum. The water level decline was not atypical and occurred during a period of generally below average rainfall. In addition, negligible surface flow was reported from Matthews Creek to Cedar Creek during the reporting period, and water level at reference site Cedar US declined below the historical minimum water level for extended periods of September to December 2023. These conditions contributed to a notable decline in flow in the mid to lower reach of Cedar Creek.

2.2.3 Natural Drainage Behaviour

Visual and photographic surveys for subsidence impacts on creeks were completed in August / September 2023 for all monitoring pools on Stonequarry Creek, Cedar Creek and Matthews Creek in the post-mining monitoring period. The purpose of these surveys is to note whether change has occurred to pool level, drainage or overland flow, and to assist in determining if any change can be attributed to mining impacts. Surveys are carried out to identify rock bar and/or stream base cracking, gas release, or increased iron precipitation.

Creek monitoring locations are illustrated on **Figure 2-4**, and a summary of creek observations for the reporting period is provided below:

- Surficial fracturing of the controlling rockbar at Pool SR17 and a rockbar at Pool SR20 have been noted, and have not changed since the previous Six Monthly Subsidence Impact Report;
- There were no additional surface fracturing or cracking noted in the waterways during the reporting period;
- No reduction in pool water level, flow or connective overland flow was observed in the waterways during the reporting period;
- No iron hydroxide precipitation or gas release was noted in the waterways during the reporting period.

The surficial fracturing of the controlling rockbar at Pool SR17 was first noted following the visual inspection on 17 November 2021. The fractures occurred in thinly bedded, laminated sandstone and were likely in response to mining related differential compression in combination with the presence of existing delamination in the rockbar surface formed by natural weathering processes.

The surficial fracturing of a rockbar at Pool SR20 was noted following the inspection on 18 August 2022. Two fractures were noted and it was confirmed that one crack was the development of an existing (pre-mining) joint / discontinuity, while the other was first observed during mining of LW W4.

Fractures at Pools SR17 and SR20 were noted to be surficial. During the reporting period, surficial fracturing at both sites was noted to be stable.

Further discussion of surficial fracturing and related TARP triggers is provided in **Section 3.2.2**.

2.2.4 Surface Water Quality

Surface water quality data has been recorded at the following sites (refer to **Figure 2-3**):

- Cedar Creek: Cedar US, CC1, CA, CB, CC, CD, CE, CF, CG;
- Matthews Creek: MB, MC1, MG; and
- Stonequarry Creek: SC1, SC2, SC, SD, SE.

Field analyses are undertaken for pH, electrical conductivity (EC), dissolved oxygen, temperature and oxidation reduction potential. Laboratory analyses are undertaken for pH, EC, TDS, alkalinity, sulphate, chloride, calcium, magnesium, sodium, potassium, fluoride, nitrate+nitrite, total kjeldahl nitrogen, phosphorus and the following total and dissolved metals: aluminium, arsenic, barium, copper, lead, lithium, manganese, nickel, selenium, strontium, zinc and iron.

A summary of observations for the reporting period is provided in **Table 2-2**. Charts illustrating water quality results for monitored pools on Matthews Creek, Cedar Creek and Stonequarry Creek are presented in Appendix C of the Surface Water Review reports (refer to **Appendix B**).

To date, there has been negligible evidence of an influence of mining LW W1-W4 on surface water quality in Matthews Creek, Cedar Creek or Stonequarry Creek. The water quality characteristics of monitoring sites following commencement of mining LW W1-W4 have been largely consistent with baseline conditions and/or consistent with reference site conditions.

During December 2023, isolated occurrences of elevated pH levels were recorded at monitoring sites SC and SD in Stonequarry Creek. From photographs of monitoring site SD taken on 8 December 2023, it is indicated that the presence of extensive algae growth has likely contributed to an increase in pH at these sites.

Also, during December 2023, an isolated occurrence of elevated dissolved aluminium was recorded at monitoring site SD in Stonequarry Creek. This measurement was only slightly elevated (0.08 mg/L) above the site specific trigger value, and it was noted that similar or greater elevations had been recorded at several sites historically. As such, the slightly elevated dissolved aluminium concentration at monitoring site SD was considered to be related to the prevailing climatic conditions and to the contribution of flow from Cedar Creek to Stonequarry Creek containing elevated concentrations of dissolved aluminium.

Further discussion of the elevated water quality occurrences and related TARP triggers is provided in **Section 3.2.3**.

Table 2-2 Summary of Notable Results for Key Water Quality Parameters for the Reporting Period

Parameter	Matthews Creek	Cedar Creek	Stonequarry Creek
pH	• Slightly acidic to near neutral pH conditions. • The pH values recorded during the review period were within the range of baseline values.	• Acidic to near neutral pH conditions. • With the exception of Cedar US, a generally declining trend in pH was recorded from April to September 2023, although the pH values remained within the range of baseline values. • An increase in pH was recorded at the majority of sites in December 2023, following above average rainfall.	• Slightly alkaline to circumneutral pH conditions. • The pH values recorded during the review period were mostly within the historical range, except for monitoring sites SD and SC. • A historical maximum pH value of 9.59 was recorded at site SD in December 2023. • An elevated pH (9.26) was recorded at monitoring site SC in December 2023.
Electrical Conductivity	• Field EC values were within the range of baseline values (less than 700 µS/cm) for the duration of the review period.	• A generally increasing trend in EC was recorded at all sites from February to November 2023, although the EC values remained within the range of baseline values. • EC values declined in December 2023 following above average rainfall.	• A generally increasing trend in EC was recorded at majority of sites from February to November 2023. • A historical maximum EC value of 1,411 µS/cm was recorded at reference site SC1 in July 2023.
Dissolved Aluminium	• The concentrations of dissolved aluminium were within the range of baseline concentrations for the duration of the review period.	• Slightly elevated concentrations of dissolved aluminium (greater than 0.1 mg/L) were recorded at CC1 from August to November 2023 and at CA from August to October 2023. • However, the concentrations recorded at all sites during the review period were within the range baseline conditions.	• The concentrations of dissolved aluminium were within the range of baseline concentrations for the duration of the review period.
Dissolved Barium	• The concentrations of dissolved barium were consistent with baseline concentrations for the duration of the review period.	• With the exception of Cedar US, a generally increasing trend in dissolved barium was recorded from March to November 2023. • Although dissolved barium concentrations increased at majority of sites, the values remained within the range of baseline values. • Dissolved barium concentrations declined in December 2023 following above average rainfall.	• A generally increasing trend in dissolved barium was recorded at all sites from March to November 2023. • A historical maximum concentration of 1.49 mg/L was recorded in October 2023 at reference site SC1. • Dissolved barium concentrations declined in December 2023 following above average rainfall.

Parameter	Matthews Creek	Cedar Creek	Stonequarry Creek
Dissolved Iron	• The concentrations of dissolved iron were generally less than or consistent with baseline concentrations for the duration of the review period.	• Slightly elevated concentrations of dissolved iron (less than 4 mg/L) were recorded at monitoring site CB from July to September 2023, however the concentrations remained within the range of baseline concentrations. • A historical maximum of 6.92 mg/L was recorded at monitoring site CB in November 2023. • The concentrations of dissolved iron recorded at all other sites were within the range of baseline concentrations for the duration of the review period.	• The concentrations of dissolved iron were within the range of baseline concentrations for the duration of the review period.
Dissolved Manganese	• Concentrations recorded at all sites were consistent with or less than baseline values.	• Concentrations recorded at all sites were within the range of baseline values.	• Concentrations recorded at all sites were within the range of baseline values.
Dissolved Nickel	• Concentrations recorded at all sites were consistent with or less than baseline values.	• With the exception of Cedar US, a generally increasing trend in dissolved nickel was recorded from March to September 2023. • The dissolved nickel concentrations declined at all sites in the second half of the review period. Dissolved nickel concentrations were within the range of baseline values at all sites with the exception of reference site CC1 from September to November 2023.	• The dissolved nickel concentrations recorded at all sites were generally within the range of baseline values.
Dissolved Zinc	• The concentrations of dissolved zinc recorded at all sites were consistent with or less than baseline values.	• With the exception of Cedar US, a generally increasing trend in dissolved zinc was recorded from March to September 2023. • The dissolved zinc concentrations declined at all sites in the second half of the review period. • Elevated concentrations (above 0.1 mg/L) were recorded at reference site CC1 from August to October 2023. • Slightly elevated concentrations (around 0.08 mg/L) were recorded at monitoring site CA from July to October 2023.	• The concentrations of dissolved zinc recorded at all sites were generally consistent with or less than baseline values.

Parameter	Matthews Creek	Cedar Creek	Stonequarry Creek
Sulphate	• The concentrations of sulphate recorded at all sites were within the range of baseline concentrations.	• The concentrations of sulphate recorded at all sites were within the range of baseline concentrations.	• With the exception of reference site SC1, the concentrations of sulphate recorded at all sites were within the range of baseline concentrations. • Reference site SC1 recorded an historical maximum of 30 mg/L in November 2023.

2.2.5 Flooding

A post-mining flood study was completed following the completion of mining in the Western Domain, and the results were included in the previous Six Monthly Subsidence Impact Report.

2.2.6 Recommendations and Actions

2.2.6.1 Current Surface Water Monitoring Recommendations

As discussed in the Surface Water Review (**Appendix B**), on the basis of results that indicate impacts from prevailing climatic conditions and the completion of 15 months of post-mining monitoring, ATC Williams has recommended that the post-mining monitoring program is ceased. In accordance with the post-mining monitoring requirements in the LW W3-W4 Water Management Plan, monitoring at surface water monitoring locations ceased in December 2023, and this report will be the final monitoring report for Western Domain.

2.2.6.2 Previous Surface Water Monitoring Recommendations

Table 2-3 provides the recommendations as made in the previous Six Monthly Subsidence Impact Report (January to June 2023, submitted in September 2023) for surface water, the previous quarterly surface water report (July to September 2023, submitted in December 2023), along with an update on the progress of these recommendations.

Table 2-3 Surface Water Monitoring Recommendations from the previous Surface Water Review and Current Progress

Item	Previous Recommendation	Progress of Recommendation
1	**Previous Six monthly Subsidence Impact Report** Ongoing review of surface monitoring data is continued to be undertaken in accordance with the LW S1A-S6A Water Management Plan.	Completed as part of this report.
2	**Previous Quarterly Surface Water Report** It is recommended that the post-mining monitoring program is ceased. It is considered that a corrective management action plan is not required to be implemented at any site in the Western Domain. This recommendation was made in light of the following findings: • The environmental consequences associated with mining related effects in the Western Domain Investigative Area are considered negligible.	The Western Domain Surface Water monitoring program was completed at the end of December 2023.

Item	Previous Recommendation	Progress of Recommendation
	• The performance measures for the Western Domain have not been exceeded. • It is considered that a corrective management action plan is not required to be implemented at monitoring site CB, pool SR17 or pool SR20.	

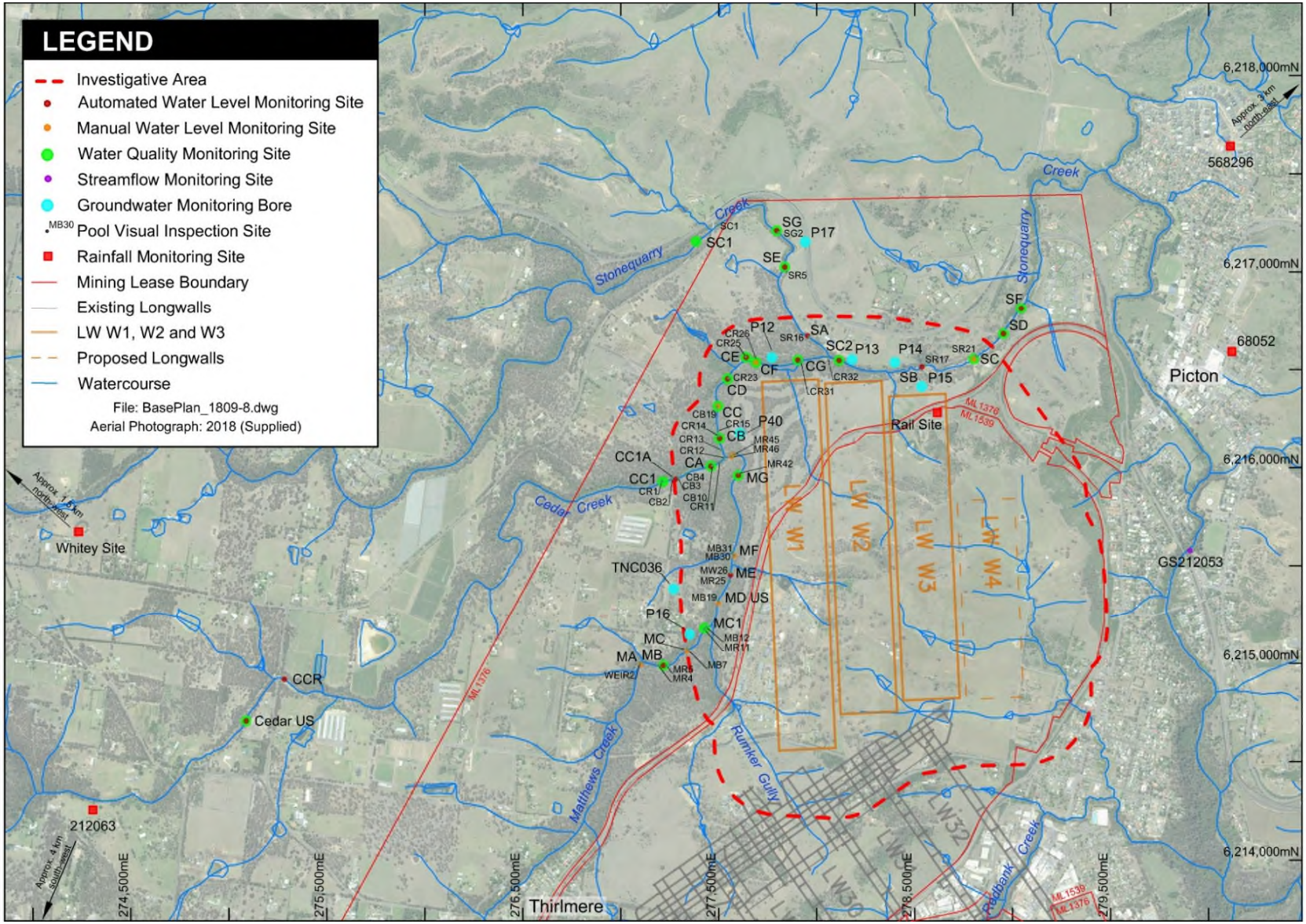

Figure 2-3 *LW W3-W4 Surface Water Monitoring Locations (source: ATC Williams, Surface Water Reviews, Appendix B).*

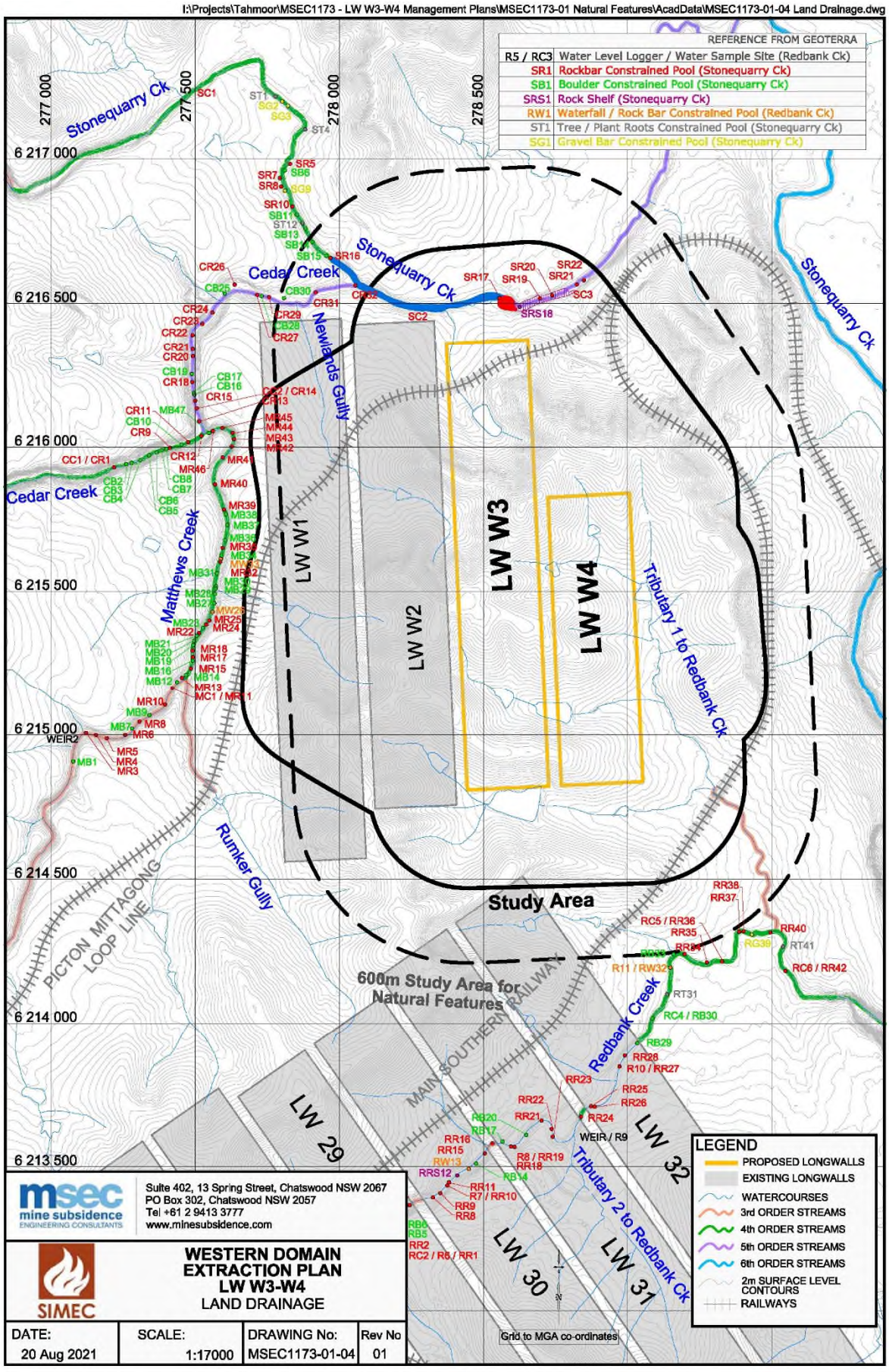

Figure 2-4 LW W3-W4 Creek Monitoring Locations (source: MSEC, 2021; LW W3-W4 Subsidence Predictions and Impact Assessment Report)

2.3 Groundwater Monitoring

The LW W3-W4 Water Management Plan was prepared to manage the potential environmental consequences of LW W3-W4 extraction on groundwater in accordance with Condition 13H(vii)(c) of DA 67/98.

During this reporting period, the LW W3-W4 Water Management Plan has been implemented to monitor groundwater:

- Shallow groundwater levels, quality and pressures, and deep groundwater levels / pressures – monthly monitoring data reviewed and reported by SLR on a quarterly basis during the post-mining phase (refer to **Appendix C**); and
- Mine water intake – data for this reporting period reviewed and reported by SLR (refer to **Appendix C**).

The following sections summarise the observations made during the reporting period for each groundwater category. Performance against all Groundwater Management Plan TARPs for the reporting period are summarised in **Table 3-3**, and actions and responses completed relating to any TARP triggers are discussed in **Section 3.2.**

2.3.1 Groundwater Bore Levels

A total of 17 open standpipe piezometers (OSPs) have been installed at six locations in the Western Domain – P12 to P17, and a number of private groundwater bores form part of the groundwater monitoring program for LW W3-W4. It is noted that Tahmoor Coal no longer has access to piezometers P13 and P17 due to land access constraints. The locations of these groundwater bores are illustrated in **Figure 2-5**.

Further detail on the below groundwater level trends, including graphs showing progressive groundwater levels, are provided in the SLR groundwater reports (refer to **Appendix C**). Further detail and discussion of TARP triggers for groundwater level are also discussed in **Section 3.2.4**.

At monitoring bores P12, P14, P15, P16 and private bores, ongoing recovery of groundwater levels are being observed following the completion of mining in the Western Domain.

Groundwater level at P12C is still recovering from a maximum groundwater depressurisation of 11m in February 2021. During the reporting period, groundwater levels remained consistent with the previous reporting period, likely related to a reduction in rainfall during seasonally dryer months. Land access to this bore was lost temporarily in November 2023 and reinstated in February 2024. A manual water level taken in February 2024 indicates a return to baseline conditions at P12C.

Groundwater level at P16C slightly increased during the reporting period. It is expected that groundwater levels at this bore will continue to rise, noting that they have been doing so under below average rainfall conditions since May 2023.

2.3.2 Groundwater Pressures

VWP arrays have been installed at locations TNC36, TNC40, TNC43, P40, P41, WD01 and WD02 (refer to **Figure 2-5**). TNC043 was decommissioned due to terminated site access and has been removed from the TARP assessment from July 2022 onwards. WD01 was decommissioned in April 2023. VWP arrays have been installed in the newly completed WD02, however trigger levels for groundwater levels of each VWP pressure sensor are yet to be established.

Further detail on the below groundwater level triggers, including graphs showing progressive groundwater levels, are provided in the SLR groundwater reports (refer to **Appendix C**). Further detail and discussion of TARP triggers for groundwater level are also discussed in **Section 3.2.5** and **Section 3.2.6**.

LW W3 and LW W4 extraction had no significant effects on shallow and deep groundwater across the Western Domain throughout the reporting period.

Groundwater elevations at P40 and P41 typically remained stable during the reporting period with the groundwater elevation in all sensors observed above the creek bed elevation.

Groundwater levels at TNC036 are steadily increasing at all sensors with significant recovery observed in the deeper sensors in the Bulgo Sandstone aquifer. All deep sensors recovered to above modelled drawdown predictions during this reporting period. Groundwater levels at TNC040 showed recovery of the aquifer to pre-mining conditions.

2.3.3 Mine Water Intake

Tahmoor Coal has a Groundwater Licence (WAL 36442) to extract 1642 ML/year of groundwater make from underground.

Water make is calculated from the difference between total mine inflows and total mine outflows. This calculation is assisted by input from flow meters installed on fresh water supply lines that pump water into the mine (mine inflow from Sydney Water supply to underground workings), and flow meters on three pipelines that extract water from underground (mine outflow). In addition, mine inflow and outflow also includes a measurement of water that enters and exits the mine through other means such as moisture in air vented in and out of the mine (water in vented air), and moisture in coal extracted from the mine.

Water make calculations provide an indication of the groundwater pumped out of the total Tahmoor Mine underground workings.

SLR completed an analysis of water make for Tahmoor Mine recorded between 1 January 2009 to 31 December 2023 (refer **Appendix C**). During this period, observed inflows to Tahmoor Mine have been ranging between 2 to 7 ML/d.

In October 2022, the Western Domain blocks were sealed. Since this time, the average groundwater inflow from Tahmoor underground workings is reported as 2.3 ML/d. As of 31 December 2023, the cumulative groundwater make for water year 2023/24 is 673 ML, which remains below the groundwater entitlement of 1,642 ML/y.

2.3.4 Groundwater Quality

A total of 17 open standpipe piezometers (OSPs) have been installed at six locations in the Western Domain – P12 to P17, and a number of private groundwater bores form part of the groundwater monitoring program for LW W3-W4. It is noted that Tahmoor Coal no longer has access to piezometers P13 and P17 due to land access constraints. The locations of these groundwater bores are illustrated in **Figure 2-5**.

Further detail on the above groundwater quality triggers, including graphs showing progressive groundwater quality results for pH, EC and selected metals, are provided in the SLR reports included in **Appendix C**. Further detail and discussion of TARP triggers for groundwater quality are also discussed in **Section 3.2.7**.

Overall, improvement in groundwater quality is being observed across most of the shallow open standpipes within the monitoring network (where data was available).

2.3.4.1 Electrical conductivity and pH

During the reporting period, a number of short-term elevation (less than three months) of pH and electrical conductivity (EC) levels were observed. These minor breaches of the trigger levels are in line with historical natural fluctuations and are unlikely to be attributable to mining.

At P12A, pH levels were elevated between January to August 2023, before decreasing to normal conditions in September 2023. pH levels at P12B and P12C remain between the lower and upper pH trigger levels, and the general trend in pH over time in P12A, P12B and P12C is consistent. Therefore, the elevation of pH at P12A is likely to be localised and natural.

2.3.4.2 Metal concentrations

A number of elevated metal concentrations were noted during the review period, including numerous short-term increases (usually less than three months). These minor breaches of the trigger levels were in line with historical natural fluctuations and are unlikely to be attributable to mining.

At P15B, elevated strontium concentrations were observed during the entire reporting period. The concentration of dissolved strontium has fluctuated over the past 12 months and likely represents the natural fluctuation in the groundwater. It has been observed in this area that strontium is released from geological strata with increased rainfall.

At P15D, elevated iron concentrations were observed during the entire reporting period. Fluctuations in dissolved iron concentrations observed during the reporting period appear consistent with observed concentrations during a similar time in mid to late 2022, and is in alignment with natural variation.

At P16B, elevated strontium concentrations were observed from October to December 2023. Similarly to that observed at P15B, this increased concentration was attributed to a release of strontium from geological strata with increased rainfall in the area.

2.3.5 Recommendations and Actions

2.3.5.1 Current Groundwater Monitoring Recommendations

In summary, groundwater level results indicate significant recover of groundwater across the area and groundwater quality results indicate that quality triggers are not likely to be due to mining impacts. In light of these results and the completion of 15 months of post-mining monitoring, SLR recommended that the post-mining monitoring program is ceased. In accordance with the post-mining monitoring requirements in the LW W3-W4 Water Management Plan, monitoring at groundwater monitoring locations ceased in December 2023, and this report will be the final monitoring report for Western Domain.

A number of bores have been selected for ongoing monitoring as part of requirements associated with other operations at Tahmoor Mine. These bores include P14 nested suite, P16 nested suite, WD02 and TNC040.

2.3.5.2 Groundwater Recommendations from the previous Six Monthly Subsidence Impact Report and Quarterly Groundwater Report

Table 2-4 provides the recommendations as made in the previous Six Monthly Subsidence Impact Report (January to June 2023, submitted in September 2023) for groundwater, the previous quarterly groundwater report (July to September 2023, submitted in December 2023), along with an update on the progress of these recommendations.

Table 2-4 Groundwater recommendations from the previous Six Monthly Subsidence Impact Report and Quarterly Groundwater Report and Current Progress

Item	Previous Recommendation	Progress of Recommendation
1	**Previous Six Monthly Subsidence Impact Report** Where a TARP Level 1 applied during the reporting period, continue the groundwater monitoring program and reporting of groundwater level and quality data in the next groundwater review report.	Completed as part of the previous quarterly groundwater report (submitted December 2023), as well as part of this Six Monthly Subsidence Impact Report (**Sections 2.3, Section 3.2; Appendix C**).
2	**Previous Six Monthly Subsidence Impact Report** Where TARP Level 2 applied during the reporting period, continue the groundwater monitoring program and reporting of groundwater level and quality data in the next groundwater review report.	Completed as part of the previous quarterly groundwater report (submitted December 2023), as well as part of this Six Monthly Subsidence Impact Report (**Sections 2.3, Section 3.2; Appendix C**).
3	**Previous Six Monthly Subsidence Impact Report** Groundwater Quality – for all sites with Level 2 TARPs in place, closely monitor concentrations against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Completed as part of this Six Monthly Subsidence Impact Report (**Sections 2.3, Section 3.2; Appendix C**). At the conclusion of this reporting period (December 2023) there are six active TARP Level 2 sites (P14B, P15A, P15B, P16A, P16B and P16C). Overall, baseline conditions are generally apparent across the area.
4	**Previous Six Monthly Subsidence Impact Report** Groundwater Levels - for all sites with Level 2 TARPs in place, closely monitor groundwater levels against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Completed as part of this Six Monthly Subsidence Impact Report (**Sections 2.3, Section 3.2; Appendix C**). The previous six-monthly reports and quarterly reports showed two monitoring sites with active Level 2 TARPs. At the conclusion of this reporting period (December 2023), the same two TARP triggers are still active (P12C and P16C). These sites have shown significant recovery and were very close to meeting TARP Level 1 criteria. Overall, there was a notable recovery and return to baseline conditions across the area during the reporting period. In February 2024, manual water level at P12C demonstrated return to baseline conditions.
5	**Previous Six Monthly Subsidence Impact Report** Groundwater Pressures – continue to evaluate groundwater levels against model predictions and the rate of depressurisation over time. For all sites with Level 2 TARPs in place, closely monitor groundwater pressures levels against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Completed as part of this Six Monthly Subsidence Impact Report (**Sections 2.3, Section 3.2; Appendix C**). The previous quarterly report showed active Level 2 TARPs at three monitoring sites. At the conclusion of this reporting period (December 2023), all TARP triggers have been resolved. Overall, there was a notable recovery and return to baseline conditions across the area during the reporting period.
6	**Previous Six Monthly Subsidence Impact Report** Revise the trigger level for dissolved iron at P15D to 2.5 mg/L (SLR, 2023a).	Completed as part of the previous quarterly groundwater report (submitted December 2023).
7	**Previous Six Monthly Subsidence Impact Report** Revise the trigger level at GW105228 to 0.25 mg/L to align with the lithium trigger level at GW115860 (SLR, 2023a).	Completed as part of the previous quarterly groundwater report (submitted December 2023).

Item	Previous Recommendation	Progress of Recommendation
8	**Previous Quarterly Surface Water Report** Overall, there has been significant recovery across the area, with minor trigger exceedances still in place. The quality triggers are not deemed to be likely due to mining impacts, and the water level/pressure triggers are for bores that have shown significant recovery and are very near Level 1 TARPs. Consequently, the post-mining period has demonstrated recovery of the aquifer to Level 1 TARP conditions ("normal" conditions). A number of bores will be selected for ongoing monitoring as part of requirements associated with current extraction operations at Tahmoor Coal. This is likely to include P14 nested suite, P16 nested suite, WD02 and TNC040.	Other than a number of bores selected for ongoing monitoring, the Western Domain Groundwater monitoring program was completed at the end of December 2023.

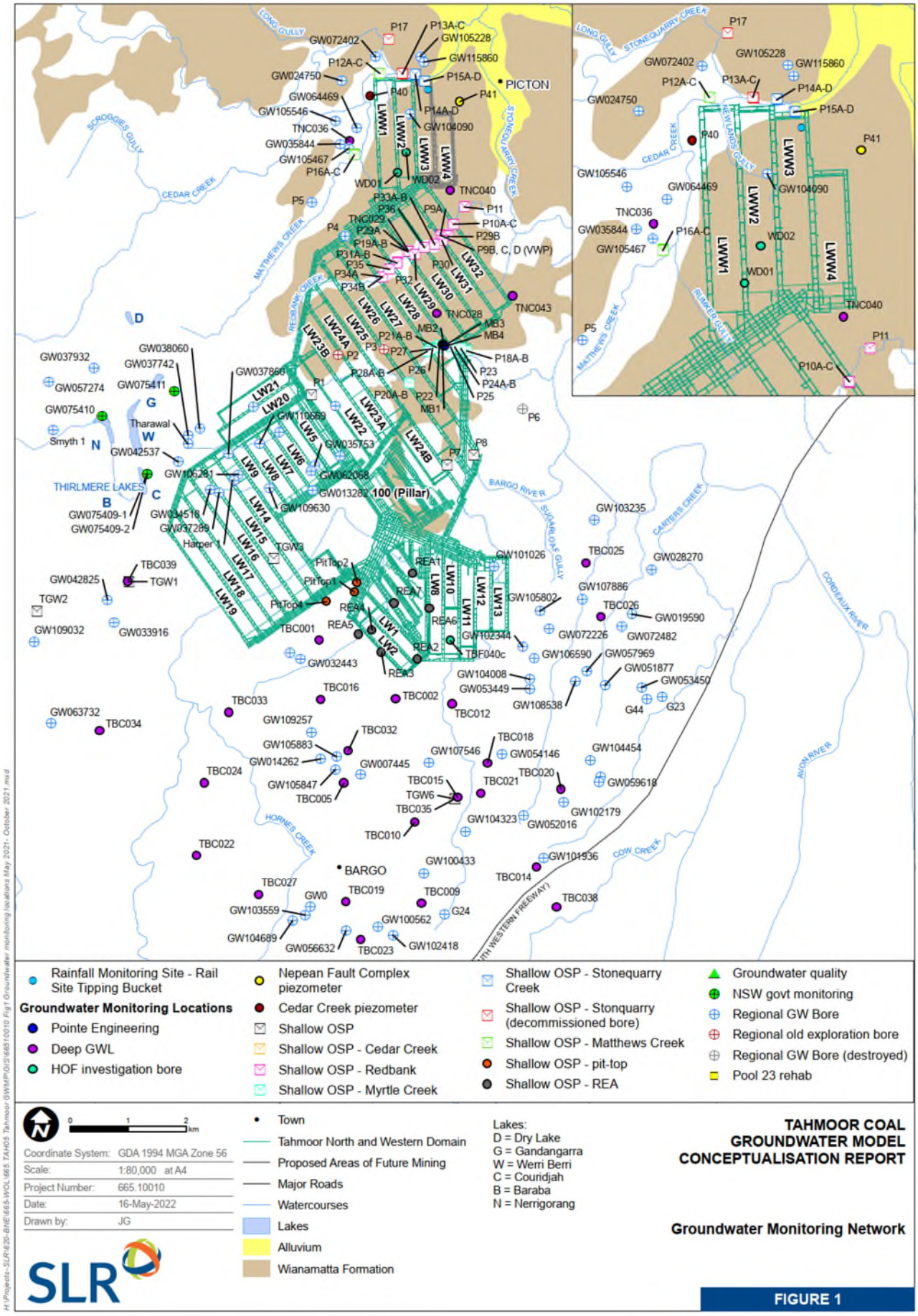

Figure 2-5 *LW W3-W4 Groundwater Monitoring Bores (source: Groundwater Six-Month Review, SLR; Appendix C)*

2.4 Land Monitoring

The LW W3-W4 Land Management Plan was prepared to manage the potential environmental consequences of LW W3-W4 extraction on steep slopes, dams, agricultural land, and land in general in accordance with Condition 13H(vii)(e) of DA 67/98.

During this reporting period, the LW W3-W4 Land Management Plan have been implemented to monitor the following landscape features:

- Steep slopes and dams – visual inspections and reporting by geotechnical engineers from Douglas Partners in September 2023 during the post-mining phase; and
- Agricultural land – visual inspections and reporting by Building Inspection Service in September 2023 during the post-mining phase.

It is noted that there are no cliffs or rock outcrops within the LW W3-W4 Study Area.

The following sections summarise the observations made during the reporting period for each land category. Performance against all Land Management Plan TARPs for the reporting period are summarised in **Table 3-3**.

2.4.1 Steep Slopes

Visual and photographic surveys for subsidence impacts on structures near steep slopes have been completed quarterly during the post-mining phase for features within the LW W3-W4 active subsidence zone. The locations of steep slopes within the LW W3-W4 Study Area are illustrated in **Figure 2-6**.

During the reporting period, structures located on Stonequarry Creek Road, Booyong Close, Attunga Close, Carramar Close, Thirlmere Way, Star Street, Connellan Crescent, and the Waste Water Treatment Plant (WWTP) were inspected. There were no signs of impacts or changes in the areas inspected that could be attributed to mine subsidence.

2.4.2 Dams

Visual and photographic surveys for subsidence impacts on dams were completed on a quarterly basis during the post-mining phase for dams within the LW W3-W4 active subsidence zone. The location of dams within the LW W3-W4 Study Area are illustrated in **Figure 2-7**.

During the reporting period, there were no observable changes to farm dams that were considered to be due to mine subsidence. Soil instability (e.g. localised soil slumping, cracking and stepping) was noted at a number of dams (FD1, FD3, FD7, FD15) during the reporting period, however these changes were confirmed to be unrelated to mining subsidence.

2.4.3 Agricultural Land

Visual and photographic surveys for subsidence impacts on agricultural land have been completed on a quarterly basis during the post-mining monitoring period. Inspections points were set up prior to the commencement of LW W3 mining to provide vantage of agricultural land within the LW W3-W4 Study Area. The purpose of the surveys is to note whether change has occurred to agricultural land, and to assist in determining if any change can be attributed to mining impacts. Surveys noted the presence of erosion, condition of boundary and internal fencing components, paddock gate condition, out-building condition, paddock dam condition, presence of any surface slumping or cracking, and the presence of vegetation dieback.

Agricultural land identified within the LW W3-W4 Study Area are illustrated on **Figure 2-8**.

During the reporting period, it was noted that seasonal changes had affected vegetation growth, however there were no observable changes to agricultural land in comparison to pre-mining baseline data.

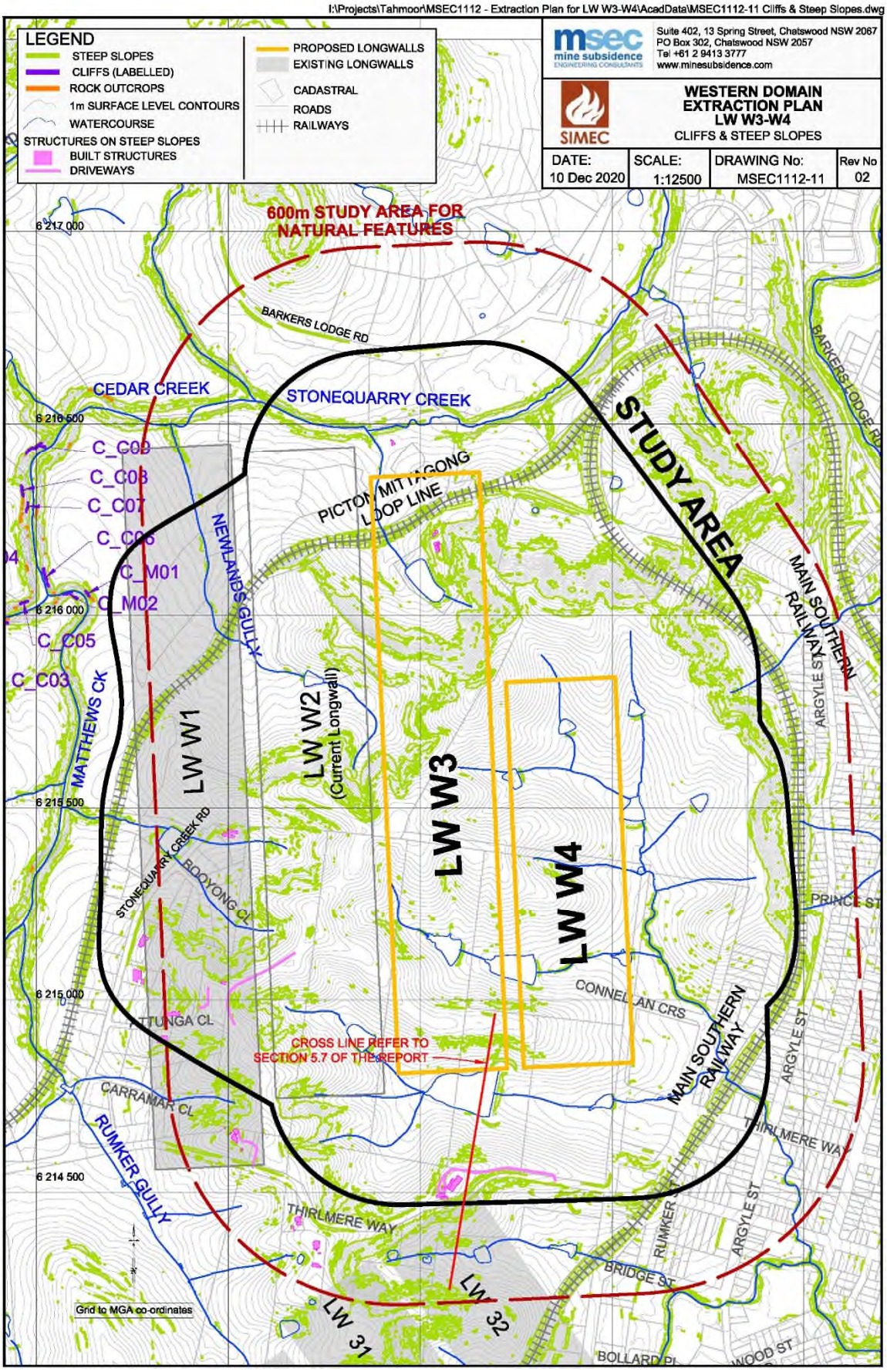

Figure 2-6 Steep slopes within the LW W3-W4 Study Area (source: MSEC, 2021 - LW W3-W4 Subsidence Predictions and Impact Assessment Report)

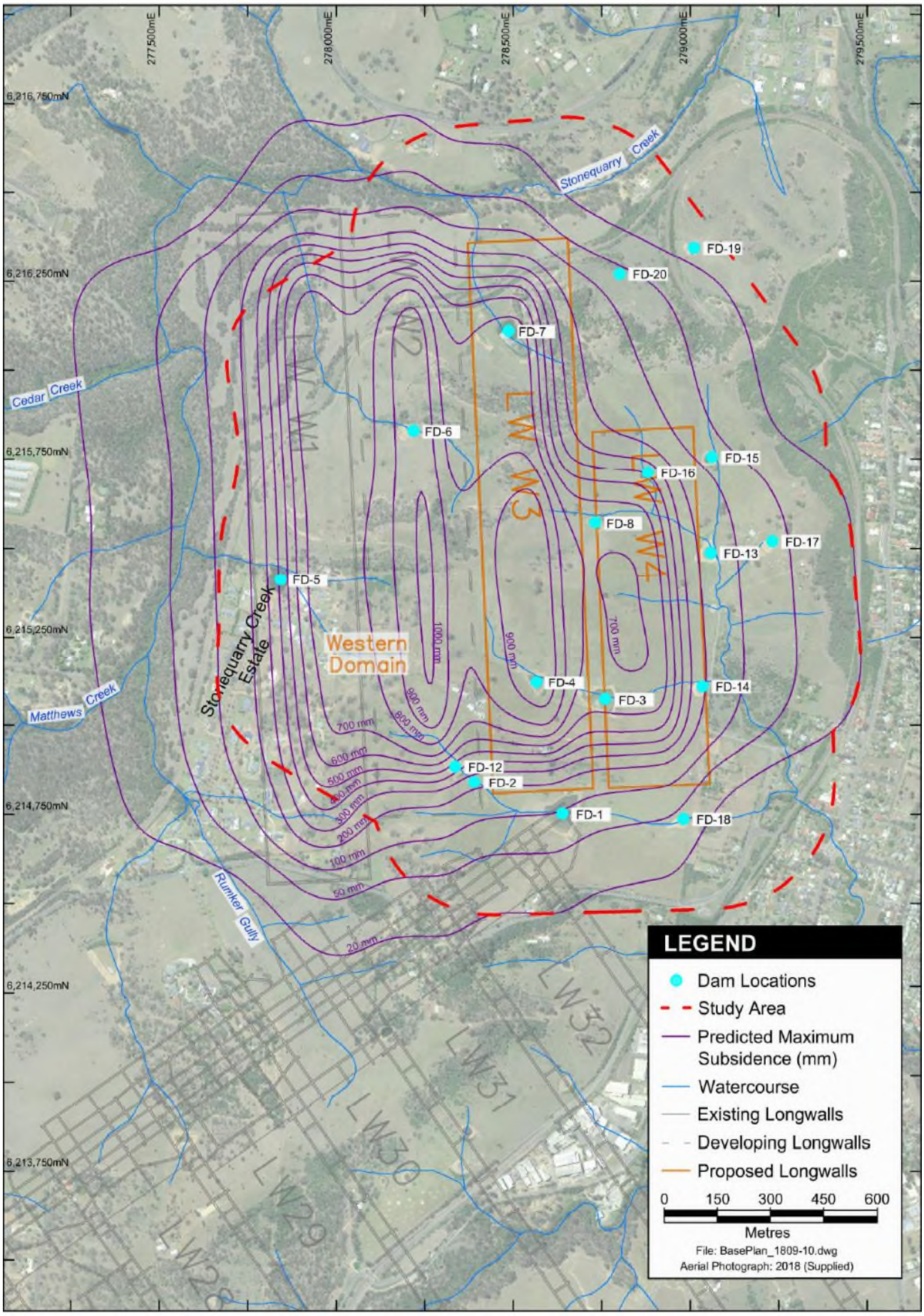

Figure 2-7 Dams within the LW W3-W4 Study Area (source: LW W3-W4 Water Management Plan)

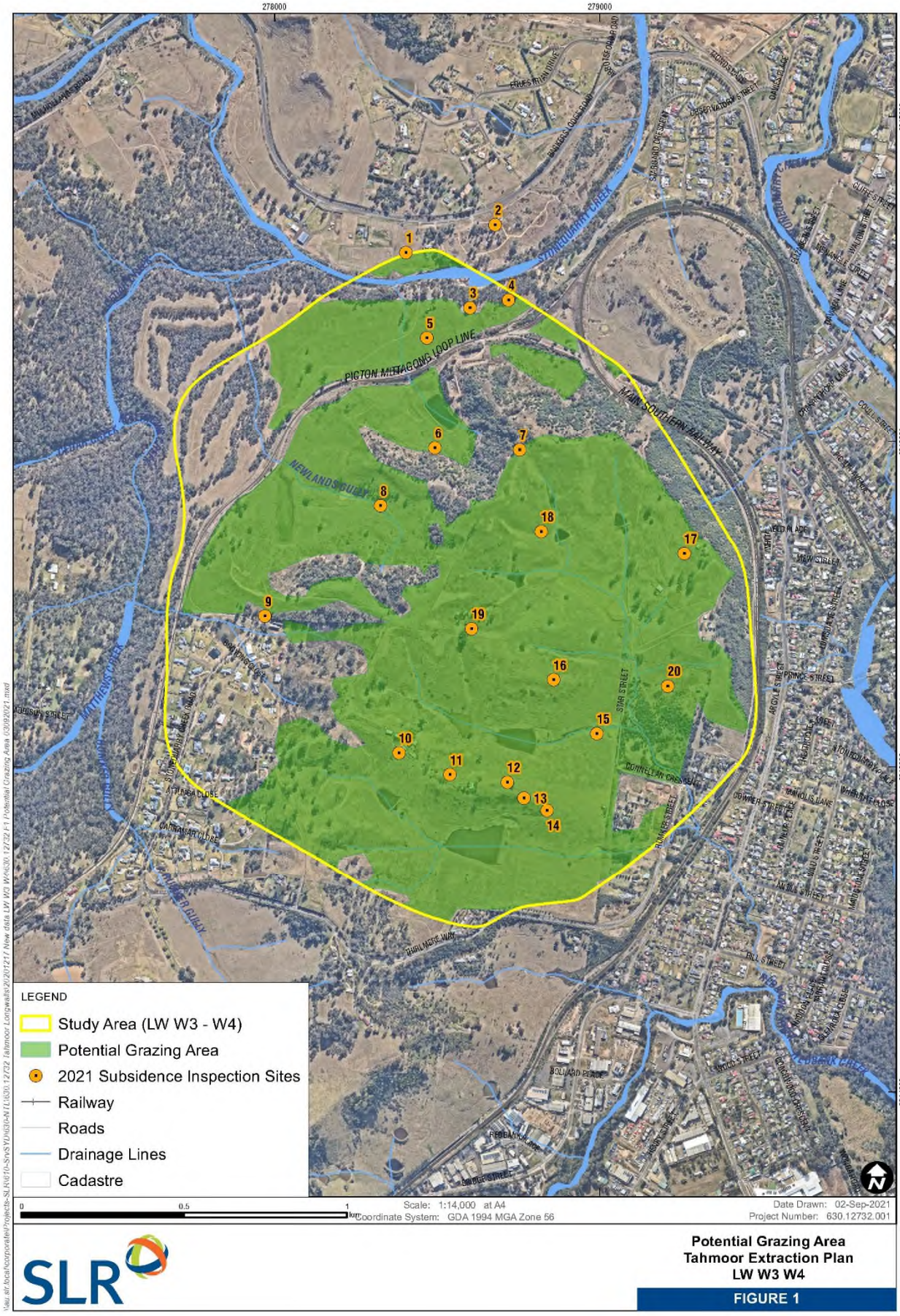

Figure 2-8 Agricultural land and inspection points within the LW W3-W4 Study Area (source: SLR Agricultural Subsidence Monitoring LW W3-W4 Report (SLR, 2021))

2.5 Biodiversity Monitoring

The LW W3-W4 Biodiversity Management Plan were prepared to manage the potential environmental consequences of LW W3-W4 extraction on aquatic and terrestrial flora and fauna in accordance with Condition 13H(vii)(d) of DA 67/98.

In the previous Six Monthly Subsidence Impact Report, it was noted that monitoring during the 12 month period following extraction of LW W4 had been completed. Therefore, no further monitoring of ecology has been required during this reporting period, in accordance with the LW W3-W4 Biodiversity Management Plan.

2.6 Heritage Monitoring

The LW W3-W4 Heritage Management Plan were prepared to manage the potential environmental consequences of LW W3-W4 extraction on Aboriginal heritage and historical heritage sites and values in accordance with Condition 13H(vii)(f) of DA 67/98.

During the reporting period, monitoring of Aboriginal heritage and historical heritage items was not required, in accordance with the LW W3-W4 Heritage Management Plan.

During previous reporting periods, cracking on sandstone culverts at 88.400 km and 88.980 km resulted in an exceedance of subsidence performance measure for 'other Aboriginal and heritage sites'. Tahmoor Coal notified DPE (now DPHI) and Heritage NSW of the trigger via the NSW Major Projects Planning Portal on 21 September 2021. A warning letter from DPE was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the *Environmental Planning and Assessment Act 1979.*

Tahmoor Coal completed remediation of the two sandstone culverts in May 2023, and DPE were notified of this completion on 19 May 2023. A site inspection of the culverts with Transport Heritage NSW was completed on 2 May 2023, and a letter was received from Transport Heritage NSW after the site inspection stating they were satisfied with the repairs completed. DPE were notified of this completion on 19 May 2023 and a site inspection of the culverts with DPE was undertaken on 6 June 2023. Correspondence was received from DPE on 23 June 2023 acknowledging the works have been undertaken.

2.7 Built Features Monitoring

The LW W3-W4 Built Features Management Plan and associated sub-plans were prepared to manage the potential environmental consequences of LW W3-W4 extraction on built features in accordance with Condition 13H(vii)(b) of DA 67/98.

A post-mining report for this reporting period was completed by MSEC (**Appendix A**). This report noted that monitoring of local roads, built structures, Picton Mittagong Loop Line, heritage-listed Weatherboard House, gas infrastructure, electrical infrastructure, telecommunications infrastructure, potable water infrastructure and sewer infrastructure was not completed during this monitoring period, in accordance with the LW W3-W4 Built Features Management Plan and associated sub-plans.

However, monitoring of the Main Southern Railway and the Victoria Bridge were completed during this reporting period, with a summary of observations made during the reporting period in the following sections. The details of the Subsidence Monitoring Program are illustrated in **Figure 2-2**. Performance against all built infrastructure TARPs for the reporting period are summarised in **Table 3-3**, and actions and responses completed relating to any TARP triggers are discussed in **Section 3.2.**

2.7.1 Main Southern Railway

Regular surveys were conducted along the Main Southern Railway during and after the mining of LW W4. All results were within survey tolerance during mining, and visual inspections did not identify any issues associated with mine subsidence.

2.7.2 Transport NSW Infrastructure

Regular surveys were conducted at the Victoria Bridge over Stonequarry Creek during and after the mining of LW W4. Very small and gradual closure was observed across Stonequarry Creek has been observed since LW W3 due to rock mass movement towards the Stonequarry Creek incised valley. In light of this movement, continuous monitoring of GNSS units and laser distance meters have been monitored and results reported quarterly.

During the reporting period, rates of change have reduced to very low levels, and very gradual ongoing residual vertical subsidence have been observed.

2.8 Public Safety Monitoring

The LW W3-W4 Public Safety Management Plan were prepared to manage the potential consequences as a result of LW W3-W4 extraction on public safety within the Study Area in accordance with Condition 13H(vii)(g) of DA 67/98.

As noted in **Section 1.3** of this report, management requirements for public safety are covered in the Built Features Management Plan and the Land Management Plan. Monitoring of steep slopes and other landscape features has been conducted for the reporting period in accordance with the LW W3-W4 Land Management Plan (refer to **Section 2.4** for a summary of monitoring results). In addition, monitoring of infrastructure items has also been conducted for the reporting period in accordance with the LW W3-W4 Built Features Management Plan (refer to **Section 2.7** for a summary of monitoring results).

No subsidence impacts were identified during the reporting period that were considered to pose a risk to public safety.

3 Overview of Impacts and Actions

3.1 Summary of Impacts

This section provides a comprehensive summary of all impacts during the reporting period, including a revised characterisation according to the relevant TARPs (if required).

Table 3-1 and **Table 3-2** provides a summary of the TARP levels that support the LW W3-W4 Extraction Plan. A summary of monitoring results for relevant TARPs is given in **Table 3-3**. A full list of TARPs for environmental features that are applicable is provided in Appendix D of the LW W3-W4 Extraction Plan.

Table 3-1 Risk Levels for Environmental Feature TARPs

Risk Level	Trigger Description
Level 1	Normal – Operations within predicted impacts.
Level 2	Within Prediction – Operations within predicted impacts but exceeds or potentially exceeds predictions.
Level 3	Almost Exceeds Prediction – Operations within predicted impacts but are likely to almost exceed predictions.
Level 4*	Exceeds Prediction – Operations exceed predicted impact.

Note: * Level 4 is only used in the Water Management Plan TARPs.

Table 3-2 Trigger Levels for Railway Features (applicable to Picton-Mittagong Loop Line, Main Southern Railway, Transport for NSW, and Stonequarry Creek Rockbar features)

Trigger Level	Trigger Description
Green	Observations within predictions. Operate as normal.
Blue	Observations outside predictions but within operating tolerance. Investigate cause. Some action may be required to prevent operating restrictions.
Yellow	Restrictions on operations. Action required. Appropriate speed restriction applied until altered to Green or Blue level.
Red	Stop trains until altered to Green or Blue level.

Table 3-3 Summary of TARP Triggers for July to December 2023

Aspect	Feature	Corresponding Management Plan and TARP	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
Surface Water	Stonequarry Creek flow	Water Management Plan – Downstream reduction in catchment flow rate in Stonequarry Creek at Picton Gauging Station (GS212053)	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]	NA – Assessment unable to be completed due to invalidation of current model calibration.[1]
	Pool water level	Water Management Plan – Impact to pool water level	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 1-5 July, 8 July to 14 August 2023.	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 8 July to 14 August 2023, and 21 August to 5 October 2023.	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 21 August to 5 October 2023.	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 21 August to 5 October, and 7 October to 17 November 2023.	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 7 October to 17 November 2023, and 19 November to 28 November 2023.	LEVEL 2 TRIGGERED[2] Surface water level trigger occurred at monitoring site CB from 18-19 December 2023.
	Natural drainage behaviour	Water Management Plan – Impact to pool level, natural drainage behaviour or overland connected flow	NR – No monitoring required.	NR – No monitoring required.	LEVEL 3 TRIGGERED[3] Natural drainage behaviour trigger occurred at monitoring site SB (Pool SR17) and Pool SR20 in Stonequarry Creek.	NR – No monitoring required.	NR – No monitoring required.	LEVEL 3 TRIGGERED[3] Natural drainage behaviour trigger occurred at monitoring site SB (Pool SR17) and Pool SR20 in Stonequarry Creek.
	Flood levels	Water Management Plan – Impact to flood levels	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Stream water quality	Water Management Plan – Stream water quality impact	No observations of water quality triggers or visual evidence of increased iron staining that was not observed in the baseline period.	No observations of water quality triggers or visual evidence of increased iron staining that was not observed in the baseline period.	No observations of water quality triggers or visual evidence of increased iron staining that was not observed in the baseline period.	No observations of water quality triggers or visual evidence of increased iron staining that was not observed in the baseline period.	No observations of water quality triggers or visual evidence of increased iron staining that was not observed in the baseline period.	LEVEL 2 TRIGGERED[4] Surface water quality triggers occurred at SC (pH) and SD (pH, Al).
Groundwater	Groundwater bore level	Water Management Plan – Groundwater levels at monitoring bores and private groundwater bores	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P12C and P16C.	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P12C and P16C.	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P12C and P16C.	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P12C and P16C.	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P12C and P16C.	LEVEL 2 TRIGGERED[5] Water level trigger occurred at P16C (P12C data not available).
	Shallow groundwater pressures	Water Management Plan – Shallow groundwater pressures at VMPs TNC036, TNC040, and TNC034	LEVEL 2 TRIGGERED[6] Depressurisation trigger occurred at TNC36 (intake 169 mbgl).	LEVEL 2 TRIGGERED[6] Depressurisation trigger occurred at TNC36 (intake 169 mbgl).	LEVEL 2 TRIGGERED[6] Depressurisation trigger occurred at TNC36 (intake 169 mbgl).	LEVEL 2 TRIGGERED[6] Depressurisation trigger occurred at TNC36 (intake 169 mbgl).	LEVEL 2 TRIGGERED[6] Depressurisation trigger occurred at TNC36 (intake 169 mbgl).	No depressurisation triggers occurred.
	Deep groundwater pressures	Water Management Plan – Deep groundwater pressures at VMPs TNC036, TNC040, and TNC043	LEVEL 2 TRIGGERED[7] Depressurisation triggers occurred at TNC36 (intake 412.5 mbgl).	No depressurisation triggers occurred.	No depressurisation triggers occurred.	No depressurisation triggers occurred.	No depressurisation triggers occurred.	No depressurisation triggers occurred.
	Groundwater quality	Water Management Plan – Groundwater quality at monitoring bores and private groundwater bores	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P12A (pH, Pb), P12C (Mn), P14B (Sr), P15B (Sr, EC), P15C (Fe), P15D (Fe), P16A (Ni), P16B (Sr), GW104090 (EC, Ba, Sr), GW105467 (Li), GW115860 (EC, Zn, Sr).	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P12A (pH, Pb), P14B (Sr), P15B (Sr), P15C (Fe), P15D (Fe).	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P15B (Sr, EC), P15D (Fe, Mn), P16C (EC).	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P12A (Pb), P14B (Sr), P15B (Sr), P15C (Al), P15D (Fe), P16A (Ni, pH), P16B (Sr), GW104090 (Sr), GW105467 (Li, Cu, Zn).	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P14B (EC), P15B (Sr), P15D (Fe), P16B (Sr, Zn).	LEVEL 2 TRIGGERED[8] Groundwater quality triggers occurred at P14B (Sr, EC), P15A (Sr), P15B (Sr, EC), P16A (Ni), P16B (Sr), P16C (Sr).

Aspect	Feature	Corresponding Management Plan and TARP	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
Landscape	Cliff lines	Land Management Plan – Cliff line damage or instability	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Steep Slopes	Land Management Plan – Steep slope damage or instability	NR – No monitoring required.	NR – No monitoring required.	No signs of cracking or movement on steep slopes near structures in the areas inspected that could be attributed to mine subsidence.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Surface cracking	Land Management Plan – Surface cracking (excluding railway corridor)	NR – No monitoring required.	NR – No monitoring required.	No signs of change in the areas inspected that could be attributed to mine subsidence.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Dams	Water Management Plan – Impacts to dams	NR – No monitoring required.	NR – No monitoring required.	No signs of change to farm dams inspected that could be attributed to mine subsidence.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Agricultural Land	Agricultural Land	Land Management Plan – Agricultural land	NR – No monitoring required.	NR – No monitoring required.	No signs of change since baseline at sites inspected.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Aquatic Ecology	Macroinvertebrates	Biodiversity Management Plan – Decline or significant negative change in macroinvertebrate indicators.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
		Biodiversity Management Plan – Reduction in aquatic habitat through loss of pools or associated reduction in water quality (AURIVAS habitat assessment)	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Terrestrial Ecology	Amphibians	Biodiversity Management Plan – Decline in amphibian populations within watercourses of the Study Area	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Riparian Vegetation	Biodiversity Management Plan – Dieback of riparian vegetation within watercourses of the Study Area	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Aboriginal Heritage	Grinding grooves, scarred tree	Heritage Management Plan – Aboriginal heritage	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	SR17 Rockbar	Stonequarry Creek Rockbar Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Historical Heritage	Railway Culverts	Heritage Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Weatherboard House	Heritage Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
Built Features	Picton-Mittagong Loop Line	Picton-Mittagong Railway Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Main Southern Railway	Main Southern Railway Management Plan	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.
	Electricity Infrastructure	Endeavour Energy Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Gas Infrastructure	Jemena Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Potable Water	Sydney Water Potable Water Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.

Aspect	Feature	Corresponding Management Plan and TARP	July 2023	August 2023	September 2023	October 2023	November 2023	December 2023
	Sewerage Infrastructure	Stonequarry Creek Sewer Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Telecommunications	Telstra Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
		NBN Co Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Local roads, bridges and culverts	Wollondilly Shire Council Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Built Structures	Built Structures Management Plan	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.	NR – No monitoring required.
	Transport for NSW Infrastructure	Transport for NSW Management Plan	No impacts observed in areas monitored this month.	No impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.	No mining impacts observed in areas monitored this month.

Notes:

NR – Monitoring not required this month.

NA – Monitoring data not available as monitoring not completed this month or reporting not yet available.

[1] Stonequarry Creek flow assessment unable to be completed due to invalidation of current model calibration as a result of revision of the rating curve for Stonequarry Creek at Picton (GS 212053) in July 2020 and change of streamflow records from December 2015.

[2] Level 2 TARP for pool water level (LW W3-W4 Water Management Plan): The recorded water level has declined below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level) AND the above has occurred at one of the upstream pools (beyond mining effects).

[3] Level 3 TARP for natural drainage behaviour (LW W3-W4 Water Management Plan): Rock bar and/or stream base cracking, gas release, or iron precipitation noted during visual inspection (in excess of baseline conditions) AND no reduction in pool water level, drainage or overland connected flow, taking in account climatic conditions and observations during baseline monitoring period.

[4] Level 2 TARP for stream water quality (LW W3-W4 Water Management Plan): The trigger for pH, EC or dissolved metals defined below occurs in one month, and there is no visual evidence of an increase in iron precipitation that was not observed in the baseline period.

[5] Level 2 TARP for groundwater bore level (LW W3-W4 Water Management Plan): Greater than 2 m water level reduction following the commencement of extraction at LW W1 (and LW W2, W3, W4) AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[6] Level 2 TARP for shallow groundwater pressures (LW W3-W4 Water Management Plan): Greater than 5 m water level reduction in VWP intakes located at or above (i.e. shallower than 200 m depth) following the commencement of extraction at LW W1 (and LW W2, W3 and W4) AND the reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.

[7] Level 2 TARP for deep groundwater pressures (LW W3-W4 Water Management Plan): Calculated or observed drawdown (based on 2009 – 2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) is within 30 m of predicted (modelled) drawdown.

[8] Level 2 TARP for groundwater quality (LW W3-W4 Water Management Plan): Short term increase (<3 months) in salinity and/or metals, or change in pH outside of baseline variability. The effect does not persist after a significant rainfall recharge event. AND/OR a similar trend or response has been noted at other monitored bores or private groundwater bores.

3.2 Summary of Actions

During the reporting period, there were seven (7) environmental aspects that were associated with TARP triggers. This section provides a summary of actions resulting from triggers being met in the TARPs, as well as required remediation actions. All triggers have been reviewed by the Environmental Response Group / Structural Response Group / specialists to determine any further actions (if required).

3.2.1 Pool Water Level TARP – Level 2 Triggers for Pool Water Level Reduction

3.2.1.1 Background

The following TARP triggers occurred during the current reporting period for water level (refer **Appendix B**):

- Monitoring Site CB – Level 2 TARP triggers occurred between 1 July to 5 July, 8 July to 14 August, 21 August to 5 October, 7 October to 17 November, 19 November to 28 November, and 18 December to 19 December 2023.

A Level 4 TARP significance was originally triggered in relation to surface water level decline for the period 19 to 29 January 2021 at monitoring site CB (pool CR14) in Cedar Creek. Whilst not visible on the surface, it is likely that mining induced subsidence had mobilised existing fractures resulting in changes in the water level recession rate of this pool. In addition, it was considered likely that mining induced groundwater drawdown had resulted in the surface water system in the vicinity of pool CR14 transitioning from a gaining stream (baseflow discharge from the groundwater stream to the stream) to a weakly gaining or losing stream (surface water recharge to the groundwater system) (**Appendix B**).

Between 1 July to 19 December 2023, a Level 2 TARP trigger intermittently applied at monitoring site CB (pool CR14). When comparing the monitoring data directly to the TARP level description, it is noted that a Level 3 may apply for this period. However, the water level decline recorded at monitoring site CB during the above mentioned periods are considered negligible and related to a catchment-wide reduction in surface flow due to below average rainfall conditions. As such, a Level 2 TARP trigger has been equated for these periods.

Further discuss of the water level observations at monitoring site CB is provided in **Section 2.2.1** and the Surface Water Review (refer **Appendix B**).

3.2.1.2 Actions Completed

The following actions have been completed in light of the Level 2 TARP triggers during this reporting period:

- *Continue monitoring as per monitoring program* - monthly monitoring was ongoing during the reporting period;
- *Continue monthly review of data* – quarterly result analysis and reporting was completed in accordance with the post-mining monitoring program;
- *Review relevant surface water level, groundwater level and streamflow data to assess comparative trends* – completed as part of this report for monitoring site CB (refer to **Appendix B**), which suggested that gaining conditions (groundwater contribution to the surface water system) were occurring during this time period in the vicinity of monitoring site CB (pool CR14);
- *Review manual water level measures for additional monitoring sites to identify potential spatial trends in water level decline* – completed as part of this report (refer to **Appendix B**), which suggested that the decline in water level at monitoring site CB was contributed to by a decline in water level at upstream reference sites Cedar US and CC1A; and
- *Convene Tahmoor Coal Environmental Response Group to review response* – completed and included a discussion of these TARP triggers. There were no actions regarding these TARP triggers.

Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE (now DPHI) on 22 December 2023, including the current report provided in **Appendix B**. These reports include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

3.2.1.3 Proposed Actions

Noting that water level decline recorded at site CB during the reporting period was not considered to be associated with mining impacts, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.2 Natural Drainage Behaviour TARP - Level 3 Trigger for Fracturing

3.2.2.1 Background

The following TARP triggers occurred during the current reporting period for natural drainage behaviour (refer **Appendix B**):

- Rockbar SR17 – Level 3 TARP trigger for laminar fracturing on the SR17 rockbar from November 2021; and
- Rockbar SR20 – Level 3 TARP trigger for fracturing on a rockbar at SR20 from August 2022.

A detailed discussion of these triggers is provided in the Surface Water Review (refer **Appendix B**), and a summary is provided below.

Rockbar SR17 was initially reported at a Level 3 TARP trigger on 28 October 2021 due to surficial fracturing of the controlling rockbar (*pers. comm.* MSEC). Brienen Environment & Safety reported this as laminar fracturing and extension of a natural crack in the rockbar following their inspection on 17 November 2021.

Since the initial observation of the laminar fracturing, no gas release or iron precipitation has been noted during visual inspections. In addition, the continuous water level records and manual water levels indicate that the fracturing of the rockbar has not resulted in an impact to the pool water holding capacity. Consequently, a Level 3 trigger significance in relation to physical features and natural behaviour of rockbar SR17 has been derived for this observation (17 November 2021 to current).

Rockbar SR20 was reported by Brienen Environment & Safety as a Level 3 significance due to surface fracturing (Natural Drainage Behaviour TARP - Rock bar and/or stream base cracking, gas release, or iron precipitation noted during visual inspection (in excess of baseline conditions) and no reduction in pool water level, drainage or overland connected flow, taking in account climatic conditions and observations during baseline monitoring period), and was first observed on 18 August 2022. No gas release or iron precipitation were observed during the visual inspections and actions completed are discussed below.

3.2.2.2 Actions Completed

In accordance with the Stonequarry Creek Rockbar Management Plan, mining of LW W3 was temporarily suspended on 28 October 2021 following initial identification of surficial fracturing of the rockbar at pool SR17. Subsequently, the Subsidence Technical Committee convened to review the required actions and responses in accordance with the Stonequarry Creek Rockbar Management Plan TARP. Additional monitoring, inspection and reporting was then implemented in accordance with the TARP. Subsequent visual inspections identified an increase in the extent of fracturing. On 1 November 2021, approval was granted to recommence mining of LW W3 subject to the continuation of monitoring at an increased frequency and initial progress of the longwall capped to a maximum of 50 metres per week.

It is noted that this fracturing has not affected the water level at Pool SR17.

Geotechnical reviews of the rockbar identified that:

- The fractures occurred in thinly bedded, laminated sandstone and were considered a response to mining related differential compression in combination with the presence of existing delamination in the rockbar surface formed by natural weathering processes;
- There was no evidence of new cracking outside the existing fractured area;
- The extension of the fractured area was associated with a veneer of sandstone sitting on top of competent sandstone;
- The fracturing was considered consistent with subsidence monitoring results and was effectively an extension of the original fracture site; and
- The fracturing provided a release for mining induced stress and was confined to the sheeted sandstone above the competent sandstone.

The following actions have been completed in light of the Level 3 TARP trigger during this (and previous) reporting period:

- *Continue monitoring as per monitoring program* - quarterly monitoring was ongoing during the reporting period;
- *Continue review of data* – completed on a quarterly basis during the reporting period (following completion of quarterly monitoring, as required by the LW W3-W4 Water Management Plan);
- *Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climate:*
    - Rockbar SR17 – In response to the Level 3 TARP trigger in relation to physical features at rockbar SR17, the Environmental Response Group convened and the surface water level data was reviewed. The water level records for monitoring site SB indicated that the surficial fracturing of the rockbar has not resulted in an impact to the pool water holding capacity. The water levels recorded at monitoring site SB (rockbar SR17) have not declined below the baseline minimum water level and no atypical water level behaviour was recorded at this site between 1 October 2021 and 15 May 2023 (extent of available monitoring data); and
    - Rockbar SR20 – In response to the Level 3 TARP trigger in relation to physical features at rockbar SR17, the Environmental Response Group convened and surface water level data, pre-mining drone footage and subsidence measurements were reviewed. From a review of pre-mining drone footage, it was determined that one of the fractures was initially observed in July 2019 during pre-mining survey. The water level records for monitoring sites SB (upstream), SC and SD (downstream) indicated that the fracturing has not resulted in an impact to pool water holding capacity. The water level recorded at monitoring sites SB, SC and SD has not declined below the baseline minimum water level during the reporting period. Additionally, MSEC indicated that there was no measurable change in closure associated with the fracturing based on the latest survey.
- *Response as defined by Environmental Response Group* – there were no actions regarding this TARP trigger; and
- *Consider increasing inspection and review of data frequency to fortnightly for sites where Level 3 has been reached* - an increase in the frequency of visual inspections and review of data in relation to rockbar physical features, natural drainage behaviour and pool water level is not considered to be required at this stage.

3.2.2.3 Proposed Actions

Noting that fracturing at Rockbar SR17 and Rockbar SR20 are stable and have not resulted in decline in water level of their respective pools, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.3 Surface Water Quality TARP – Level 2 Trigger for Surface Water Quality

3.2.3.1 Background

The following TARP triggers occurred during the current reporting period for surface water quality (refer **Appendix B**):

- Monitoring Site SC – Level 2 TARP trigger for elevated pH in December 2023; and
- Monitoring Site SD – Level 2 TARP trigger for elevated dissolved Aluminium and pH in December 2023.

A detailed discussion of these triggers is provided in the Surface Water Review document (refer **Appendix B**), and a summary is provided in **Section 2.2.4**.

3.2.3.2 Actions Completed

The following actions have been completed in response to the Level 2 TARP triggers during this reporting period:

- *Continue monitoring as per monitoring program* - monthly monitoring was ongoing according to the monitoring program;
- *Continue monthly review of data including analysis of water quality trend along creek (upstream to downstream) to identify spatial changes* – completed on a quarterly basis during the post-mining stage; and
- *Convene Tahmoor Coal Environmental Response Group to review response* – completed following the reporting of this data, including discussions of these TARP triggers. There were no actions regarding this TARP trigger.

Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE (now DPHI) on 22 December 2023, including the current report provided in **Appendix B**. These reports include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

3.2.3.3 Proposed Actions

Noting that surface water quality triggers recorded during the reporting period were not considered to be associated with mining impacts, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.4 Groundwater Bore Level TARP – Level 2 Triggers for Open Standpipe Piezometer Groundwater Levels

3.2.4.1 Background

During this reporting period, two groundwater intakes in OSPs have recorded reduced water level elevation below the baseline range (refer to **Appendix C**):

- P12C – Level 2 TARP trigger from July to November 2023; and
- P16C – Level 2 TARP trigger from July to December 2023 (entire reporting period).

P12C and P16C recorded a Level 4 TARP trigger from December 2020 to August 2021.

During this reporting period, a Level 2 TARP applied from July to November 2023. Land access to this bore was lost temporarily in November 2023 and reinstated in February 2024. A manual water level taken in February 2024 indicates a return to baseline conditions at P12C, and the bore is now considered to be at Level 1 (normal conditions).

During the reporting period, a Level 2 TARP applied at P16C for the entire reporting period. Groundwater levels continue to slightly increase and it is noted that they have been doing so under below average rainfall conditions since May 2023.

Further discuss of the groundwater level observations at P12C and P16C is provided in **Section 2.3.1** and the Groundwater Review (refer **Appendix C**).

3.2.4.2 Actions Completed

On 30 December 2020, Level 4 TARP triggers for the reduced water level elevations at P12C, P16B, P16C and TNC036 were notified to DPE (now DPHI) and NRAR. This reduction was attributed to mining induced depressurisation of deeper groundwater aquifer, however this also correlated to a reduction in rainfall recharge events.

In light of the Level 4 TARP triggers, Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE (now DPHI) on 25 June 2021. This Six Monthly Subsidence Impact Report includes this 3-monthly monitoring reporting. These reporting requirements include a review and interpretation of monitoring data, assessment against performance measures and performance indicators for surface water and groundwater, and any recommendations in relation to ongoing monitoring or corrective actions.

The following actions have been completed in light of the Level 2 TARP triggers during this reporting period:

- *Continue monitoring program* – monthly monitoring was ongoing during the reporting period;
- *Ongoing review of water level data* – result analysis and reporting were completed on a quarterly basis during the post-mining stage;
- *Review relevant surface water level, groundwater level and streamflow data to assess comparative trends* – completed as part of 3-monthly Monitoring Reporting for surface water and groundwater. The last monitoring report was provided to DPE (now DPHI) in December 2023; and
- *Convene Tahmoor Coal Environmental Response Group to review response* – completed on a monthly basis, including the discussion of any groundwater level TARP triggers. There were no actions regarding this TARP trigger.

3.2.4.3 Proposed Actions

In light of the demonstration of aquifer recovery to normal conditions or almost normal conditions (as is the case for P16C), no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.5 Shallow Groundwater Pressures TARP – Level 2 Triggers for Shallow Vibrating Wire Piezometer Groundwater Pressure

3.2.5.1 Background

During this reporting period, one shallow (<200 mbgl) sensor at TNC036 (intake HBSS-169m) recorded a depressurisation below the baseline range between July to November 2023. This TARP resolved (returned to Level 1) in December 2023, demonstrating full recover and the return to pre-mining conditions.

Further discuss of the groundwater level observations at TNC036 is provided in **Section 2.3.2** and the Groundwater Review (refer **Appendix C**).

3.2.5.2 Actions Completed

On 30 December 2020, Level 4 TARP triggers for the reduced water level elevations at P13C, P16B, P16C and TNC036 were notified to DPE (now DPHI) and NRAR. This reduction was attributed to mining induced depressurisation of deeper groundwater aquifer, however this also correlated to a reduction in rainfall recharge events. The Level 4 TARP triggers observed during this reporting period are a continuation of the trend as previously notified.

In light of the Level 4 TARP triggers, Tahmoor Coal have been providing quarterly (3-monthly) monitoring reports for surface water and groundwater as per the request by DPE (now DPHI) on 25 June 2021. This report incorporates the 3-monthly monitoring reporting requirement, including a review and interpretation of monitoring data, assessment against performance measures and performance indicators for groundwater (Refer to **Section 2.3**; **Appendix C**), and any recommendations in relation to ongoing monitoring or corrective actions (**Section 2.3.5**).

The following actions have been completed in light of the Level 2 TARP trigger during this reporting period:

- *Continue monitoring program* - monitoring was ongoing during the reporting period;
- *Ongoing review of water level data* – result analysis and reporting were completed on a quarterly basis during the post-mining stage; and
- *Convene Tahmoor Coal Environmental Response Group to review response* – completed on a monthly basis, including the discussion of any groundwater level TARP triggers. There were no actions regarding this TARP trigger.

3.2.5.3 Proposed Actions

In light of the demonstration of aquifer recovery to normal conditions in the shallow sensors of TNC036, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.6 Deep Groundwater Pressures TARP – Level 2 Trigger for Deep Vibrating Wire Piezometer Groundwater Pressure

3.2.6.1 Background

During this reporting period, one deep (>200 mbgl) sensor at TNC036 (intake HBSS-412.5m) exceeded the predicted (modelled) drawdown in July 2023 only. This TARP resolved (returned to Level 1 and within predicted drawdown) in August 2023, indicating recovery of the aquifer.

Further discuss of the groundwater level observations at TNC036 is provided in **Section 2.3.2** and the Groundwater Review (refer **Appendix C**).

3.2.6.2 Actions Completed

The following actions have been completed in light of the Level 2 TARP trigger during this reporting period:

- *Continue monitoring program* - monitoring was ongoing during the reporting period;
- *Ongoing review of water level data* – result analysis and reporting were completed on a quarterly basis during the post-mining stage; and
- *Convene Tahmoor Coal Environmental Response Group to review response* – completed on a monthly basis, including the discussion of any groundwater level TARP triggers. There were no actions regarding this TARP trigger.

3.2.6.3 Proposed Actions

In light of the demonstration of aquifer recovery to normal conditions in the deep sensors of TNC036, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

3.2.7 Groundwater Quality TARP – Level 2 Triggers for Groundwater Quality

3.2.7.1 Background

A number of Level 2 TARP triggers occurred for groundwater quality (refer to **Table 3-3**). These short-term increases in groundwater quality are considered to be due to natural fluctuations rather than mining related effects. Further discussion of these triggers is provided in **Section 2.3.4** and the groundwater report (refer **Appendix C**).

3.2.7.2 Actions Completed

As discussed in the groundwater reports in **Appendix C**, the following actions were completed in response to the Level 2 TARP triggers for this reporting period:

- *Continue monitoring as per monitoring program* - monthly groundwater monitoring was ongoing during the reporting period;
- *Ongoing review of water quality data* – result analysis and reporting were completed on a quarterly basis during the post-mining stage; and
- *Convene Tahmoor Coal Environmental Response Group to review response* - completed following the reporting of this data, which included the discussion of these TARP triggers.

3.2.7.3 Proposed Actions

Noting that groundwater quality triggers recorded during the reporting period were not considered to be associated with mining impacts, no further monitoring is considered to be required and monitoring in accordance with the LW W3-W4 Water Management Plan has now been completed.

4 Assessment of Environmental Performance

4.1 Environmental Performance Measures and Indicators

The following development consents include subsidence impact performance measures as conditions for the extraction of LW W3-W4:

- DA 67/98 Modification 5:
  - Condition 13A – Performance Measures for Natural and Heritage Features;
  - Condition 13E – Performance Measures for Built Features;
- LW W3-W4 Extraction Plan Approval:
  - Condition 1 – Performance Measures for Stonequarry Creek, Cedar Creek and Matthews Creek.

The subsidence impact performance measures were adopted as part of the LW W3-W4 Extraction Plan and associated management plans. To assist in defining the performance measures, each measure has been assigned subsidence performance indicator(s).

These performance measures and indicators are provided in **Table 4-1**, as well as an assessment of performance.

Table 4-1 Assessment of Environmental Performance

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Water Management				
Stonequarry Creek, Cedar Creek and Matthews Creek (LW W3-W4 Extraction Plan Approval)	No subsidence impact or environmental consequence greater than minor*	This performance indicator will be considered to be exceeded if mining-induced fracturing in a rockbar or stream bed results in a reduction in pool water level below historically recorded water levels, taking into account rainfall and observations during the baseline monitoring period, for: • More than 10% of pools located within the 600 m Study Area for Natural Features; and/or • Pool SR17.	**No** Less than 10% of the pools within the Investigative Area have been impacted and the surficial fracturing of the rockbar at pool SR17 and surface cracking of SR20 in Stonequarry Creek has not resulted in an impact to pool water level. Consequently, there is negligible evidence to date of subsidence impacts with environmental consequences greater than minor associated with mining in the Western Domain.	Sections 2.2.2 and 2.2.3
	No connective cracking between the surface, or the base of the alluvium, and the underground workings.	This performance indicator will be considered to be exceeded if analysis of inflow data suggests high correlation to rainfall events and significant departure from recent groundwater model predictions. This would be supported by analysis of pre- and post-mining goaf centreline bore data.	**No** As discussed in the Groundwater Monitoring Report (refer **Appendix C**), a post-mining Height of Fracture (HoF) hole was installed over LW W2 to determine the height of fracturing from underground workings. The HoF hole indicates that from surface to 79 metres below ground level, there was no obvious change in defects or permeability between the pre and post mining boreholes. Therefore, there is no evidence of connective cracking between surface and seam.	Section 2.3.3
Public Safety (DA 67/98 Condition 13E)	Negligible additional risk**.	<u>Flooding</u> This performance indicator will be considered to be exceeded if subsidence results in the post-mining 1% AEP flood level being above the floor level of one or more dwelling.	**No**	Section 2.2.5

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Land Management				
Public Safety (DA 67/98 Condition 13E)	Negligible additional risk**.	Landscape Features This performance indicator will be considered to be triggered if subsidence impacts to landscape features result in the collapse of cliffs, rock outcrops or steep slopes in proximity to members of the public.	**No**.	Section 2.4
Biodiversity Management				
Threatened species, threatened populations, or endangered ecological communities (DA 67/98 Condition 13A)	Negligible environmental consequences**.	This performance indicator will be considered to be triggered if: • Changes in macroinvertebrate and stream health indicators are statistically significant; • If visual assessment of aquatic habitat identifies mining subsidence induced impacts. • Statistically significant changes in amphibian diversity is detected toward baseline attributed to mining, as detected during amphibian monitoring; and/or • Statistically significant changes in riparian vegetation is detected toward baseline attributed to mining, as detected during riparian monitoring.	**No**	Section 2.5

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Heritage Management				
Heritage sites (DA 67/98 Condition 13A)	Negligible subsidence impacts or environmental consequences**. Negligible loss of heritage value**.	Isolated finds/artefact scatters (AHIMS items) No performance indicators are currently established as impacts are predicted to be negligible.	**No** *Note: The LW W3-W4 Heritage Management Plan assessed the probability of impacts to isolated finds / artefact scatters from the proposed longwall mining as very unlikely. Impacts to open sites, such as artefact scatters, are limited to cracking in the surface soils which is unlikely to affect the artefacts. Therefore monitoring of these sites have not been included in the monitoring program.*	Not applicable
		Scarred tree (AHIMS item) This performance indicator will be considered to be triggered if: • subsidence monitoring identifies a perceptible tilt increase that places the tree at risk of falling; and/or • subsidence monitoring identifies a perceptible cracking in the tree unrelated to natural weathering or trauma damage	**No** *Note: The LW W3-W4 Heritage Management Plan assessed the probability of impacts to the scarred tree from the proposed longwall mining as very unlikely.* *Impacts to open sites, such as the scarred trees, are limited to cracking in the surface soils which is unlikely to affect the item. Therefore monitoring of this item has not been included in the monitoring program.*	Section 2.6.1
		Grinding grooves (AHIMS item) This performance indicator will be considered to be triggered if: • subsidence monitoring identifies visible perceptible impacts such as subsidence induced cracking; and • these subsidence impacts result in impacts to the heritage values of the site.	**No**	Section 2.6.1

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Heritage Management				
Heritage sites (DA 67/98 Condition 13A)	Negligible subsidence impacts or environmental consequences**. Negligible loss of heritage value**.	Main Southern Railway Heritage Items (Mushroom Tunnel, Picton Tunnel, Antill Street Underbridge, Picton Viaduct, Argyle Street Underbridge) This performance indicator will be considered to be triggered if subsidence monitoring identifies cracking of external brick work or physical impacts to the historical heritage values of the structure, measurable tilt or visible perceptible impacts such as subsidence induced cracking, exfoliation, brick movement or brick fall.	**No**	Section 2.6.2
		Main Southern Railway Heritage Items (Pedestain overbridge 86.1 km, MSR culverts, Subway 88.133 km, high retaining wall 84.687 km, bridge on Matthews Lane, Prince Street overbridge, Connellan Crescent Overbridge) This performance indicator will be considered to be triggered if subsidence monitoring identifies visible perceptible impacts such as subsidence induced cracking, brick movement or brick fall.	**No**	Section 2.6.2
		Cottage (Weatherboard) This performance indicator will be considered to be triggered if subsidence monitoring identifies damage to external cladding or internal finishes.	**No**	Section 2.6.2
		Redbank Uniting Church This performance indicator will be considered to be triggered if subsidence monitoring identifies visible perceptible impacts such as subsidence induced cracking, brick movement or brick fall.	**No**	Section 2.6.2

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Heritage Management				
		Rural Landscape – Thirlmere Way This performance indicator will be considered to be triggered if subsidence monitoring identifies visual subsidence, surface cracks.	**No**	Section 2.6.2
		Rural landscape – Thirlmere Way (local heritage significance) No performance indicators are currently established as impacts are predicted to be negligible.	**No**	Section 2.6.2
Other Aboriginal and heritage sites (DA 67/98 Condition 13A)	Negligible subsidence impacts or environmental consequences**.	Loop line Sandstone culverts (local heritage significance) This performance indicator will be considered to be triggered if subsidence monitoring identifies visible perceptible impacts such as subsidence induced cracking, exfoliation, block movement or block fall.	**Yes** Cracking on sandstone culverts at 88.400 km and 88.980 km resulted in exceedance of subsidence performance indicators. DPE (now DPHI) and Heritage NSW were notified of this exceedance on 21 September 2021. A warning letter from DPE (now DPHI) was received on 16 May 2022 regarding the breach against Section 4.2(1)(b) of the EP&A Act. Tahmoor Coal has complete remediation of the two sandstone culverts and there are no residual impacts.	Sections 2.6.2
		Loop line brick culverts (local heritage significance) This performance indicator will be considered to be triggered if subsidence monitoring identifies visible perceptible impacts such as subsidence induced cracking, exfoliation, brick movement or brick fall.	**No**	Sections 2.6.2

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Built Feature Management				
Key Public Infrastructure: • Main Southern Railway; • Picton-Mittagong Loop Line; and • Electricity transmission lines and towers. (DA 67/98 Condition 13E)	Always safe and serviceable.	None allocated.	**No**	Section 2.7
	Damage that does not affect safety or serviceability must be fully repairable, and must be fully repaired.	None allocated.	**No**	Section 2.7
Other Infrastructure: • Electricity distribution lines, poles and associated towers; • Unsealed roads and road culverts, fire trails, fences and other built features; and • Other public infrastructure. (DA 67/98 Condition 13E)	Always safe.	None allocated.	**No**	Section 2.7
	Serviceability should be maintained wherever practicable.	None allocated.		
	Loss of serviceability must be fully compensated.	None allocated.		
	Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.	None allocated.	**No**	Section 2.7
Privately-owned residences (DA 67/98 Condition 13E)	Always safe.	None allocated.	**No**	Section 2.7
	Serviceability should be maintained wherever practicable.	None allocated.		
	Loss of serviceability must be fully compensated.	None allocated.		
	Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.	None allocated.	**No**	Section 2.7

Feature	Subsidence Performance Measure	Subsidence Performance Indicator	Subsidence Performance Measure Exceeded?	Section Discussed
Built Feature Management				
Other privately-owned built features and improvements, including farm dams, swimming pools, tennis courts, roads, tracks and fences (DA 67/98 Condition 13E)	Always safe.	None allocated.	**No**	Section 2.7
	Serviceability should be maintained wherever practicable.	None allocated.		
	Loss of serviceability must be fully compensated.	None allocated.		
	Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.	None allocated.	**No**	Section 2.7
Public Safety (DA 67/98 Condition 13E)	Negligible additional risk**.	None allocated.	**No**	Section 2.7
Mine workings				
First workings (DA 67/98 Condition 13A)	To remain long term stable and non-subsiding.	None allocated.	**No**	Not applicable
Second workings (DA 67/98 Condition 13A)	To be carried out only within the approved mine plan, in accordance with an approved Extraction Plan.	None allocated.	**No**	Not applicable

NOTES:

* minor is defined as *not very large, important or serious* by DPE (now DPHI).

** For the purpose of this Extraction Plan and associated documents, 'negligible' is defined as being 'so small and insignificant as to not be worth considering'. A negligible impact is viewed with regards to a long term context, causing little or no impact. If a short-term impact causes a greater than negligible impact, the impact can still be considered negligible if the impacts are of a limited duration and are considered negligible when considered over the long term.

5 Document Information

5.1 References

Department of Planning and Environment (DPE) (2015), Draft Guidelines for the Preparation of Extraction Plans V5.

Mine Subsidence Engineering Consultants (MSEC) (2021), Tahmoor Coal – Longwalls W3 and W4, Subsidence Predictions and Impact Assessments for Natural and Built Features due to the Extraction of the Proposed Longwalls W3 and W4 in Support of the Extraction Plan Application. Prepared for Tahmoor Coal, March 2021, document MSEC1112.

SLR (2021), Agricultural Subsidence Monitoring LW W3-W4, letter report to Tahmoor Coal, 26th August 2021, document 630.12953.001

Tahmoor Coal Documents:

- Extraction Plan LW W3-W4 Extraction Plan Main Document, TAH-HSEC-326
- Extraction Plan LW W3-W4 Water Management Plan, TAH-HSEC-328
- Extraction Plan LW W3-W4 Land Management Plan, TAH-HSEC-330
- Extraction Plan LW W3-W4 Biodiversity Management Plan, TAH-HSEC-325
- Extraction Plan LW W3-W4 Heritage Management Plan, TAH-HSEC-331
- Extraction Plan LW W3-W4 Stonequarry Creek Rockbar Management Plan, TAH-HSEC-352
- Extraction Plan LW W3-W4 Built Features Management Plan, TAH-HSEC-332
- Extraction Plan LW W3-W4 Public Safety Management Plan, TAH-HSEC-333
- Extraction Plan LW W3-W4 Subsidence Monitoring Program, TAH-HSEC-329

5.2 Glossary of Terms

Terms references to this document are provided below in **Table 5-1**.

Table 5-1 Glossary of Terms

Term	Definition
Active Subsidence Zone	The active subsidence zone for each longwall is defined by the area bounded by the predicted 20 mm subsidence contour for the active longwall and a distance of 150 m in front of the active longwall face and 450 m behind the active longwall face or following 500 m of longwall extraction.
Angle of draw	The angle of inclination from the vertical of the line connecting the goaf edge of the workings and the limit of subsidence (which is usually taken as 20 mm of subsidence).
Built features	Includes any building or work erected or constructed on land, including dwellings and infrastructure such as a formed road, street, path, walk, or driveway; any pipeline, water sewer, telephone, gas or other infrastructure service main.
Cliffs	Continuous rockfaces having minimum heights of 10 m, minimum lengths of 20 m and minimum slopes of 2 to 1, i.e. having minimum angles to the horizontal of 63°.
Closure	The reduction in the horizontal distance between the valley sides. The magnitude of closure, which is typically expressed in the units of mm, is the greatest reduction in distance between any two points on the opposing valley sides.

Term	Definition
	It should be noted that the observed closure movement across a valley is the total movement resulting from various mechanisms, including conventional mining induced movements, valley closure movements, far-field effects, downhill movements and other possible strata mechanisms.
Curvature	Second derivative of subsidence, or the rate of change of tilt, and is calculated as the change in tilt between two adjacent sections of the tilt profile divided by the average length of those sections. Curvature is usually expressed as the inverse of the Radius of Curvature with the units of 1/km (km-1), but the value of curvature can be inverted, if required, to obtain the radius of curvature, which is usually in km. Curvature can be either hogging (i.e. convex) or sagging (e.g. concave).
Longwall	A system of mining coal in which the seam is extracted on a broad front or long face using a coal shearer and the roof is supported by hydraulic roof supports.
Reporting period	1 July 2023 to 31 December 2023.
Run of mine (ROM)	Raw coal production. The unprocessed mined coal that is conveyed to the CPP. ROM may consist of coal and rock.
Strain	The change in the horizontal distance between two points divided by the original horizontal distance between the points, i.e. strain is the relative differential displacement of the ground along or across a subsidence monitoring line. Strain is dimensionless and can be expressed as a decimal, a percentage or in parts per notation. Tensile Strains are measured where the distance between two points or survey pegs increases and Compressive Strains where the distance between two points decreases. Whilst mining induced strains are measured along monitoring lines, ground shearing can occur both vertically, and horizontally across the directions of the monitoring lines.
Study Area	Study Area as defined in the LW W3-W4 Extraction Plan.
Subsidence	The vertical movement of a point on the surface of the ground as it settles above an extracted panel, but 'subsidence of the ground' in some references can include both a vertical and horizontal movement component. The vertical component of subsidence is measured by determining the change in surface level of a peg that is fixed in the ground before mining commenced and this vertical subsidence is usually expressed in units of mm. Sometimes the horizontal component of a peg's movement is not measured, but in these cases, the horizontal distances between a particular peg and the adjacent pegs are measured.
Subsidence impacts	The physical changes or damage to the fabric or structure of the ground, its surface and environmental features, or built structures that are caused by the subsidence effects. These impacts considerations can include tensile and shear cracking of the rock mass, localised buckling of strata, bed separation, rock falls, collapse of overhangs, failure of pillars, failure of pillar floors, dilation, slumping and also include subsidence depressions or troughs.
Subsidence consequences	The knock-on results of subsidence impacts, i.e. any change in the amenity or function of a natural feature or built structure that arises from subsidence impacts. Consequence considerations include public safety, loss of flows, reduction in water quality, damage to artwork, flooding, draining of aquifers, the environment, community, land use, loss of profits, surface improvements and infrastructure. Consequences related to environmental features are referred to as environmental consequences.

Term	Definition
Tilt	The change in the slope of the ground as a result of differential subsidence, and is calculated as the change in subsidence between two points divided by the horizontal distance between those points. Tilt is, therefore, the first derivative of the subsidence profile. Tilt is usually expressed in units of mm/m. A tilt of 1 mm/m is equivalent to a change in grade of 0.1 %, or 1 in 1000.
Western Domain	Area to the north-west of the Main Southern Railway.

5.3 Abbreviations

Abbreviations used in this document are provided below in **Table 5-2**.

Table 5-2 Abbreviations

Abbreviation	Definition
AHIMS	Aboriginal Heritage Information System
ARTC	Australian Rail Track Corporation
AUSRIVAS	The Australian River Assessment System
BACI	Before After Control Impact design
BGSS	Bargo Sandstone
BIS	Building Inspection Service
CTF	Cease to flow
DA	Development Approval
DRNSW	Department of Regional NSW
DPE	NSW Department of Planning and Environment (formerly DPIE, now DPHI)
DPIE	NSW Department of Planning, Industry and Environment (now DPHI, formerly DPIE and DPE)
DPHI	NSW Department of Planning, Housing and Infrastructure (formerly DPE, now DPHI)
EC	Electrical conductivity
EPA	NSW Environment Protection Authority
EPT	Ephemeroptera Plecoptera Trichoptera scores
GFG	GFG Alliance
GNSS	Global Navigation Satellite System units
HBSS	Hawkesbury Sandstone
HEC	Hydro Engineering and Consulting, now ATC Williams
Km	Kilometres
LW W1	Longwall West 1
LW W1-W2	Longwall West 1 to West 2
LW W2	Longwalls West 2
LW W3	Longwall West 3
LW W3-W4	Longwalls West 3 to West 4
LW W4	Longwall West 4
m	metres
mbgl	Metres below ground level

Abbreviation	Definition
mg/L	Milligrams per litre
ML	Mining Lease
mm	millimetre
MSEC	Mine Subsidence Engineering Consultants
MSR	Main Southern Railway
NRAR	NSW Industry – Land & Water – Natural Resources Access Regulator – East
NSW	New South Wales
OE	Observed expected score
OSP	Open Standpipe Piezometers
pH	pH units
PMLL	Picton-Mittagong Loop Line railway
RCE	Riparian Channel and Environment Inventory
RCP	Reinforced Concrete Pipe
Tahmoor Coal	Tahmoor Coal Pty Ltd
Tahmoor Mine	Tahmoor Coal Mine
TARP	Trigger Action Response Plan
TDS	Total dissolved solids
TfNSW	Transport for NSW
VMP	Vibrating Wire Piezometer
WWTP	Wastewater treatment plant

5.4 Document Distribution

This report and associated documents have been distributed according to **Table 5-3**.

Table 5-3 Distribution List for Six Monthly Subsidence Impact Report

Agency	Contact Person	Position	Electronic Copy
NSW Department of Planning, Housing and Infrastructure - Planning	(Planning Portal)	(Planning Portal)	(https://www.planningportal.nsw.gov.au/major-projects)
	Jessie Evans	Director – Resource Assessments	Jessie.evans@planning.nsw.gov.au
	Gabrielle Allan	Team Leader	Gabrielle.Allan@planning.nsw.gov.au
NSW Resources Regulator (Subsidence)	(General email)	(General email)	subsidence.monitoring@planning.nsw.gov.au nswresourcesregulator@service-now.com
	Ray Ramage	Mine Safety Officer - Subsidence	ray.ramage@planning.nsw.gov.au
NSW Resources Regulator – Mining Act Inspectorate	Greg Kininmonth	Manager Environmental Operations (Southern)	greg.kininmonth@planning.nsw.gov.au
Mining Exploration and Geoscience	(General email)	(General email)	resource.operations@planning.nsw.gov.au

Agency	Contact Person	Position	Electronic Copy
Wollondilly Shire Council	(General email)	(General email)	council@wollondilly.nsw.gov.au
	David Henry	Acting Team Leader Environmental Services	david.henry@wollondilly.nsw.gov.au
Subsidence Advisory NSW	(General email)	(General email)	subsidencetechnical@customerservice.nsw.gov.au
	John Johnston	Technical Manager	John.Johnston@customerservice.nsw.gov.au
Natural Resources Access Regulator	(General email)	(General email)	nrar.servicedesk@dpie.nsw.gov.au
	Guy Ohandja	Manager Compliance Monitoring & Audit	guy.ohandja@nrar.nsw.gov.au
Environment Protection Authority	(General email)	(General email)	epa.illawarra@epa.nsw.gov.au
	Andrew Couldridge	Senior Operations Officer - Metropolitan Illawarra	andrew.couldridge@epa.nsw.gov.au
TCCCC Committee Members	Documents sent to TCCCC Committee Members at private email addresses.		

Appendix A – Subsidence Monitoring Report

Six Monthly Subsidence Monitoring Report for Tahmoor Longwall W4

Summary	
Monitoring period	1 July 2023 to 31 December 2023
Length of extraction of LW W4	LW W4 commenced extraction on 16 May 2022 and finished extraction on 13 September 2022
Distance travelled by longwall since previous report	
Distance to completion of LW W4	

Summary of observed ground movements

Subsidence Parameter		Maximum observed at completion of LW W4	Location
Subsidence (mm)	*Inc* *Total*	718 897	LW W4 Centreline LW W1-W4 Crossline
Tilt (mm/m)	*Inc* *Total*	9.7 9.8	LW W1-W4 Crossline LW W1-W4 Crossline
Hogging Curvature (km^{-1})	*Inc* *Total*	0.37 0.35	LW W1-W4 Crossline LW W1-W4 Crossline
Sagging Curvature (km^{-1})	*Inc* *Total*	-0.19 -0.33	LW W1-W4 Crossline LW W3 Centreline
Tensile Strain (mm/m)	*Inc* *Total*	0.9 1.3	LW W4 Centreline LW W2 Centreline
Compressive Strain (mm/m)	*Inc* *Total*	-4.8 -5.6	LW W4 Centreline LW W4 Centreline

This monitoring report provides the results of the latest ground surveys for LW W4, in accordance with the requirements of subsidence management plans and the Residual Subsidence Monitoring Plan, which was developed and implemented by Tahmoor Coal in January 2024.

Longwall W4

LW W4 commenced on 16 May 2022 finished extraction on 13 September 2022.

Monitoring Results

Ground monitoring has continued after the extraction of LW W4. Monitoring results are shown graphically at the back of this report.

A map showing the locations of survey marks is provided in Drawing No. MSEC1263-01. Monitoring has continued at GNSS units that are located directly above and adjacent to LW W4. Traditional surveys have continued on a monthly basis along the Main Southern Railway and some of its key infrastructure sites, and at the Victoria Bridge.

Subsidence above LW W4

GNSS Site 24 is located directly above the centreline of LW W4, approximately 200 metres from the commencing end. The unit has recorded approximately 680 mm subsidence and has also moved to the east and south. Rates of change have reduced to very low levels.

The development of subsidence over time is shown in Figure A. GNSS Site 24 recorded an additional 9 mm of vertical subsidence between 1 July 2023 and 31 December 2023.

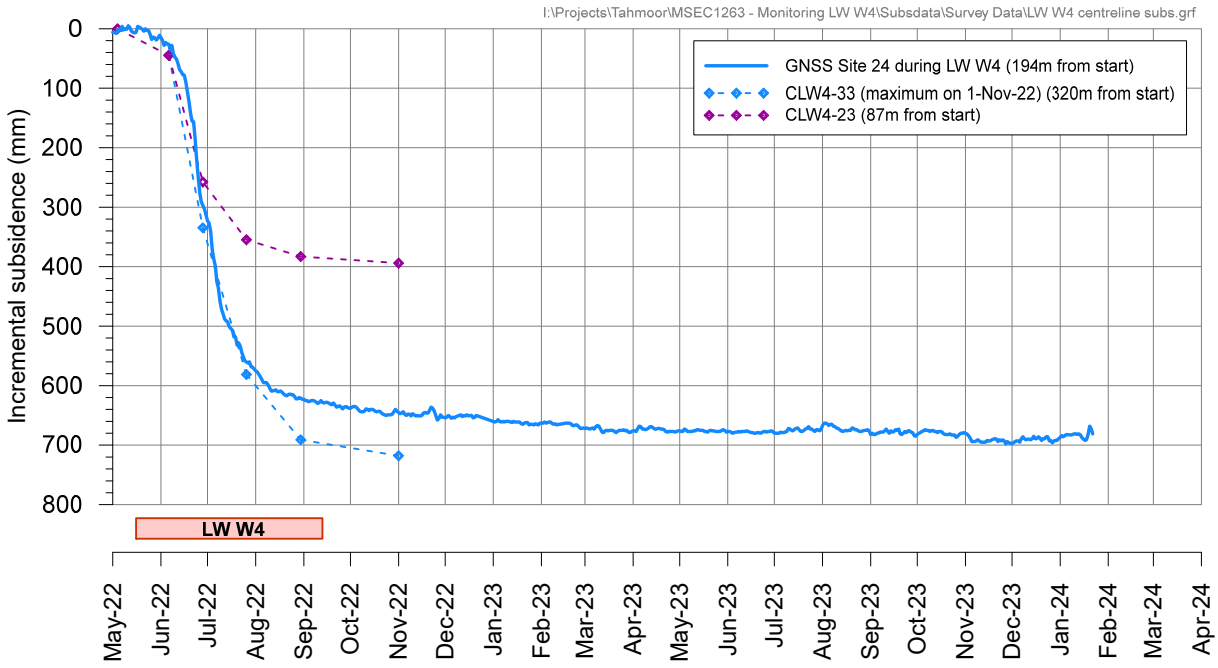

Figure A Development of subsidence along centreline of LW W4

Main Southern Railway

Monthly surveys were conducted along the Main Southern Railway during and after the mining of LW W4. Results were within survey tolerances during mining, noting that the pegs along this rail corridor have been affected by changes in soil moisture. Rail stress gauges, track geometry surveys and visual inspections did not identify any issues along the railway associated with mine subsidence.

Continued ongoing minor horizontal movements had been observed along the Railway and at the Thirlmere Way Underbridge and Connellan Crescent Overbridge but rates of change had reduced to low levels between 1 July 2023 and 31 December 2023.

Victoria Bridge

Regular surveys were conducted at the Victoria Bridge over Stonequarry Creek during and after the mining of LW W4. Very small and gradual closure was observed across Stonequarry Creek.

Visual inspections did not identify any impacts associated with mine subsidence but the gap between the deck and the eastern abutment was observed to almost close during the mining of LW W3. The buffer board was replaced on 7 June 2022 and the gap reinstated. A gap of 35 mm was measured between the structural cross beam and abutment on 10 June 2022. The gap between the deck and the eastern abutment was reinstated on 24 January 2023. The gap has gradually reduced over time to 19 mm. Rates of change are reducing to be very low levels. Quarterly monitoring and reporting continues.

GNSS monitoring

Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure their absolute horizontal and vertical positions in real time. The measured position of each GNSS unit varies depending on atmospheric conditions and the array of satellites that are present in the sky at each time, and the vegetation cover surrounding each unit. Measured variations in height are typically greater than the variations for eastings and northings.

GNSS unit 1 is located above the Picton Tunnel on the Main Southern Railway. Very minor changes within survey tolerances were observed between July 2023 and October 2023. A minor trend is currently observed since October 2023, which may be due to environmental factors. Monitoring continues.

GNSS units 0 and 2 are located at each end of the Picton Viaduct on the Main Southern Railway. Very minor changes within survey tolerances were observed between July 2023 and December 2023. Monitoring continues.

GNSS units 3 and 25 are located at each end of Victoria Bridge. Very minor changes within survey tolerances were observed at GNSS unit 3 on the eastern abutment between July 2023 and December 2023. A very minor ongoing trend of movement has been measured at GNSS unit 25 on the western abutment, which correlates with the observation of a gradual closure across Stonequarry Creek at the Bridge. Monitoring continues.

GNSS units 7, 8, 9, 10, 11 and 19 are located at intervals along the Picton Mittagong Loop Line. GNSS Site 24 is located directly above the centreline of LW W4. The results are shown in Fig. G07 to Fig. G11, Fig. G19 and Fig. G24.

It can be seen from Fig. G07 to G09 that GNSS units 7, 8 and 9 have recorded very minor ongoing residual subsidence during the reporting period. They recorded an additional 13 mm, 9 mm and 11 mm, respectively, of vertical subsidence between 1 July 2023 and 31 December 2023. Very little measurable change was recorded at GNSS units 10, 11 and 19, which are located to the side of the extracted longwall panels.

Very minor changes in horizontal movements have been observed between July 2023 and December 2023 though some units have recorded a slight movement to the north since October 2023, which may be due to environmental factors. Monitoring continues.

GNSS units 26 and 27 were installed in August 2023 along the Main Southern Railway as part of the Residual Subsidence Monitoring Plan. Minor changes have been observed and monitoring continues.

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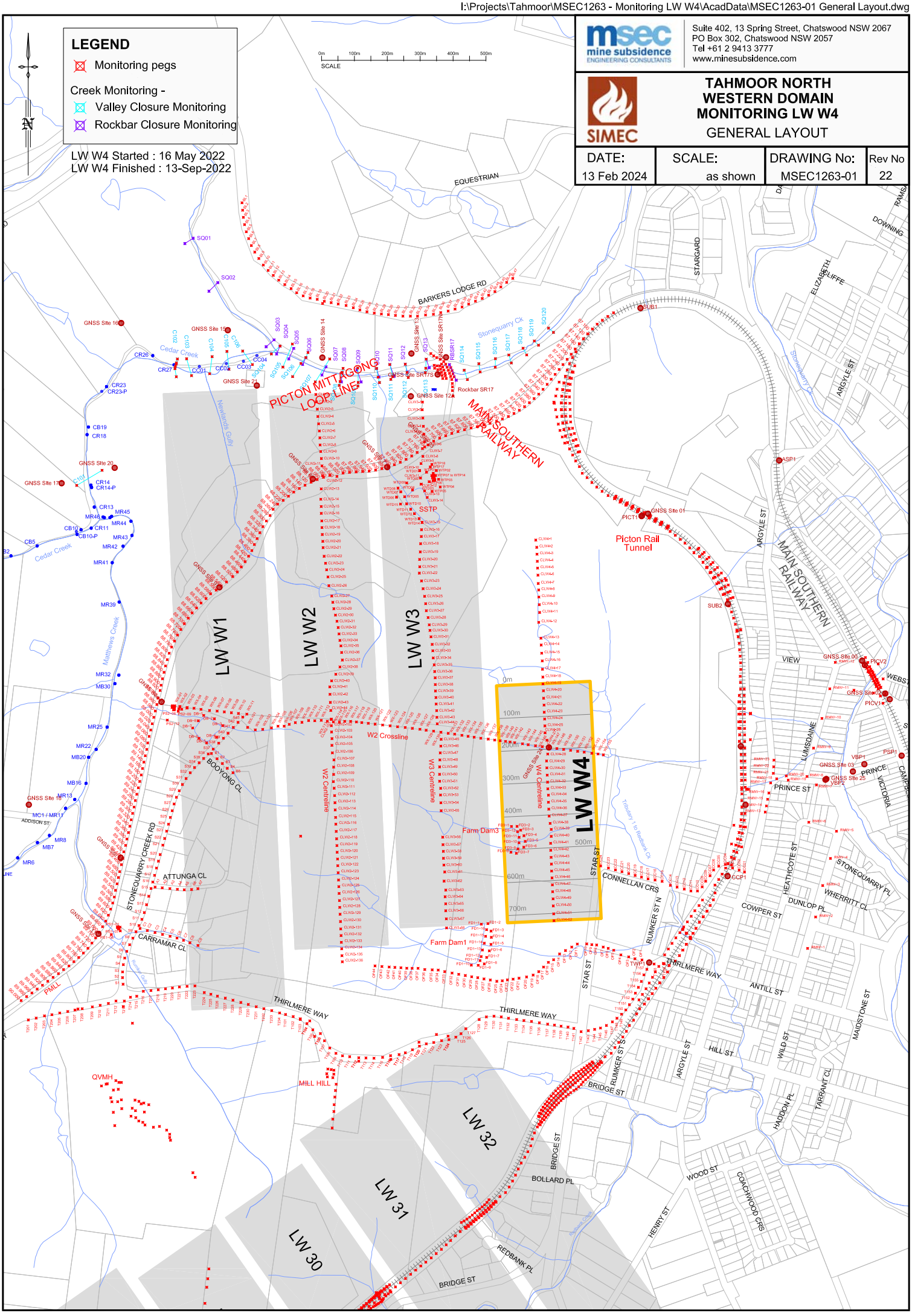
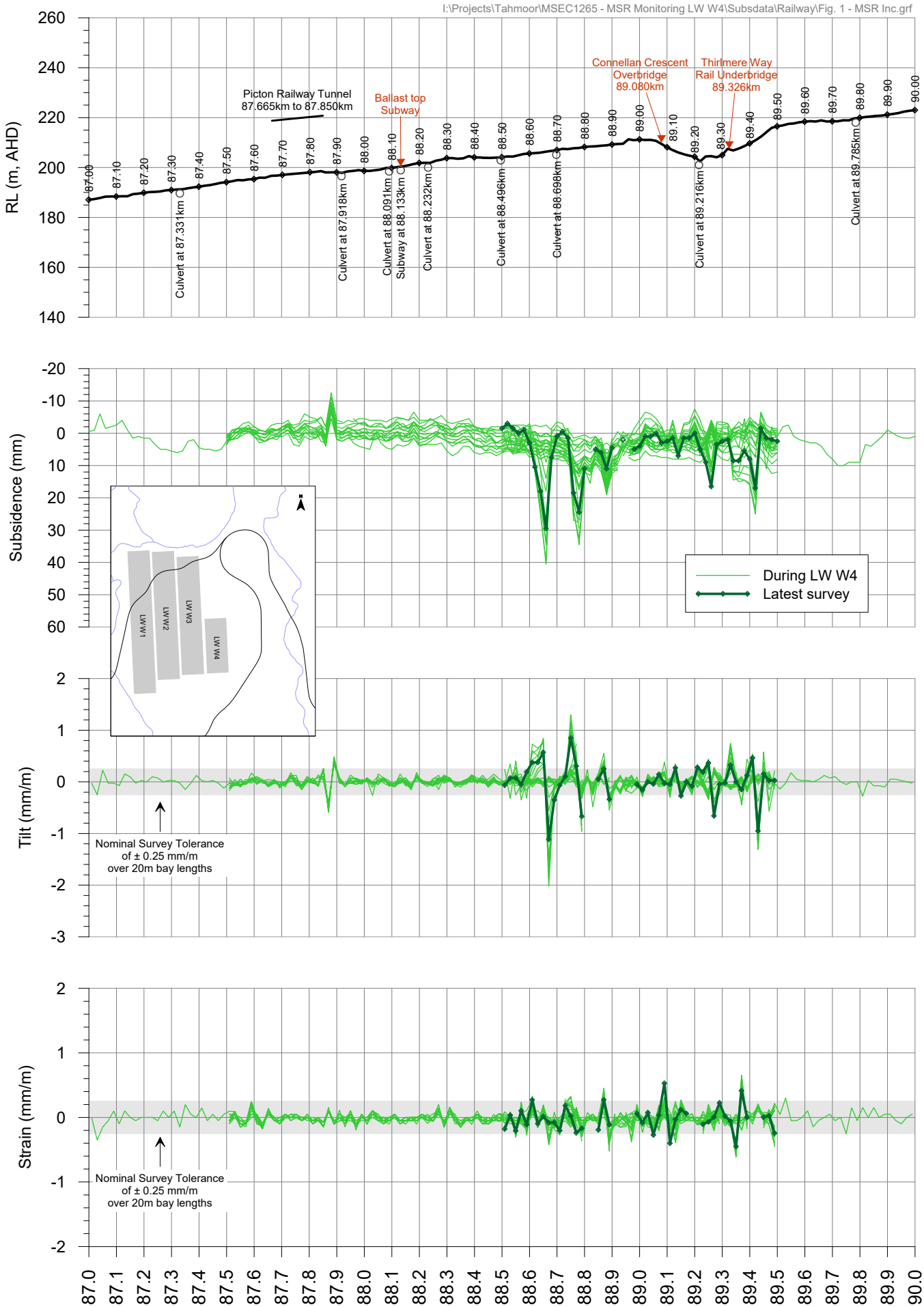


Tahmoor LW W4 - Main Southern Railway
Incremental subsidence profiles
Survey date: 19 January 2024



msec

Fig. 1-R22

Tahmoor LW W4 - Main Southern Railway
Total subsidence profiles
Survey date: 19 January 2024

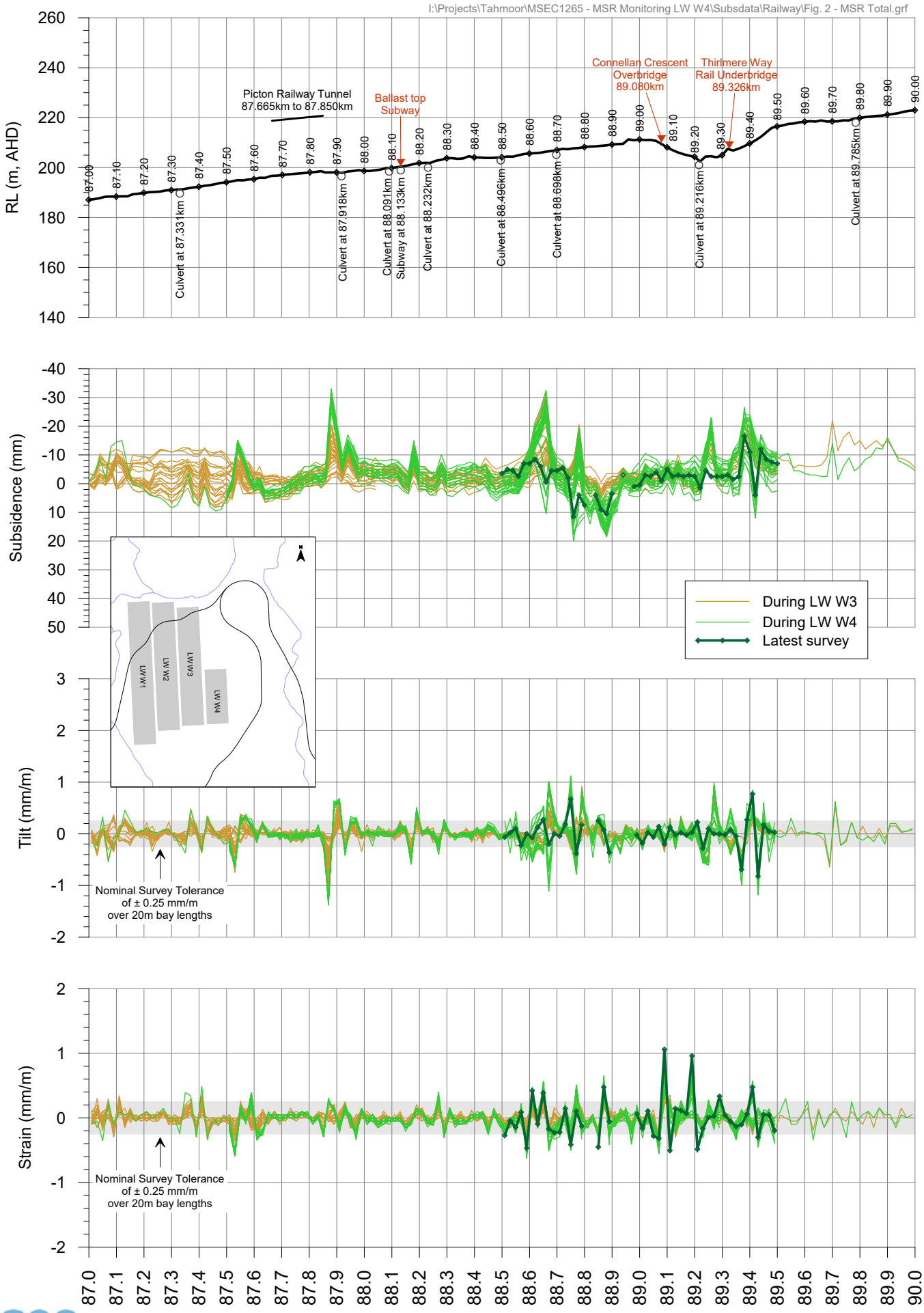


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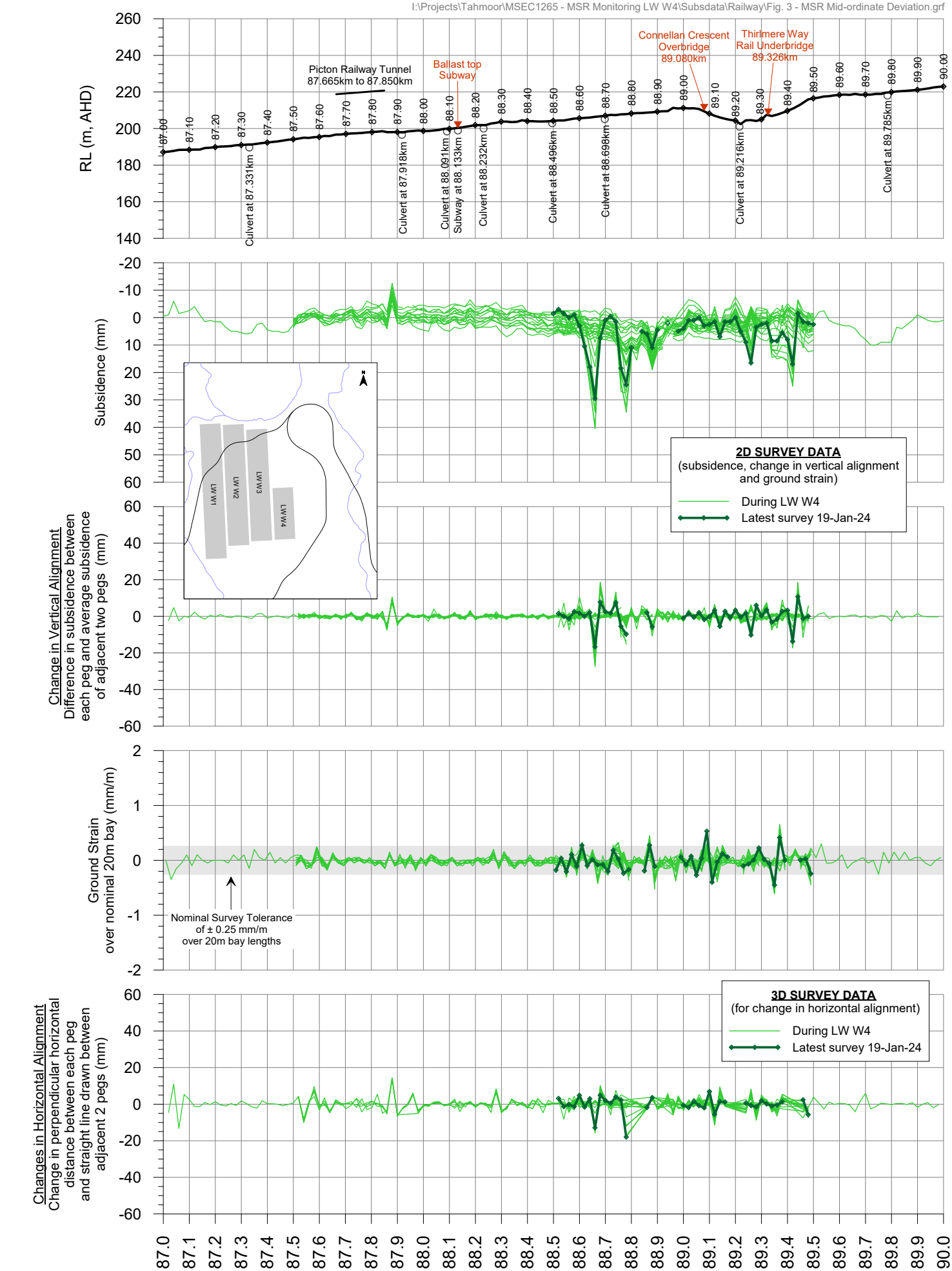
Fig. 2-R22

Tahmoor LW W4 - Main Southern Railway
Incremental changes in vertical and horizontal alignment

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Railway\Fig. 3 - MSR Mid-ordinate Deviation.grf

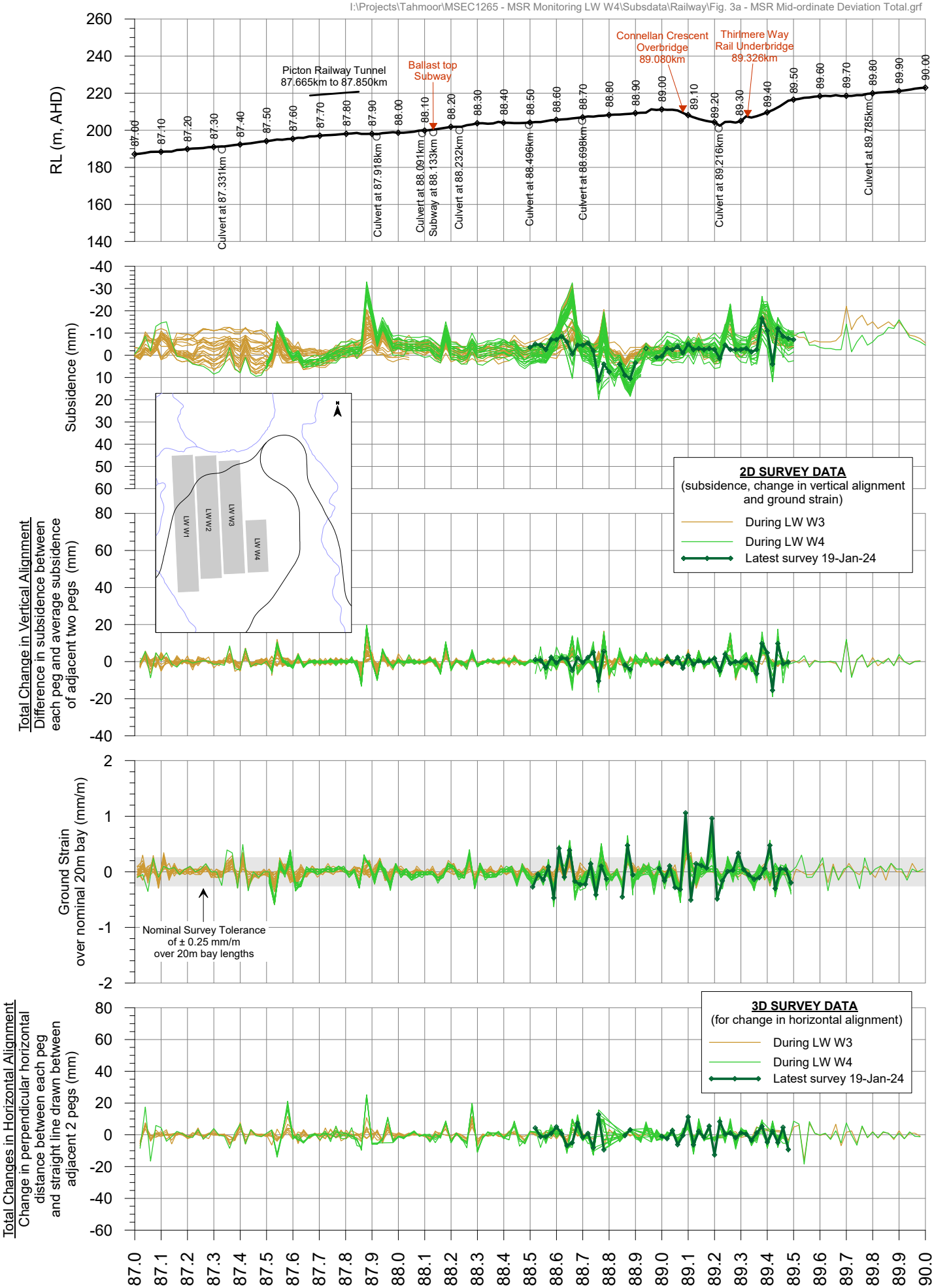


msec

Fig. 3-R22

Tahmoor LW W4 - Main Southern Railway
Total changes in vertical and horizontal alignment

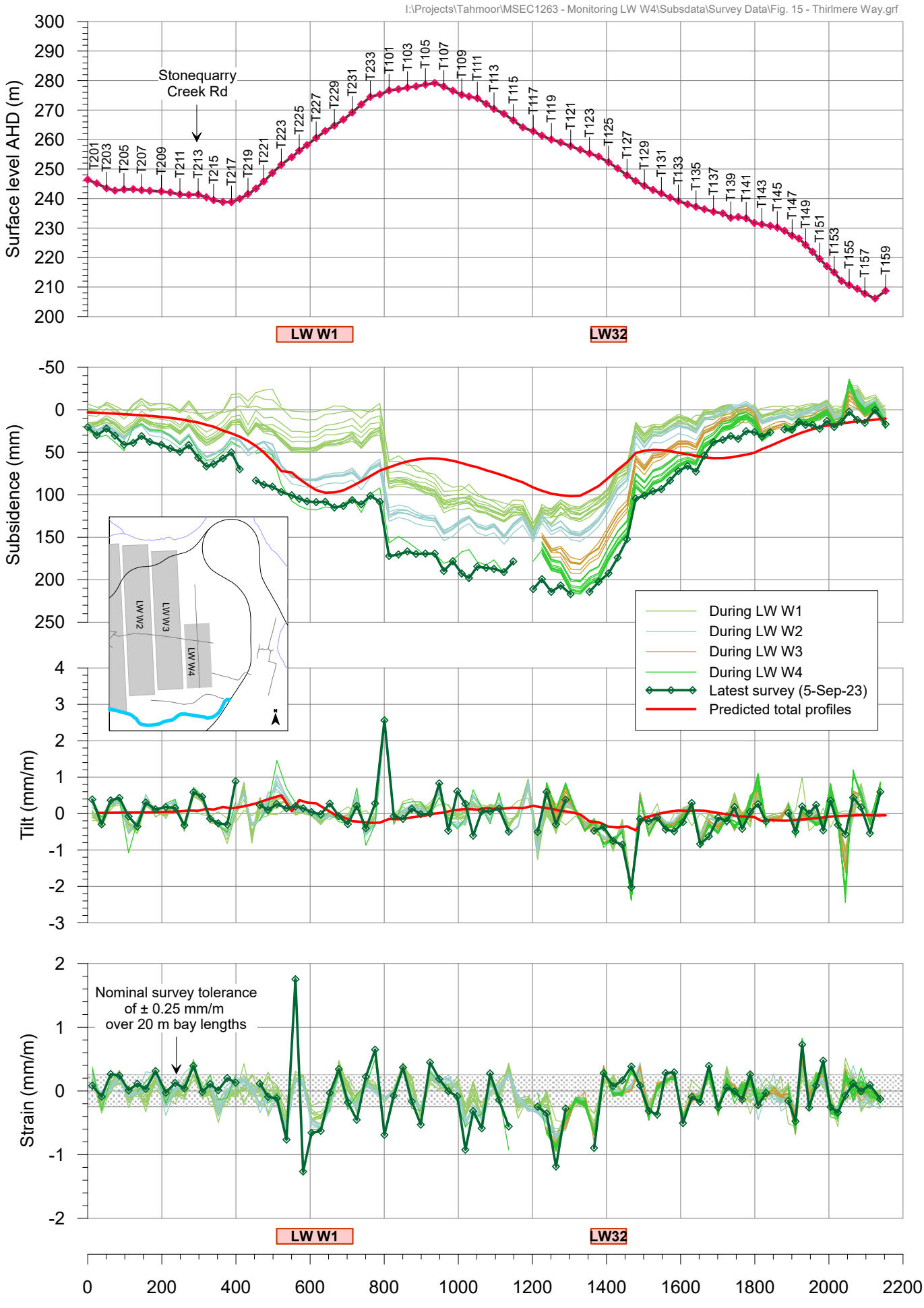
I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Railway\Fig. 3a - MSR Mid-ordinate Deviation Total.grf



msec

Fig. 3a-R22

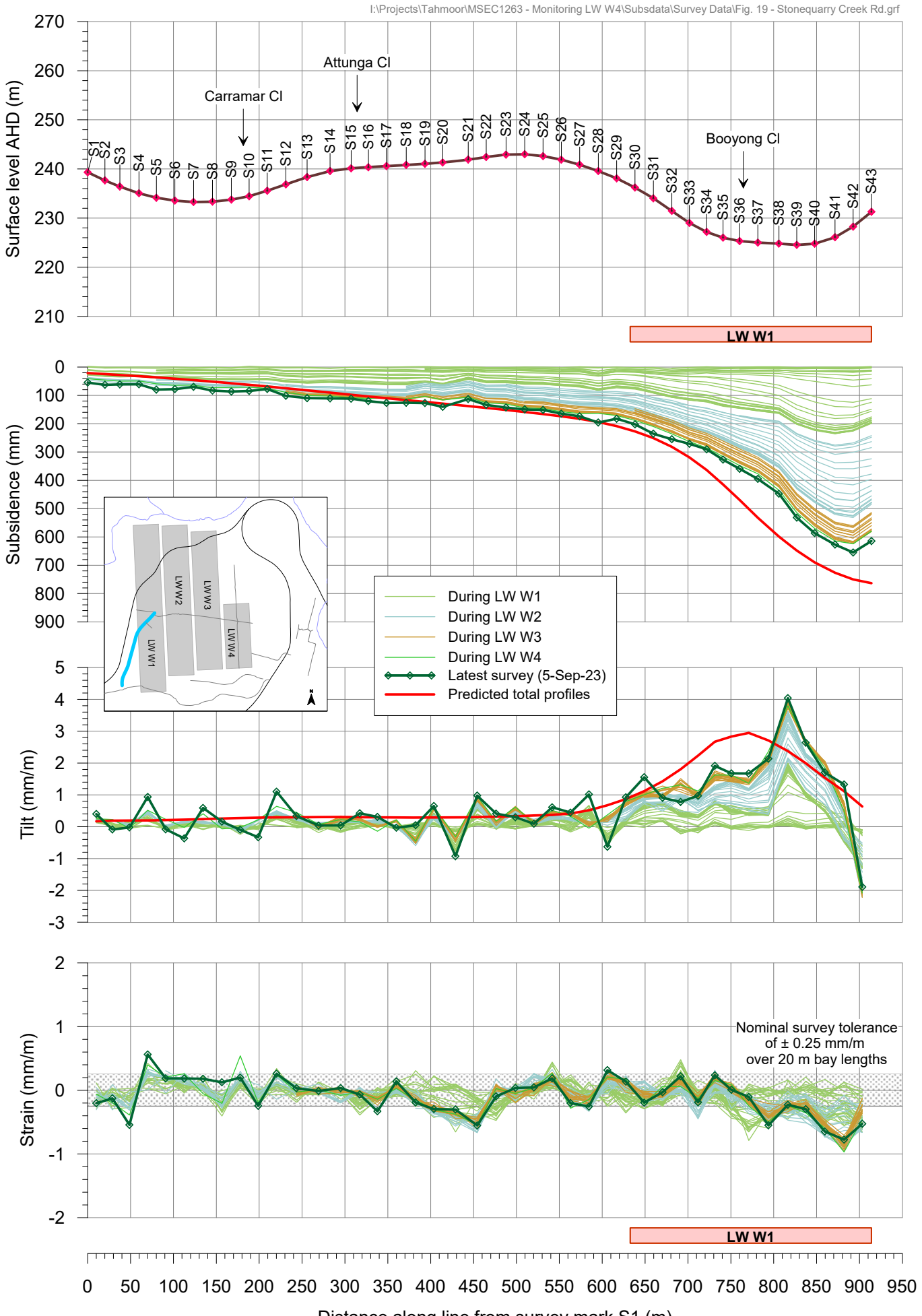
Tahmoor LW W4
Total subsidence profiles along Thirlmere Way



msec

Fig. 15-R22

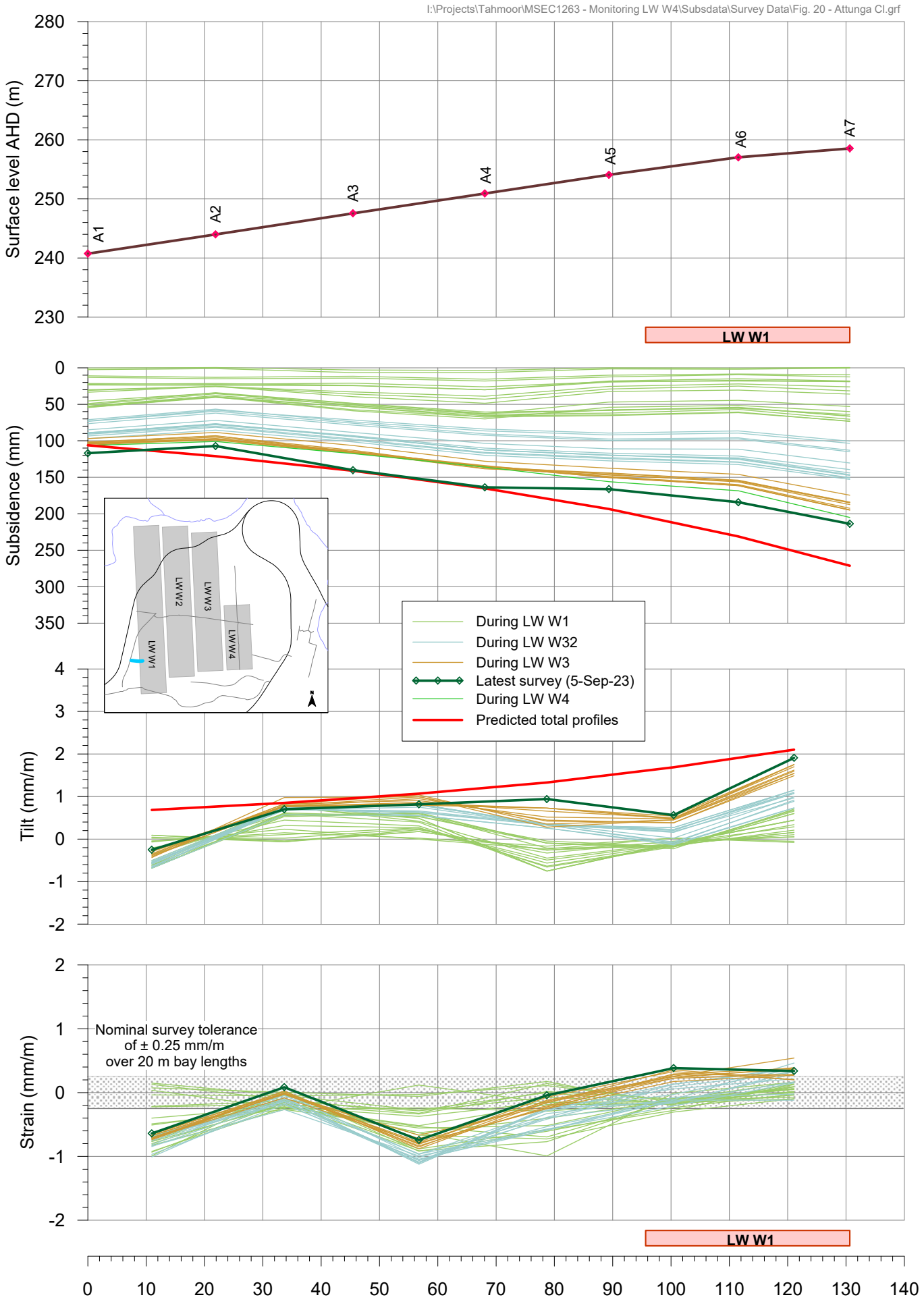
Tahmoor LW W4
Total subsidence profiles along Stonequarry Creek Rd



msec

Fig. 19-R22

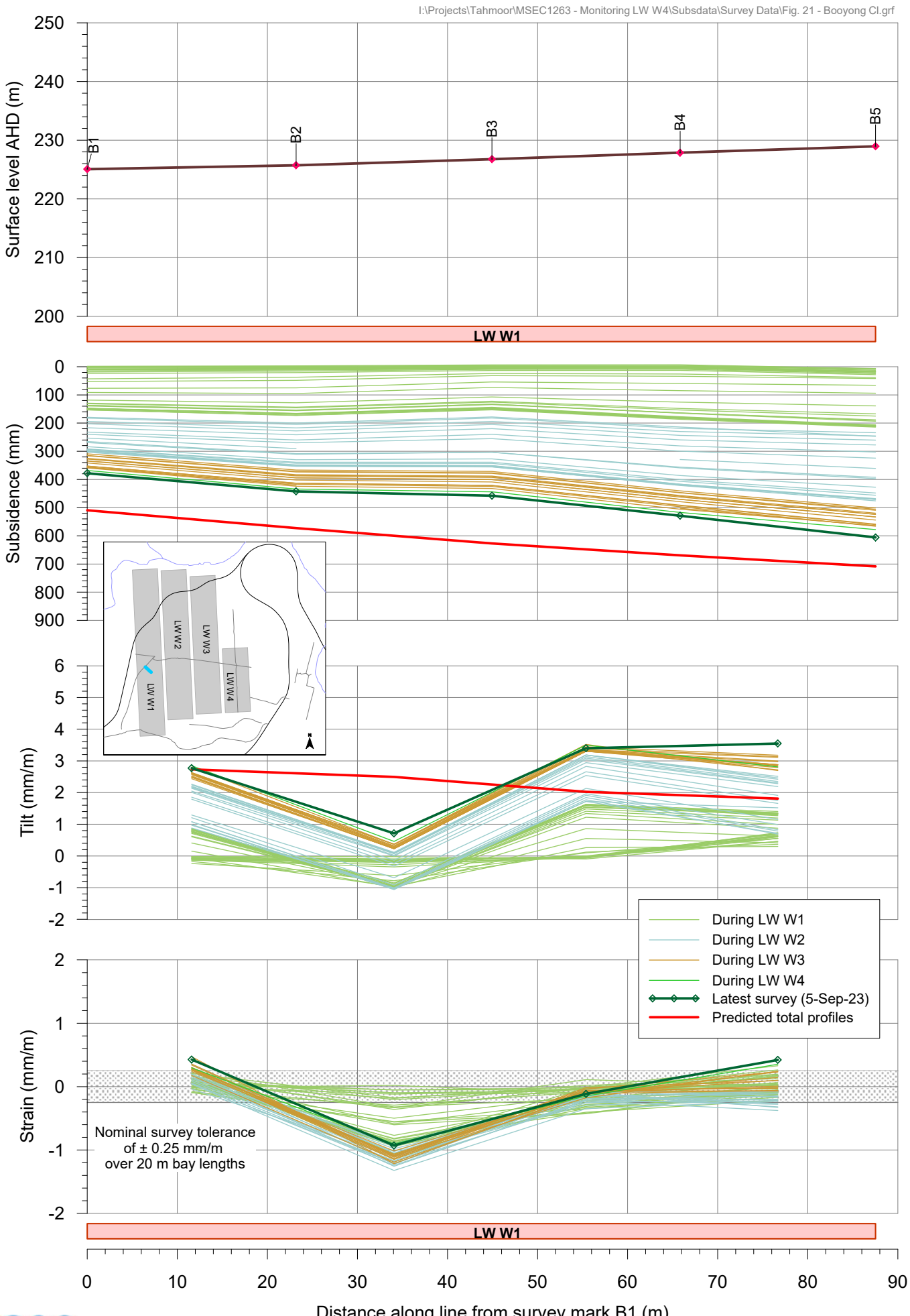
Tahmoor LW W4
Total subsidence profiles along Attunga Close



msec

Fig. 20-R22

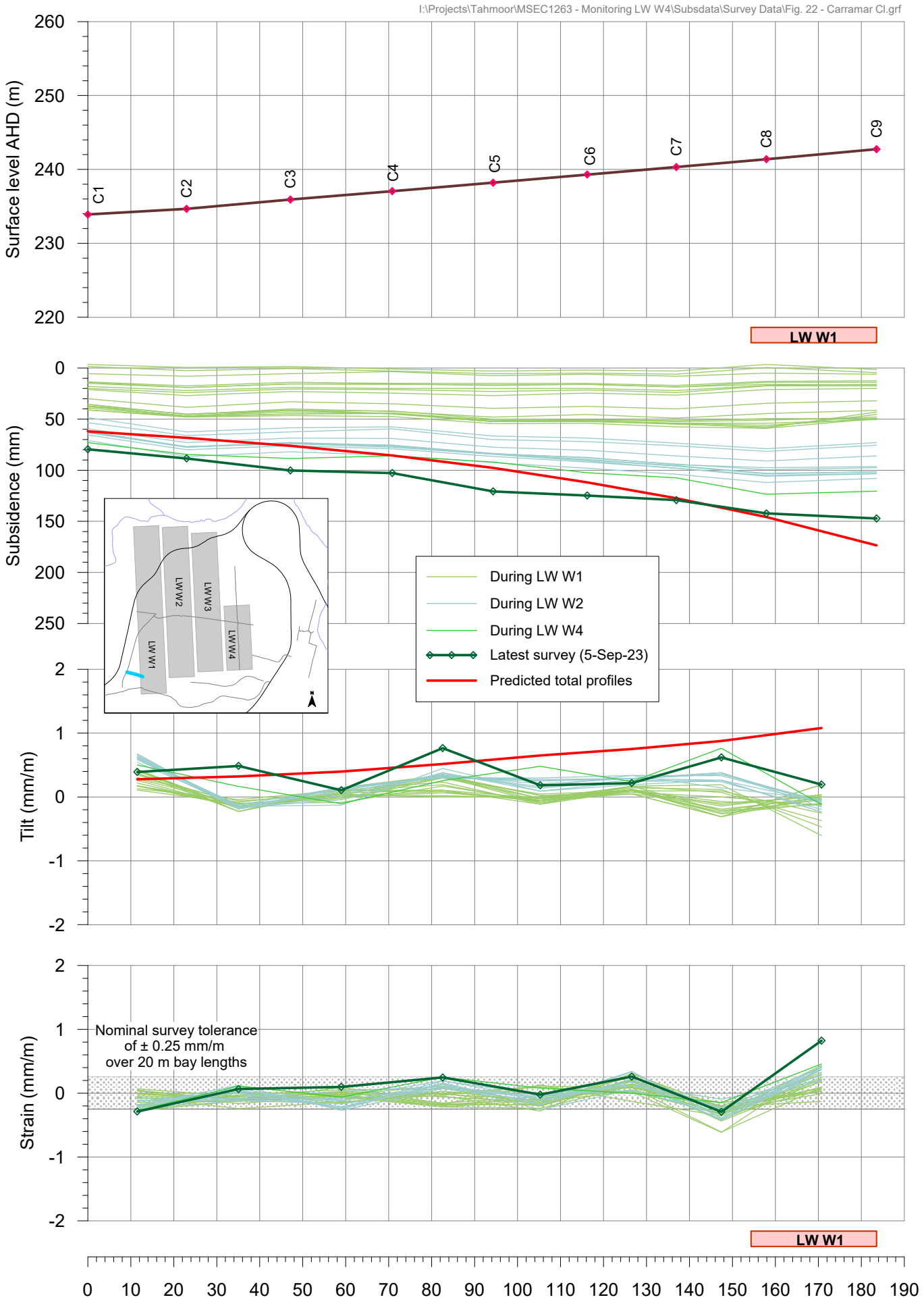
Tahmoor LW W4
Total subsidence profiles along Booyong Close



msec

Fig. 21-R22

Tahmoor LW W4
Total subsidence profiles along Carramar Close

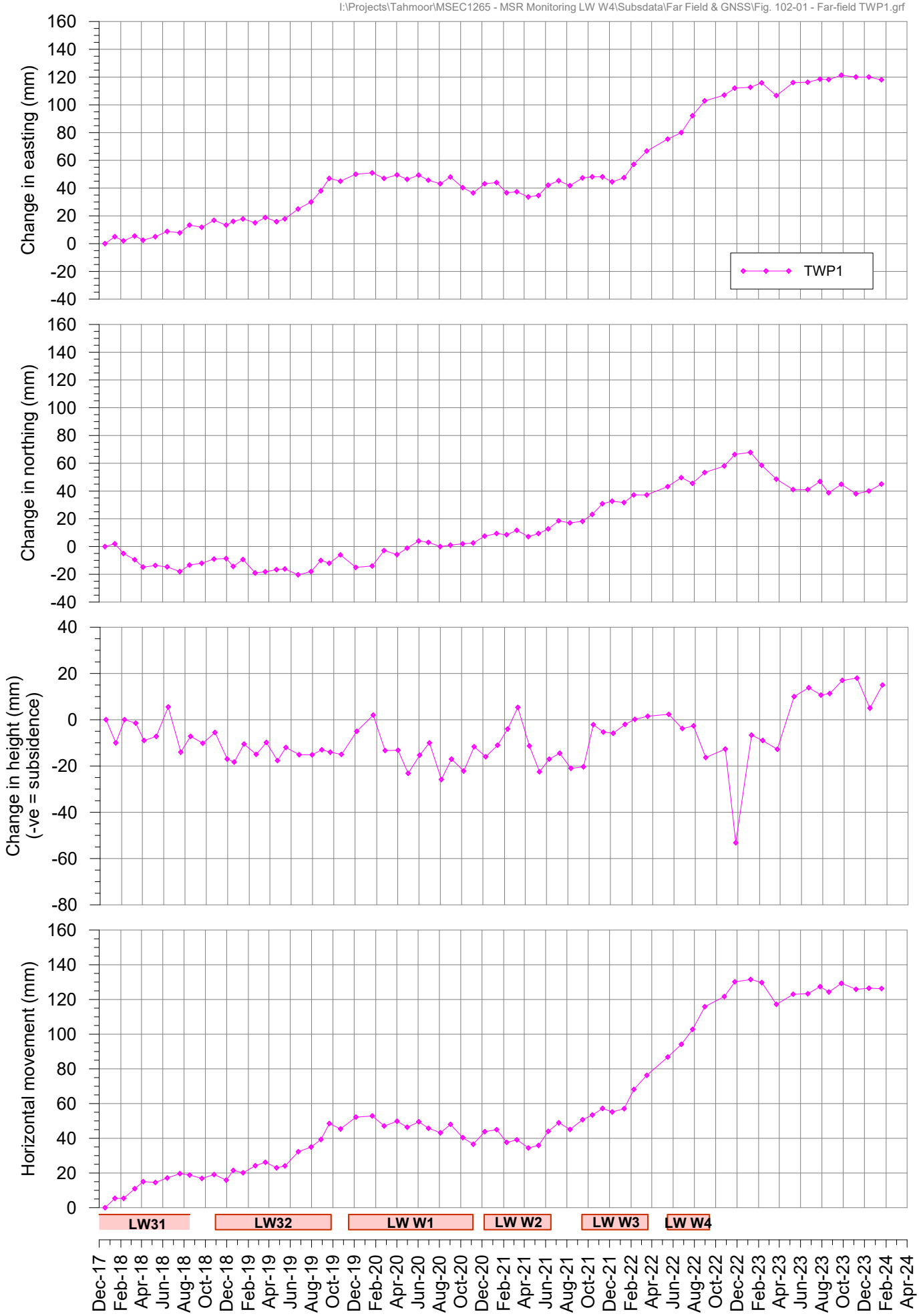


msec

Fig. 22-R22

Tahmoor - LW W4
Far-field Monitoring - Thirlmere Way Underbridge

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. 102-01 - Far-field TWP1.grf

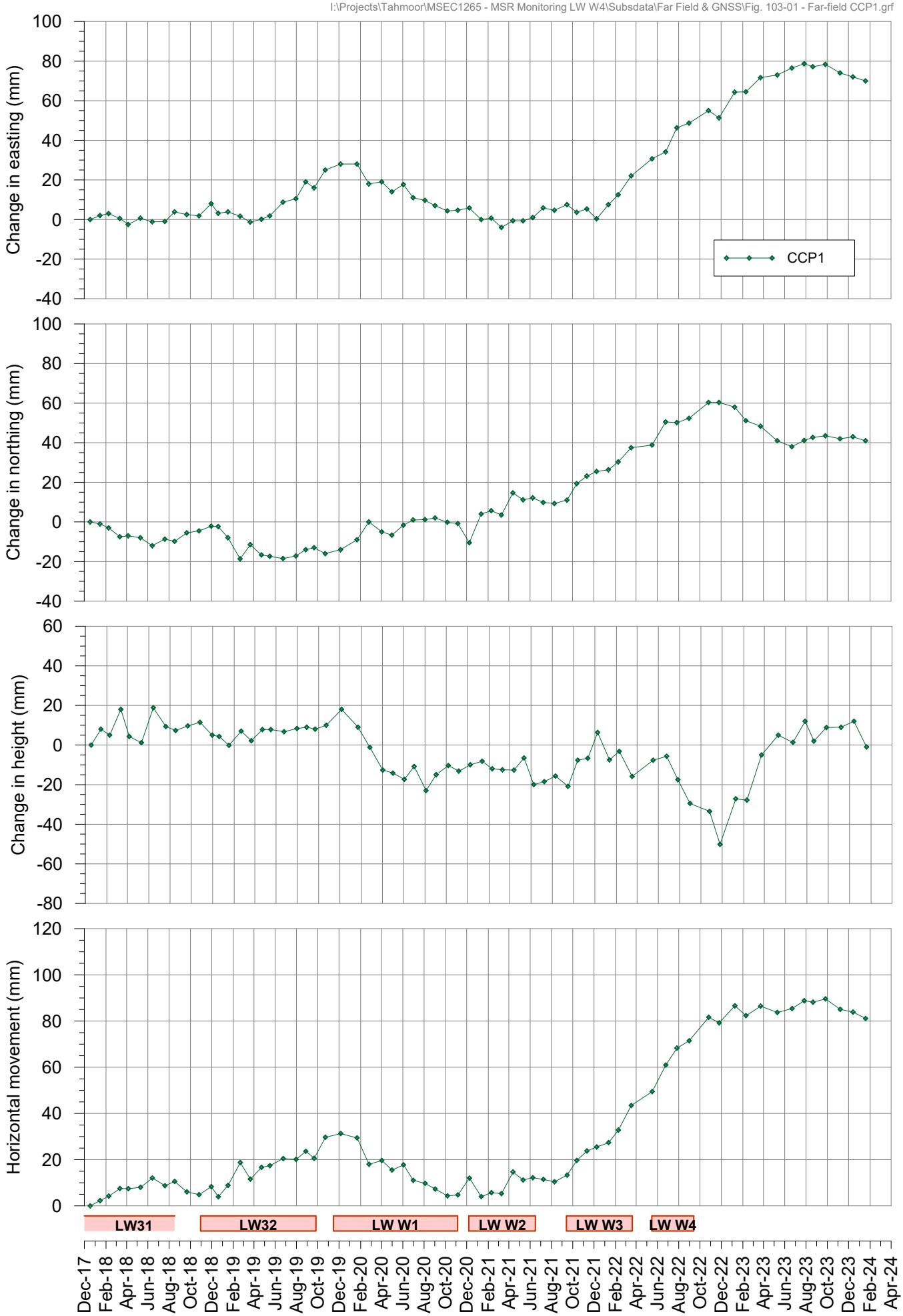


msec

Fig. 102-01-R22

Tahmoor - LW W4
Far-field Monitoring - Connellan Crescent Overbridge

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. 103-01 - Far-field CCP1.grf

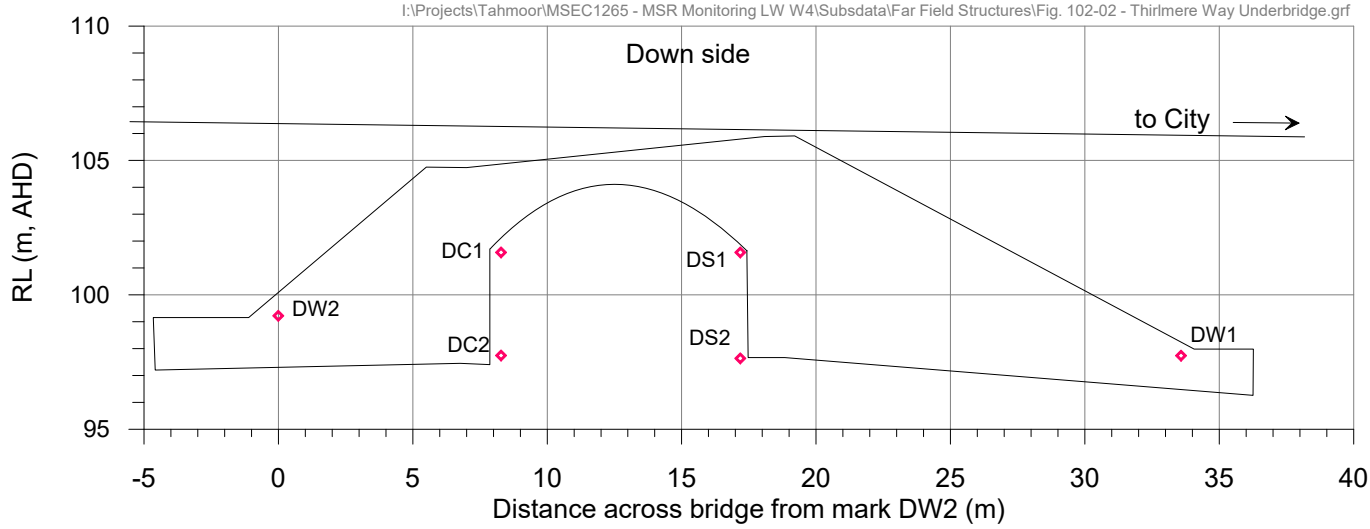


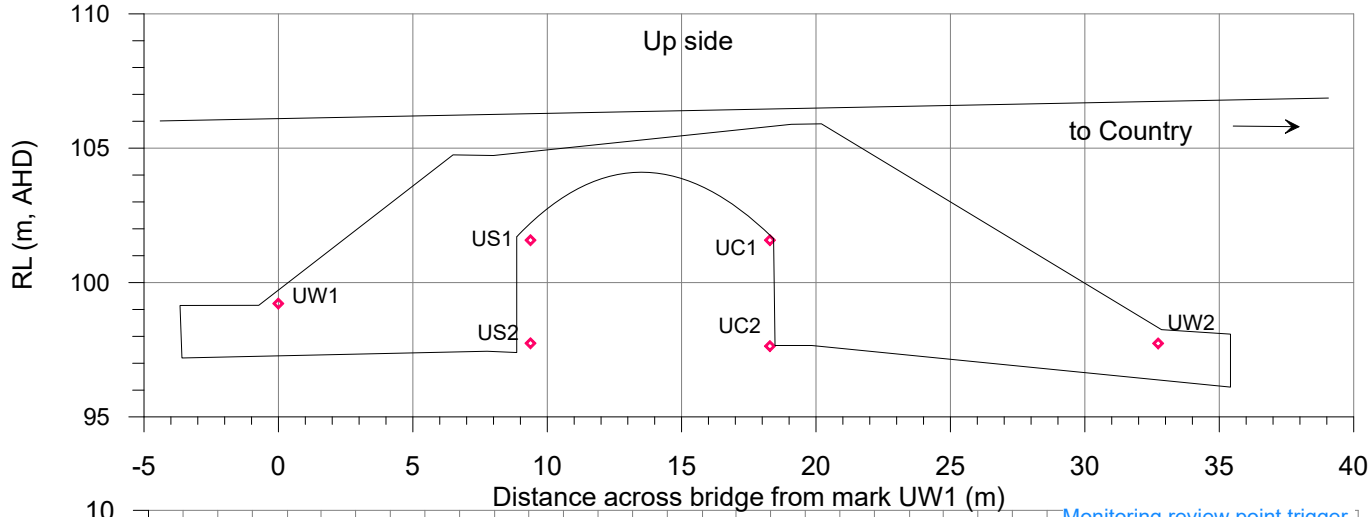
msec

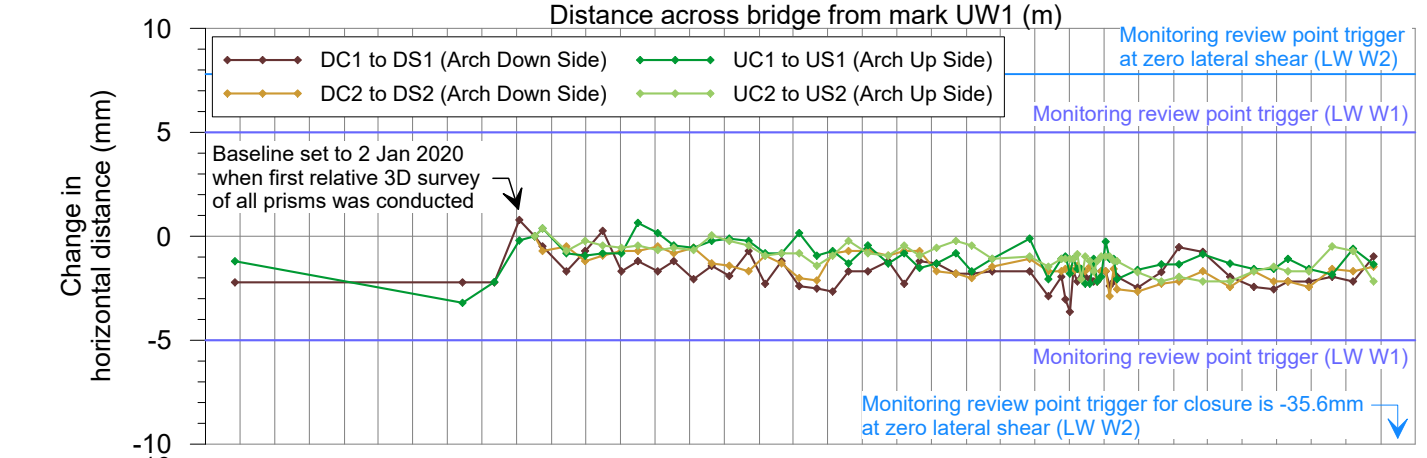
Fig. 103-01-R22

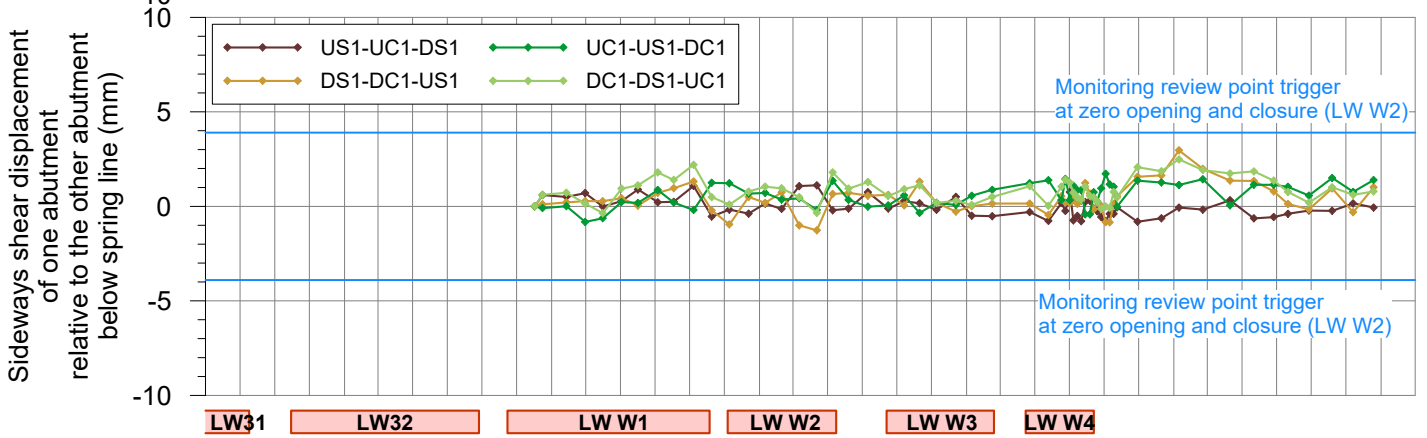
Thirlmere Way Underbridge (89.326km)

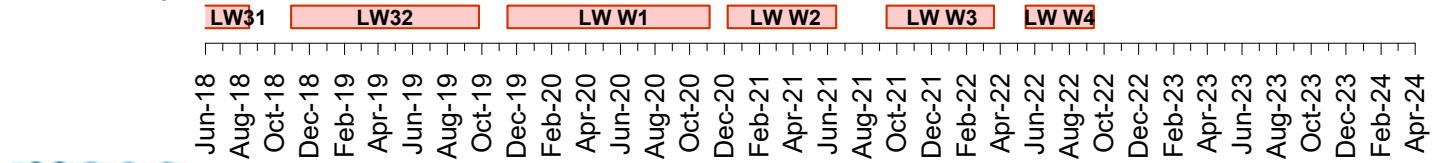
I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field Structures\Fig. 102-02 - Thirlmere Way Underbridge.grf









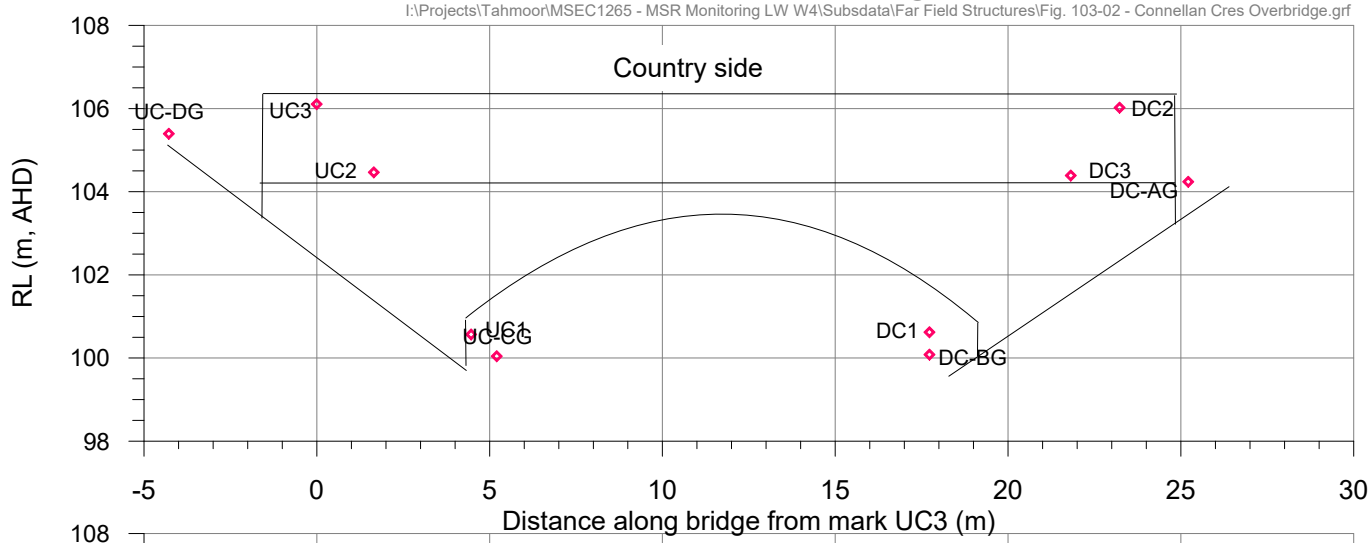


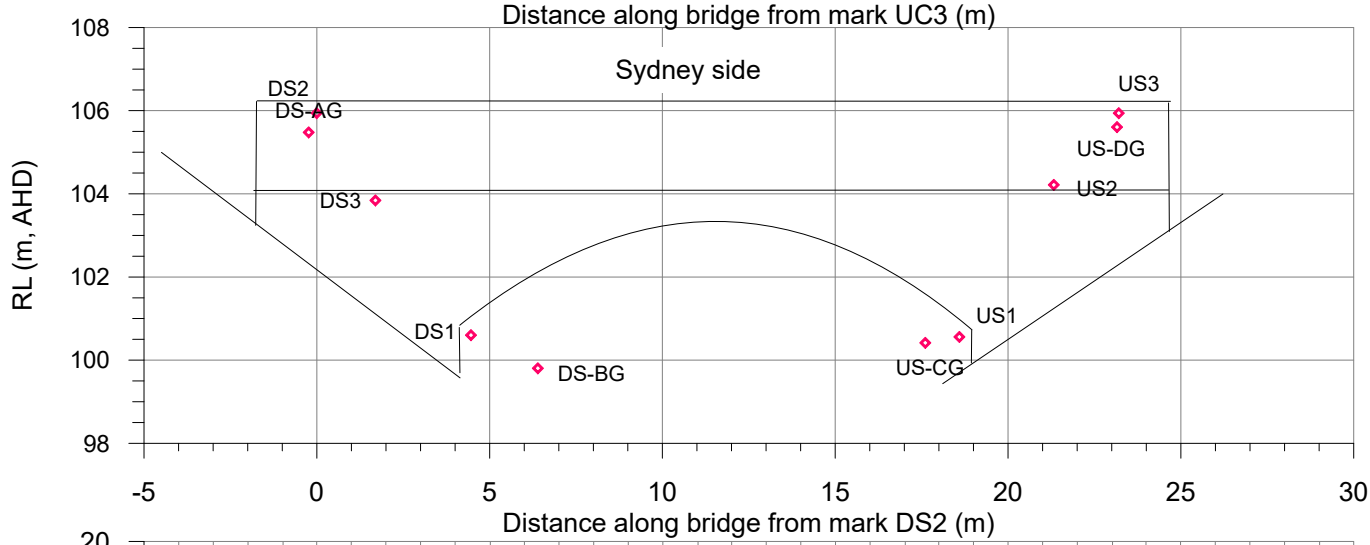
msec

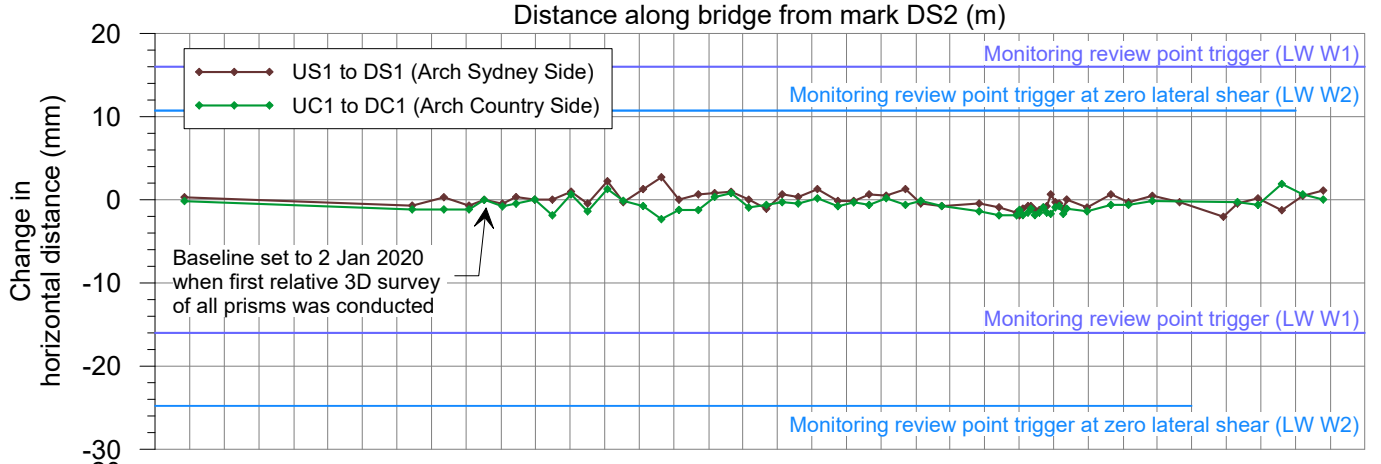
Fig. 102-02-R22

Connellan Crescent Overbridge (89.080km)

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field Structures\Fig. 103-02 - Connellan Cres Overbridge.grf







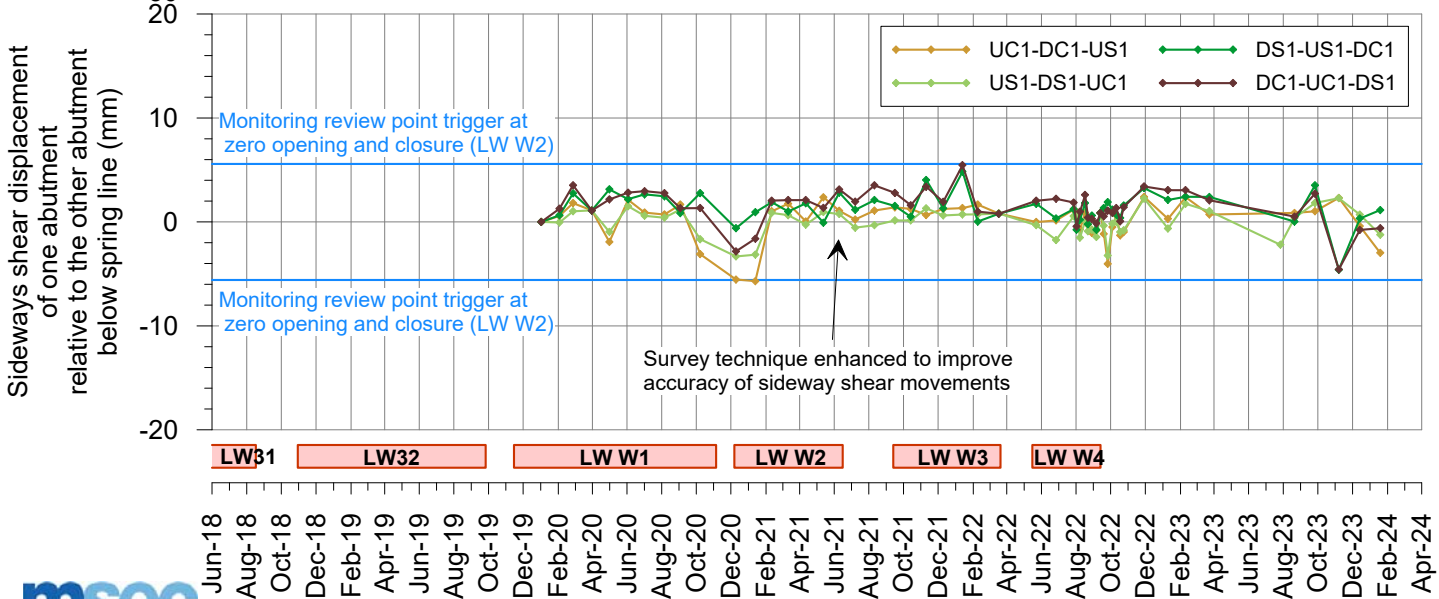
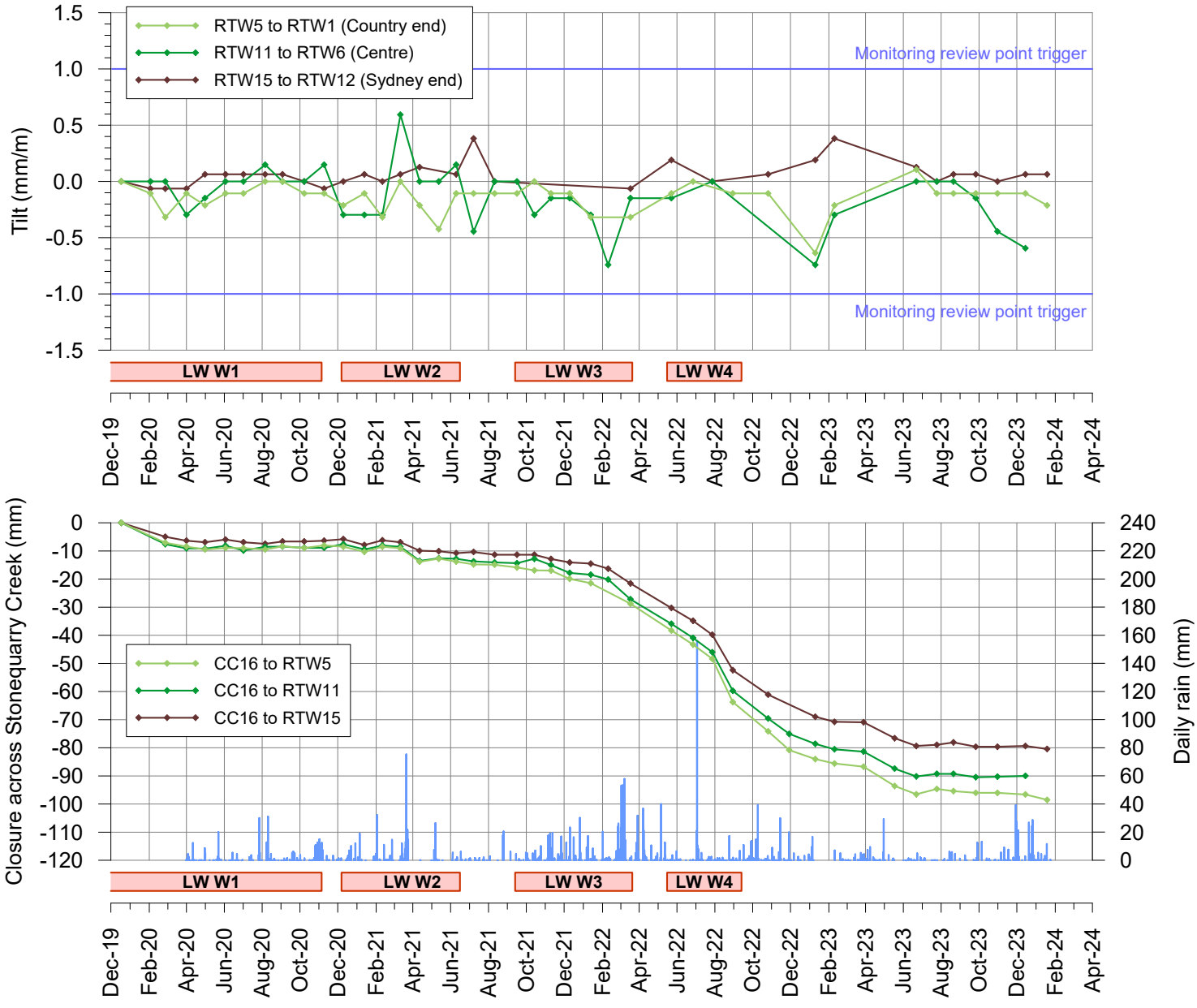


Fig. 103-02-R22

Retaining Wall (84.687km)

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field Structures\Fig. 113-02 - Retaining Wall.grf

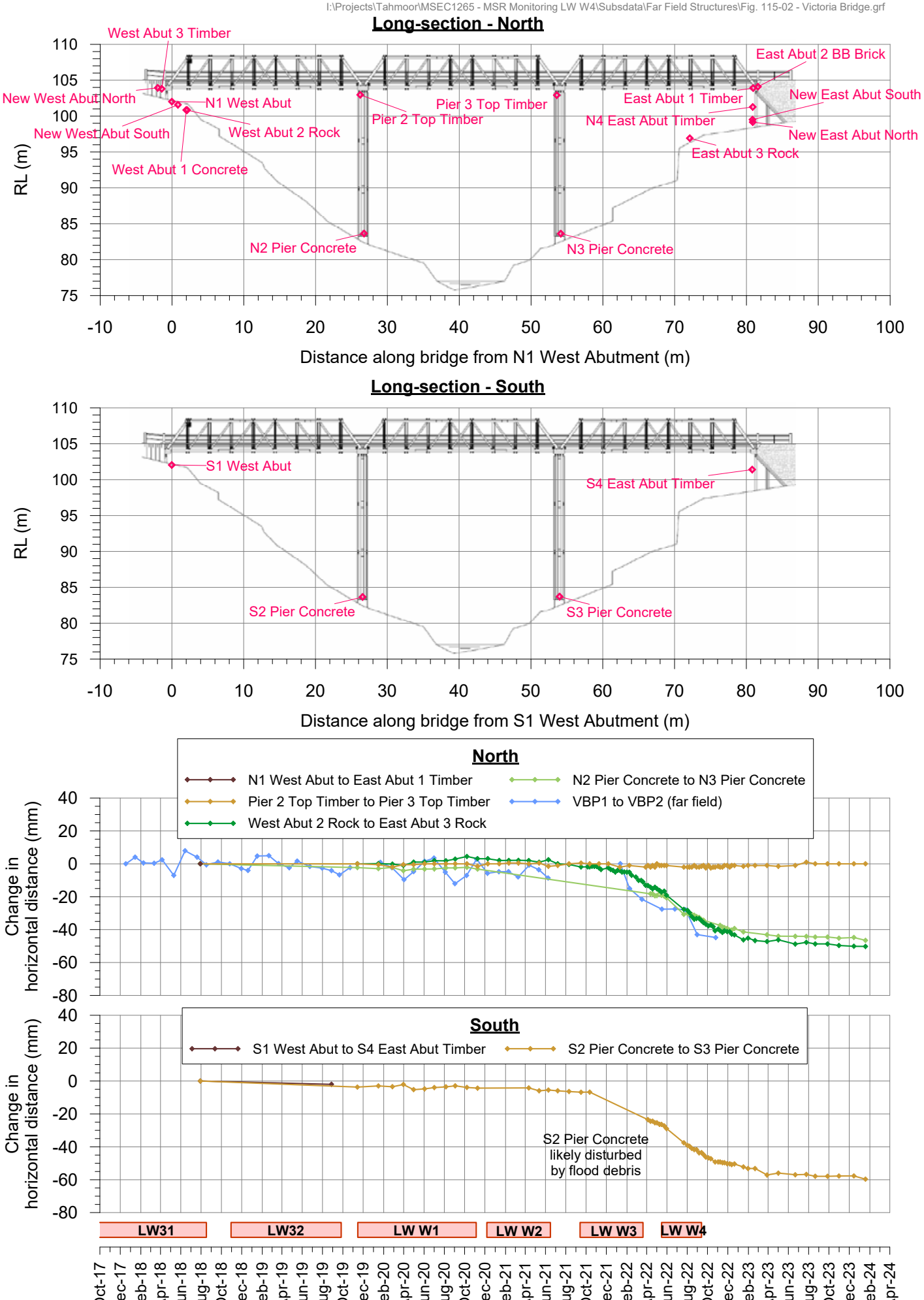


msec

Fig. 113-02-R22

Victoria Bridge over Stonequarry Creek

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field Structures\Fig. 115-02 - Victoria Bridge.grf

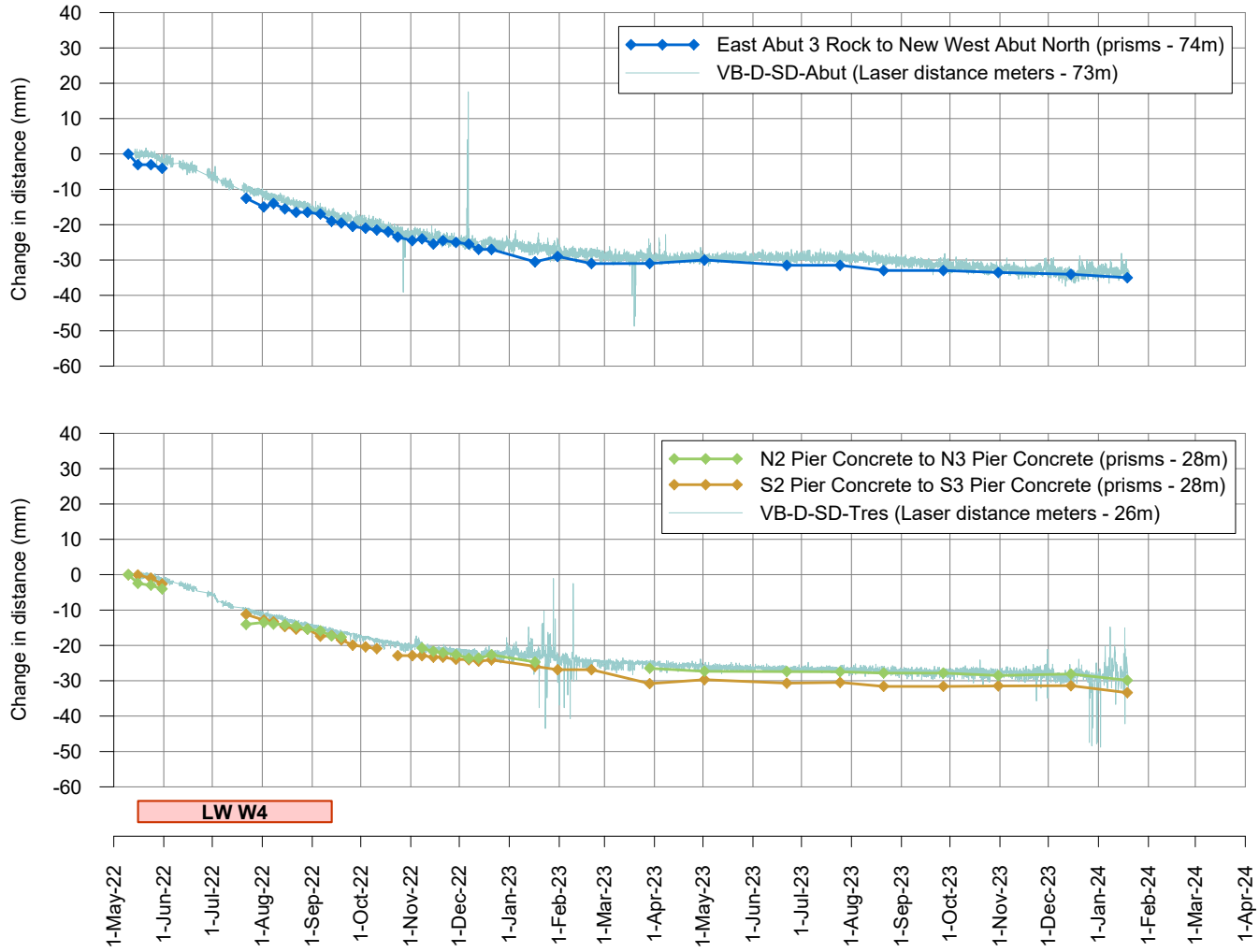


msec

Fig. 115-02 R22

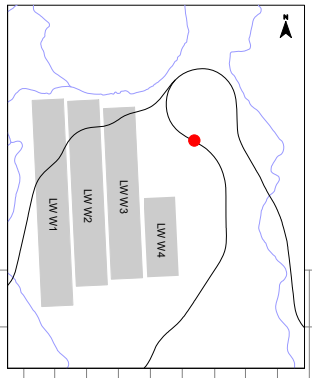
Incremental changes in distance along Victoria Bridge

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Victoria Bridge\Fig. 115-03 - Victoria Bridge changes in distance.grf

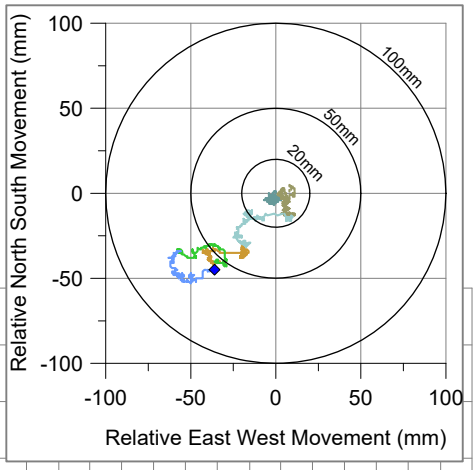


Tahmoor LW W4 - Main Southern Railway
GNSS Monitoring at Picton Tunnel (Site 01)

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. G01 - GNSS Time Series Site 1.grf



During LW31
During LW32
During LW W1
During LW W2
During LW W3
During LW W4



Change in easting (mm)

Change in northing (mm)

Daily change from start of LW W1
7 day running average
PICT1 (Far-field)
PT111 (Far-field - installed into rock)

Change in height (mm)
(+ve = subsidence)

LW31 LW32 LW W1 LW W2 LW W3 LW W4

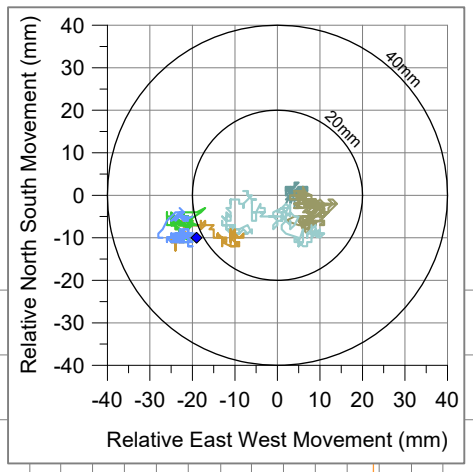
Dec-17 Feb-18 Apr-18 Jun-18 Aug-18 Oct-18 Dec-18 Feb-19 Apr-19 Jun-19 Aug-19 Oct-19 Dec-19 Feb-20 Apr-20 Jun-20 Aug-20 Oct-20 Dec-20 Feb-21 Apr-21 Jun-21 Aug-21 Oct-21 Dec-21 Feb-22 Apr-22 Jun-22 Aug-22 Oct-22 Dec-22 Feb-23 Apr-23 Jun-23 Aug-23 Oct-23 Dec-23 Feb-24 Apr-24

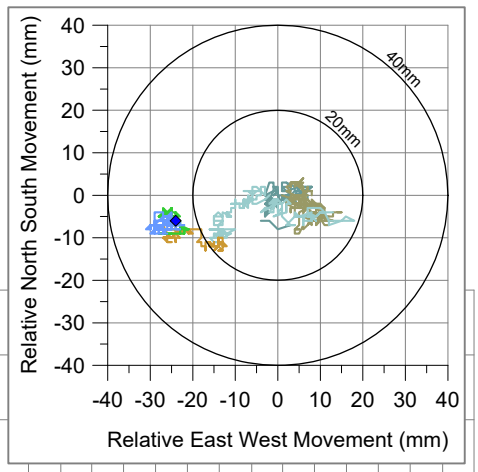
msec

Fig. G01-R22

Tahmoor LW W4 - Main Southern Railway
GNSS Monitoring at Picton Viaduct (Sites 00 and 02)

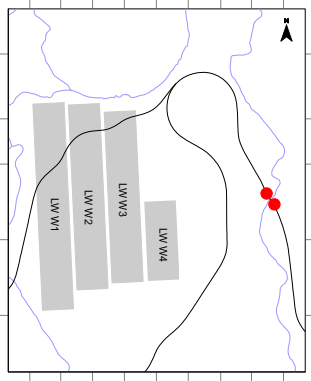
I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. G02 - GNSS Time Series Site 2.grf





During LW31
During LW32
During LW W1
During LW W2
During LW W3
During LW W4

Change in easting (mm)



Daily change from start of LW W1 - Site 0 at Northen end
Daily change from start of LW W1 - Site 2 at Southern end
7 day running averages
PICV1 - Southern end (Far-field)
PICV2 - Northern end (Far-field)

Change in northing (mm)

Change in height (mm)
(+ve = subsidence)

Site investigation on 28 June confirmed drift due to sensor sliding down post as a result of vibration caused by passing trains. Sensor unit fixed to post on 4 July 2019.

Sensor unit replaced on 4 July 2020.

LW31 | LW32 | LW W1 | LW W2 | LW W3 | LW W4

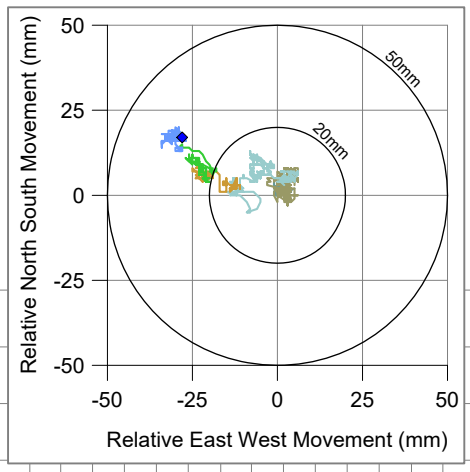
Dec-17 Feb-18 Apr-18 Jun-18 Aug-18 Oct-18 Dec-18 Feb-19 Apr-19 Jun-19 Aug-19 Oct-19 Dec-19 Feb-20 Apr-20 Jun-20 Aug-20 Oct-20 Dec-20 Feb-21 Apr-21 Jun-21 Aug-21 Oct-21 Dec-21 Feb-22 Apr-22 Jun-22 Aug-22 Oct-22 Dec-22 Feb-23 Apr-23 Jun-23 Aug-23 Oct-23 Dec-23 Feb-24 Apr-24

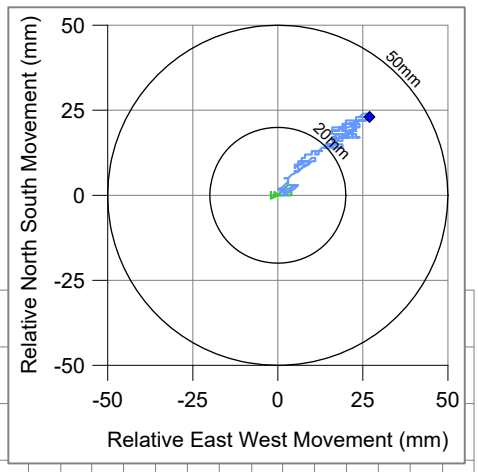
msec

Fig. G02-R22

Tahmoor LW W4 - Main Southern Railway
GNSS Monitoring at Victoria Bridge (Sites 03 and 25)

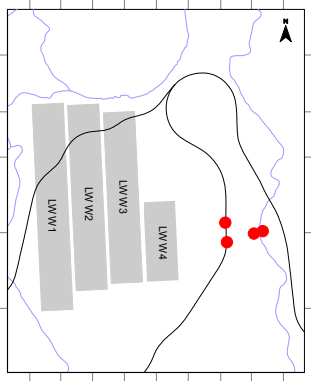
I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. G03 - GNSS Time Series Site 3.grf





During LW31
During LW32
During LW W1
During LW W2
During LW W3
During LW W4

Change in easting (mm)



Daily change - Site 3 at Eastern end
Daily change - Site 25 at Western end
7 day running averages
VBP1 - Eastern end (Far-field)
VBP2 - Western end (Far-field)

Change in northing (mm)

Change in height (mm)
(+ve = subsidence)

LW31 | LW32 | LW W1 | LW W2 | LW W3 | LW W4

Dec-17 Feb-18 Apr-18 Jun-18 Aug-18 Oct-18 Dec-18 Feb-19 Apr-19 Jun-19 Aug-19 Oct-19 Dec-19 Feb-20 Apr-20 Jun-20 Aug-20 Oct-20 Dec-20 Feb-21 Apr-21 Jun-21 Aug-21 Oct-21 Dec-21 Feb-22 Apr-22 Jun-22 Aug-22 Oct-22 Dec-22 Feb-23 Apr-23 Jun-23 Aug-23 Oct-23 Dec-23 Feb-24 Apr-24

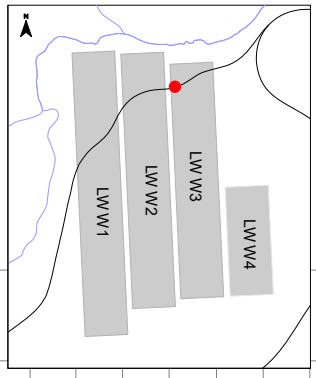
msec

Fig. G03-R22

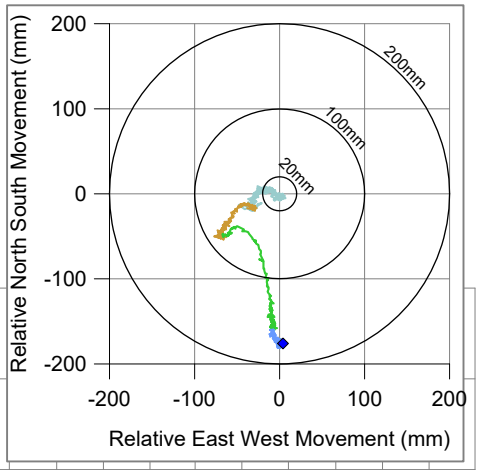
Tahmoor LW W4 - GNSS Monitoring

Site 7 - PMLL culvert at 87.850km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G07 - GNSS.grf



During LW W1
During LW W2
During LW W3
During LW W4



Change in easting (mm)

150
100
50
0
-50
-100

Change in northing (mm)

50
0
-50
-100
-150
-200
-250

Daily change from start of LW W1
7 day running average

Change in height (mm)
(+ve = subsidence)

-100
0
100
200
300
400
500
600

LW W1 LW W2 LW W3 LW W4

Nov-19 Jan-20 Mar-20 May-20 Jul-20 Sep-20 Nov-20 Jan-21 Mar-21 May-21 Jul-21 Sep-21 Nov-21 Jan-22 Mar-22 May-22 Jul-22 Sep-22 Nov-22 Jan-23 Mar-23 May-23 Jul-23 Sep-23 Nov-23 Jan-24 Mar-24

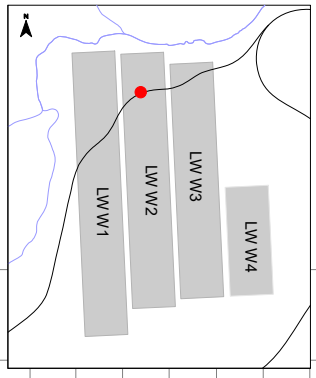
msec

Fig. G07-R22

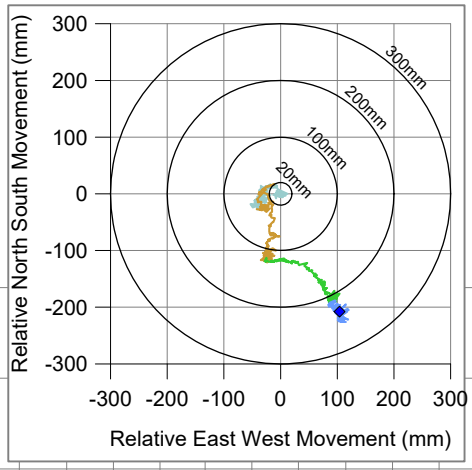
Tahmoor LW W4 - GNSS Monitoring

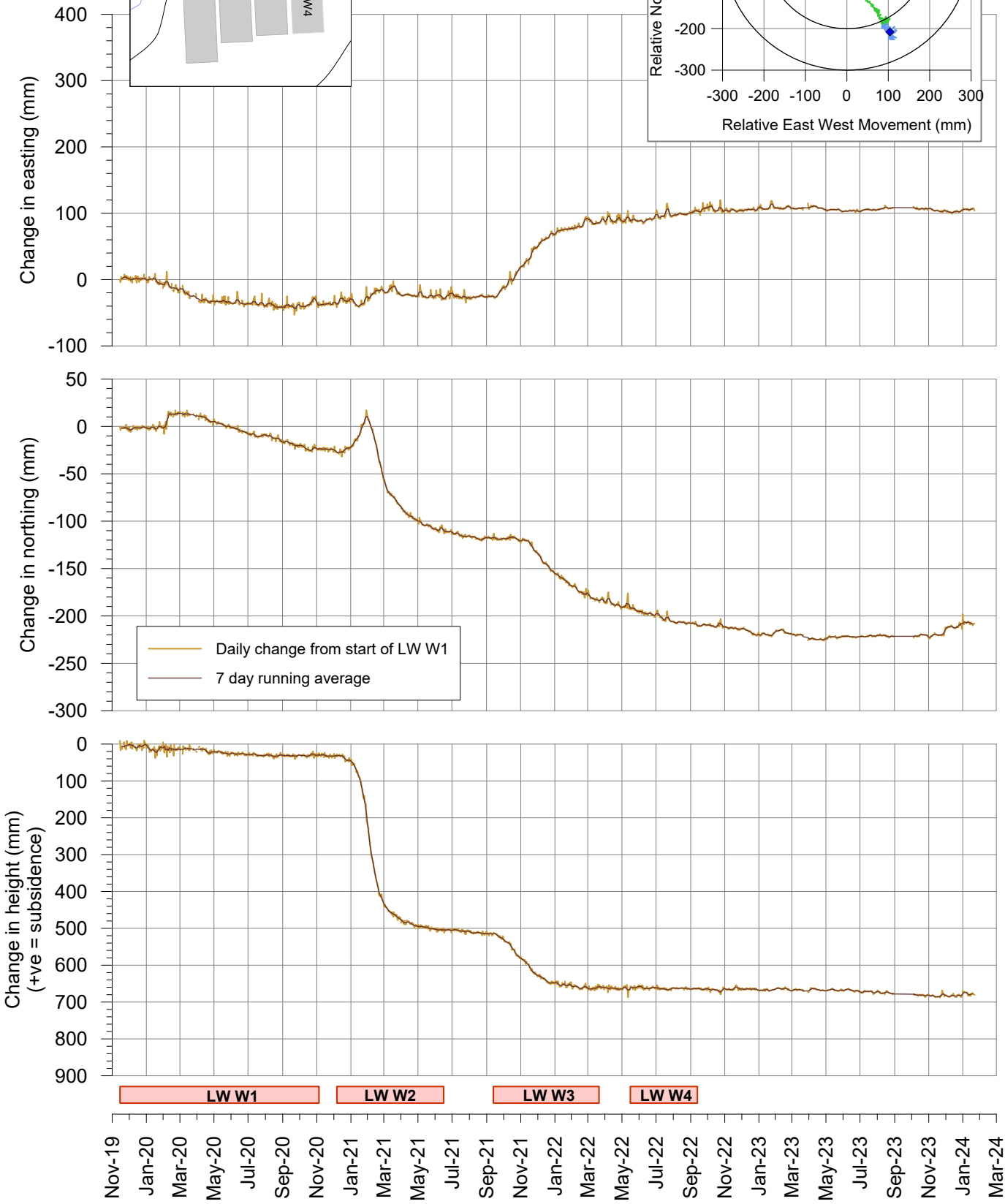
Site 8 - LW W2 centreline - PMLL at 88.110km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G08 - GNSS.grf



During LW W1
During LW W2
During LW W3
During LW W4





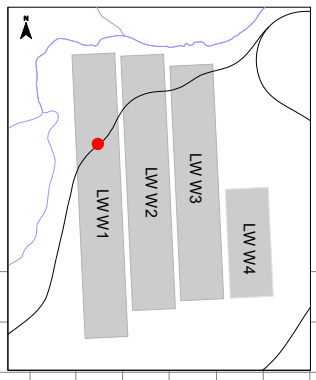
msec

Fig. G08-R22

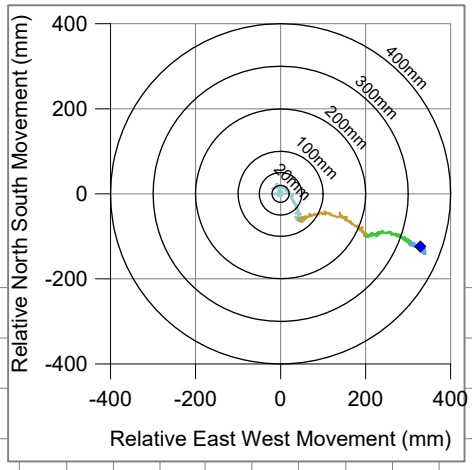
Tahmoor LW W4 - GNSS Monitoring

Site 9 - LW W1 centreline - PMLL at 88.550km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G09 - GNSS.grf



During LW W1
During LW W2
During LW W3
During LW W4



Change in easting (mm)

800 700 600 500 400 300 200 100 0 -100

Change in northing (mm)

50 0 -50 -100 -150 -200

Daily change from start of LW W1
7 day running average

Change in height (mm)
(+ve = subsidence)

-100 0 100 200 300 400 500 600 700

LW W1 LW W2 LW W3 LW W4

Nov-19 Jan-20 Mar-20 May-20 Jul-20 Sep-20 Nov-20 Jan-21 Mar-21 May-21 Jul-21 Sep-21 Nov-21 Jan-22 Mar-22 May-22 Jul-22 Sep-22 Nov-22 Jan-23 Mar-23 May-23 Jul-23 Sep-23 Nov-23 Jan-24 Mar-24

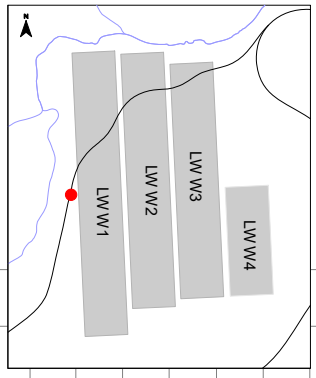
msec

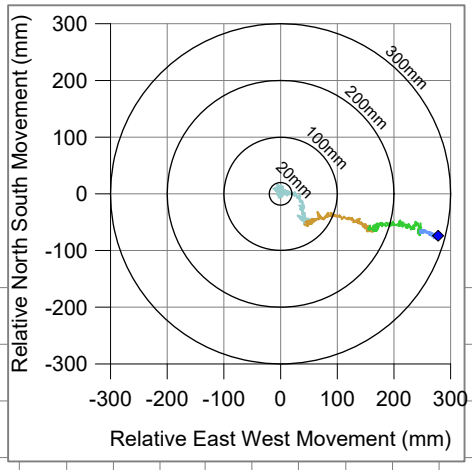
Fig. G09-R22

Tahmoor LW W4 - GNSS Monitoring

Site 10 - PMLL at 89.000km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G10 - GNSS.grf





During LW W1
During LW W2
During LW W3
During LW W4

Change in easting (mm)

700 600 500 400 300 200 100 0 -100

Daily change from start of LW W1
7 day running average

Change in northing (mm)

40 20 0 -20 -40 -60 -80 -100

Change in height (mm)
(+ve = subsidence)

-50 0 50 100 150 200 250 300

LW W1 LW W2 LW W3 LW W4

Nov-19 Jan-20 Mar-20 May-20 Jul-20 Sep-20 Nov-20 Jan-21 Mar-21 May-21 Jul-21 Sep-21 Nov-21 Jan-22 Mar-22 May-22 Jul-22 Sep-22 Nov-22 Jan-23 Mar-23 May-23 Jul-23 Sep-23 Nov-23 Jan-24 Mar-24

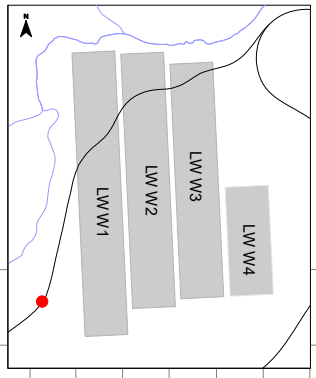
msec

Fig. G10-R22

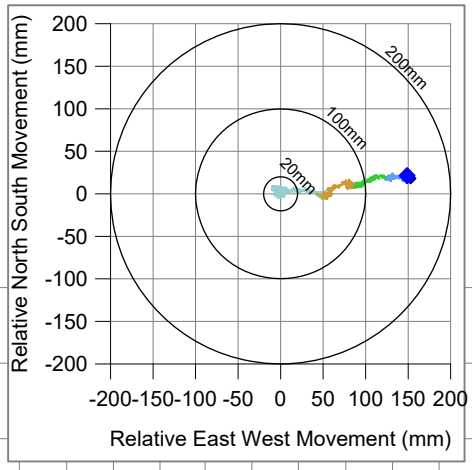
Tahmoor LW W4 - GNSS Monitoring

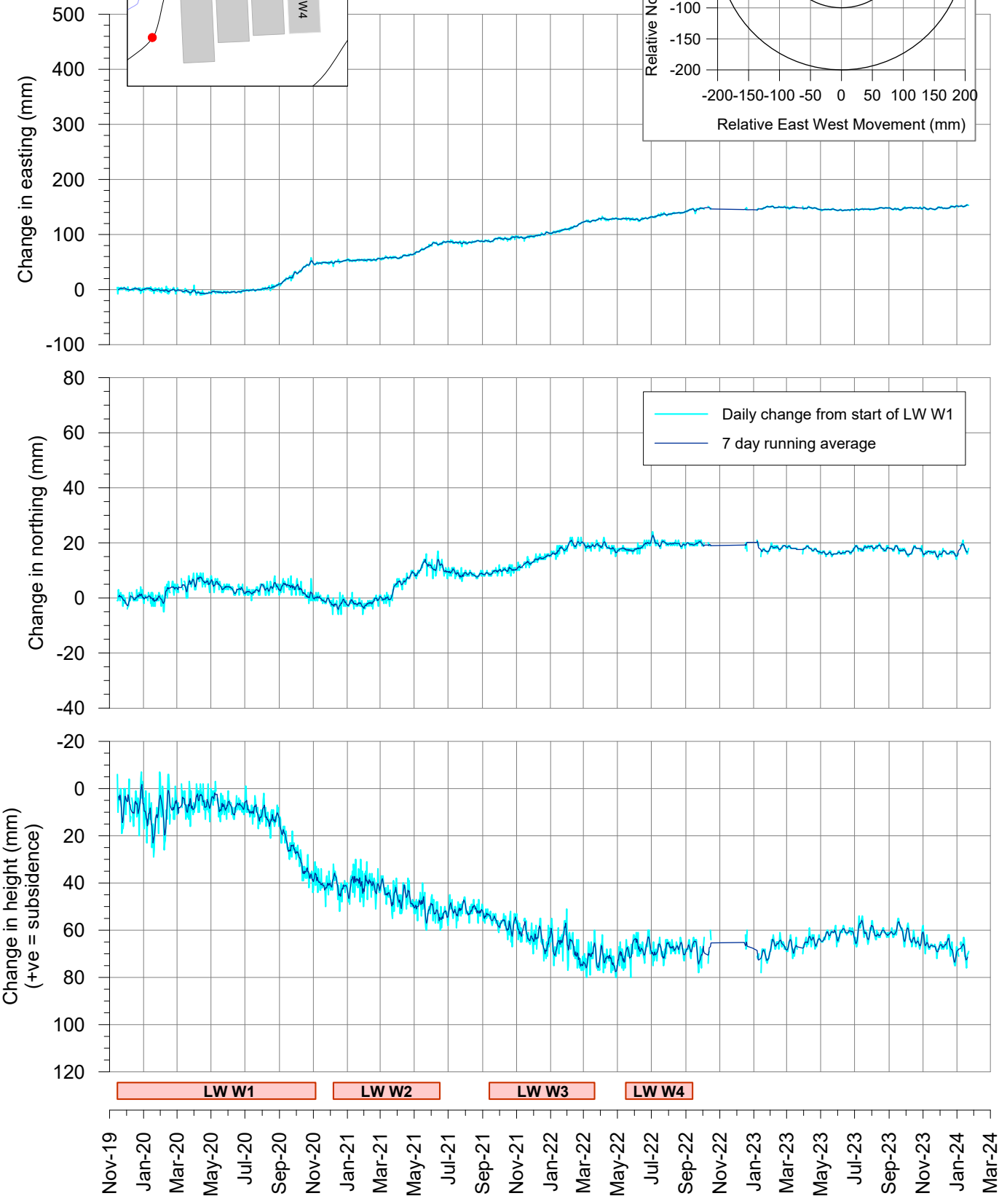
Site 11 - PMLL at 89.629km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G11 - GNSS.grf



During LW W1
During LW W2
During LW W3
During LW W4





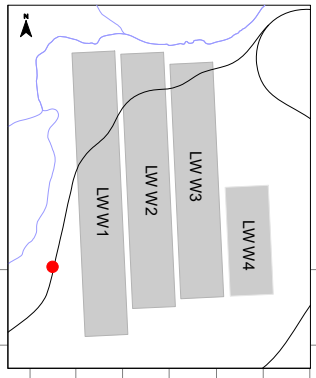
msec

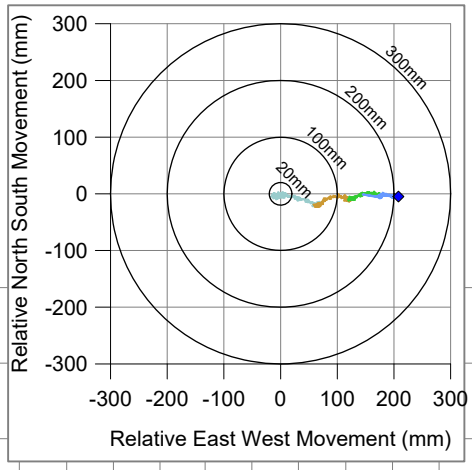
Fig. G11-R22

Tahmoor LW W4 - GNSS Monitoring

Site 19 - PMLL at 89.440km

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G19 - GNSS.grf





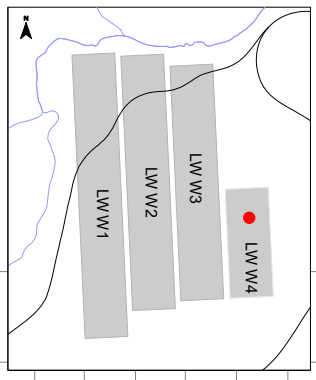
msec

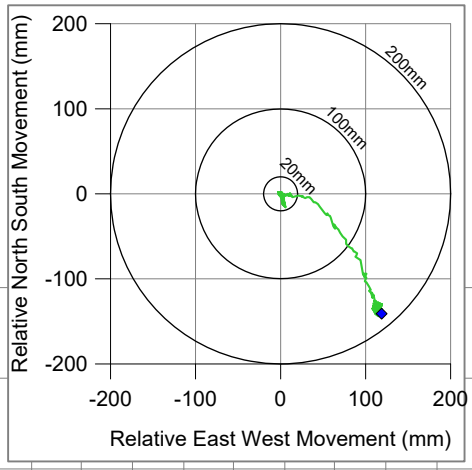
Fig. G19-R22

Tahmoor LW W4 - GNSS Monitoring

Site 24 above LW W4

I:\Projects\Tahmoor\MSEC1263 - Monitoring LW W4\Subsdata\Survey Data\Fig. G24 - GNSS.grf





During LW W4

Change in easting (mm)

400
300
200
100
0
-100

Daily change
7 day running average

Change in northing (mm)

50
0
-50
-100
-150
-200

Change in height (mm)
(+ve = subsidence)

0
100
200
300
400
500
600
700
800

LW W4

Mar-22 Apr-22 May-22 Jun-22 Jul-22 Aug-22 Sep-22 Oct-22 Nov-22 Dec-22 Jan-23 Feb-23 Mar-23 Apr-23 May-23 Jun-23 Jul-23 Aug-23 Sep-23 Oct-23 Nov-23 Dec-23 Jan-24 Feb-24 Mar-24

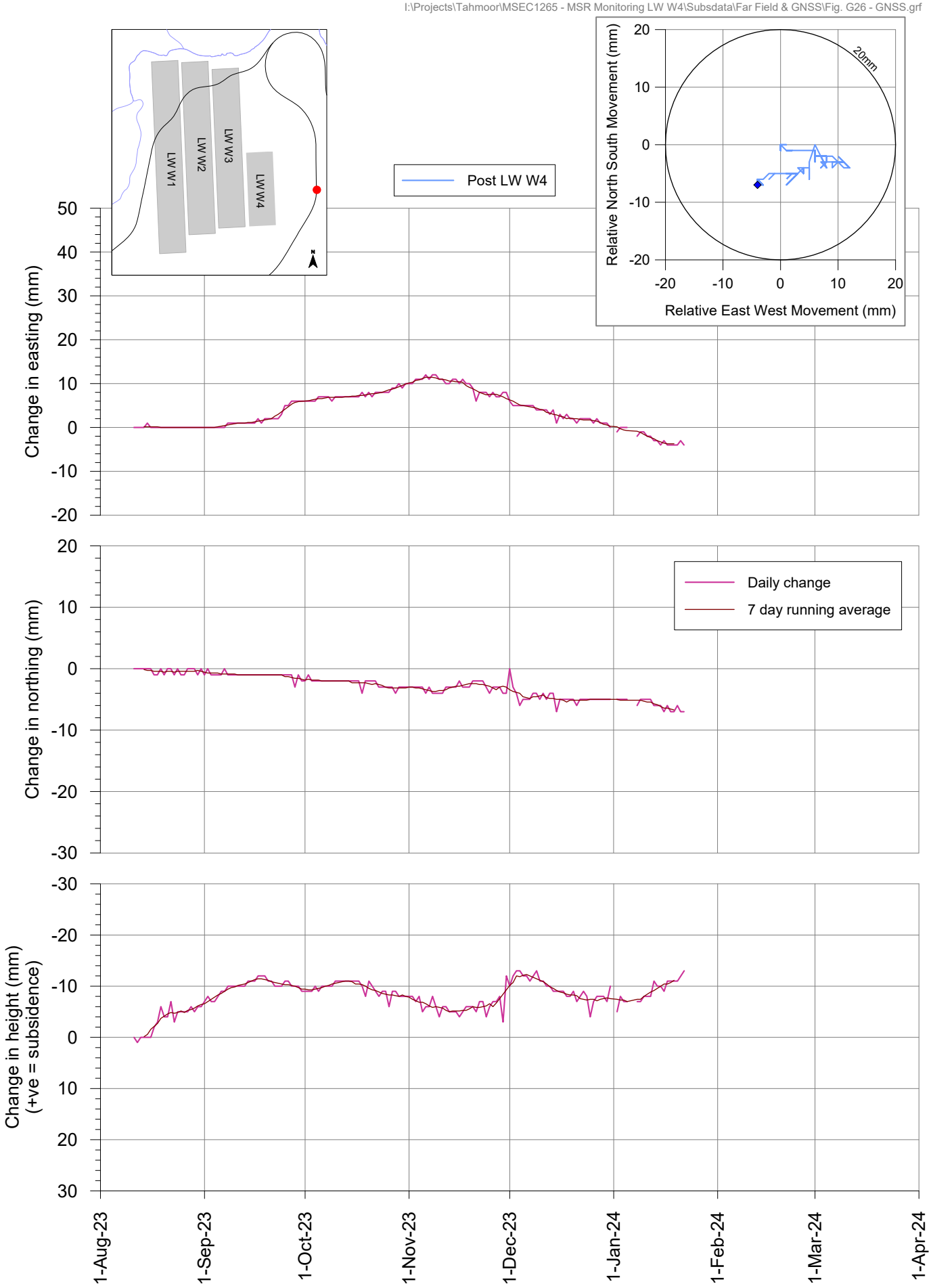
msec

Fig. G24-R22

Tahmoor LW W4 - GNSS Monitoring

Site 26 - MSR at 88.78km

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. G26 - GNSS.grf



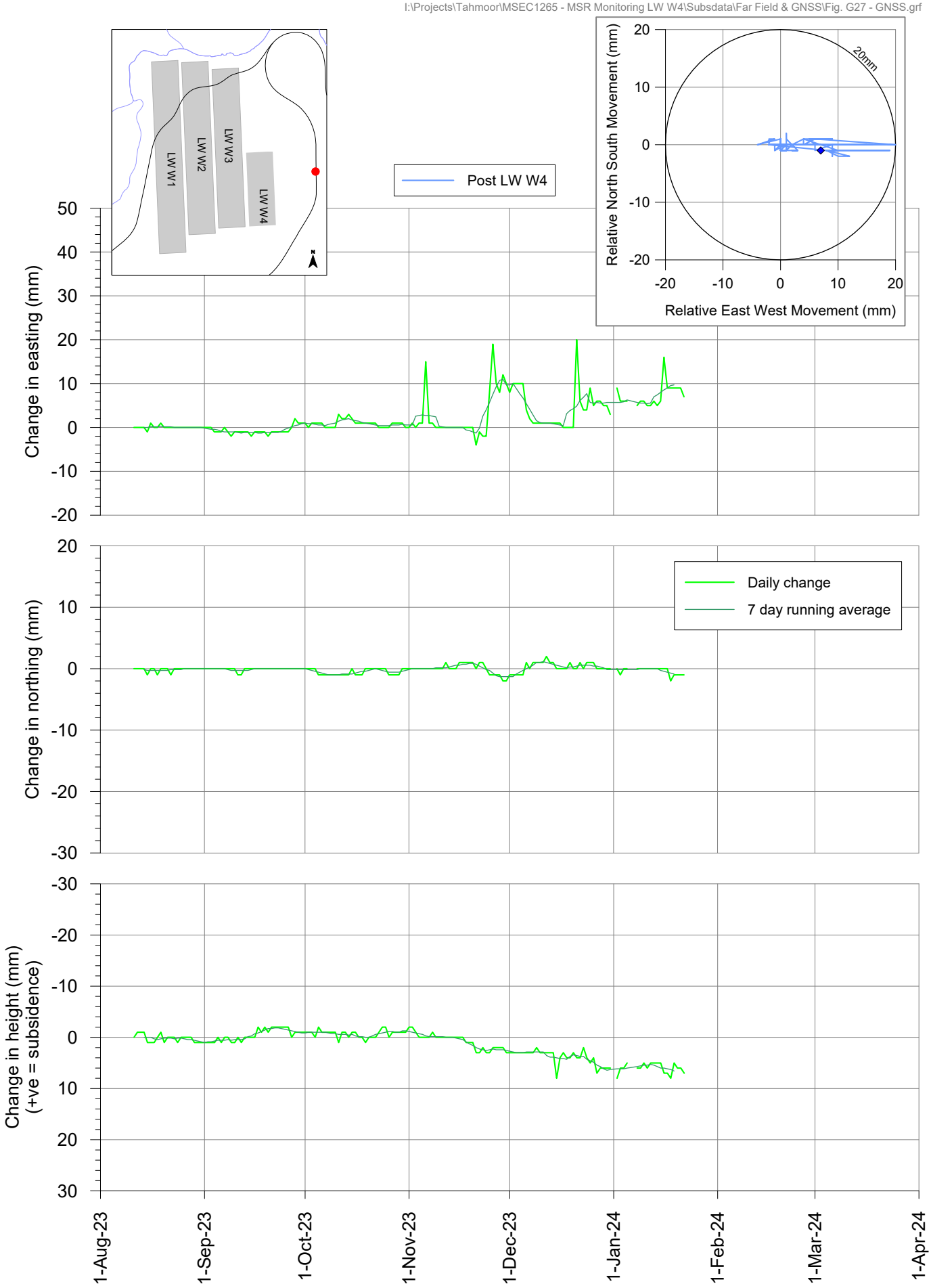
msec

Fig. G26-R22

Tahmoor LW W4 - GNSS Monitoring

Site 27 - MSR at 88.60km

I:\Projects\Tahmoor\MSEC1265 - MSR Monitoring LW W4\Subsdata\Far Field & GNSS\Fig. G27 - GNSS.grf



msec

Fig. G27-R22

Appendix B – Surface Water Monitoring Report

DRAFT REPORT

TAHMOOR COAL PTY LTD
ABN: 97076663968

Tahmoor North Western Domain

Surface Water Review
1 July to 31 December 2023

121171-26R002-rev0
MARCH 2024

TAILINGS.WATER.WASTE.

Document Control

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Document Title:	Surface Water Review 1 July to 31 December 2023
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Document Number:	121171-26R002-rev0

Revision History

Revision	Issue	Issue Date	Prepared by	Reviewed by
Rev A	Draft	5 March 2024	Pamella Grangeiro	Camilla West
Rev 0	Final	12 March 2024	Pamella Grangeiro	Camilla West / Tahmoor Coal

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APPENDICES

1 INTRODUCTION

1.1 Background

The Tahmoor North Western Domain (Western Domain) Investigative Area, which encompasses longwall (LW) West 1 (W1) to West 4 (W4), is shown in **MAP 1**. Mining of LW W1 to LW W2 was conducted from November 2019 to June 2021 while mining of LW W3 to LW W4 was conducted from September 2021 to September 2022.

In accordance with the *Tahmoor North Western Domain Longwalls West 3 and West 4 Water Management Plan* (Tahmoor Coal, 2021; WMP), Tahmoor Coal Pty Ltd (Tahmoor Coal) are required to implement monitoring of groundwater, surface water, subsidence, as well as other environmental and built features.

Accordingly, Tahmoor Coal developed a comprehensive rainfall, surface water and groundwater monitoring network within and adjacent to the Western Domain. The surface water monitoring network comprises water level monitoring sites, water quality monitoring sites and visual inspection sites. The locations of the relevant rainfall stations, surface water and groundwater monitoring sites and visual inspection sites are shown in **MAP 1**.

Tahmoor Coal have engaged ATC Williams Pty Ltd (ATCW) to undertake a review and analysis of surface water monitoring data recorded at sites within and adjacent to the Tahmoor North Western Domain (the Western Domain) for the period of 1 July 2023 to 31 December 2023. The groundwater and subsidence review are undertaken by independent specialists. Subsidence relevant details are summarised in this report.

In accordance with the WMP, surface water monitoring is required to be undertaken for 12 months following the cessation of mining. Mining of the Western Domain was completed 13 September 2022. As such, this report constitutes review of data recorded following completion of mining the Western Domain.

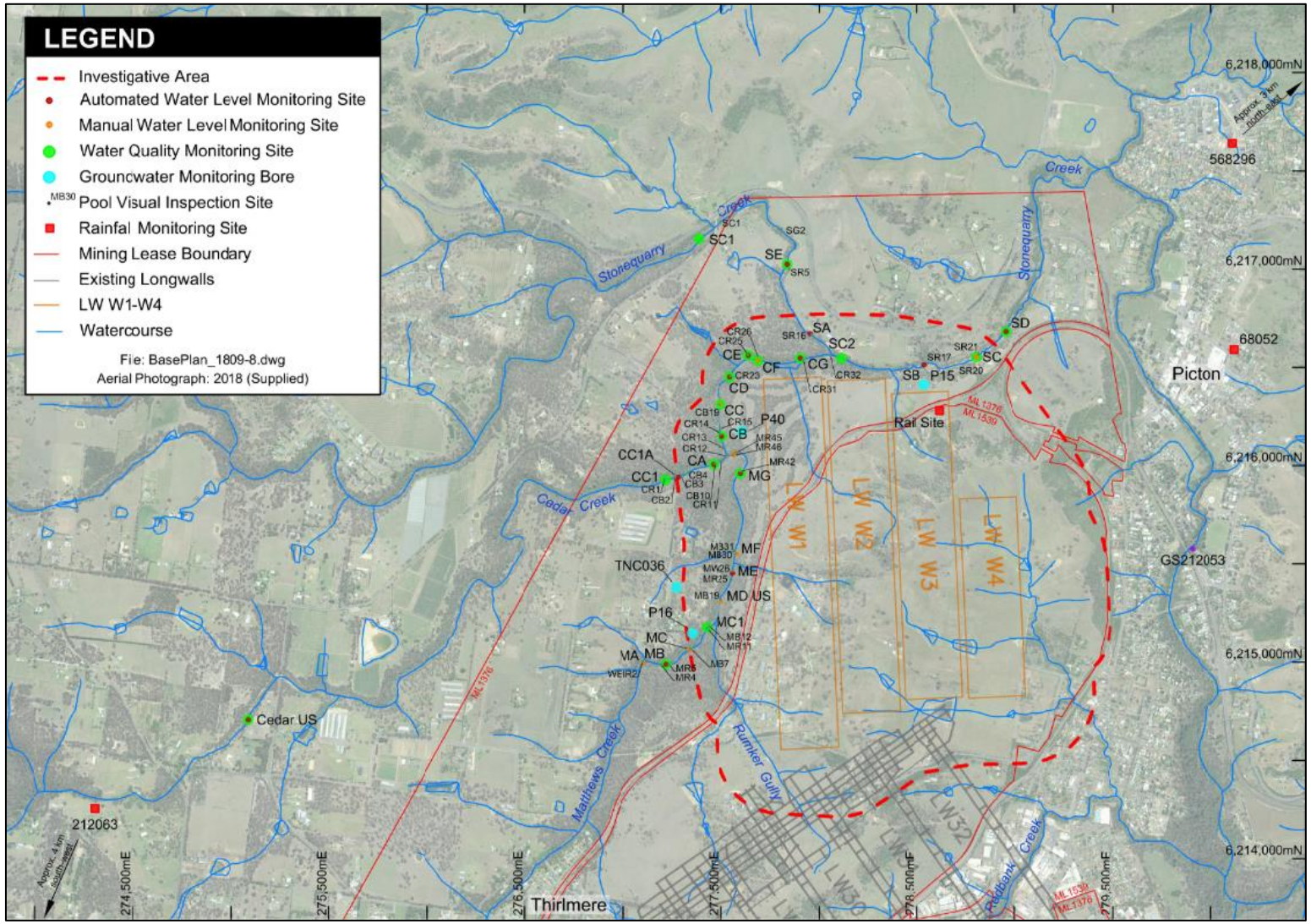
1.2 Scope

The scope of this report comprises:

- Review and interpretation of monitoring data for the period 1 July to 31 December 2023, referred to as the review period herein;
- Assessment against the performance measures (listed in DA67/98) and performance indicators (Tahmoor Coal, 2021) for surface water; and
- Recommendations in relation to ongoing monitoring and/or corrective actions.

This report predominantly presents and interprets surface water monitoring data recorded in the vicinity of the Western Domain Investigative Area (refer **MAP 1**). The report addresses the extent and longevity of mining related surface water impacts; in addition to the surface water trigger exceedances that have been recorded at monitoring sites during the period of review. Assessment of groundwater is detailed in SLR (2023).

MAP 1: RELEVANT RAINFALL, SURFACE WATER AND GROUNDWATER MONITORING SITES



2 SURFACE WATER MONITORING PROGRAM

2.1 Overview

Surface water level and quality data have been collected by Tahmoor Coal at monitoring sites located on Matthews Creek, Cedar Creek and Stonequarry Creek as shown in **MAP 1** and detailed in **Appendix A**. The surface water monitoring program is described in the WMP (Tahmoor Coal 2021a). The purpose of the surface water monitoring program is to ensure compliance with regulatory requirements and to enable identification of potential mining related impacts to:

- physical features and natural drainage behaviour (assessed by independent specialists and summarised herein);
- surface water level; and
- surface water quality.

The surface water level data, water quality data and visual inspection records are assessed against the performance measures, performance indicators and TARPs documented in the WMP.

To facilitate the assessment, surface water monitoring sites have been implemented as follows:

Baseline Site:	Surface water monitoring site that has been monitored for water level and quality prior to the commencement of mining in the Western Domain. Baseline surface water monitoring sites were used to derive Site Specific Guideline Values (SSGVs) which inform the TARPS.
Reference Site:	Surface water monitoring site that is located upstream of the subsidence impact zone and is considered unlikely to be affected by mining activity. These sites are utilised as benchmarks for observations from potential impact sites.
Potential Impact Site:	Surface water monitoring site located within the potential subsidence impact zone (as defined based on mining induced subsidence predictions), from which a potential effect on surface water level or quality from the site activity may be detected.

Based on these definitions, surface water monitoring sites have been classified as follows:

Baseline / Impact Site

- Cedar Creek (CA, CB, CC, CD, CE, CF, CG)
- Matthews Creek (MC/MC1, MD US, ME, MF, MG)
- Stonequarry Creek (SA, SB, SC2, SC, SD)

Reference / Control Site

- Cedar Creek (Cedar US, CC1/CC1A)
- Matthews Creek (MA, MB)
- Stonequarry Creek (SC1, SE)

Further detail on each monitoring site is provided in **Appendix A.**

2.2 Methodology

In accordance with the WMP, surface water monitoring is conducted at the monitoring sites listed in **Section 2** above. Unless otherwise required in accordance with the WMP, the surface water monitoring program comprises:

- Automated water level monitoring measured via a water pressure sensor that continuously records pressure measurements.
- Water level measurements recorded manually on a monthly basis at sites with and without automated water level monitoring.
- Field and laboratory water quality monitoring undertaken monthly.

The monitored water quality constituents are defined in **TABLE 1**.

TABLE 1: SUMMARY OF WATER QUALITY MONITORING PARAMETERS

Field Monitoring	Laboratory Analysis
pH	pH
Electrical Conductivity (EC)	EC
Temperature	major cations and anions: calcium, magnesium, sodium and potassium, sulphate, alkalinity, chloride
Dissolved Oxygen (DO)	dissolved and total metals: aluminium, arsenic, barium, copper, iron, lead, lithium, manganese, nickel, selenium, strontium and zinc
Oxidation Reduction Potential (ORP)	total Kjeldahl nitrogen
	total nitrogen
	nitrite + nitrate
	total phosphorus
	total cations and total anions

Field work and quality control/quality assurance associated with this monitoring program are undertaken by others. Data constraints associated with the monitoring program are documented in **Section 4.2**.

3 SUMMARY OF MONITORED SUBSIDENCE MOVEMENTS

Tahmoor Coal installed ground survey marks above and adjacent to LW W1–W4 with monitoring of subsidence movements undertaken at key locations across Stonequarry Creek, Matthews Creek and Cedar Creek.

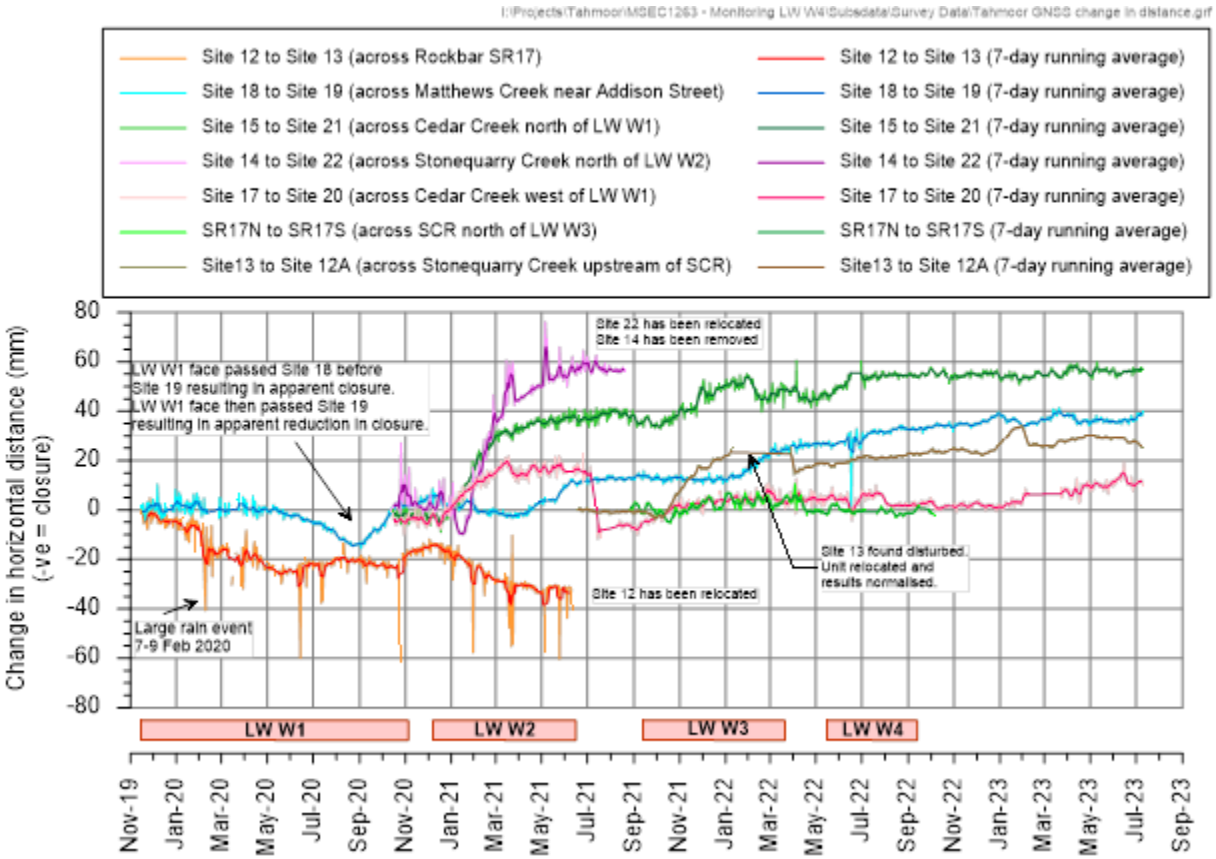
Changes in horizontal distances calculated between GNSS[1] units that are stationed close together are presented in **DIAGRAM 1**.

In July 2023 the GNSS units were discontinued for the following reasons:

- Mining of the Western Domain was completed in September 2022;
- Residual subsidence movements had declined to low levels; and
- Land access agreements had come to the end of the term life.

As such **DIAGRAM 1** below presents data from mining commencement to 1 July 2023.

DIAGRAM 1: OBSERVED CHANGES IN HORIZONTAL DISTANCES BETWEEN GNSS UNITS (SOURCE: MSEC, 2023)



[1] Global Navigation Satellite System (GNSS) units are fixed survey stations that continuously measure absolute horizontal and vertical positions at a location in real time.

From the completion of LW W4 (October 2022) to 1 July 2023, the following was recorded (MSEC, 2023):

- Small changes in horizontal distance at Site SR17N to Site SR17S across rockbar SR17 (SCR).
- Less than 10 mm change in horizontal distance at Site 13 to Site 12A, located across Stonequarry Creek upstream of rockbar SR17 (SCR).
- Less than 10 mm change in horizontal distance at Site 18 to Site 19, located across Matthews Creek near Addison Street.
- Less than 20 mm change in horizontal distance at Site 17 to Site 20, located across Cedar Creek to the west of LW W1.

4 SURFACE WATER MONITORING REVIEW

The following sections present a summary of rainfall trends, pool visual inspection outcomes, surface water level data and water quality monitoring data recorded at monitoring sites in Matthews Creek, Cedar Creek and Stonequarry Creek (refer **MAP 1** for site locations). **Section 5** presents further interpretation of monitoring data for sites where a trigger significance level in excess of Level 1 was reported during the review period.

4.1 Rainfall Trends

DIAGRAM 2 presents daily rainfall data recorded at the Tahmoor Coal rainfall station, referred to as "Rail Site". The cumulative rainfall residual is also presented and has been calculated using SILO Point Data for a location in close proximity to the Western Domain in combination with the Rail Site rainfall data. The cumulative rainfall residual was calculated for the period January 2018 to December 2023 to illustrate climatic trends over a medium to long-term period.

The cumulative rainfall residual represents the cumulative deviation from the average daily rainfall where positive (upward) slope in the plot indicates periods of above average rainfall and negative (downward) slope indicates periods of below average rainfall.

The cumulative rainfall residual depicted in **DIAGRAM 2** illustrates a generally declining trend in rainfall from February to late November 2023. From December 2023, generally above average rainfall was recorded.

DIAGRAM 2: DAILY RAINFALL AND CUMULATIVE RAINFALL RESIDUAL

4.2 Data Constraints

The following monitoring constraints are noted for the review period:

- Monitoring site MB at Matthews Creek: A change in water level behaviour was recorded at monitoring site MB from November 2022. Field personnel identified that water was no longer flowing over the rockbar control, rather was flowing through the embankment. The location of embankment flow comprises sandy soil and is directly beneath a tree that was dislodged during a flood event. It is considered that the change in water level behaviour was reflective of the change in site conditions.
- Monitoring sites SA and SE at Stonequarry Creek: the sites were decommissioned in December 2023 due to termination of the land access agreement.
- Monitoring site MG at Matthews Creek: access to this site in December 2023 was restricted due to high water level.

4.3 Surface Water Levels

Appendix B provides charts of the automated and manual water level data for the full period of record. Note that the CTF level shown on the automated water level plots refers to the point at which surface water ceases to flow over the streamflow control i.e., the lowest point on a controlling rockbar or boulder field. In the event that streamflow over the rockbar or boulder field ceases, there may still be streamflow around or under the rockbar/boulder field control which reports downstream of the control.

TABLE 2 presents a summary of the automated water level monitoring data for the review period. Exceedances of trigger levels are discussed in **Section 5**.

TABLE 2: SUMMARY OF AUTOMATED WATER LEVEL MONITORING DATA FOR THE REVIEW PERIOD

Monitoring Site	Classification	Summary of Recorded Water Level During Review Period	Appendix B - Diagram Number
Matthews Creek			
MB (Pool MR5)	Reference Site	A change in water level behaviour was recorded at monitoring site MB from November 2022.	Diagram B2
ME (Pool MR26)	Potential Impact Site	In response to below average rainfall, the water level declined intermittently below the CTF level from July to mid-November 2023, although remained above the baseline minimum. Following rainfall from late November 2023, the water level rose and generally remained above the CTF level.	Diagram B5
MG (Pool MR42)	Potential Impact Site	In response to below average rainfall, the water level declined intermittently below the CTF level from July to mid-November 2023, although remained above the baseline minimum. Following rainfall from late November 2023, the water level rose and remained above the CTF level.	Diagram B7

Monitoring Site	Classification	Summary of Recorded Water Level During Review Period	Appendix B - Diagram Number
Cedar Creek			
Cedar US	Reference Site	In response to below average rainfall, the water level was at or below the CTF level from July to mid-November 2023. Historical minimum water levels were recorded at times between September and December 2023. Following rainfall from late November 2023, the water level rose and generally remained above the CTF level.	Diagram B8
CC1A (Pool CB3)	Reference Site	The water level was recorded at or slightly above the CTF level from July to October 2023; declining below the CTF level from mid-October to early November 2023 and below the sensor level (baseline minimum) from late October to early November 2023. The water level rose above the CTF level in response to rainfall from early November 2023.	Diagram B9
CA (Pool CB10)	Potential Impact Site	In response to below average rainfall, the water level declined intermittently below the CTF level from September to late-November 2023, although remained above the baseline minimum. Following rainfall from late November 2023, the water level rose and remained above the CTF level.	Diagram B10
CB (Pool CR14)	Potential Impact Site	The water level was recorded at or slightly below the CTF level and the baseline minimum from July to late November 2023. The water level increased above the CTF level and baseline minimum from late-November 2023. Following rainfall from late November 2023, the water level rose and remained generally above the CTF level.	Diagram B11
CD (Pool CR23)	Potential Impact Site	The water level remained above the baseline minimum and the CTF level for the duration of the review period (1 July to December 2023).	Diagram B13
CE (Pool CR25)	Potential Impact Site	The water level remained at or slightly above the baseline minimum and the CTF level from July to late November 2023. Following rainfall from late November 2023, the water level rose and remained generally above the CTF level.	Diagram B14
CG (Pool CR31)	Potential Impact Site	The water level remained above the baseline minimum and the CTF level for the duration of the review period (1 July to December 2023).	Diagram B16

Monitoring Site	Classification	Summary of Recorded Water Level During Review Period	Appendix B - Diagram Number
Stonequarry Creek			
SE (Pool SR5)	Reference Site	The water level trended around the baseline minimum from July to mid-August 2023. From mid-August, the water level declined and was recorded slightly below the baseline minimum for the majority of the period to November 2023 (extent of available data).	Diagram B17
SA (Pool SR16)	Potential Impact Site	The water level remained above the CTF level and the baseline minimum from July to December 2023.	Diagram B18
SB (Pool SR17)	Potential Impact Site	The water level remained above the baseline minimum level from July to December 2023.	Diagram B19
SD	Potential Impact Site	The water level remained above the baseline minimum from July to December 2023. Consistent with historical behaviour, the water level declined below the CTF level during periods of below average rainfall.	Diagram B21

4.4 Surface Water Quality

The water quality monitoring data has been reviewed for the following constituents, which are considered to be primary indicators of potential mining related influences:

- pH;
- Electrical conductivity (EC);
- Dissolved metals: aluminium, barium, iron, manganese, nickel and zinc; and
- Sulphate.

The water quality data recorded during the review period is summarised in **TABLE 3.** Monitoring results for key constituents are also shown on a series of plots in **Appendix C**. Exceedances of trigger levels are discussed in **Section 5**.

TABLE 3: SUMMARY OF KEY WATER QUALITY CONSTITUENTS – 1 JULY TO 31 DECEMBER 2023

Constituent	**Matthews Creek:** MB (reference site), MC1 and MG (potential impact sites)	**Cedar Creek:** Cedar US and CC1 (reference sites), CA, CB, CC, CD, CE, CF and CG (potential impact sites)	**Stonequarry Creek:** SC1 and SE (reference sites), SC2, SC and SD (potential impact sites)
Field pH (Diagram C1, Appendix C)	• Slightly acidic to near neutral pH conditions. • The pH values recorded during the review period were within the range of baseline values.	• Acidic to near neutral pH conditions. • With the exception of Cedar US, a generally declining trend in pH was recorded from April to September 2023, although the pH values remained within the range of baseline values. • An increase in pH was recorded at the majority of sites in December 2023, following above average rainfall.	• Slightly alkaline to circumneutral pH conditions. • The pH values recorded during the review period were mostly within the historical range, except for monitoring sites SD and SC. • A historical maximum pH value of 9.59 was recorded at site SD in December 2023. • An elevated pH (9.26) was recorded at monitoring site SC in December 2023.
Field Electrical Conductivity (Diagram C3, Appendix C)	• Field EC values were within the range of baseline values (less than 700 µS/cm) for the duration of the review period.	• A generally increasing trend in EC was recorded at all sites from February to November 2023, although the EC values remained within the range of baseline values. • EC values declined in December 2023 following above average rainfall.	• A generally increasing trend in EC was recorded at majority of sites from February to November 2023. • A historical maximum EC value of 1,411 µS/cm was recorded at reference site SC1 in July 2023.
Dissolved Aluminium (Diagram C5, Appendix C)	• The concentrations of dissolved aluminium were within the range of baseline concentrations for the duration of the review period.	• Slightly elevated concentrations of dissolved aluminium (greater than 0.1 mg/L) were recorded at CC1 from August to November 2023 and at CA from August to October 2023. • However, the concentrations recorded at all sites during the review period were within the range baseline conditions.	• The concentrations of dissolved aluminium were within the range of baseline concentrations for the duration of the review period.

Constituent	Matthews Creek: MB (reference site), MC1 and MG (potential impact sites)	Cedar Creek: Cedar US and CC1 (reference sites), CA, CB, CC, CD, CE, CF and CG (potential impact sites)	Stonequarry Creek: SC1 and SE (reference sites), SC2, SC and SD (potential impact sites)
Dissolved Barium (Diagram C6, Appendix C)	• The concentrations of dissolved barium were consistent with baseline concentrations for the duration of the review period.	• With the exception of Cedar US, a generally increasing trend in dissolved barium was recorded from March to November 2023. • Although dissolved barium concentrations increased at majority of sites, the values remained within the range of baseline values. • Dissolved barium concentrations declined in December 2023 following above average rainfall.	• A generally increasing trend in dissolved barium was recorded at all sites from March to November 2023. • A historical maximum concentration of 1.49 mg/L was recorded in October 2023 at reference site SC1. • Dissolved barium concentrations declined in December 2023 following above average rainfall.
Dissolved Iron (Diagram C7, Appendix C)	• The concentrations of dissolved iron were generally less than or consistent with baseline concentrations for the duration of the review period.	• Slightly elevated concentrations of dissolved iron (less than 4 mg/L) were recorded at monitoring site CB from July to September 2023, however the concentrations remained within the range of baseline concentrations. • A historical maximum of 6.92 mg/L was recorded at monitoring site CB in November 2023. • The concentrations of dissolved iron recorded at all other sites were within the range of baseline concentrations for the duration of the review period.	• The concentrations of dissolved iron were within the range of baseline concentrations for the duration of the review period.
Dissolved Manganese (Diagram C8, Appendix C)	• Concentrations recorded at all sites were consistent with or less than baseline values.	• Concentrations recorded at all sites were within the range of baseline values.	• Concentrations recorded at all sites were within the range of baseline values.

Constituent	Matthews Creek: MB (reference site), MC1 and MG (potential impact sites)	Cedar Creek: Cedar US and CC1 (reference sites), CA, CB, CC, CD, CE, CF and CG (potential impact sites)	Stonequarry Creek: SC1 and SE (reference sites), SC2, SC and SD (potential impact sites)
Dissolved Nickel (Diagram C9, Appendix C)	• Concentrations recorded at all sites were consistent with or less than baseline values.	• With the exception of Cedar US, a generally increasing trend in dissolved nickel was recorded from March to September 2023. • The dissolved nickel concentrations declined at all sites in the second half of the review period. • Dissolved nickel concentrations were within the range of baseline values at all sites with the exception of reference site CC1 from September to November 2023.	• The dissolved nickel concentrations recorded at all sites were generally within the range of baseline values.
Dissolved Zinc (Diagram C10, Appendix C)	• The concentrations of dissolved zinc recorded at all sites were consistent with or less than baseline values.	• With the exception of Cedar US, a generally increasing trend in dissolved zinc was recorded from March to September 2023. • The dissolved zinc concentrations declined at all sites in the second half of the review period. • Elevated concentrations (above 0.1 mg/L) were recorded at reference site CC1 from August to October 2023. • Slightly elevated concentrations (around 0.08 mg/L) were recorded at monitoring site CA from July to October 2023.	• The concentrations of dissolved zinc recorded at all sites were generally consistent with or less than baseline values.
Sulphate (Diagram C11, Appendix C)	• The concentrations of sulphate recorded at all sites were within the range of baseline concentrations.	• The concentrations of sulphate recorded at all sites were within the range of baseline concentrations.	• With the exception of reference site SC1, the concentrations of sulphate recorded at all sites were within the range of baseline concentrations. • Reference site SC1 recorded an historical maximum of 30 mg/L in November 2023.

4.5 Pool Visual Inspections

The following visual inspections were conducted between 1 July to 31 December 2023:

1. 1 and 6 September 2023 - Cedar Creek;
2. 30 August and 1 September 2023 - Matthews Creek; and,
3. 13 September and 7 December 2023 - Stonequarry Creek.

Based on these visual inspections, all sites inspected at Stonequarry Creek, Cedar Creek and Matthews Creek were reported at a Level 1 trigger significance[2] in relation to physical features and natural behaviour of pools, with the exception of pools SR17 and SR20 in Stonequarry Creek which were reported at a Level 3 trigger significance[3] (SIMEC, 2023).

Pool SR17 was initially reported at a Level 3 significance on 28 October 2021 due to surficial fracturing of the controlling rockbar (pers. comm. MSEC). Brienen Environment & Safety (BES, 2021) reported this as laminar fracturing and extension of a natural crack in the rockbar following an inspection on 17 November 2021. A Level 3 trigger significance in relation to physical features and natural behaviour of pool SR17 applies for the period including and following 17 November 2021 (BES, 2021).

Pool SR20 was reported by BES (2022) as a Level 3 significance due to surface fracturing of the controlling rockbar observed on 18 August 2022. Two fractures were identified at pool SR20, the first initially observed in July 2019 during the pre-mining survey and the second during the August 2022 visual inspection. Between August and November 2022, it was reported that the fractures had widened, but were reported to have stopped increasing in size at the time of the February 2023 visual inspection.

Since the initial observation of fracturing, no gas release or iron precipitation has been noted during visual inspections. A Level 3 trigger significance in relation to physical features and natural behaviour of pool SR20 applies for the period including and following 18 August 2022 (BES, 2022).

There was no reduction in pool flow or connective overland flow, in excess of natural behaviour, at any observed site during the August, September and December 2023 visual inspections. Additionally, there was no observed fracturing with the exception of rockbar SR17 and SR20. No gas release was observed at any site during the August, September and December 2023 visual inspections (Tahmoor Coal, 2023).

[2] No observed impact to pool level, drainage or overland connected flow.

[3] Rockbar and / or stream base cracking, gas release or iron precipitation noted during visual inspection (in excess of baseline conditions) and no reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during the baseline monitoring period.

5 ASSESSMENT AGAINST SURFACE WATER TARPS

5.1 LW W4 Subsidence Impact Performance Measures

The subsidence impact performance measures and performance indicators for natural features defined in the WMP are summarised in **TABLE 4**. The monitoring results, in conjunction with the TARPs, are used to assess the impacts of mining in the Western Domain against the subsidence impact performance measures specified in **TABLE 4**. This report addresses the first subsidence performance measure listed in **TABLE 4**.

TABLE 4: SUBSIDENCE PERFORMANCE MEASURES AND PERFORMANCE INDICATORS FOR SURFACE WATER AND GROUNDWATER RESOURCES

Feature	Subsidence Performance Measures	Subsidence Performance Indicators
Stonequarry Creek, Cedar Creek and Matthews Creek	No subsidence impact or environmental consequence greater than minor*	This performance measure will be considered to be exceeded if mining-induced fracturing in a rockbar or stream bed results in a reduction in pool water level below historically recorded water levels, taking into account rainfall and observations during the baseline monitoring period, for: • More than 10% of pools located within the Study Area for Natural Features; and/or • Pool SR17.
	No connective cracking between the surface, or the base of the alluvium, and the underground workings	This performance indicator will be considered to be exceeded if analysis of inflow data suggests high correlation to rainfall events and significant departure from groundwater model predictions. This would be supported by analysis of pre- and post-mining goaf centreline bore data.

* Minor is defined as *not very large, important or serious*

5.2 Impact to Pool Water Level, Physical Features and Natural Behaviour

5.2.1 Significance Triggers for Automated Pool Water Level and Physical Features

The significance levels / triggers, as detailed in the WMP, are summarised in **TABLE 5** for pool water level and in **TABLE 6** for physical features and natural behaviour of pools. In accordance with the WMP, the pool water level data and visual inspection observations have been assessed against the tabulated criteria for each trigger level.

TABLE 5: SIGNIFICANCE LEVELS / TRIGGERS FOR POOL WATER LEVEL

TARP Level	Pool Water Level
Level 1	The recorded water level has not declined below the recorded baseline minimum level (in one 24 hour period for automated pool water level) OR the recorded water level has declined below the recorded baseline minimum level (in one 24 hour period for automated pool water level) but the decline is due to a monitoring or sensor error or the magnitude of the decline (below the recorded baseline minimum level) is within the range of sensor accuracy.
Level 2	The recorded water level has declined below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level) AND the above has occurred at one of the upstream pools (beyond mining effects).
Level 3	The recorded water level has declined, although not atypically*, below the recorded baseline minimum level (for more than one 24 hour period for automated pool water level) AND the above has not occurred at one of the upstream pools (beyond mining effects).
Level 4	The recorded water level has declined atypically* below the previously recorded minimum level (for more than one 24 hour period for automated pool water level) AND similar behaviour has not occurred at one of the upstream pools (beyond mining effects).

* 'Atypical' surface water characteristics relate to a notable and/or rapid water level decline or change in the slope of the falling limb of the hydrograph or the water level recessionary behaviour below the CTF level which is inconsistent with baseline conditions and cannot be attributed to climatic conditions.

TABLE 6: SIGNIFICANCE LEVELS / TRIGGERS FOR PHYSICAL FEATURES AND NATURAL BEHAVIOUR OF POOLS

TARP Level	Physical Features and Natural Behaviour of Pools
Level 1	No observed impacts to pool level, drainage or overland connected flow.
Level 2	Visually observed reduction in pool level, drainage or overland connected flow AND the above has occurred at one of the upstream pools (beyond mining effects) OR visual monitoring of pools has not noted any mining related impacts*.
Level 3	Rockbar and / or stream base cracking, gas release or iron precipitation noted during visual inspection (in excess of baseline conditions) AND no reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during the baseline monitoring period.
Level 4	Visually observed reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during the baseline monitoring period AND the above change has not occurred at one of the upstream pools (beyond mining effects).

* Rockbar and/or stream base cracking, gas release or iron precipitation in excess of baseline conditions.

5.3 Assessment of Automated Pool Water Level Data and Visual Inspection Observations

A summary of the pool water level, physical features and natural behaviour TARP significance levels for potential impact sites over the duration of the review period is presented in **TABLE 7** and discussed in the sections which follow.

TABLE 7: SURFACE WATER TARP SIGNIFICANCE LEVELS – 1 JULY TO 31 DECEMBER 2023

Date	Location(s)	Comment	TARP Significance
Surface Water Level			
1 July to 31 December 2023	All monitoring sites in Cedar Creek (excluding CB), Matthews Creek and Stonequarry Creek	The recorded water level did not decline below the baseline minimum level (in one 24-hour period).	Level 1
6 July to 7 July, 15 August to 20 August, 6 October, 18 October, 18 November, 29 November to 17 December and 20 December to 31 December 2023	Site CB in Cedar Creek	The recorded water level did not decline below the baseline minimum level (in one 24-hour period).	Level 1
1 July to 5 July, 8 July to 14 August, 21 August to 5 October, 7 October to 17 November, 19 November to 28 November and 18 December to 19 December 2023	Site CB in Cedar Creek	The recorded water level has declined (by a maximum of 2 cm) below the recorded baseline minimum level (for more than one 24- hour period for automated pool water level) AND the above has occurred at one of the upstream pools (beyond mining effects).	Level 2
Physical Features and Natural Pool Behaviour			
1 July to 31 December 2023	All monitoring sites in Cedar Creek and Matthews Creek	No observed impacts to pool level, drainage or overland connected flow.	Level 1*
1 July to 31 December 2023	All monitoring sites in Stonequarry Creek (excluding SR17 and SR20)	No observed impacts to pool level, drainage or overland connected flow.	Level 1*
1 July to 31 December 2023	SR17 rockbar in Stonequarry Creek	Rockbar fracturing noted during visual inspection (in excess of baseline conditions) AND no reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during the baseline monitoring period.	Level 3*
1 July to 31 December 2023	SR20 rockbar in Stonequarry Creek	Rockbar fracturing noted during visual inspection (in excess of baseline conditions) AND no reduction in pool water level, drainage or overland connected flow, taking into account climatic conditions and observations during the baseline monitoring period.	Level 3*

* Source: Tahmoor Coal (2023)

5.3.1 Trigger Exceedance Action and Response

TABLE 8 summarises the actions and responses required to be undertaken in relation to the Level 2 trigger exceedances recorded at monitoring site CB and the Level 3 trigger exceedances recorded at pool SR17 and pool SR20.

TABLE 8: TRIGGER EXCEEDANCE ACTION AND RESPONSE

Level	Action	Response
Pool water level		
Level 2	• Continue monitoring as per monitoring program • Continue monthly review of data • Convene Tahmoor Coal Environmental Response Group to review response	• As defined by Environmental Response Group
Impact to physical features and natural behaviour of pools		
Level 3	• Continue monitoring as per monitoring program • Continue monthly review of data • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess if the change in behaviour is related to LW W3-W4 mining effects, other catchment changes or the prevailing climatic conditions	• As defined by Environmental Response Group • Consider increasing inspection and review of data frequency to fortnightly for sites where Level 3 has been reached

5.3.1.1 Monitoring Site CB (Pool CR14)

As stated in **TABLE 7**, the following trigger levels are considered to apply for monitoring site CB (pool CR14) for the current review period:

- Level 1: 6 July to 7 July, 15 August to 20 August, 6 October, 18 October, 18 November, 29 November to 17 December and 20 December to 31 December 2023.
- Level 2: 1 July to 5 July, 8 July to 14 August, 21 August to 5 October, 7 October to 17 November, 19 November to 28 November and 18 December to 19 December 2023.

Accordingly, the Environmental Response Group convened, and the surface water level data was reviewed in relation to climatic conditions, subsidence monitoring data and groundwater level trends.

The following is considered in relation to the Level 2 trigger exceedances for monitoring site CB:

- The water level decline recorded at monitoring site CB during the review period was negligible - maximum 2 cm decline below the baseline minimum (refer **Diagram B11**, **Appendix B**).
- The water level decline was not atypical and occurred during a period of generally below average rainfall (refer **DIAGRAM 2**).
- The water level was recorded below the CTF level at monitoring site MG for portions of July to December 2023 i.e., negligible surface flow was reporting from Matthews Creek to Cedar Creek during these periods - refer **Diagram B7**, **Appendix B**.
- Based on available water level records, the water level at reference site Cedar US declined below the historical minimum water level for extended periods of September to December 2023, indicating a notable decline in flow in the mid to lower reach of Cedar Creek (upstream of mining related influences) - refer **Diagram B8**, **Appendix B**.

- The water level at reference site CC1A declined below the sensor level (baseline minimum) from 27 October to 5 November 2023.
- Based on the subsidence movements recorded following cessation of mining (refer **Section 3**), it is considered that negligible residual subsidence movements are likely to have occurred at monitoring site CB during the review period.
- Groundwater levels at monitoring site P40 (A, B, C and D) were recorded above the creek bed elevation from approximately December 2022 to 31 December 2023 indicating that baseflow (groundwater contribution) was likely to have contributed to Cedar Creek in the vicinity of monitoring site CB during the review period (SLR, 2023).

When comparing the monitoring data directly to the TARP level descriptions included in **TABLE 8**, it is noted that a Level 3 may be considered to apply for the period 1 July to 5 July and 8 July to 14 August 2023. However, the water level decline recorded at monitoring site CB during the above mentioned periods is considered negligible and related to a catchment-wide reduction in surface flow due to below average rainfall conditions. As such, a Level 2 trigger exceedance has been equated for these periods.

Further summary in relation to the water level trends recorded at monitoring site CB and associated monitoring is provided in **Section 5.4.2.1**.

5.3.1.2 Pool SR17

As described in **Section 4.5**, pool SR17 was initially reported at a Level 3 significance on 28 October 2021 due to surficial fracturing of the controlling rockbar (pers. comm. MSEC). A visual inspection on 10 May 2023 was undertaken with no reduction in water level observed at Pool SR17. Since the initial observation of fracturing, no gas release or iron precipitation in excess of baseline conditions has been noted during visual inspections.

In response to the Level 3 trigger exceedances in relation to physical features at monitoring site SB (pool SR17), the Environmental Response Group convened and the surface water level data was reviewed. The water level records for monitoring site SB (pool SR17) shown in **Diagram B22**, **Appendix B**, indicate that fracturing of the rockbar has not resulted in an impact to the pool water holding capacity. The water level recorded at monitoring site SB (pool SR17) has not declined below the baseline minimum water level and no atypical water level behaviour has been recorded at this site to date. As such, there is no requirement to increase the frequency of visual inspections and review of data in relation to pool physical features, natural drainage behaviour and pool water level. Further summary in relation to the site physical features, water level records and monitoring recommendations are provided in **Section 5.4.2.1**.

5.3.1.3 Pool SR20

As described in **Section 4.5**, pool SR20 was reported by BES (2022) as a Level 3 significance due to surface fracturing of the controlling rockbar observed on 18 August 2022. Between August and November 2022, it was reported that the fractures had widened, but were reported to have ceased increasing in size at the time of the February 2023 visual inspection.

In response to the Level 3 trigger exceedance in relation to physical features at pool SR20, the Environmental Response Group convened, and the surface water level data was reviewed for the monitoring sites upstream of pool SR20 (monitoring site SB) and downstream of pool SR20 (monitoring sites SC and SD). The monitoring data for these sites indicates that the water level did not decline below the baseline minimum water level between 18 August 2022 (date that fracturing was initially observed) and 30 September 2023 (end of review period). **Diagram B21, Appendix B** shows that, with the exception of rainfall periods, the water level at monitoring site SD was recorded below the CTF level from January to June 2023. However, the decline in water level is considered consistent with baseline characteristics and associated with below average rainfall conditions.

Additionally, as indicated in **Section 3**, only minor subsidence movements have been recorded in the Western Domain since the completion of mining (13 September 2022). As such, further mining related widening of the fractures is considered unlikely to occur.

Accordingly, there is no requirement to increase the frequency of visual inspections and review of data in relation to pool physical features, natural drainage behaviour and pool water level. Further summary

in relation to the physical features and water level records for this site and monitoring recommendations is provided in **Section 5.4.2.1**.

5.4 Surface Water Quality

5.4.1 Significance Triggers for Surface Water Quality

Water quality data has been analysed for key water quality parameters of relevance to surface water systems and the effects of subsidence, namely pH, EC, dissolved (field filtered) aluminium, iron, manganese, nickel and zinc at monitoring sites on Matthews Creek, Cedar Creek and Stonequarry Creek. The monitoring results have been assessed against the criteria for each significance level/trigger listed in **TABLE 9.**

TABLE 9: SIGNIFICANCE LEVELS / TRIGGERS FOR WATER QUALITY

TARP Level	Surface Water Quality
Level 1	The triggers for pH, EC and dissolved metals do not occur and there is no visual evidence of increased iron staining that was not observed in the baseline period.
Level 2	The trigger for pH, EC or dissolved metals occurs in one month and there is no visual evidence of increased iron staining that was not observed in the baseline period.
Level 3	The trigger for pH, EC or dissolved metals occurs in one month and there is visual evidence of increased iron staining that was not observed in the baseline period.
Level 4	Any of the following: • pH: the value falls below a corresponding control (upstream) site(s) mean*, or at the site itself, minus two standard deviations (i.e. the sample becomes more acidic) for more than two consecutive months OR the value rises above corresponding control (upstream) site(s) mean, or at the site itself, plus two standard deviations (i.e. the sample becomes more alkaline) for more than two consecutive months. • EC: the value rises above corresponding control (upstream) site(s) mean*, or at the site itself, plus two standard deviations for more than two consecutive months. • Dissolved metals: a specific metal or metals laboratory value/s rise above corresponding control (upstream) site(s) mean*, or at the site itself, plus two standard deviations for more than two consecutive months.

* The value is compared with the corresponding control (upstream) site(s) mean to date plus two standard deviations and with the baseline mean plus two standard deviations for the site itself.

5.4.2 Assessment of Surface Water Quality

A summary of the water quality TARP significance levels for the review period is presented in **TABLE 10** and discussed in the sections which follow.

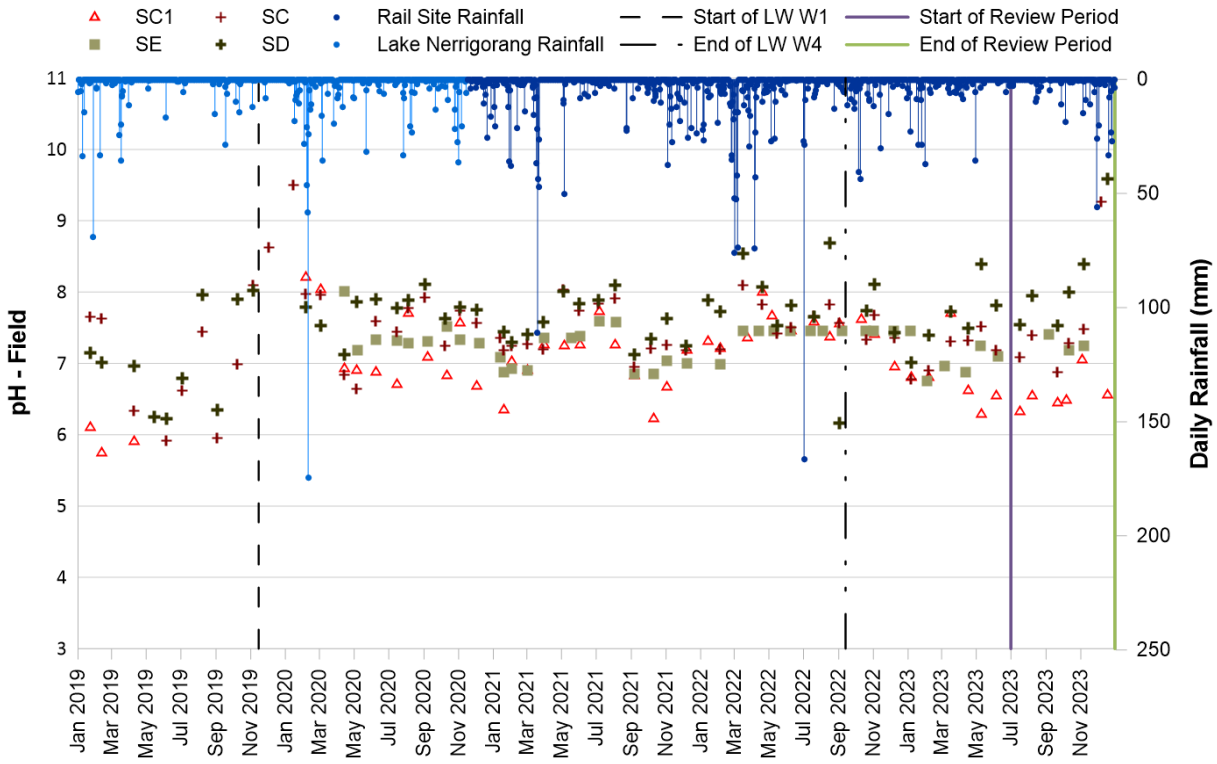
TABLE 10: WATER QUALITY TARP SIGNIFICANCE LEVELS – 1 JULY TO 31 DECEMBER 2023

Date	Location(s)	Comment	TARP Significance
Surface Water Quality			
July to December 2023	All monitoring sites in Matthews Creek	The triggers for pH, EC and dissolved metals did not occur.	Level 1
July to December 2023	All monitoring sites in Cedar Creek	The triggers for pH, EC and dissolved metals did not occur.	Level 1
July to December 2023	All monitoring sites in Stonequarry Creek (excluding SC and SD in December 2023)	The triggers for pH, EC and dissolved metals did not occur.	Level 1
December 2023	Sites SC and SD in Stonequarry Creek	The trigger for pH occurred in one month and there was no visual evidence of increased iron staining that was not observed in the baseline period.	Level 2
December 2023	Site SD in Stonequarry Creek	The trigger for dissolved aluminum occurred in one month and there was no visual evidence of increased iron staining that was not observed in the baseline period.	Level 2

5.4.2.1 pH at Monitoring Sites SD and SC

The field pH recorded at monitoring sites SD and SC and reference sites SC1 and SE is shown on **DIAGRAM 3**.

DIAGRAM 3: FIELD PH



As shown in **DIAGRAM 3**, the pH values recorded in December 2023 at monitoring sites SC and SD were elevated (above pH 9) resulting in an exceedance of the site-specific trigger values. The same did not occur at the reference sites SC1 and SE.

The elevated pH recorded in December 2023 occurred following an extended period of generally below average rainfall, resulting in water level decline at these pools. Photographs of monitoring site SD taken on 8 December 2023 show the presence of extensive algae growth, with field measurements indicating supersaturation of dissolved oxygen at both monitoring sites. As such, it is considered that the increase in algae growth likely contributed to an increase in pH at these sites.

5.4.2.2 Dissolved Aluminium at Monitoring Site SD

The dissolved aluminium concentrations recorded at monitoring site SD and reference sites SC1 and SE are shown on **DIAGRAM 4**.

DIAGRAM 4: DISSOLVED ALUMINIUM

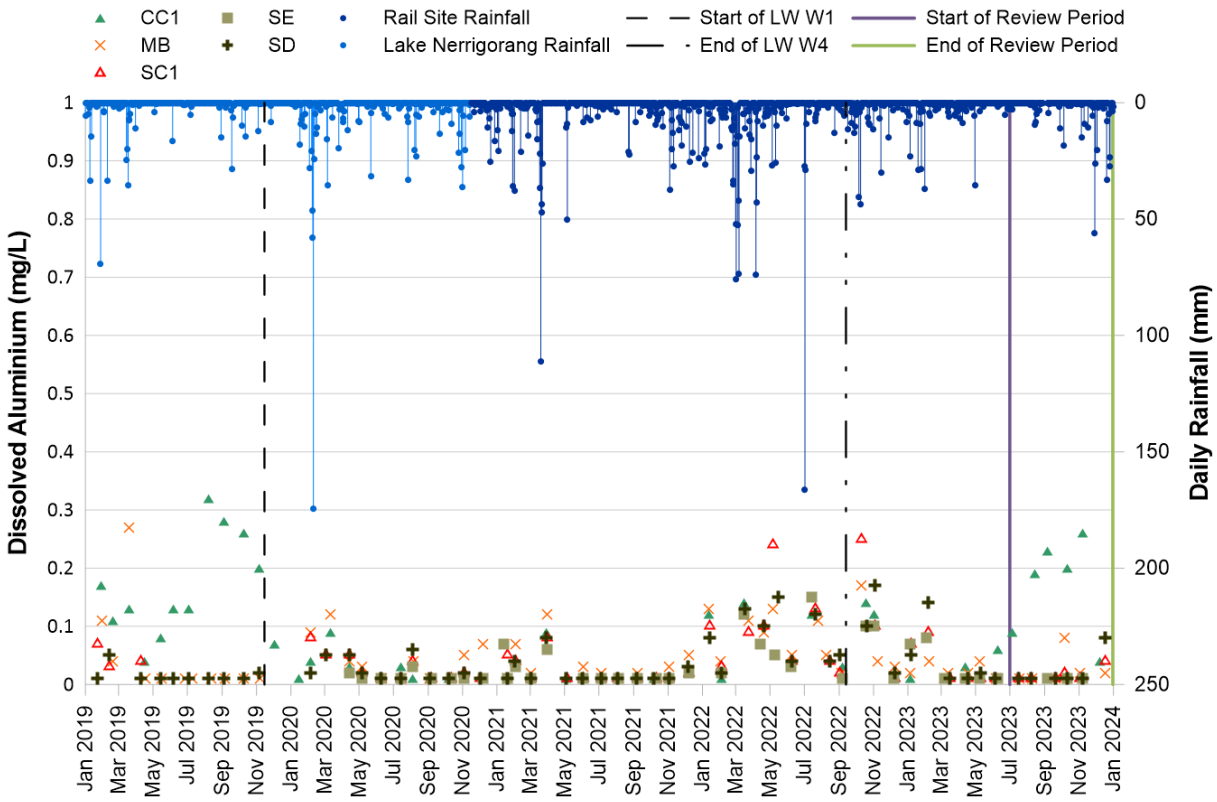


DIAGRAM 4 indicates that the concentration of dissolved aluminium recorded in December 2023 at monitoring site SD was slightly elevated (0.08 mg/L), exceeding the site specific trigger value. Although a similar exceedance did not occur at the reference sites on Stonequarry Creek in December 2023, elevated dissolved aluminium concentrations, equal to or in excess of 0.08 mg/L, were recorded at reference site CC1 on Cedar Creek and MB on Matthews Creek in the proceeding months. It is noted that elevated concentrations of dissolved aluminium, in excess of 0.08 mg/L, have been recorded at several sites historically, including during the baseline period.

As such, it is considered that the slightly elevated dissolved aluminium concentration recorded at monitoring site SD in December 2023 was related to the prevailing climatic conditions and to the contribution of flow from Cedar Creek to Stonequarry Creek containing elevated concentrations of dissolved aluminium.

6 SUMMARY AND CONCLUSIONS

Review and assessment of surface water monitoring data recorded prior to and during the review period of 1 July to 31 December 2023 has indicated the following:

- Surface Water Level:
  - With the exception of monitoring site CB in Cedar Creek, a trigger significance above Level 1 did not occur at sites in Cedar Creek, Matthews Creek and Stonequarry Creek during the review period.
  - A Level 2 trigger exceedance was recorded at monitoring site CB (pool CR14) in Cedar Creek from 1 July to 5 July, 8 July to 14 August, 21 August to 5 October, 7 October to 17 November, 19 November to 28 November and 18 December to 19 December 2023. The water level declined by a maximum of 2 cm below the baseline minimum during these periods.
  - A decline of 2 cm below the baseline minimum is considered negligible and related to a reduction in surface flow reporting to monitoring site CB from upstream Cedar Creek and Matthews Creek, consistent with generally below average rainfall conditions.
- Physical Features and Natural Behaviour of Pools:
  - A Level 3 trigger exceedance was reported for rockbar SR17 and SR20 located in Stonequarry Creek.
  - The water level records for monitoring site SB (pool SR17) indicate that the surficial fracturing of the rockbar has not resulted in an apparent impact to the pool water holding capacity.
  - The water level records for sites downstream of pool SR20 (monitoring sites SC and SD) indicate that the surficial fracturing of the rockbar at pool SR20 has not resulted in an apparent impact to the pool water holding capacity.
- Surface Water Quality:
  - No triggers above a Level 1 trigger exceedance were reported for monitoring sites at Mathews Creek and Cedar Creek.
  - A Level 2 trigger exceedance for pH was recorded at monitoring sites SC and SD in December 2023. The trigger exceedances are considered related to the prevailing climatic conditions and unrelated to potential residual mining effects.
  - A Level 2 trigger exceedance for dissolved aluminium was recorded at monitoring site SD in December 2023. The trigger exceedance is considered related to the prevailing climatic conditions and to the contribution of flow from Cedar Creek to Stonequarry Creek containing elevated concentrations of dissolved aluminium.

The monitoring data for 1 July to 31 December 2023 indicates that less than 10% of pools within the Investigative Area have been impacted. Consequently, there is negligible evidence to date of subsidence impacts with environmental consequences greater than minor[4] associated with mining in the Western Domain.

On the basis of the above and following 12 months of post-mining monitoring, it is recommended that the post-mining monitoring program is ceased.

It is considered that a corrective management action plan is not required to be implemented at any site in the Western Domain.

[4] Minor is defined as *not very large, important or serious.*

REFERENCES

[1] ATCW (2023). Surface Water Review 1 January to 31 March 2023 Prepared for Tahmoor Coal Pty Ltd by ATC Williams Pty Ltd (ATCW), June 2023. Doc ref: 121171-16R005-rev0.

[2] BES (2021) Longwall West 4 Creek Monitoring – 17 November 2021, Matthews, Cedar and Stonequarry Creeks. Prepared for Tahmoor Coking Coal by Brienen Environment & Safety (BES), November 2021.

[3] BES (2022) Longwall West 4 Creek Monitoring – 30 August 2022, Matthews, Cedar and Stonequarry Creeks. Prepared for Tahmoor Coking Coal by Brienen Environment & Safety (BES), August 2022.

[4] HEC (2022). Tahmoor Mine LW W3 Surface Water and Groundwater Review - October to December 2021. Prepared for Tahmoor Coal Pty Ltd by Hydro Engineering & Consulting Pty Ltd (HEC). Doc ref: 121171-16.r1c. 24, February 2022.

[5] MSEC (2023). Six Monthly Subsidence Monitoring Report for Tahmoor Longwall W4 for the period 1 January 2023 to 30 June 2023. Prepared for Tahmoor Coal Pty Ltd by Mine Subsidence Engineering Consultants Pty Ltd (MSEC), August 2023.

[6] NEH (2023). Tahmoor Western Domain – Aquatic Ecology Monitoring Report 2017-2023, Autumn 2023. Prepared for Tahmoor Coal Pty Ltd by Niche Environment and Heritage Pty Ltd (NEH), September 2023.

[7] SLR (2024) Six-Monthly Groundwater Reporting: July – December 2023. Prepared for Tahmoor Coal Pty Ltd by SLR Consulting Australia Pty Ltd (SLR), March 2024.

[8] Tahmoor Coal (2021a). Tahmoor North Western Domain Longwalls West 3 and West 4 Water Management Plan. September 2021.

[9] Tahmoor Coal (2021b). Tahmoor North – Western Domain, LW W3-W4 Stonequarry Creek Rockbar Management Plan. September 2021.

[10] Tahmoor Coal (2023). Western Domain – Cedar Creek, Matthews Creek and Stonequarry Creek Waterways Inspections. September and December 2023.

[11] ATCW (2023). Tahmoor North Western Domain – Surface Water Review 1 January to 30 June 2023. September 2023.

[12] ATCW (2023). Tahmoor North Western Domain – Surface Water Review 1 July to 30 September 2023. December 2023.

CONDITIONS OF REPORT

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APPENDIX A – SUMMARY OF SURFACE WATER MONITORING SITES RELEVANT TO WESTERN DOMAIN

Location	Monitoring Site(s)	Monitoring Component	Classification	Natural Control Characteristics	Water Quality Monitoring Commencement
Cedar Creek	Cedar US	Water level and quality	Reference Site	Rockbar constrained	October 2020
	CC1A (Pool CB3)	Water level	Reference Site	Boulder/rockbar constrained	-
	CC1	Water quality	Reference Site	Boulder/rockbar constrained	January 2019
	CA (Pool CB10)	Water level and quality	Potential Impact Site	Boulder constrained	June 2019
	CB (Pool CR14)	Water level and quality	Potential Impact Site	Rockbar constrained	January 2019
	CD (Pool CR23)	Water level and quality	Potential Impact Site	Rockbar/boulder constrained	January 2021
	CE (Pool CR25)	Water level and quality	Potential Impact Site	Rockbar/boulder constrained	January 2021
	CF	Water level and quality	Potential Impact Site	Rockshelf constrained	January 2021
	CG (Pool CR31)	Water level and quality	Potential Impact Site	Rockshelf constrained	January 2019
Matthews Creek	MB (Pool MR5)	Water level and quality	Reference Site	Rockbar constrained	January 2019
	MC1	Water level and quality	Baseline / Potential Impact Site	Rockshelf/boulder constrained	January 2019
	ME (Pool MR25)	Water level	Potential Impact Site	Boulder/rockbar constrained	-
	MG (Pool MR42)	Water level and quality	Potential Impact Site	Boulder constrained	January 2019
Stonequarry Creek	SA (Pool SR16)	Water level	Potential Impact Site	Rockbar/boulder constrained	-
Stonequarry Creek	SB (Pool SR17)	Water level	Potential Impact Site	Rockbar constrained	-

Location	Monitoring Site(s)	Monitoring Component	Classification	Natural Control Characteristics	Water Quality Monitoring Commencement
	SC	Water level and quality	Baseline / Potential Impact Site	Rockbar constrained	January 2019
	SC1	Water quality	Reference Site	Rockshelf constrained	January 2019
	Pool SR20	Water level and quality	Potential Impact Site	Rockbar constrained	-
	SD	Water level and quality	Baseline / Potential Impact Site	Rockbar constrained	January 2019
	SE (Pool SR5)	Water level and quality	Reference Site	Rockbar constrained	April 2020

APPENDIX B – WATER LEVEL PLOTS

MATTHEWS CREEK SURFACE WATER MONITORING SITES

DIAGRAM B1: MONITORING SITE MA WATER LEVEL RECORDS

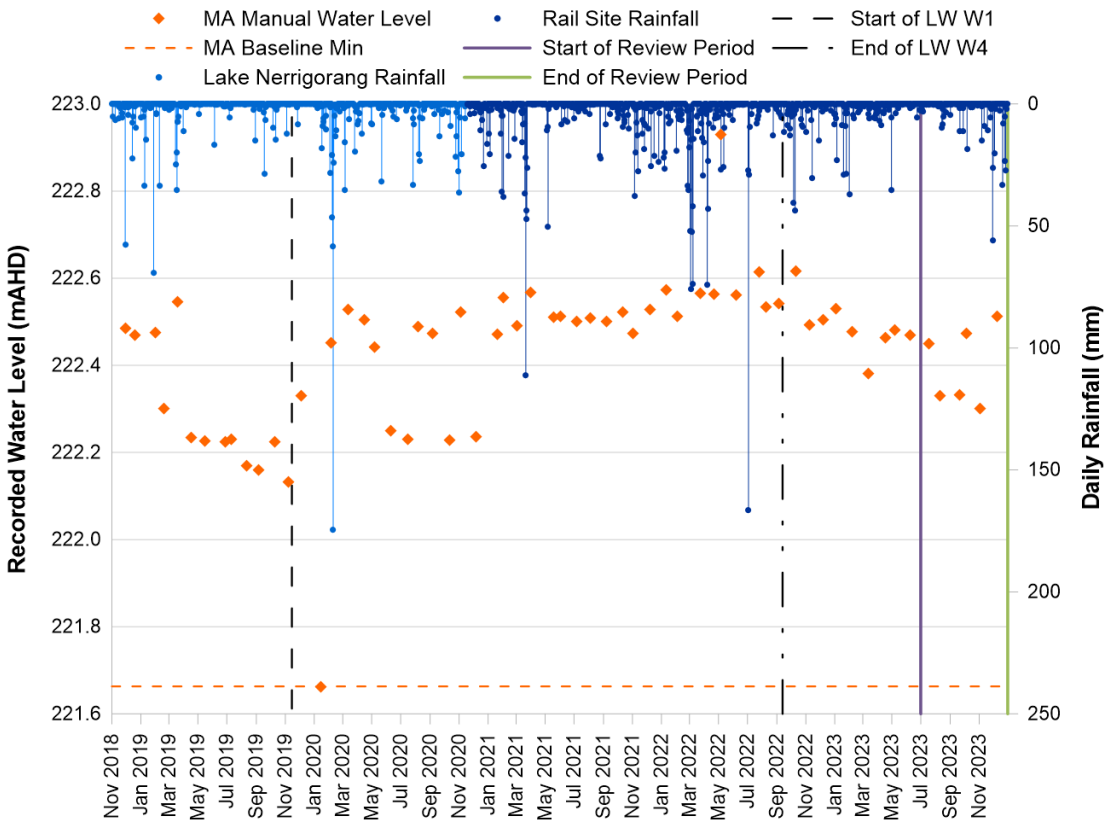


DIAGRAM B2: MONITORING SITE MB WATER LEVEL RECORDS

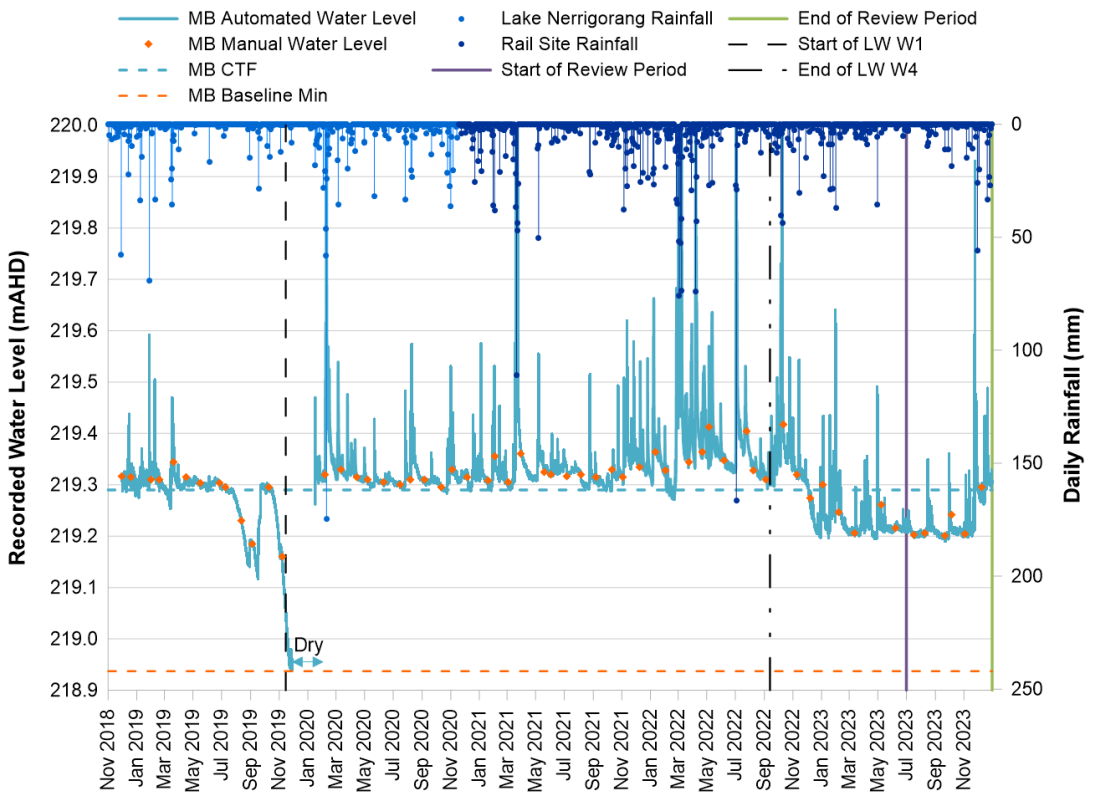


DIAGRAM B3: MONITORING SITE MC WATER LEVEL RECORDS

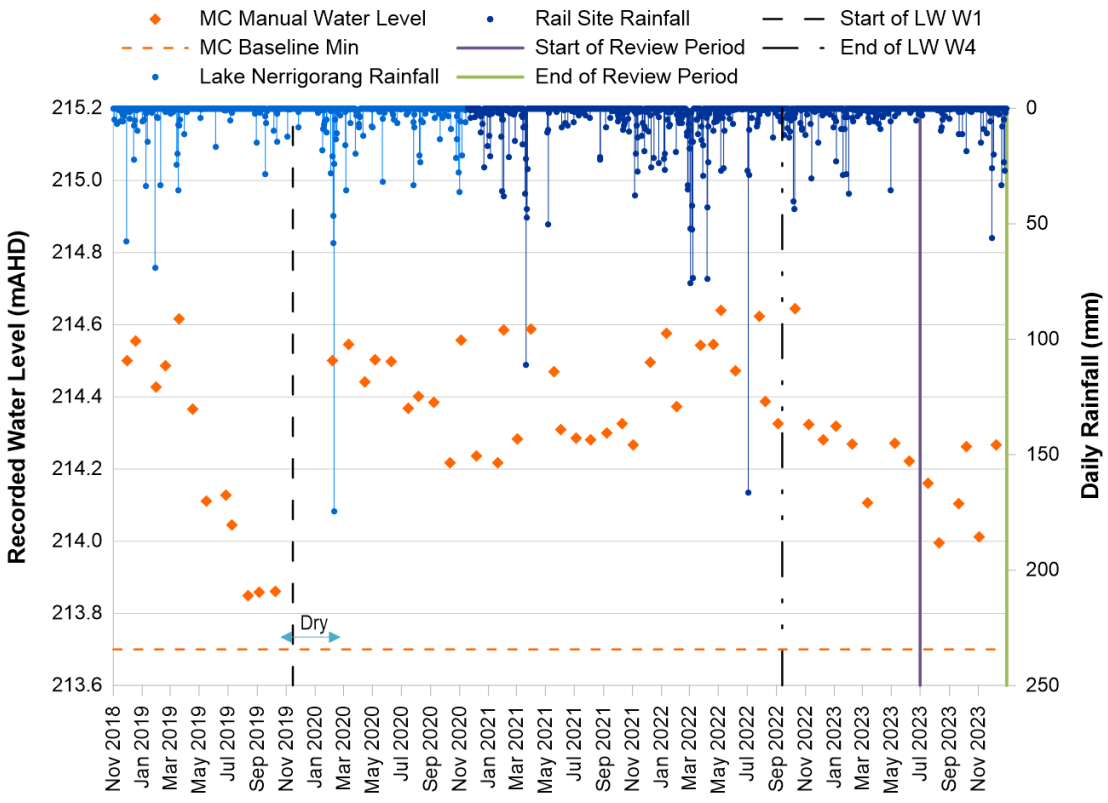


DIAGRAM B4: MONITORING SITE MD US WATER LEVEL RECORDS

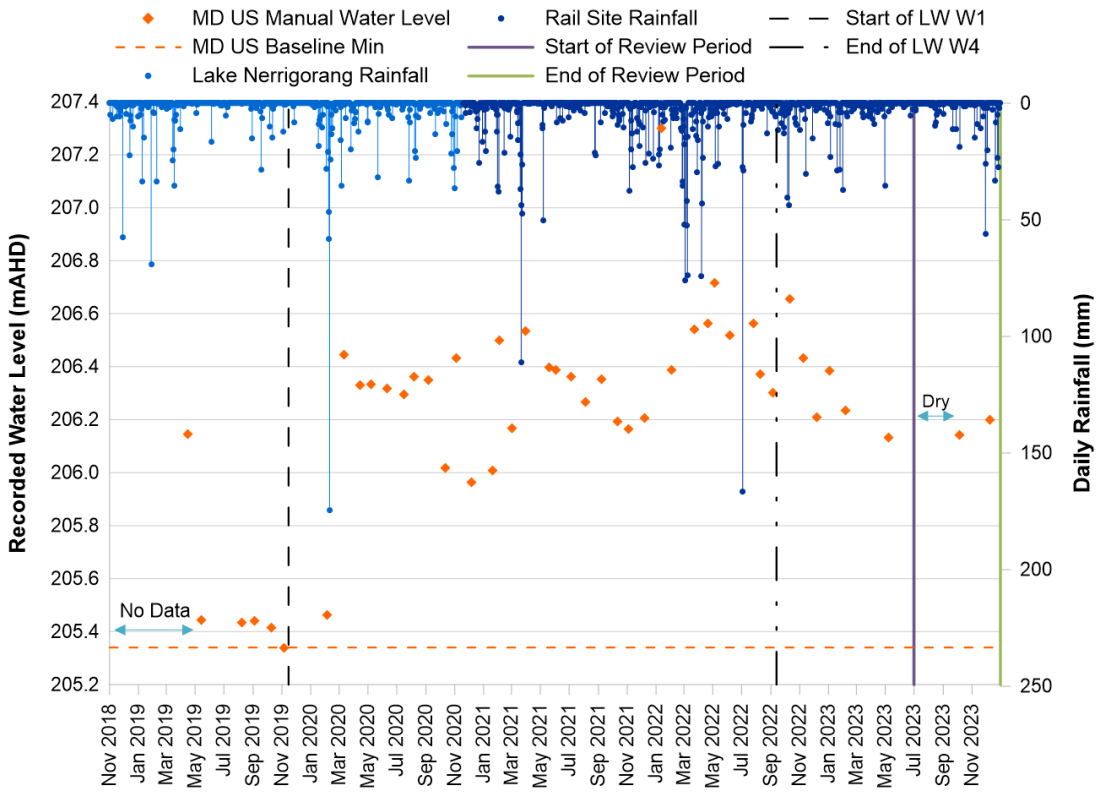


DIAGRAM B5: MONITORING SITE ME WATER LEVEL RECORDS

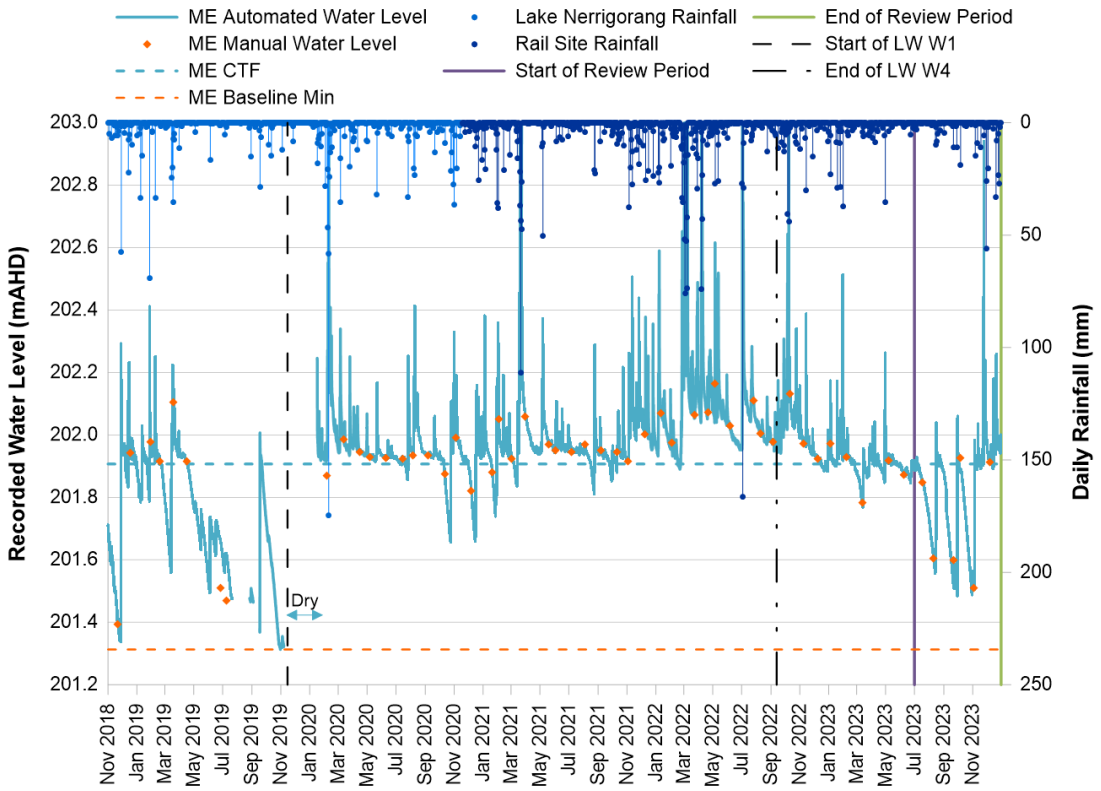


DIAGRAM B6: MONITORING SITE MF WATER LEVEL RECORDS

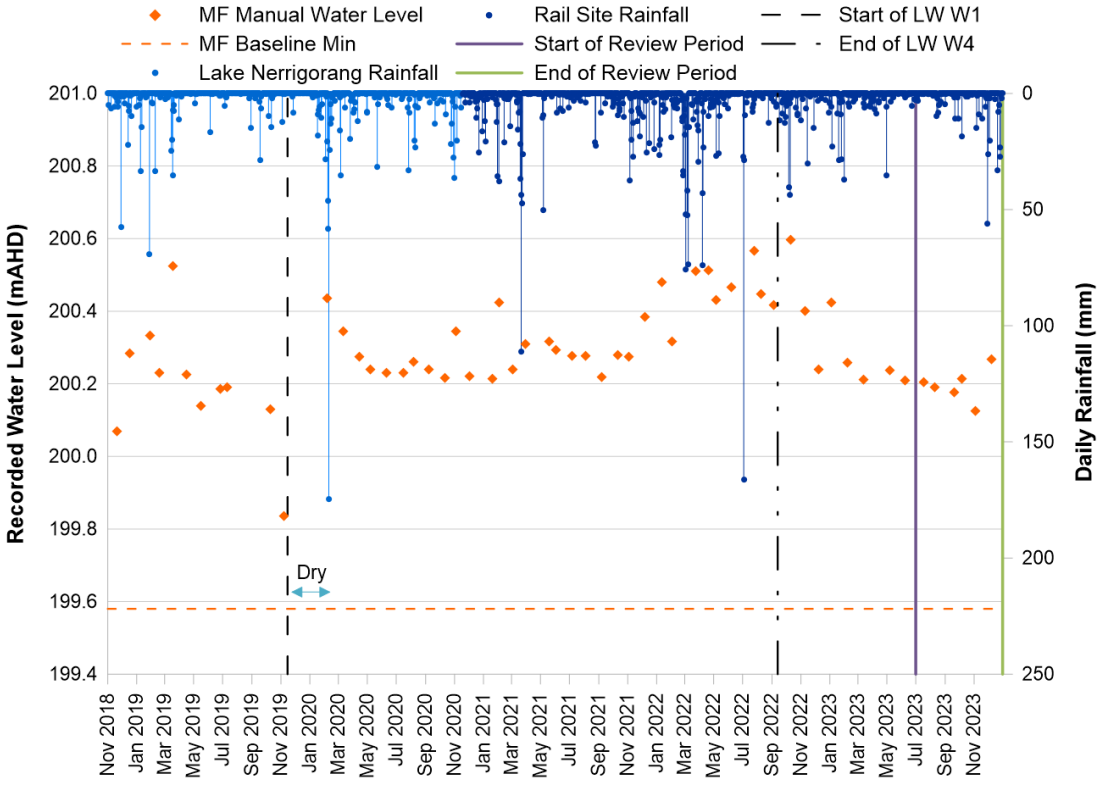
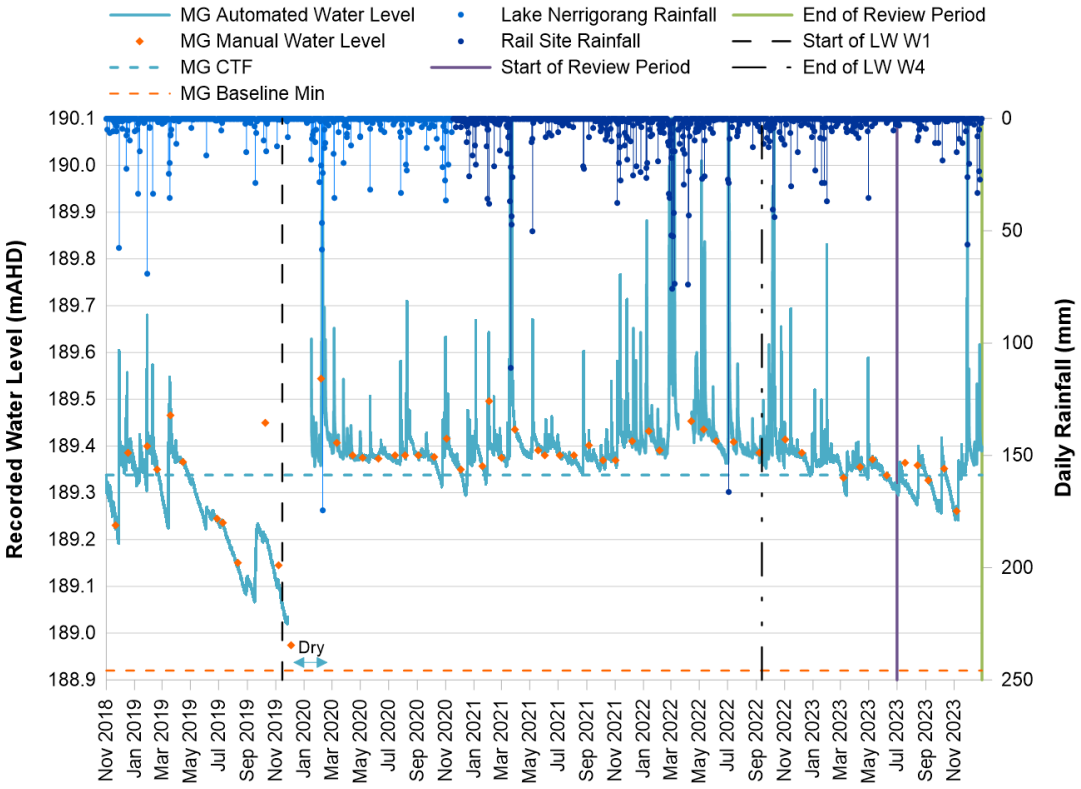


DIAGRAM B7: MONITORING SITE MG WATER LEVEL RECORDS[5]



[5] No data was recorded between 17 March and 14 April 2022 due to a logger re-start issue.

CEDAR CREEK SURFACE WATER MONITORING SITES

DIAGRAM B8: MONITORING SITE CEDAR US WATER LEVEL RECORDS

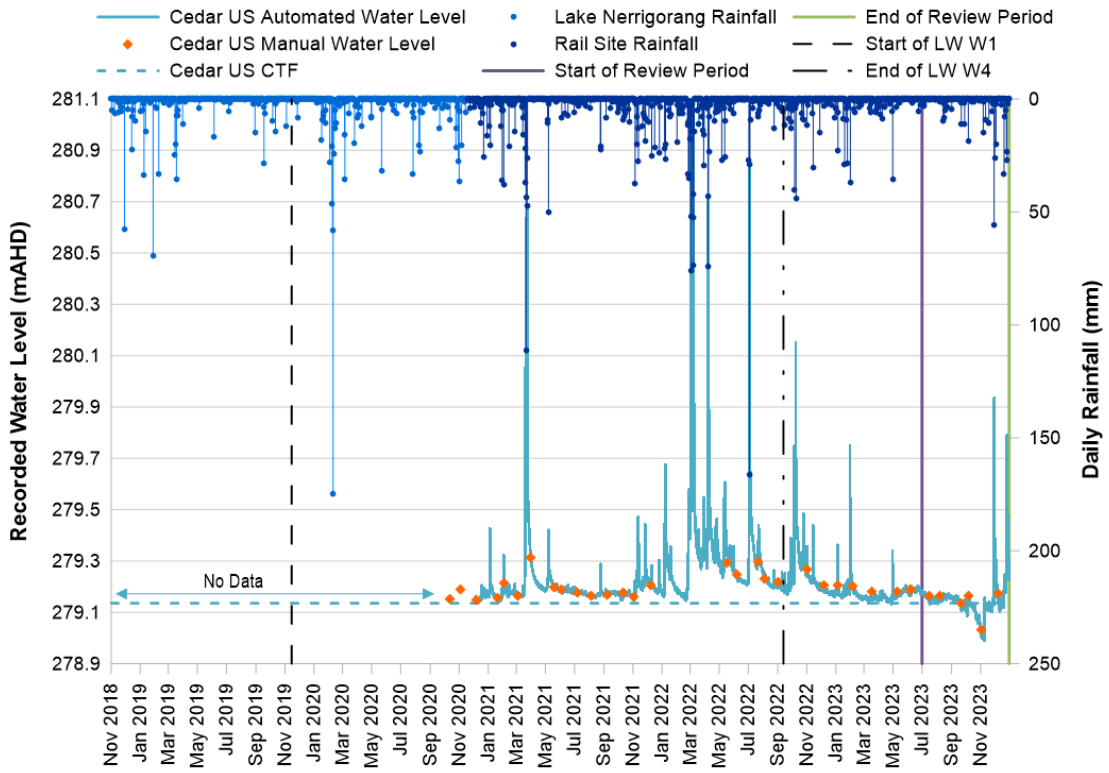


DIAGRAM B9: MONITORING SITE CC1A WATER LEVEL RECORDS

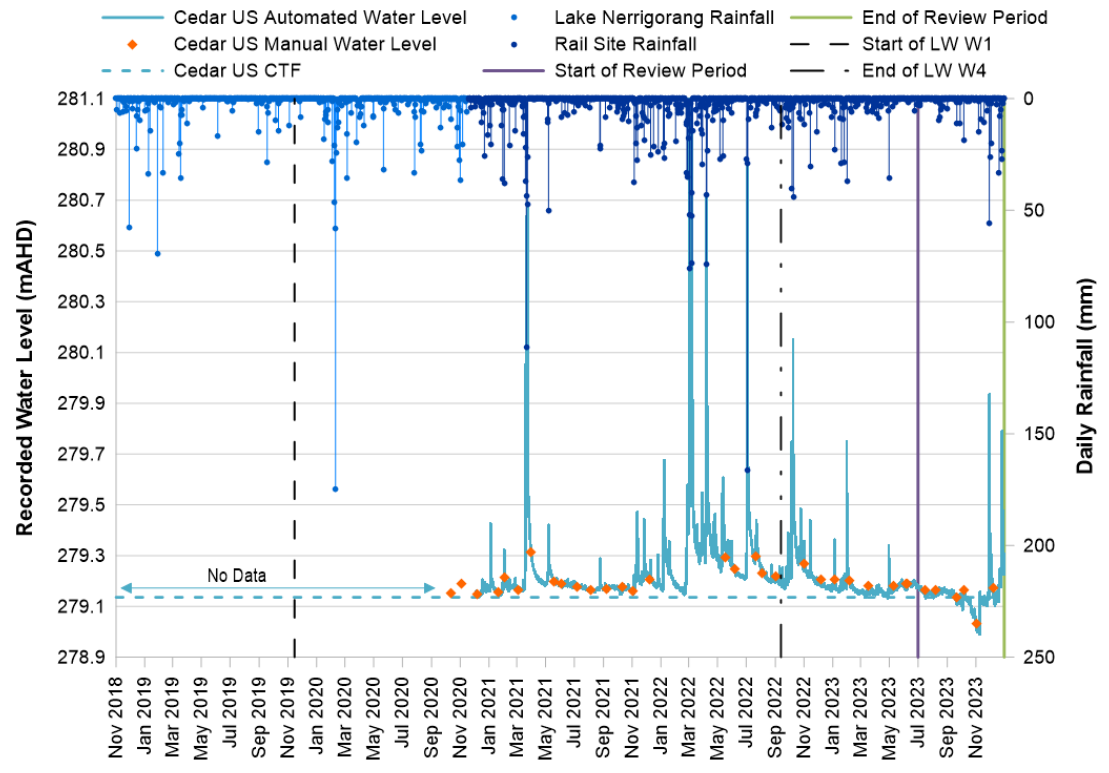


DIAGRAM B10: MONITORING SITE CA WATER LEVEL RECORDS

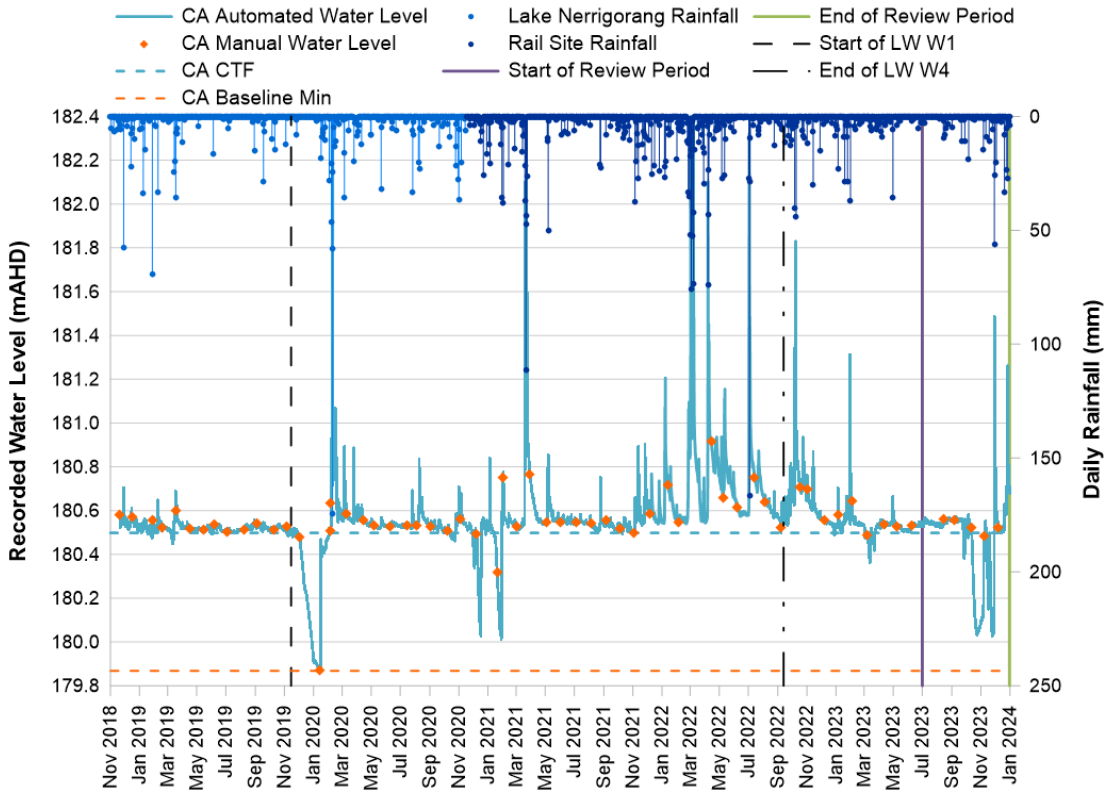


DIAGRAM B11: MONITORING SITE CB WATER LEVEL RECORDS

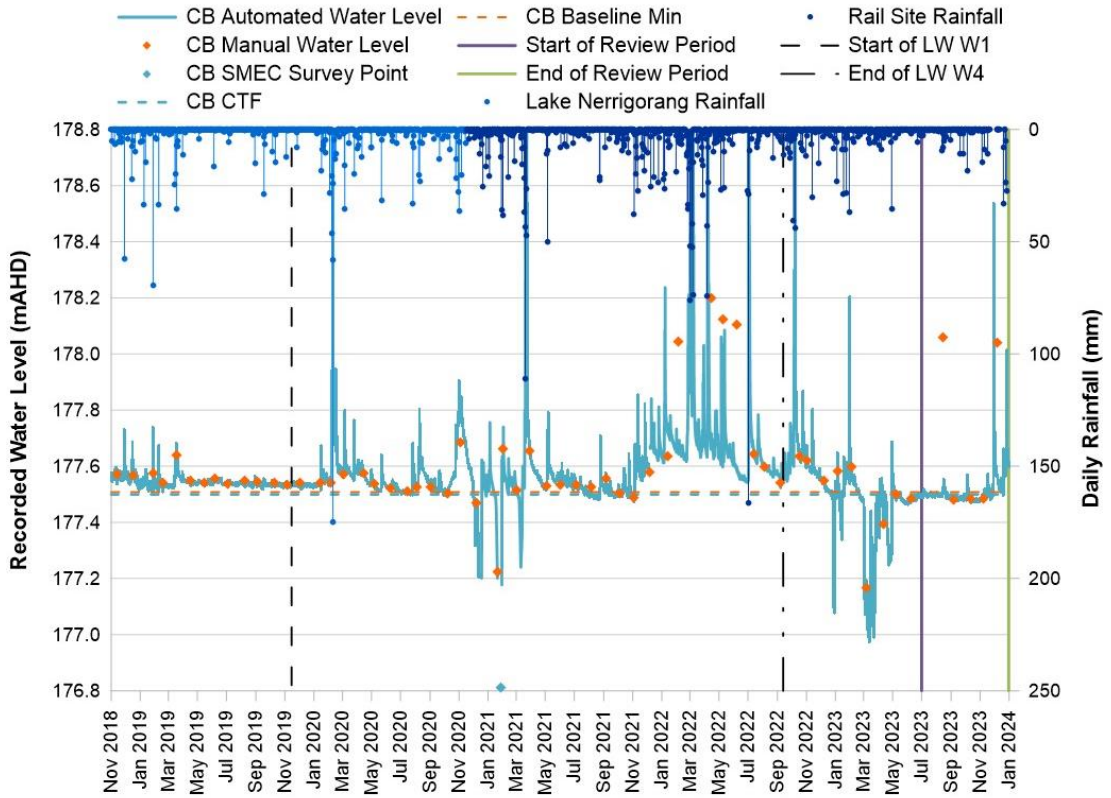


DIAGRAM B12: MONITORING SITE CC WATER LEVEL RECORDS

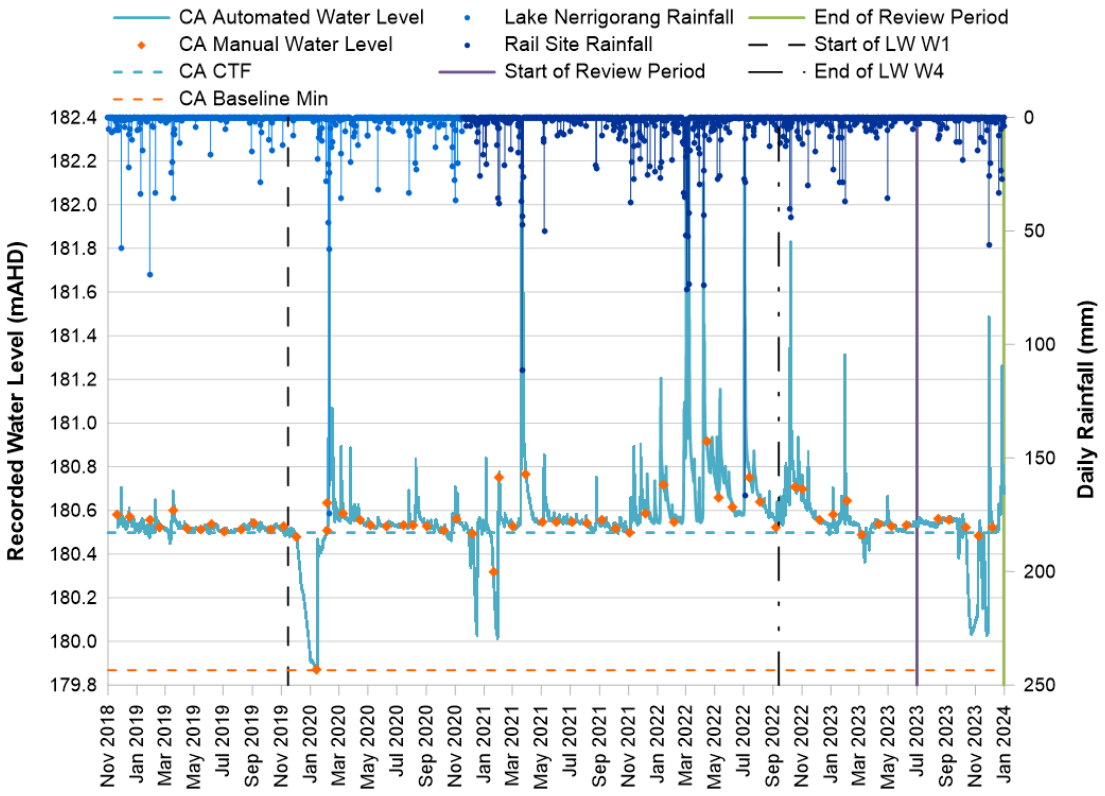


DIAGRAM B13: MONITORING SITE CD WATER LEVEL RECORDS

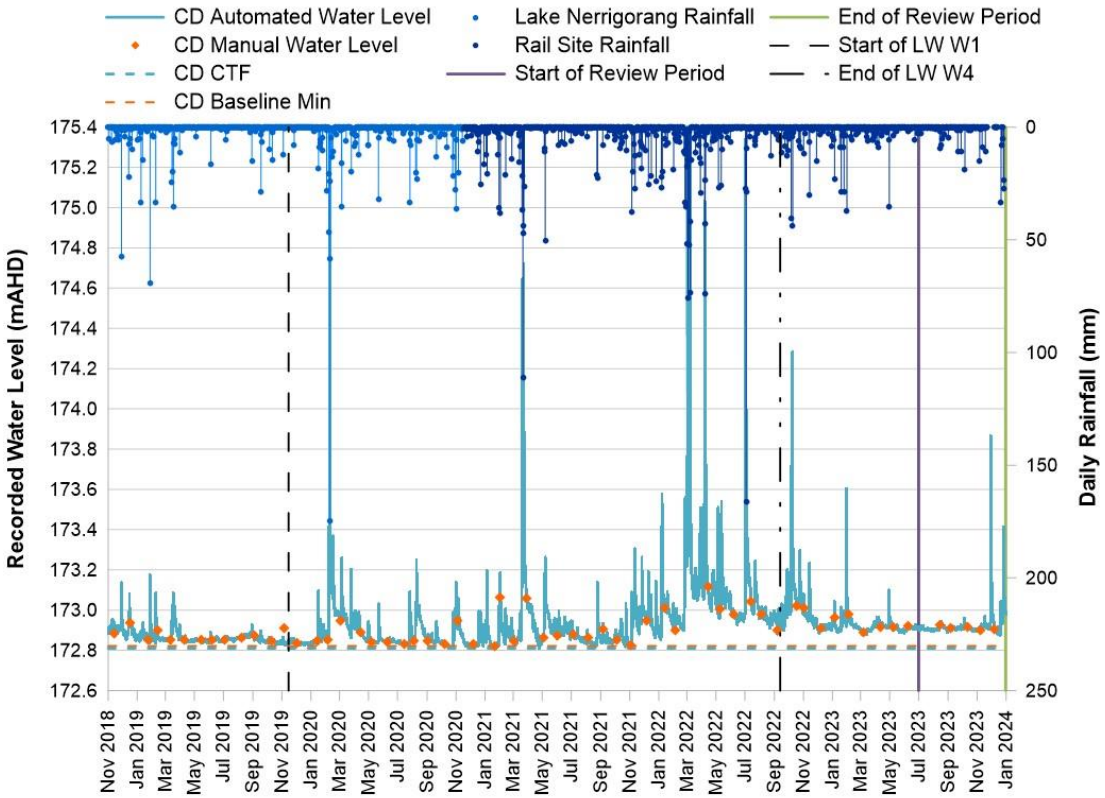


DIAGRAM B14: MONITORING SITE CE WATER LEVEL RECORDS

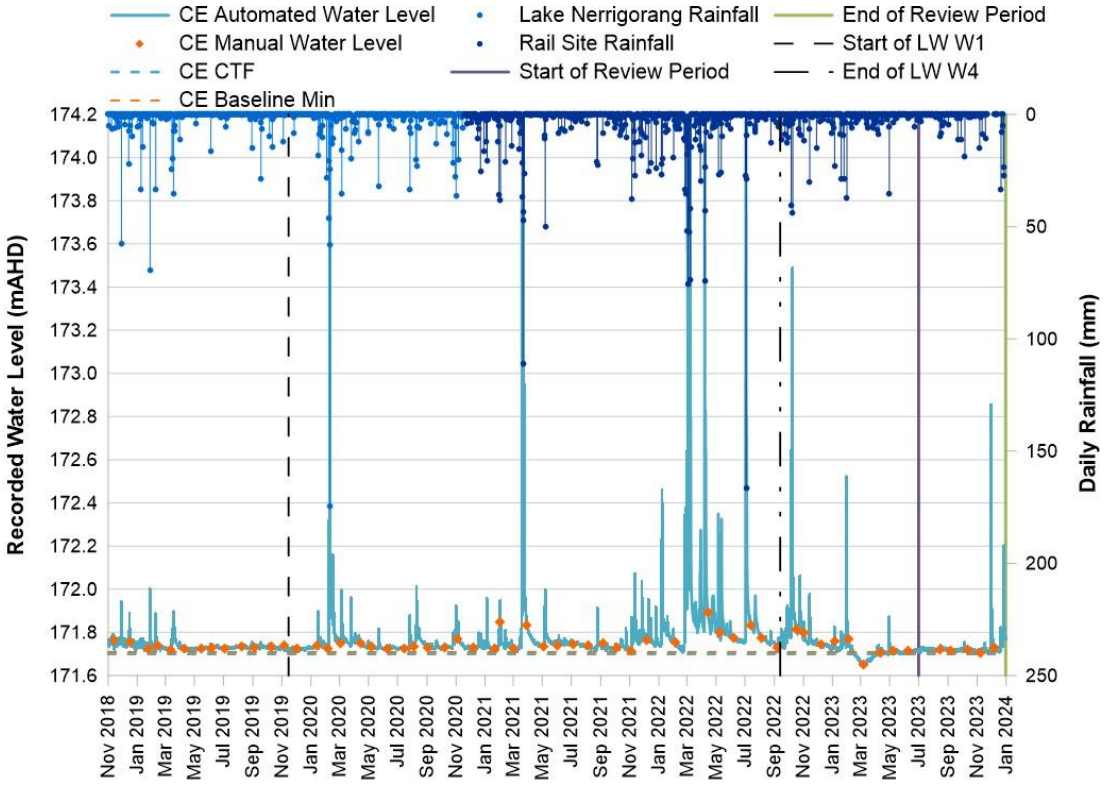


DIAGRAM B15: MONITORING SITE CF WATER LEVEL RECORDS

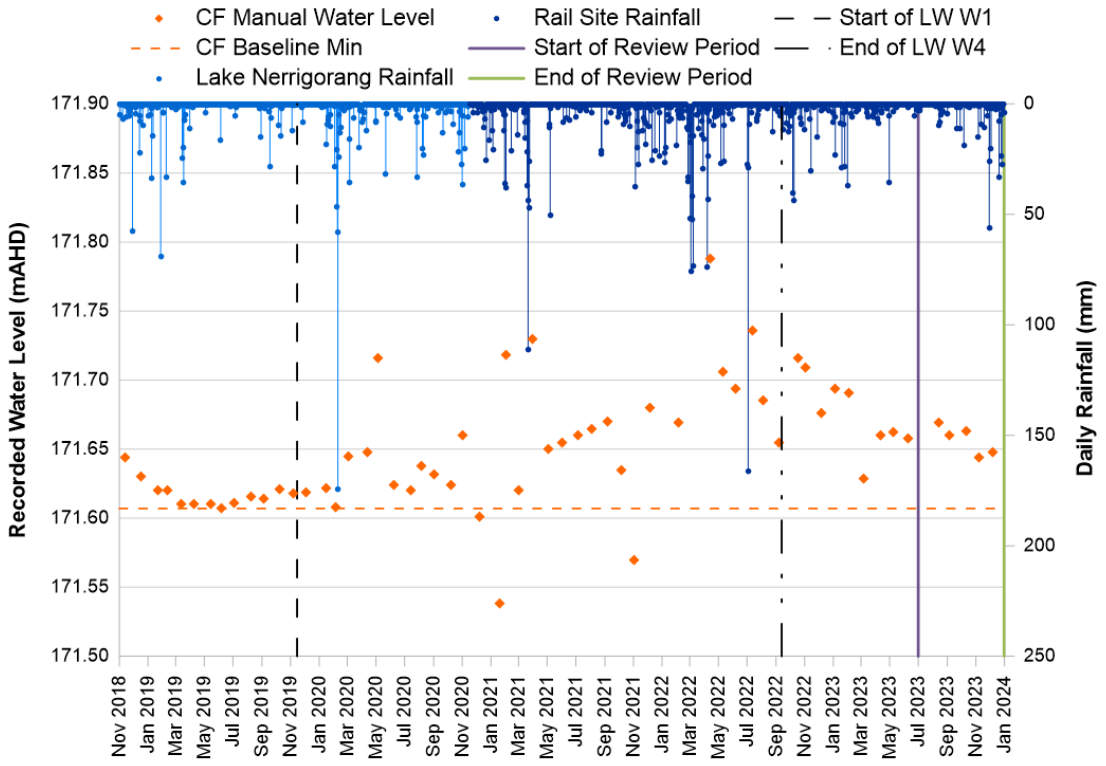
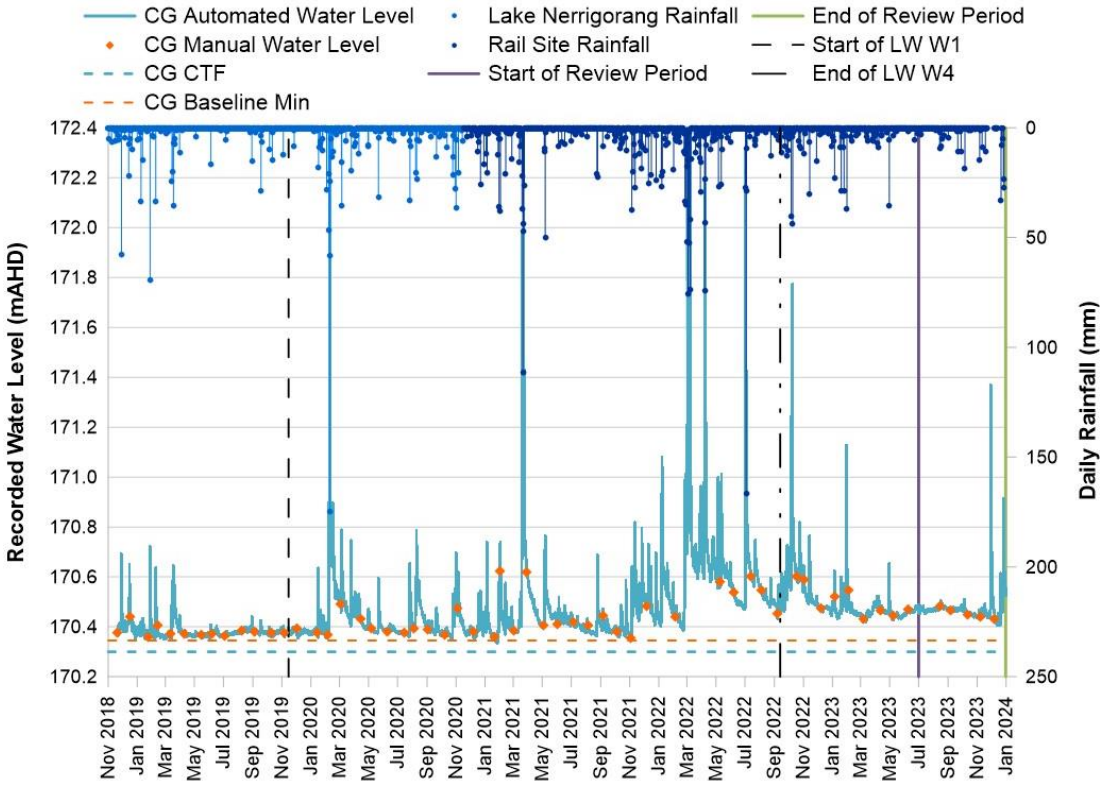


DIAGRAM B16: MONITORING SITE CG WATER LEVEL RECORDS



STONEQUARRY CREEK SURFACE WATER MONITORING SITES

DIAGRAM B17: MONITORING SITE SE WATER LEVEL RECORDS

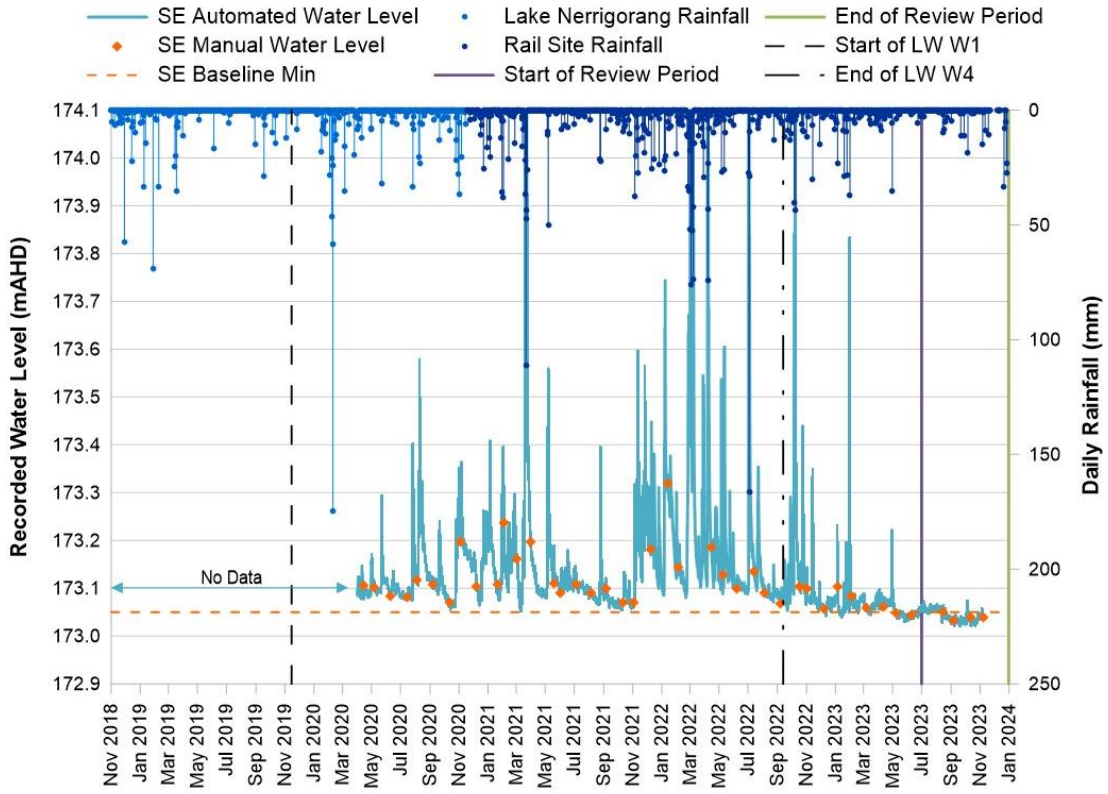
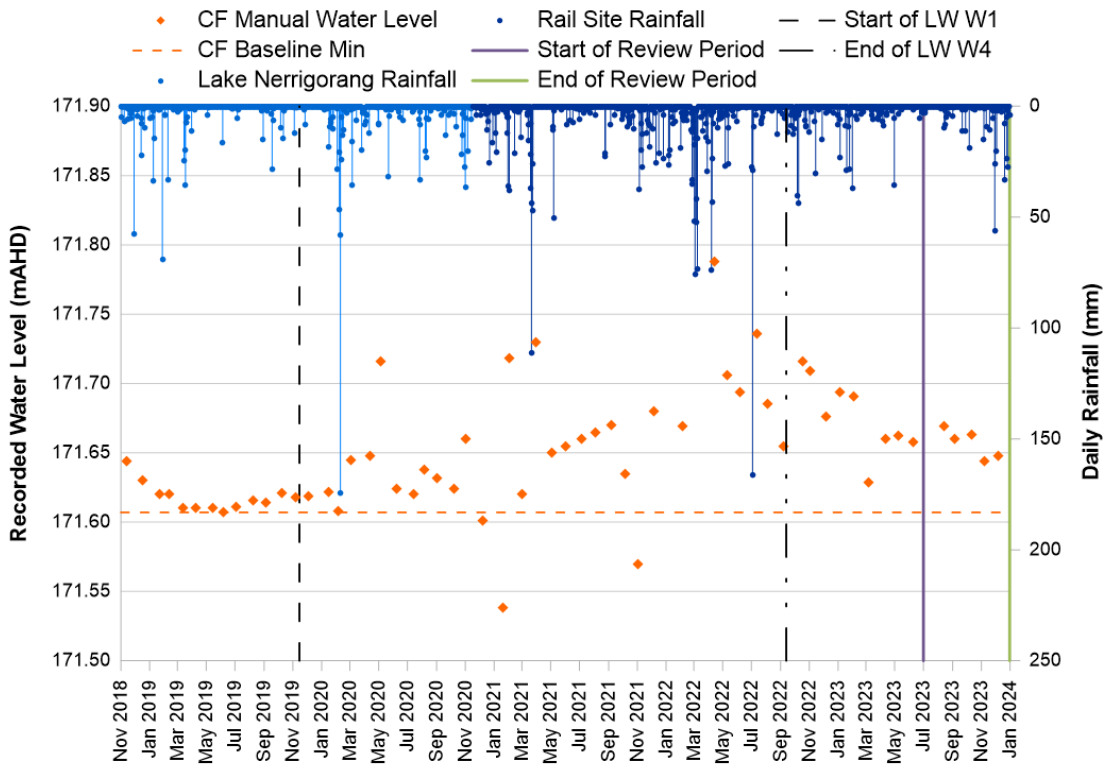
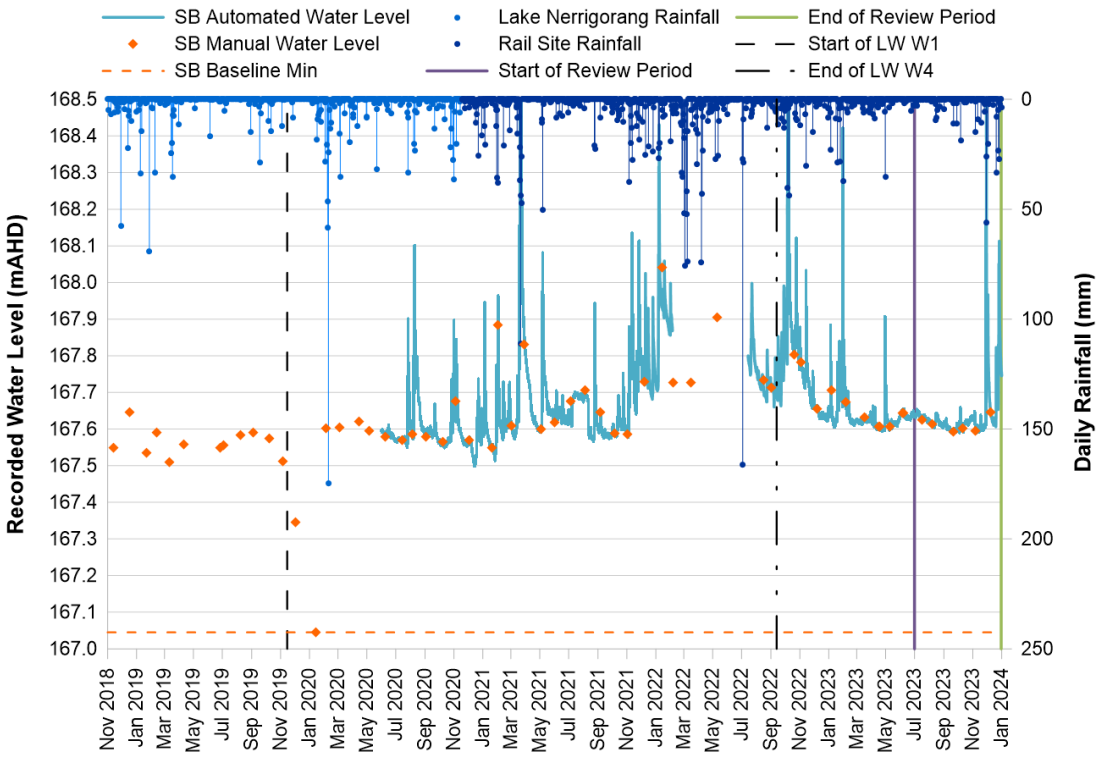


DIAGRAM B18: MONITORING SITE SA WATER LEVEL RECORDS[6]



[6] Between 15 January and 5 February 2022, an incomplete data download occurred at monitoring site SA, or the logger was not correctly restarted, and as such no data is available for this period.

DIAGRAM B19: MONITORING SITE SB WATER LEVEL RECORDS[7]



[7] The logger at monitoring site SB was washed away during a major rainfall event from late February to early March 2022 and as such data has not been collected since 5 February 2022. A manual water level measurement was unable to be recorded in April and June 2022 due to high flow.

DIAGRAM B20: MONITORING SITE SC WATER LEVEL RECORDS

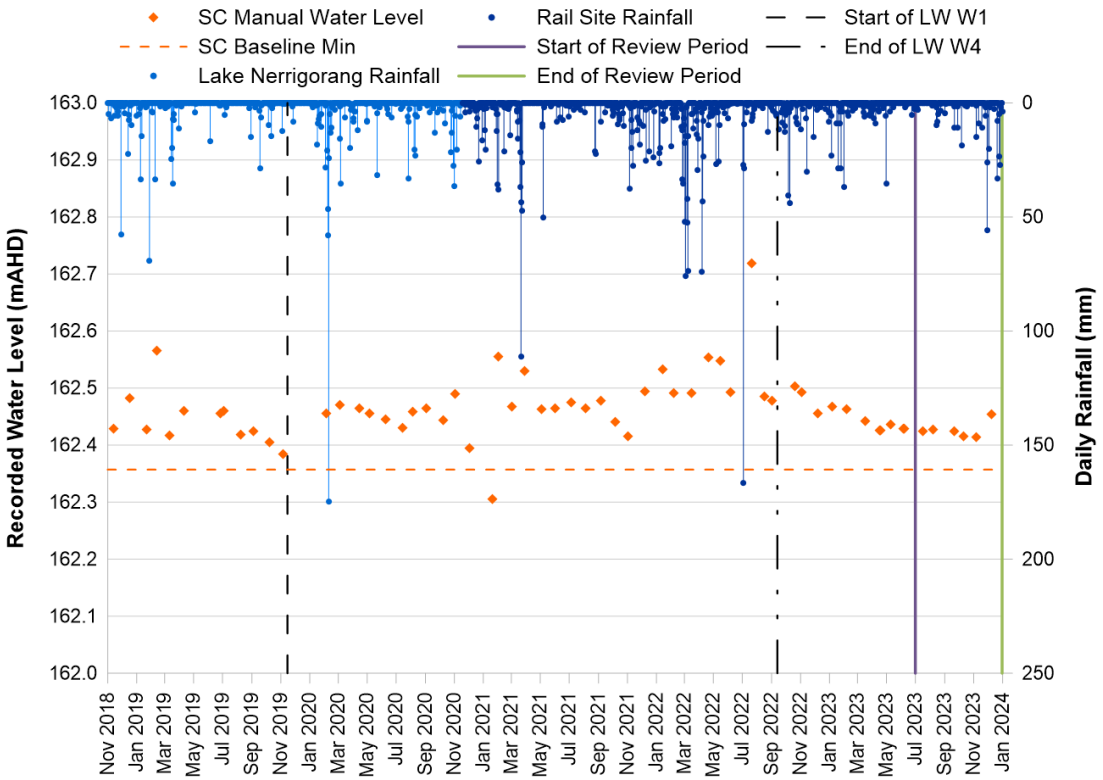
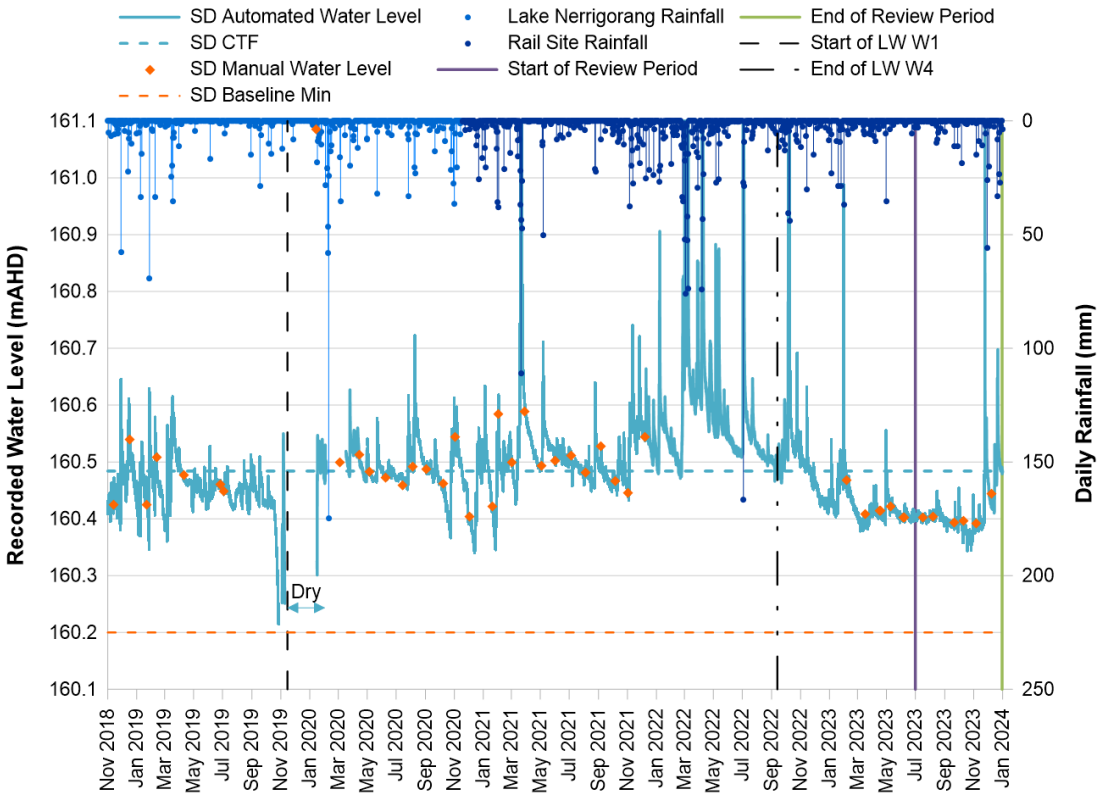


DIAGRAM B21: MONITORING SITE SD WATER LEVEL RECORDS[8]



[8] The water level sensor has not been located and therefore records are not available from 7 December 2021.

APPENDIX C – WATER QUALITY PLOTS[9]

[9] When the recorded value was below the limit of reporting, the value has been plotted at the limit of reporting in the following plots.

DIAGRAM C1: FIELD PH RECORDS

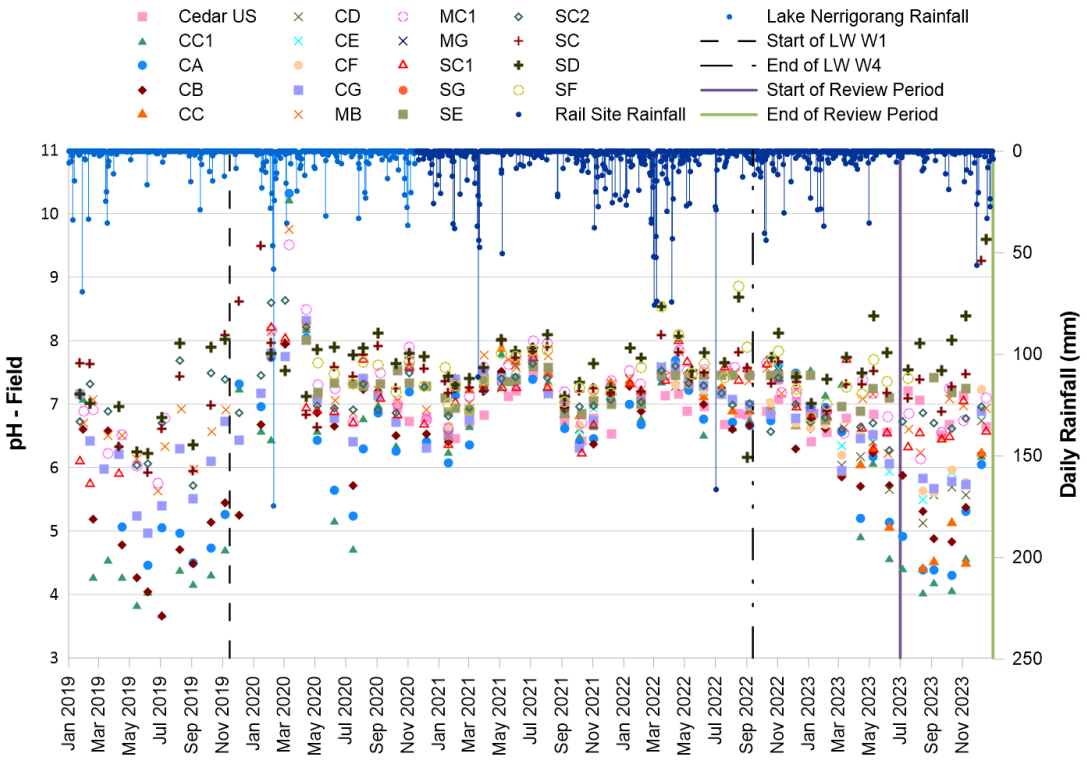


DIAGRAM C2: LABORATORY PH RECORDS

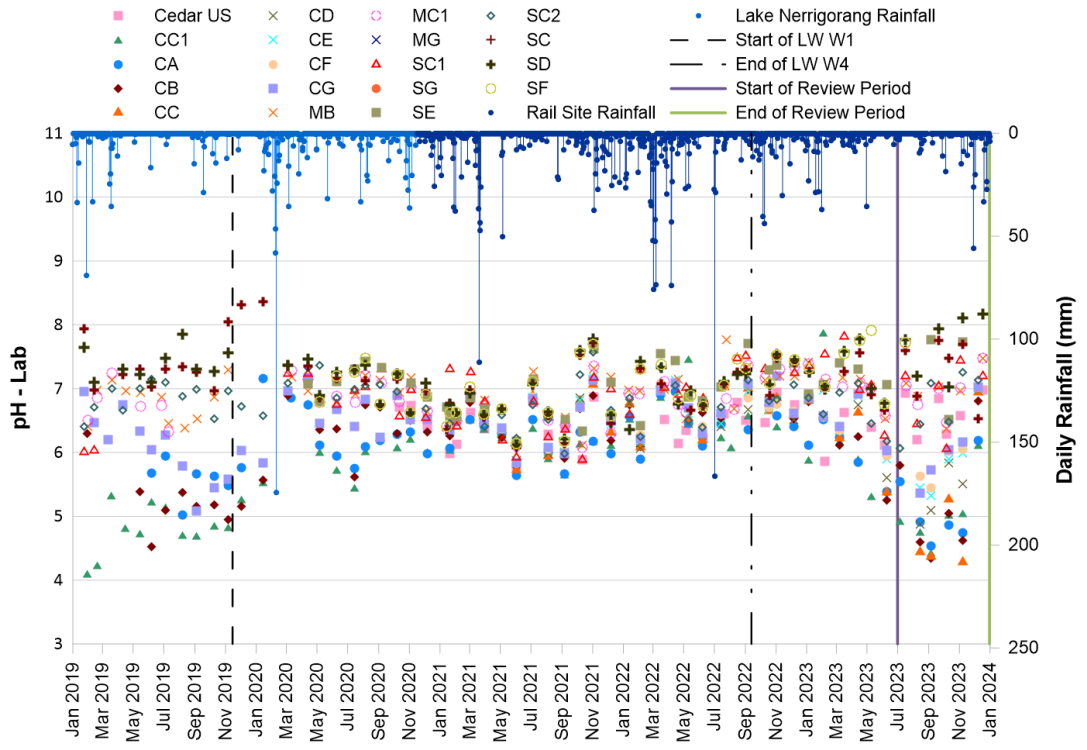


DIAGRAM C3: FIELD ELECTRICAL CONDUCTIVITY RECORDS

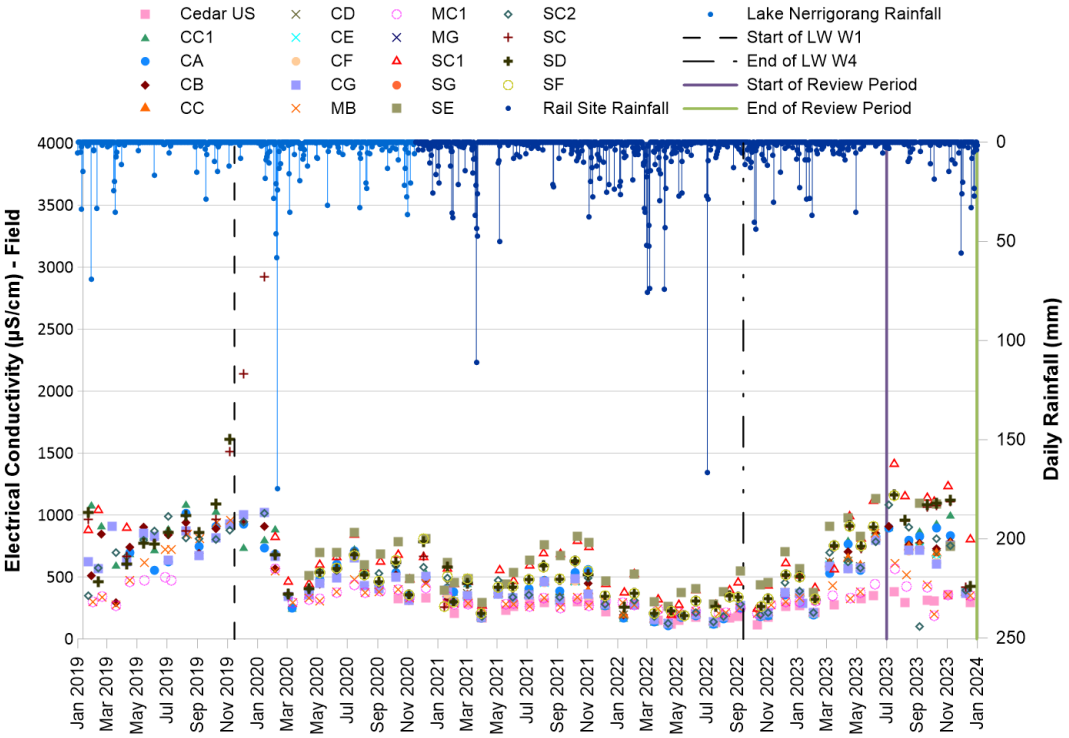


DIAGRAM C4: LABORATORY ELECTRICAL CONDUCTIVITY RECORDS

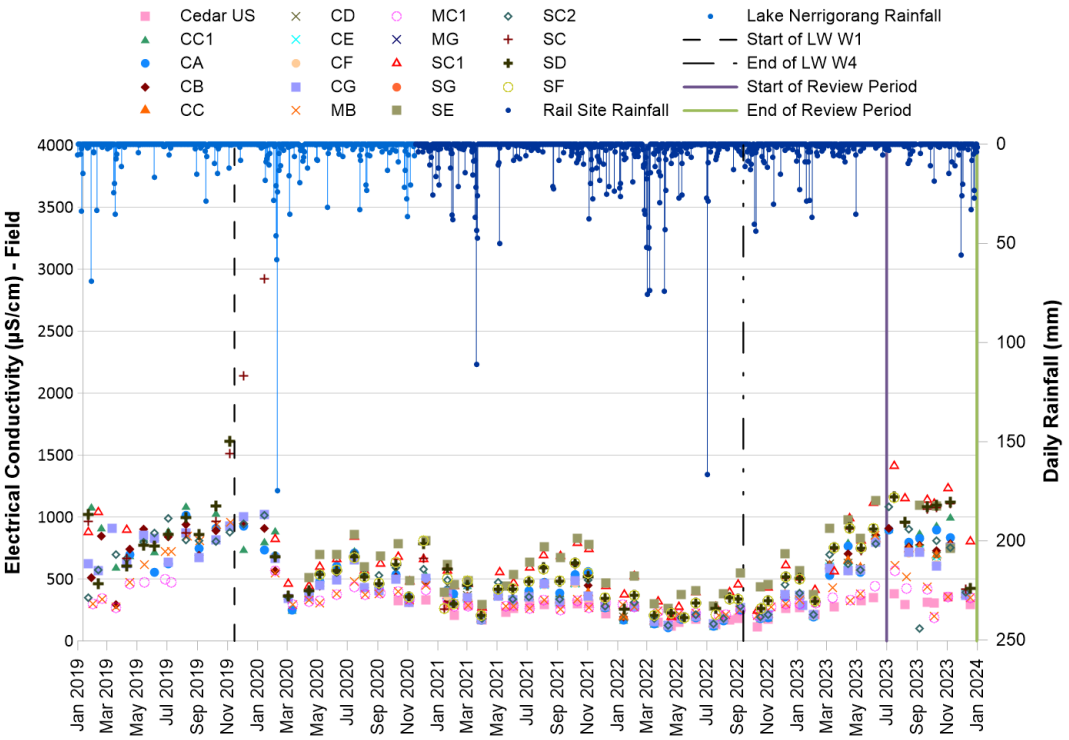


DIAGRAM C5: DISSOLVED ALUMINIUM RECORDS

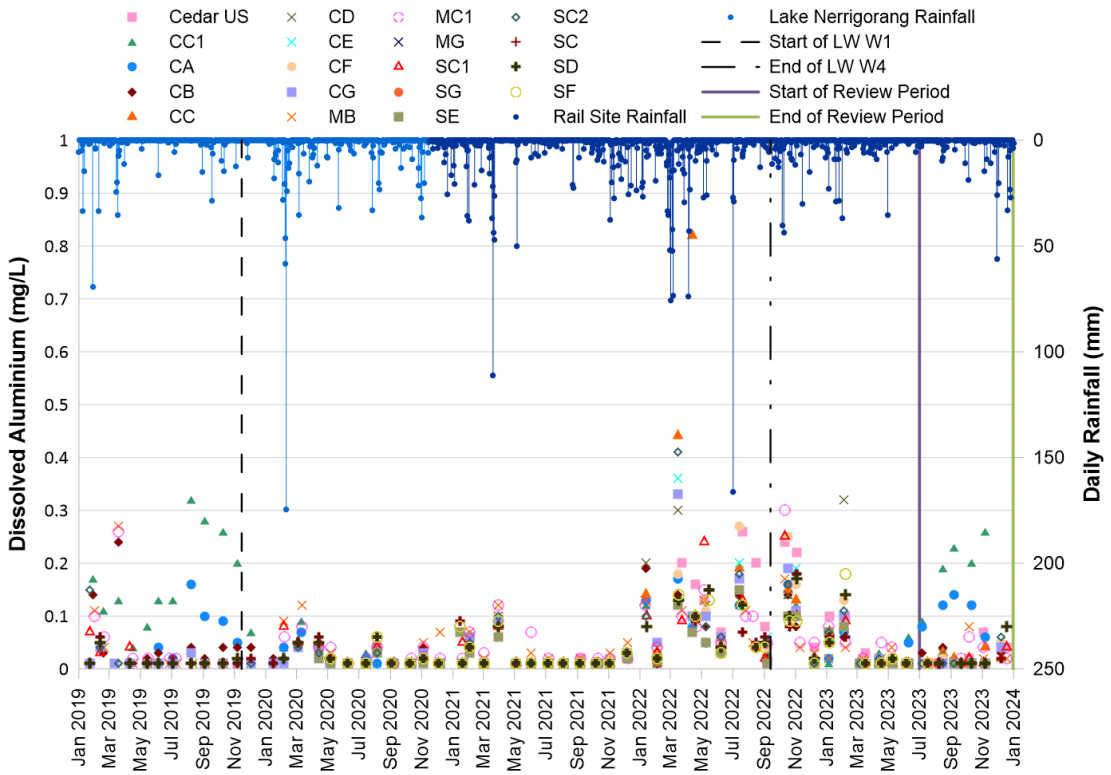


DIAGRAM C6: DISSOLVED BARIUM RECORDS

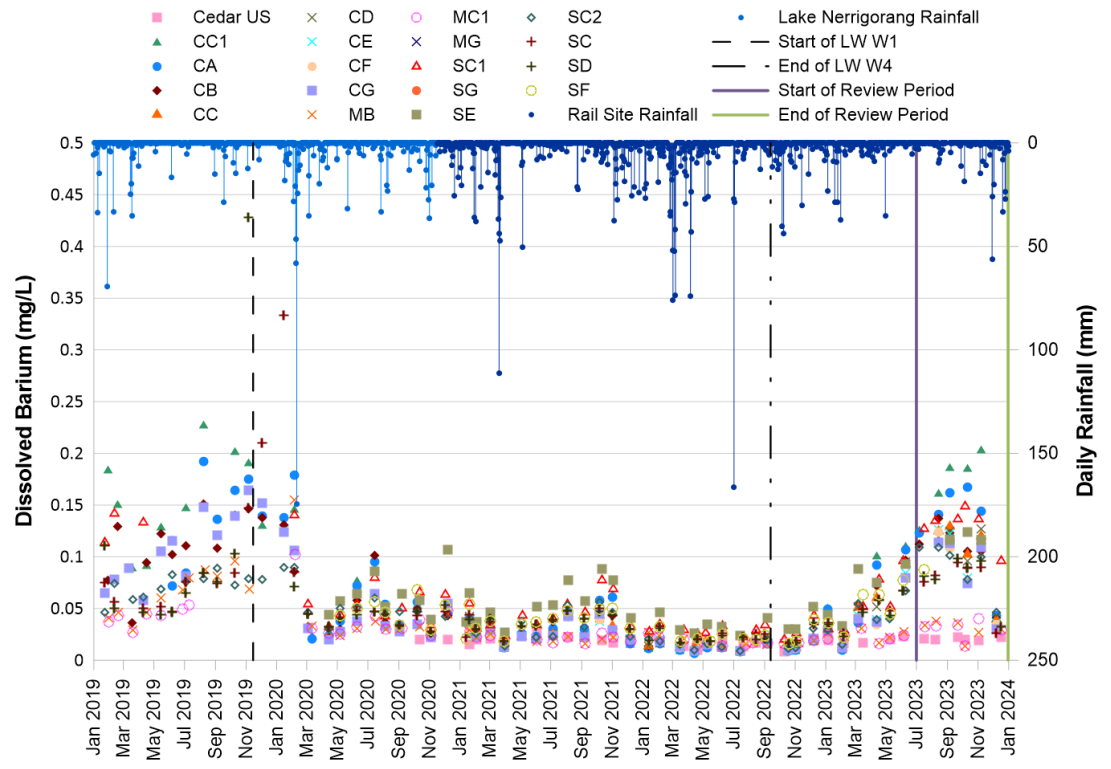


DIAGRAM C7: DISSOLVED IRON RECORDS

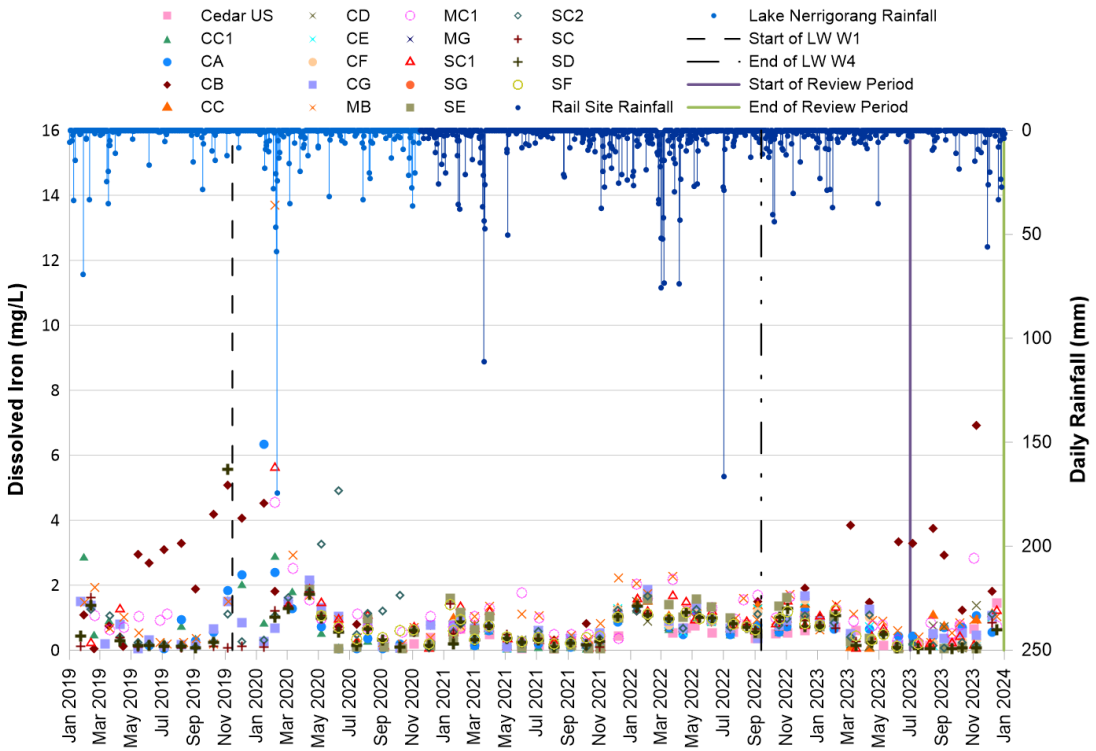


DIAGRAM C8: DISSOLVED MANGANESE RECORDS

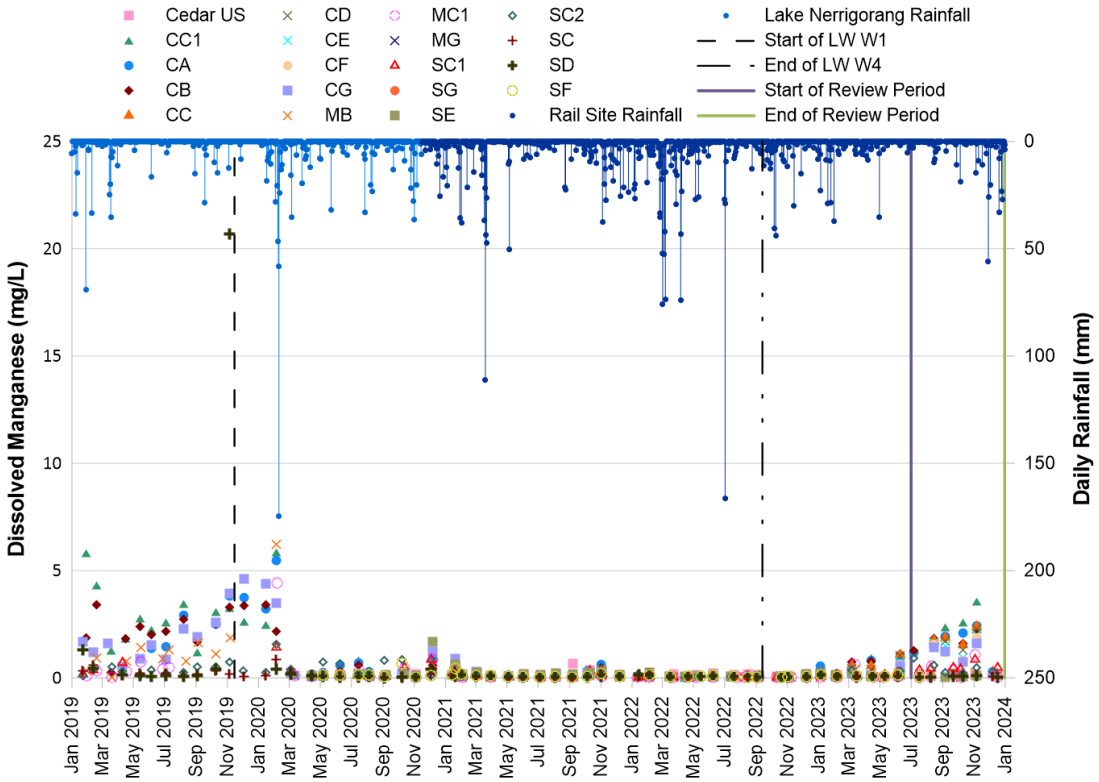


DIAGRAM C9: DISSOLVED NICKEL RECORDS

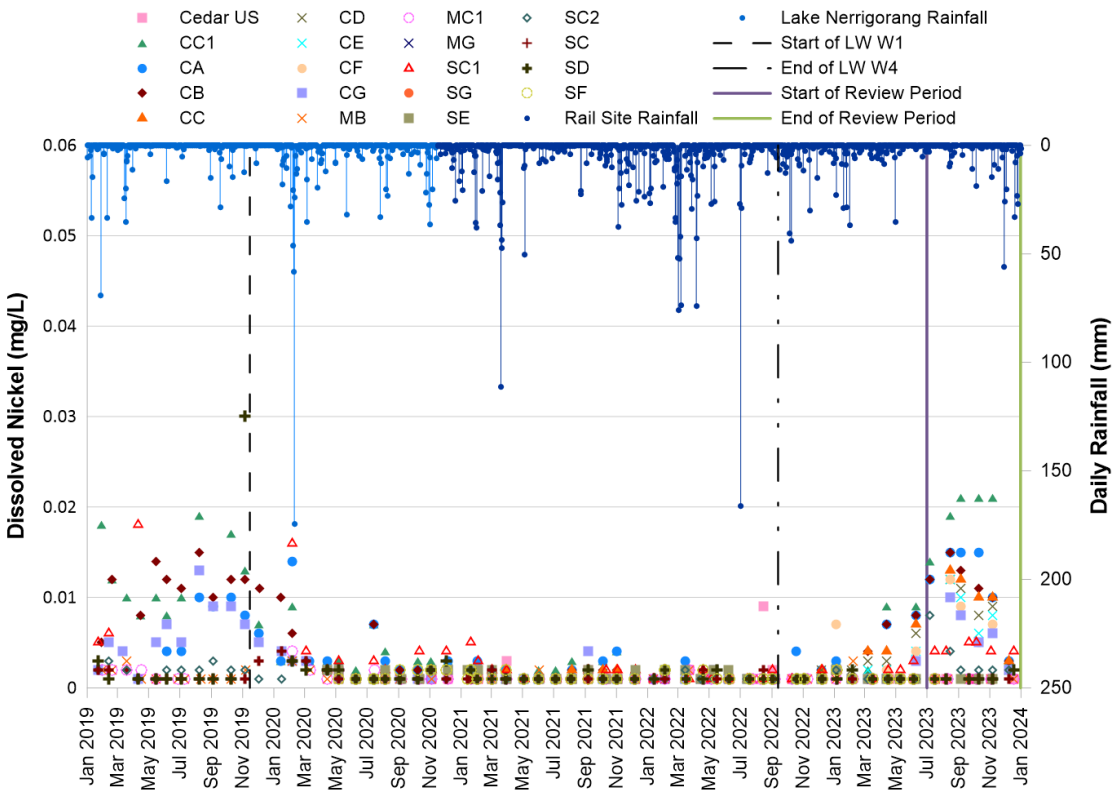


DIAGRAM C10: DISSOLVED ZINC RECORDS

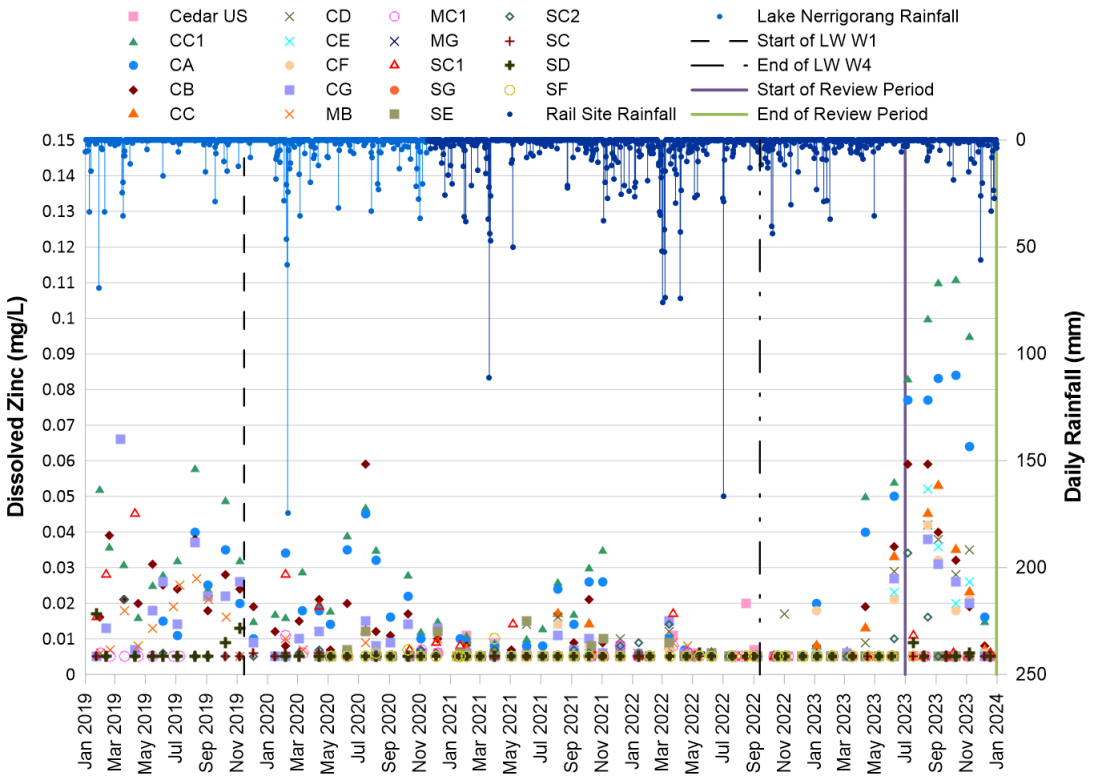
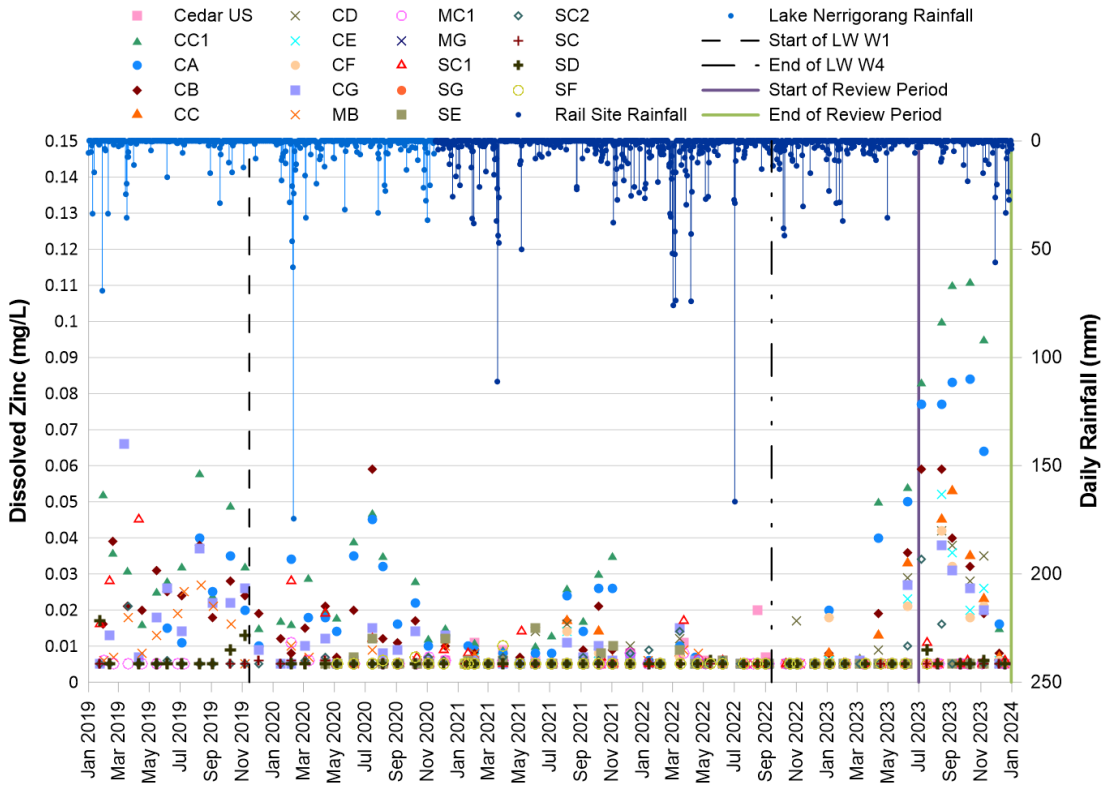


DIAGRAM C11: SULPHATE RECORDS



Appendix C – Groundwater Monitoring Report

Six - Monthly Groundwater Reporting: July – December 2023

Tahmoor Western Domain

Tahmoor Coal Pty Ltd

2975 Remembrance Driveway, Bargo NSW 2574

Prepared by:

SLR Consulting Australia

SLR Project No.: 640.030985.00001

13 March 2024

Revision: 1.0

Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
0.1	23 February 2024	Alastair Smith	Sharon Hulbert	Sharon Hulbert

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Tahmoor Coal Pty Ltd (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

Table of Contents

Tables in Text

Figures in Text

Appendices

Acronyms and Abbreviations

Al	Aluminium
As	Arsenic
BHCSS	Bald Hill Claystone
Ba	Barium
BGSS	Bulgo Sandstone
BUCO	Bulli Coal Seam
CCL	Consolidated Coal Lease
Cu	Copper
EC	Electrical Conductivity
Filt	Filtered
HBSS	Hawkesbury Sandstone
Fe	Iron
Pb	Lead
Li	Lithium
LW	Longwall
mbgl	Metres below ground level
Mn	Manganese
ML	Mining Lease
Ni	Nickel
pH	Potential of Hydrogen
SCSS	Scarborough Sandstone
Se	Selenium
SSD	State Significant Development
Sr	Strontium
TDS	Total Dissolved Solids
TARP	Trigger Action Response Plan
VWP	Vibrating Wire Piezometer
WMP	Water Management Plan
WWFM	Wianamatta Form
Zn	Zinc

1.0 Introduction

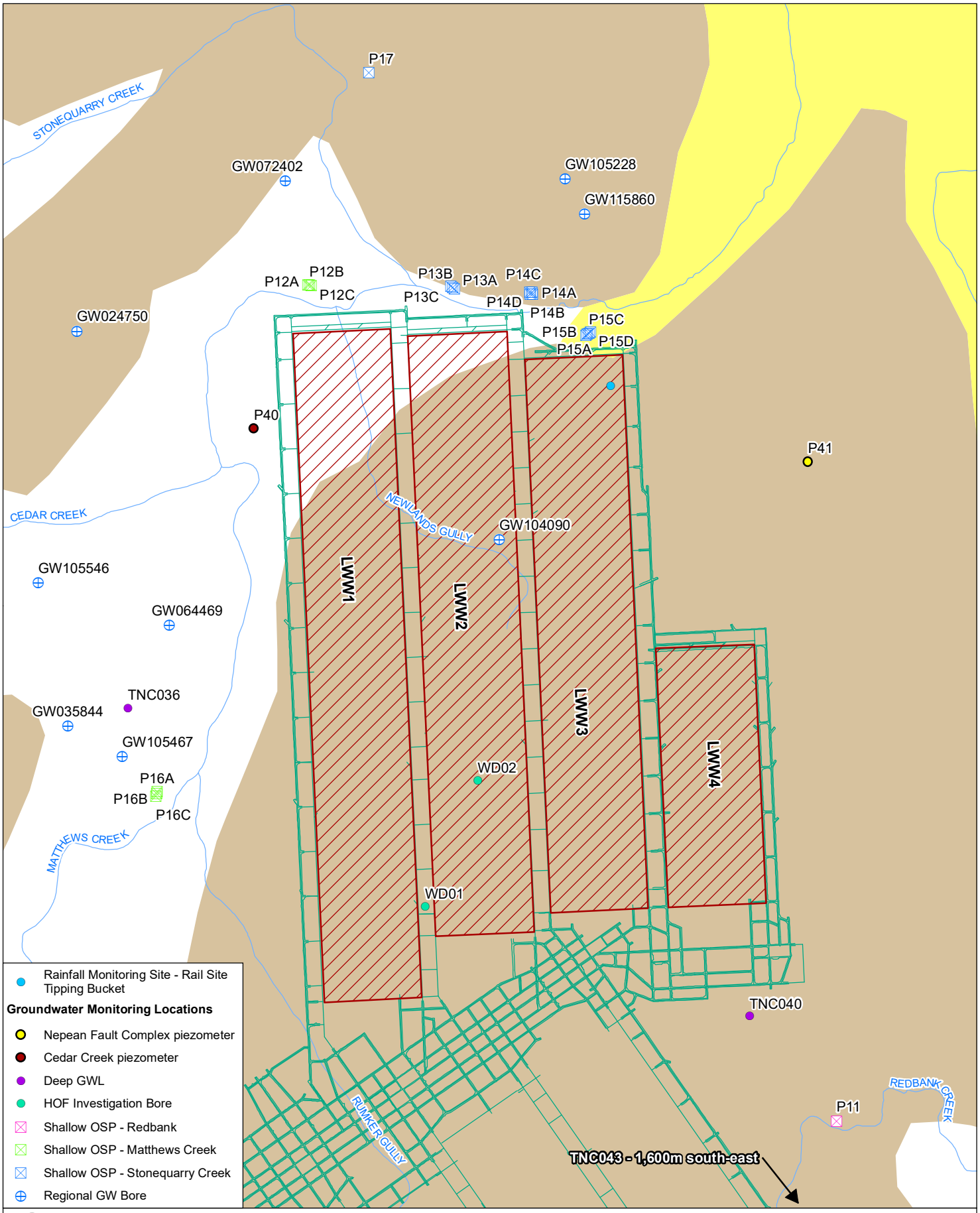
1.1 Background

SLR Consulting Australia Pty Ltd (SLR) was engaged by Tahmoor Coal Pty Ltd (Tahmoor Coal) to undertake a review of groundwater data, which has been collected by primarily by Consulting Earth Scientists Pty Ltd (CES), for the Tahmoor Western Domain (Western Domain) of the Tahmoor Coal Mine (Tahmoor Mine).

Tahmoor Mine, located approximately 80 kilometres (km) south-west of Sydney in the Southern Coalfields of New South Wales (NSW), is an underground mine extracting from the Bulli coal seam via longwall mining.

Mining at Western Domain commenced on 15 November 2019, and concluded on 13 September 2022. The Western Domain mining area lies within Mining Lease (ML) 1376 and ML 1539.

Western Domain comprises 4 longwalls; Longwall (LW) West 1 (W1), LW West 2 (LW W2), LW West 3 (LW W3) and LW West 4 (LW W4) as presented in **Figure 1**. All Western Domain longwalls are orientated north to south. Extraction associated with LW W3 and LW W4 are the focus of this compliance reporting document, as per the *Longwall W3-W4 Water Management Plan* (Tahmoor Coal, 2021).


P17
STONEQUARRY CREEK
GW072402
GW105228
GW115860
P12A
P12B
P12C
P13B
P13A
P13C
P14C
P14A
P14D
P14B
P15C
P15B
P15D
P15A
GW024750
P40
P41
CEDAR CREEK
NEWLANDS GULLY
GW104090
GW105546
GW064469
LWW1
LWW2
LWW3
LWW4
TNC036
GW035844
GW105467
P16A
P16B
P16C
MATTHEWS CREEK
WD02
WD01
TNC040
RUMKER GULLY
REDBANK CREEK
P11
TNC043 - 1,600m south-east
Rainfall Monitoring Site - Rail Site Tipping Bucket
Groundwater Monitoring Locations
Nepean Fault Complex piezometer
Cedar Creek piezometer
Deep GWL
HOF Investigation Bore
Shallow OSP - Redbank
Shallow OSP - Matthews Creek
Shallow OSP - Stonequarry Creek
Regional GW Bore
0
100
200
m
Coordinate System: GDA 1994 MGA Zone 56
Scale: 1:14,000 at A4
Project Number: 640.030985.00001
Date: 23-Nov-2023
Drawn by: AS
Town
Tahmoor Mine Plan Layout
Major Roads
Watercourses
LW W4 Extraction Void (complete on 19/09/2022)
Alluvium
Wianamatta Formation
Hawkesbury Sandstone
SLR
TAHMOOR COAL
GROUNDWATER MONTHLY REVIEW
(OCTOBER 2022)
Groundwater Monitoring Network
FIGURE 1
H:\Projects-SLR\640-MEL\640.030985.00001 Tahmoor WD Quaterly July-Sept\06 SLR Data\01 CAD\GIS\GIS\640.030985 Fig1 Tahmoor Coal Groundwater Monthly Review (Oct 2022).mxd

1.2 TARPS

Trigger Action Response Plans (TARPs) were developed to outline the appropriate actions to monitor and manage any potential subsidence and/or depressurisation related impacts that may result due to the extraction activities (SLR, 2021). The current TARP considered the natural pre-mining (baseline) variability and trends for groundwater levels at the Western Domain monitoring bores and private bores in the development of triggers.

Prior to the commencement of mining at Longwall W3, the TARPs set out in the Longwall W1-W2 Water Management Plan (Tahmoor Coal, 2019) were applied. Upon commencement of mining at Longwall W3, the TARPs set out in the Longwall W3-W4 Water Management Plan (Tahmoor Coal, 2021) were applied and are pertinent to this report.

The TARPs address various components of the groundwater system, as described in the Tahmoor North – Western Domain, LW W3-W4 Water Management Plan (Tahmoor Coal, 2021) and presented in **Appendix A**. Western Domain groundwater monitoring sites are captured in the following TARPs:

- Groundwater Quality Bores P12, P13, P14, P15, P16, P17 and Private;
- Groundwater Levels P12, P13, P14, P15, P16, P17 and Private;
- Groundwater Pressures (Shallow) TNC036, TNC040, WDO1, WD02; and
- Groundwater Pressures (Deep) TNC036.

1.3 Report Objective

This report assesses the Western Domain groundwater monitoring data against the triggers for groundwater quality, level and pressure in the TARPs for the reporting period from 1 July 2023 to 31 December 2023 (inclusive).

This report includes a:

- summary of TARP exceedances during the reporting period;
- summary of trigger exceedances over time including the identification of breaches of triggers that remain within normal condition in this reporting period;
- summary of general groundwater level and quality trends across the monitoring network;
- high-level outline of potential factors influencing exceedances (a detailed analysis of exceedances is not discussed in this report) during the reporting period;
- evaluation of mine groundwater inflows; and
- summary of actions that were undertaken during the reporting period to address the recommendations presented in the previous reporting period.

Additionally, given post-mining obligations were concluded in September 2023 (12-months post conclusion of extraction), this document will be the final compliance review report. A summary of the final status of the monitoring network bores will also be provided to close out the monitoring.

The information in this six-monthly report will be included in the Annual Review.

2.0 Monitoring Period Summary

2.1 Mine Operations

No mining activities were undertaken at Western Domain during the reporting period, with extraction concluded on 13 September 2022.

The schedule of previously mined longwalls is summarised in **Table 1**.

Table 1 Western Domain Mining Operations

Longwall	Start Date	End Date
LW W1	15 November 2019	6 November 2020
LW W2	7 December 2020	17 June 2021
LW W3	13 September 2021	21 March 2022
LW W4	16 May 2022	13 September 2022

2.2 Rainfall Analysis

Rainfall over the past 12 months, in comparison to the long-term average (i.e., January 1900 – present) is shown in **Table 2**. The SILO climate record for the location 0.05° x 0.05° tile centred on a location within proximity of Tahmoor Mine (latitude: -34.25, longitude: 150.60) has been used for this assessment to understand long-term rainfall trends.

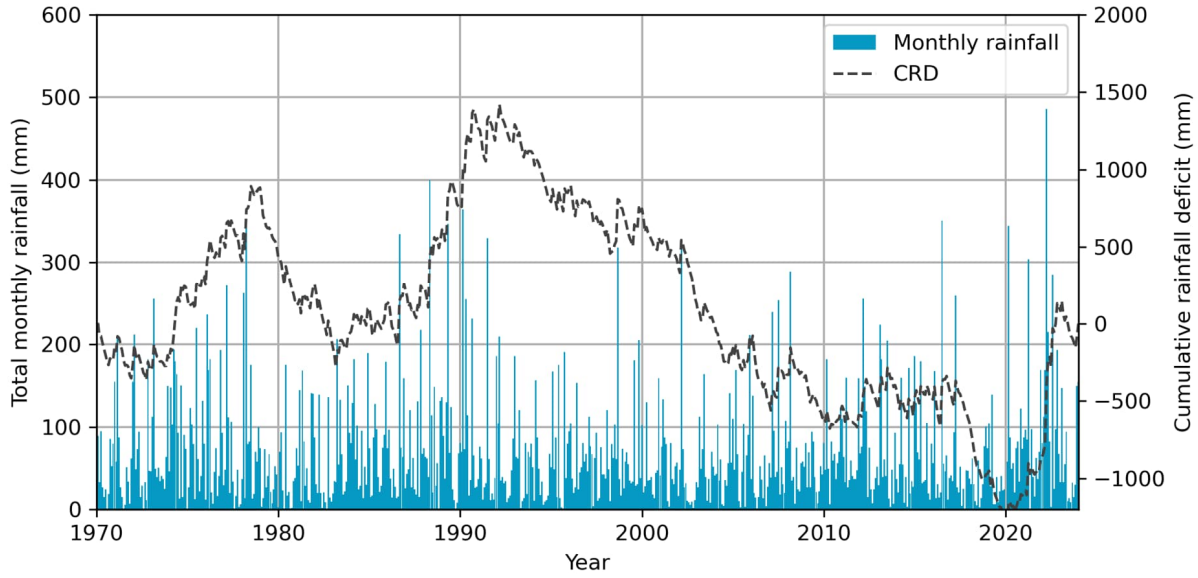
Below average rainfall was observed during the reporting period. July and September 2023 were particularly dry conditions with a total monthly rainfall of 8.8 mm and 15.1 mm respectively.

Table 2 Monthly Rainfall vs Long-Term Average Rainfall

SILO (-34.25, 150.60)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Long-term average rainfall (mm)	84.6	113.7	98.9	69.5	53.6	63.3	39.6	47.0	43.7	64.2	79.9	66.2
January – September 2023 monthly rainfall (mm)	147.3	32.8	54.8	94.1	10.3	13.6	8.8	32.7	15.1	30.0	149.5-	154.5

Long-term monthly average rainfall, potential evaporation and estimated actual evapotranspiration is presented in **Figure 2**. Excluding the month of June, the evaporation and evapotranspiration are, on average, generally higher than rainfall.

The historical record of monthly rainfall and the calculated trend in rainfall, using the cumulative residual departure from mean method, is presented in



where a positive gradient indicates above average rainfall, whilst a declining trend represents below average. During the reporting period, there have been below average rainfall conditions.

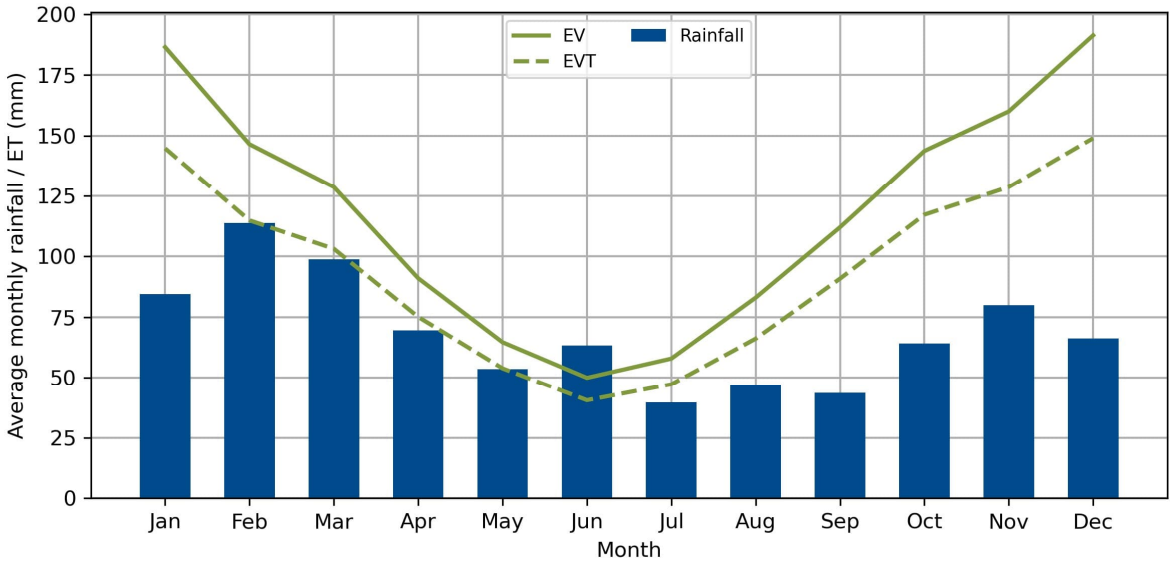


Figure 2 Average Monthly Rainfall, Evaporation and Evapotranspiration

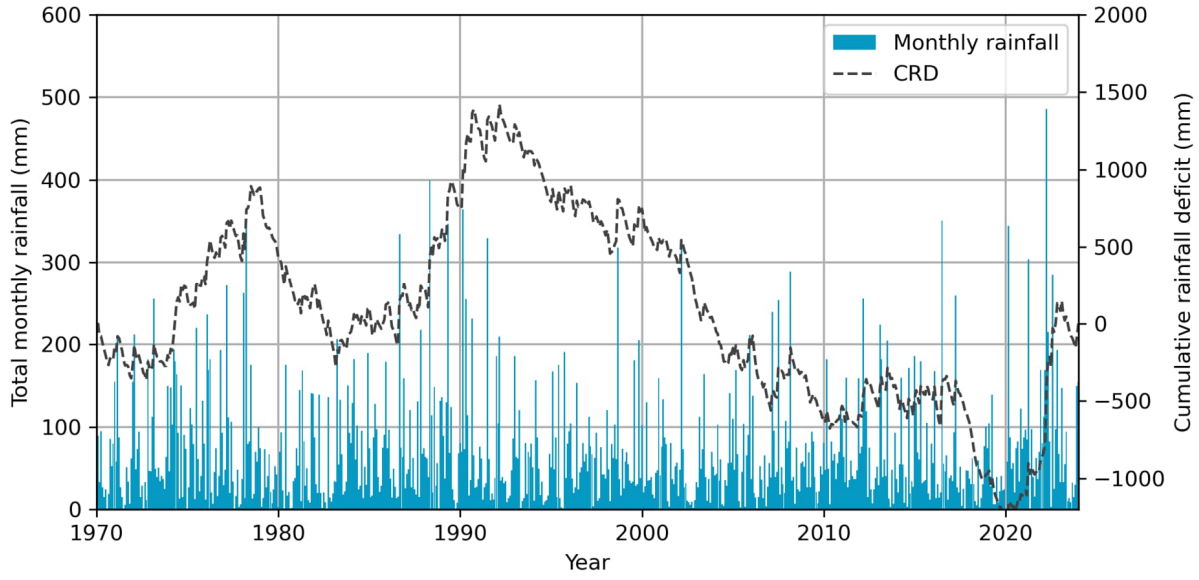


Figure 3 Cumulative Rainfall Departure and Total Monthly Rainfall

2.3 Monitoring Network Status

Details for each of the Western Domain groundwater monitoring network bores is presented in **Appendix B**. Bore locations are shown on **Figure 1**.

An update on the status of the groundwater monitoring network bores during the reporting period includes:

- Groundwater level data at P16B was not available after 7 July 2023 as the logger at this site was unable to be retrieved due to a blockage in the bore. The bore was unblocked in early October 2023 and a new logger was installed. Groundwater level data was collected for the remainder of the monitoring period (October to December 2023).
- Groundwater quality data at P16B was not available in August 2023 and September 2023 as the sleeve at this site was unable to be retrieved due to a blockage in the bore. Maintenance works was subsequently completed for this bore and groundwater quality data was collected for the remainder of the monitoring period (October to December 2023).
- Groundwater monitoring data was not available at private bores GW072402, GW105546 and GW105467. This is because GW072402 has been blocked for several years (SLR, 2023a), and GW105546 and GW105467 are inaccessible.
- Groundwater quality data or manual groundwater levels were not collected at private bores GW104090, GW105228 and GW115860 in August 2023, September 2023, November or December 2023.
- Groundwater level data at WD01 was not available as the bore was decommissioned in April 2023. WD02, the post-mining Height of Fracturing (HoF) hole, VWP data has been presented here to provide additional information.
- Land access to P12 A – C was ceased prior to the reporting period. However, in order to close out monitoring at this site, the bores were reinstated in February 2024.

The bores which were monitored during this reporting period are:

- Groundwater Quality: P12A-C, P14A-D, P15A-D, P16A-C, GW104090, GW105228, GW115860.
- Groundwater Level: P9, P11, P12A-C, P14A-D, P15A-D, P16A-C, GW104090, GW105228, GW115860.
- Groundwater Pressures (Shallow): P40, P41, TNC036, TNC040, WD02
- Groundwater Pressures (Deep): TNC036, WD02.

3.0 TARP Assessment

3.1 TARP Exceedances

Temporal groundwater monitoring data is presented against the relevant TARP trigger levels, for all relevant monitoring locations, in **Table 4** (groundwater level triggers) and **Table 5** (groundwater quality triggers).

TARP exceedances observed during the reporting period are summarised in **Table 3**. The final column of **Table 3** indicated those TARP exceedances that remain active as of December 2023.

Table 3 July – December 2023 Exceedances

Exceedance Site	Exceedance Level	Exceedance Parameter	TARP	Active Exceedance December 2023
P16C	2	Groundwater level	Level (Shallow)	Active
P12C	2	Groundwater level	Level (Shallow)	Active (inactive as of February 2024)
P12A	2	pH upper, Pb	Quality	Inactive
P12C	2	Mn	Quality	Inactive
P14B	2	EC, Sr	Quality	Active
P15B	2	EC, Sr	Quality	Active
P15C	2	Fe, Al	Quality	Inactive
P15D	2	Fe, Mn	Quality	Inactive
P16A	2	pH, Ni	Quality	Active
P16B	2	Sr	Quality	Active
P16C	2	EC, Sr	Quality	Active
GW104090	2	EC, Ba, Sr	Quality	Inactive
GW115860	2	EC, Zn, Sr	Quality	Inactive

3.2 Trigger Summary

A summary of groundwater level trigger breaches over time is presented in **Table 4** where the performance of each bore against each trigger is indicated as “L1”, meaning that the groundwater level remains consistent with baseline variability and pre-mining trends, or indicated as “L2” and highlighted, meaning that the trigger was breached in that month and is an exceedance.

A summary of groundwater quality trigger breaches in this reporting period is presented in **Table 5**, where the performance of each bore against each trigger is indicated as “L1”, meaning that there is no observable changes outside of the baseline variability in groundwater quality, or indicated as “L2” and highlighted, meaning that the trigger was breached in that month and is an exceedance.

December 2023 data is bolded for each bore for ease of viewing to see ‘active’ exceedances.

Table 4 Groundwater Level Trigger Summary: July 2023 – December 2023

Bore	Type	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23
P12A	Shallow Open Standpipe	L1	L1	L1	L1	L1	^
P12B	Shallow Open Standpipe	L1	L1	L1	L1	L1	^
P12C	Shallow Open Standpipe	L2	L2	L2	L2	L2	^
P14A	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P14B	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P14C	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P14D	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P15A	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P15B	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P15C	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P15D	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P16A	Shallow Open Standpipe	L1	L1	L1	L1	L1	L1
P16B	Shallow Open Standpipe	L1	^	^	L1	L1	L1
P16C	Shallow Open Standpipe	L2	L2	L2	L2	L2	L2
GW104090	Private Bore	L1	^	^	^	^	^
GW105467	Private Bore	*	*	*	*	*	*
GW105228	Private Bore	L1	^	^	^	^	^
GW072402	Private Bore	#	#	#	#	#	#
GW115860	Private Bore	L1	^	^	^	^	^
GW105546	Private Bore	*	*	*	*	*	*
P41A	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
P41B	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1

Bore	Type	Jul 23	Aug 23	Sep 23	Oct 23	Nov 23	Dec 23
P41C	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
P41D	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
TNC036 (HBSS-65m)	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
TNC036 (HBSS-97m)	Shallow VWP (< 200m)	L1	L2~	L1	L1	L1	L1
TNC036 (BGSS-169m)	Shallow VWP (< 200m)	L2	L2	L2	L2	L2	L1
TNC040 (WNFM-27m)	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
TNC040 (HBSS-65m)	Shallow VWP (< 200m)	L1	L1	L1	L1	L1	L1
TNC036 (BGSS-214m)	Deep VWP (> 200m)	L1	L1	L1	L1	L1	L1
TNC036 (BGSS-412.5m)	Deep VWP (> 200m)	L2	L1	L1	L1	L1	L1

^ Data unavailable, * Bore is inaccessible, # Bore is blocked, $ Bore not surveyed, ~ data erroneous, VWP = Vibrating Wire Piezometer

Table 5 Groundwater Quality Trigger Summary: April 2023 – September 2023

Bore	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
P12A	Jul	L2	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1
P12A	Aug	L2	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1
P12A	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12A	Oct	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1
P12A	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12A	**Dec**	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P12B	Jul	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12B	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12B	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12B	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12B	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12B	**Dec**	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P12C	Jul	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12C	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12C	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12C	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12C	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P12C	**Dec**	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P14A	Jul	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14A	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14A	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14A	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14A	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14A	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P14B	Jul	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P14B	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P14B	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14B	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	**L1**	L1	L2	L1
P14B	Nov	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14B	**Dec**	**L1**	**L1**	**L2**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**
P14C	Jul	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14C	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14C	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14C	Oct	L1	L1	L1	L1	L1	L1	L1	L1	**L1**	L1	L1	**L1**	L1	L1	L1

Bore	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
P14C	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14C	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P14D	July	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14D	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14D	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14D	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14D	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P14D	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P15A	July	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15A	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15A	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15A	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15A	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15A	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**
P15B	July	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P15B	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P15B	Sep	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P15B	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P15B	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P15B	**Dec**	**L1**	**L1**	**L2**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**
P15C	July	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15C	Aug	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15C	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15C	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1
P15C	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15C	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P15D	July	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15D	Aug	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15D	Sep	L1	L1	L1	L2	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15D	Oct	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15D	Nov	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P15D	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P16A	July	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1
P16A	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16A	Sep	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1

Bore	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
P16A	Oct	L2	L1	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L1
P16A	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16A	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**
P16B	July	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P16B	Aug	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P16B	Sep	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
P16B	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
P16B	Nov	L1	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L2	L1
P16B	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**
P16C	July	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16C	Aug	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16C	Sep	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16C	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16C	Nov	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
P16C	**Dec**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L1**	**L2**	**L1**
GW104090	July	L1	L1	L2	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L2	L1
GW104090	Aug	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW104090	Sep	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW104090	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1
GW104090	Nov	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW104090	**Dec**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**
GW105467	July	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105467	Aug	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105467	Sep	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105467	Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105467	Nov	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105467	**Dec**	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
GW105228	July	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L2	L1	L1	L1
GW105228	Aug	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW105228	Sep	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW105228	Oct	L1	L1	L1	L1	L1	L2	L1	L2	L1	L1	L1	L2	L1	L1	L1
GW105228	Nov	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW105228	**Dec**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**
GW072402	July	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW072402	Aug	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#

Bore	Month	pH Upper	pH Lower	EC	Fe	Mn	Cu	Pb	Zn	Ni	Al	As	Li	Ba	Sr	Se
GW072402	Sep	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW072402	Oct	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW072402	Nov	#	#	#	#	#	#	#	#	#	#	#	#	#	#	#
GW072402	**Dec**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**
GW115860	July	L1	L1	L2	L1	L1	L1	L1	L2	L1	L1	L1	L1	L1	L2	L1
GW115860	Aug	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW115860	Sep	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW115860	Oct	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1	L1
GW115860	Nov	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
GW115860	**Dec**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**	**^**
GW105546	Jul	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105546	Aug	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105546	Sep	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
GW105546	Oct	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105546	Nov	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
GW105546	**Dec**	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

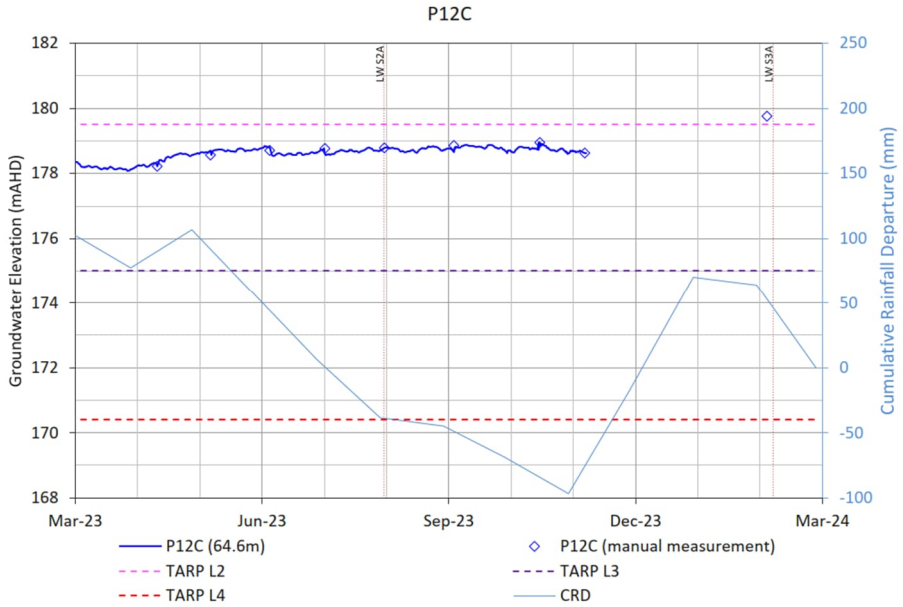
^ Data unavailable, * Bore is inaccessible, # Bore is blocked, $ Bore not surveyed, ~ data erroneous

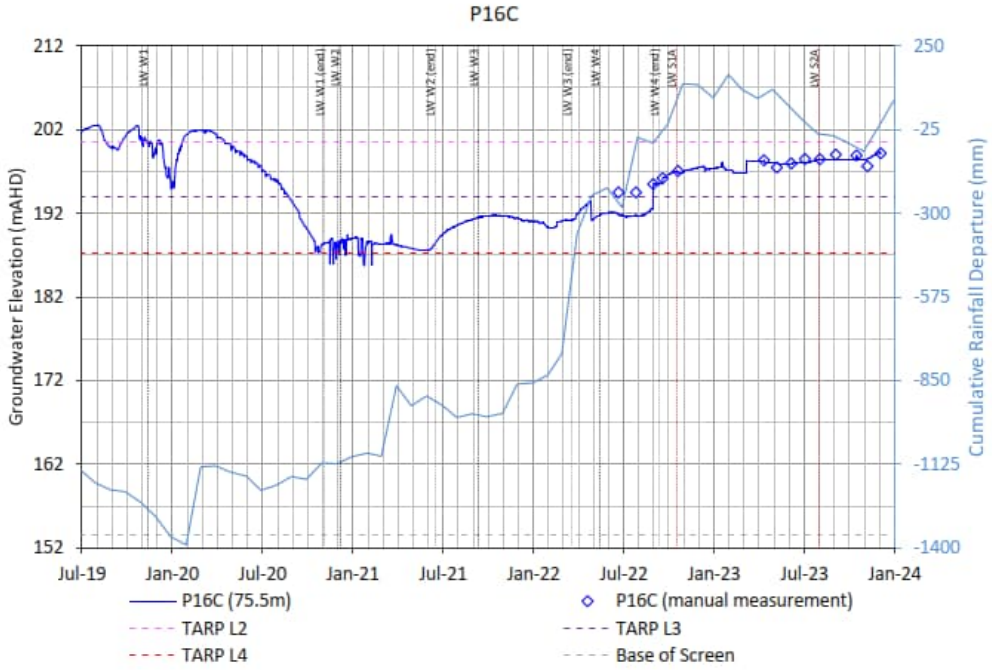
3.3 Groundwater Level Trends

3.3.1 Discussion

Table 6 provides a brief discussion pertaining to each of the observed exceedances listed in **Table 3.** This is not a detailed cause and effect analysis, rather a consideration of potential influencing factors and observations. Where the exceedance is present in December 2023 (considered an active exceedance), the temporal plot is provided for additional context.

Table 6 Groundwater Level Exceedances Discussion

Site	Discussion
P12C	TARP Level 2 exceedance was observed during the entire reporting period. This TARP Level 2 exceedance follows a period of recovery in groundwater from the observed TARP Level 3 conditions prior to May 2022. During the reporting period, groundwater levels remained consistent with the previous reporting period following a slight increase in groundwater levels between October 2022 and April 2023. This increase occurred after maximum groundwater depressurisation was observed in February 2021, which was caused by mining at LW W1-W2. No notable increase in groundwater level has occurred between May 2023 and November 2023 however groundwater stabilisation during this period is likely related to a reduction in rainfall during these seasonally dryer months. Land access to this bore was lost (change in landholder) temporarily. In order to close out the monitoring and trigger exceedance at this site Tahmoor Coal sough to regain land access, which occurred in February 2024. Loggers have been reinstated for ongoing monitoring. The manual water level taken in February 2024, indicated a return to baseline conditions at P12C (in line with all the P12 bores). Noting this, the bore is now considered to be Level 1 trigger, showing a return to baseline conditions. 

Site	Discussion
P16C	TARP Level 2 exceedance was observed during the entire reporting period. Overall, groundwater levels slightly increased during the reporting period except for November 2023 where a slight decrease in groundwater level occurred. This decrease was likely attributed to low rainfall during this month. It is expected that groundwater levels will continue to rise, noting that they have been doing so under below average rainfall conditions since approximately May 2023. 
TNC036 (BGSS-169m)	TARP Level 2 exceedance was observed between July 2023 and November 2023 of the reporting period. Steadily increasing groundwater levels were observed during these months consistent with previous reporting until in December 2023 groundwater levels increased to above the TARP Level 1 trigger.

3.3.2 General Trends

3.3.2.1 Site P9/P11

Groundwater elevations at P9A, located on Redbank Creek upstream from P11, decreased between July and September 2023 however groundwater level data was not available at P9A for the remainder of the monitoring period.

At P9B groundwater level data was not available between June 2023 and October 2024 due to a sensor failure. In November 2024 the sensor was fixed with ground water elevations at this location reporting a slight increase when compared to the previous available data in June 2023.

Groundwater elevation at P11 has shown a subtle steady decrease in water level over the reporting period, likely commensurate with below average rainfall conditions.

A delayed mining effect on groundwater levels due to previous mining of LW W4 was not observed at P9A and P11 during the review period.

3.3.2.2 VWPs

Groundwater elevations at P40 and P41 typically remained stable during the reporting period with the groundwater elevation in all sensors observed above the creek bed elevation (Cedar Creek). Groundwater levels at P40C appeared to be influenced by a faulty sensor between April and July 2023, although appear functional in this reporting period.

Groundwater levels at TNC036 are steadily increasing at most sensors with significant recovery observed in the deeper sensors in the Bulgo Sandstone aquifer (both recovered to above modelled drawdown predictions at this time).

Groundwater levels in the two remaining sensors at TNC040 (WNFM – 27m, and HBSS – 65m) show recovery of the aquifer to Level 1 TARP conditions. The shallowest sensor, screening the Wianamatta Formation at 27 metres below ground level appeared to follow trends in cumulative rainfall with a steady decrease in groundwater level reported during the first half of the monitoring period between July and October before increasing in November and December.

3.3.2.3 Site P12, P14, P15, P16 and Private Bores

Overall, recovery of groundwater levels is observed in the shallow open standpipes and private bores within the monitoring network.

3.3.2.4 Site WD02

WD02 is the post-mining Height of Fracturing (HoF) hole installed in 2023. It is the second of a pair of two fully cored boreholes drilled over Longwall West 2, with the first, WD01, drilled before mining. WD01 was decommissioned at the installation of WD02, with WD01 suffering shearing of majority of it's sensors as a result of the longwall mining operations. WD02 was completed on the 29th March 2023 over the centre of LW West 2 panel, 430 m inbye the LW West 2 finish line.

Eight VWP sensors were installed, as defined in **Table 7.**

Table 7 WD02 VWP Installation Details

VWP Number	Stratigraphic Unit	VWP Install Depth (depth below surface metres)
1	Hawkesbury Sandstone	130
2	Hawkesbury Sandstone	200
3	Newport Formation	240
4	Bulgo Sandstone	280
5	Bulgo Sandstone	305
6	Bulgo Sandstone	330
7	Bulgo Sandstone	355
8	Bulgo Sandstone	410

The sensors all show relatively stable groundwater pressures, excluding the sensor at 280 metres which indicates an increase in pressure over time (**Figure 4**).

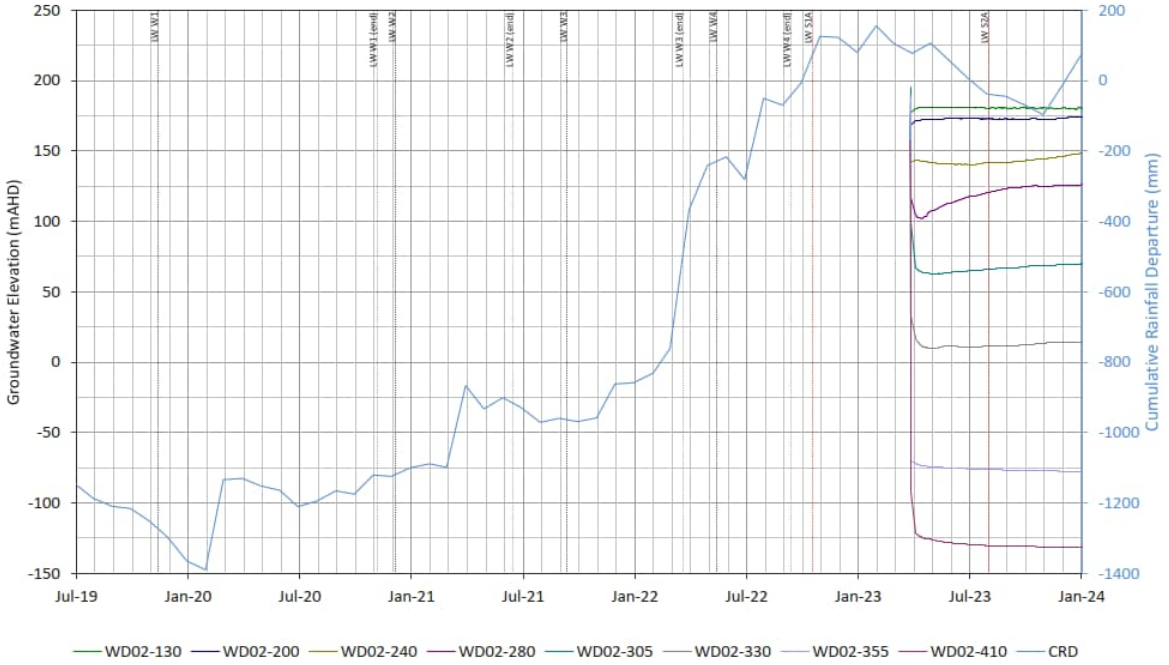


Figure 4 Groundwater Elevation over time at WD02.

3.3.2.4.1 Subsidence Performance Measure

WD02 informs the subsidence performance measure as detailed in **Table 8** (adapted from Table 5-1: Subsidence Performance Measure and Performance Indicators for Surface Water and Groundwater Resources, as per the Tahmoor North – Western Domain Longwalls West 3 and West 4 Water Management Plan, Tahmoor Coal, 2021).

Table 8 Subsidence Performance Measure and Performance Indicators for Surface Water and Groundwater resources (redacted, Tahmoor Coal, 2021)

Feature	Subsidence Performance Measures	Subsidence Performance indicators
LW W1 – W2 Extraction Plan Approval Conditions of Consent – Condition 7(1) Table 1: Subsidence impact performance measure – natural features		
Stonequarry Creek, Cedar Creek and Matthews Creek	No connective cracking between the surface, or the base of the alluvium, and the underground workings.	The performance indicator will be considered to be exceeded if analysis of inflow data suggests high correlation to rainfall events and significant departure from recent groundwater model predictions. This would also be supported by analysis of the pre- and post- mining goaf centerline bore data.

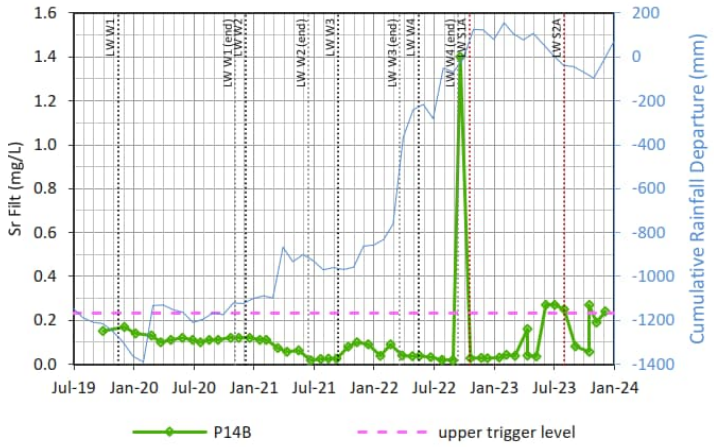
The fracture profile post-mining indicated that from surface to 79 metres below ground level, there was no obvious change in defects or permeability between the pre and post mining boreholes (SCT, 2023). Such that, the fracture profile does not extend to the surface and consequently, there is no evidence of connective cracking between surface and seam.

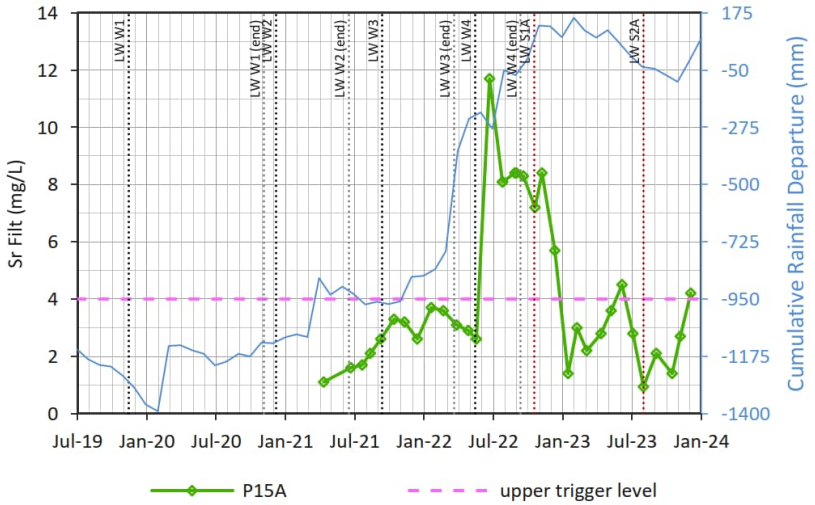
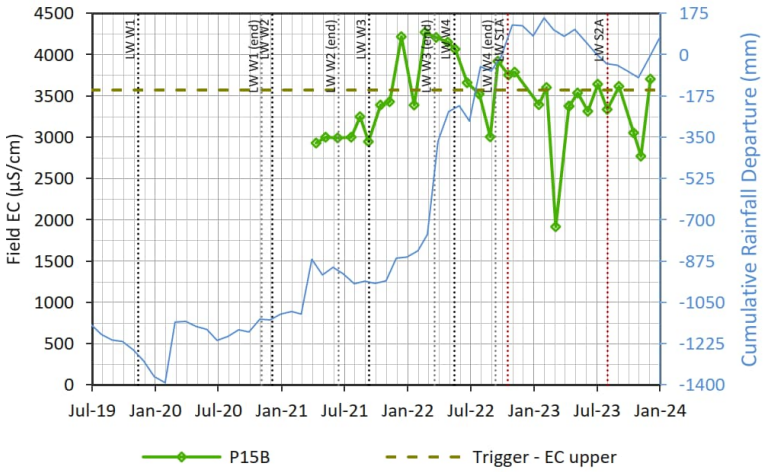
3.4 Groundwater Quality Trends

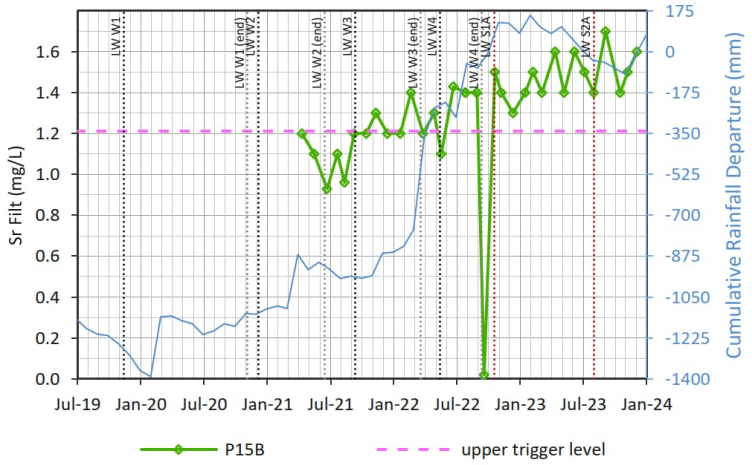
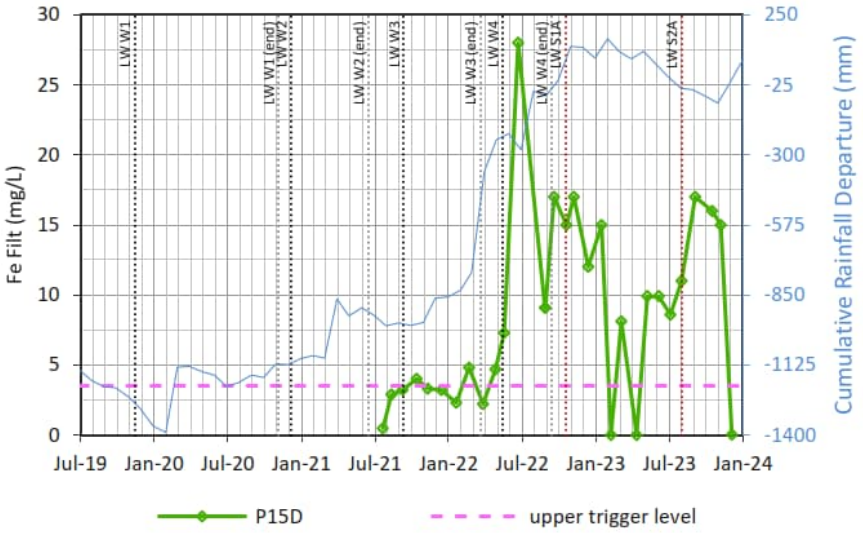
3.4.1 Discussion

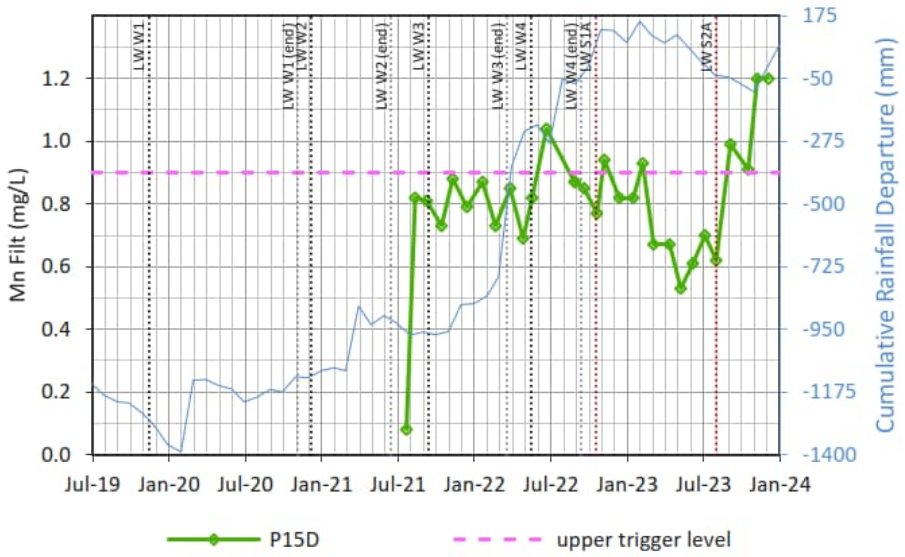
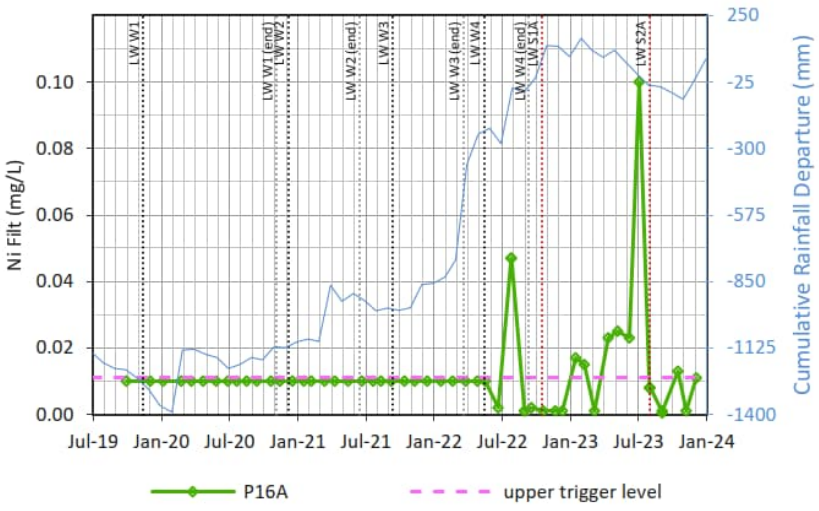
Table 9 provides a brief discussion pertaining to each of the observed exceedances as listed in **Table 3.** This is not a detailed cause and effect analysis, rather a consideration of potential influencing factors and observations. Where the exceedance is present in December 2023 (considered an active exceedance), the temporal plot is provided for additional context.

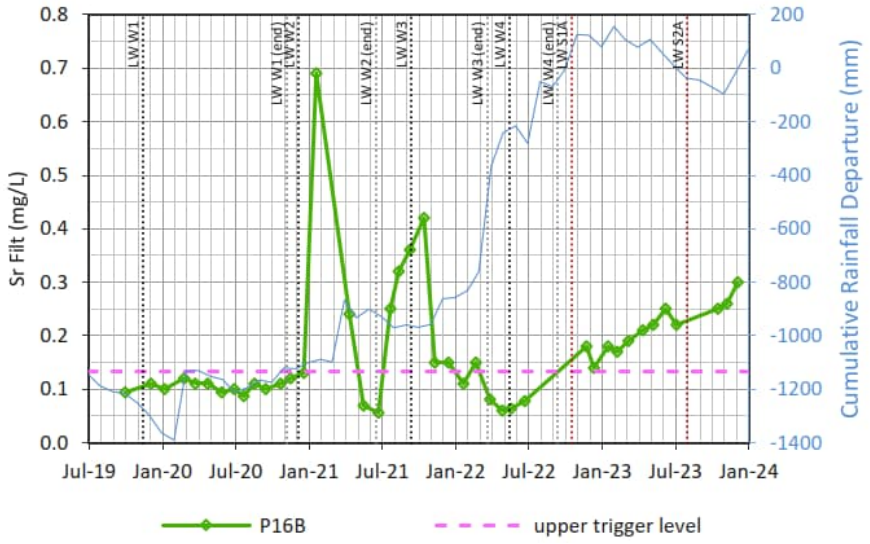
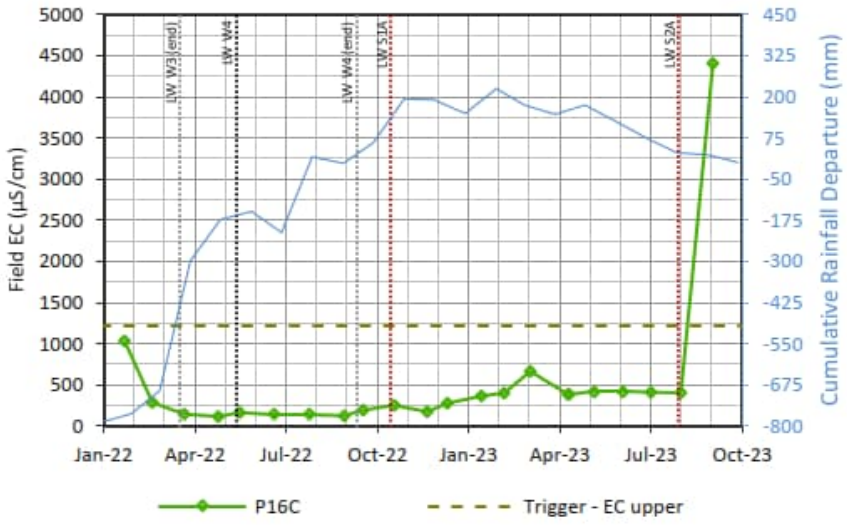
Table 9 Groundwater Quality Exceedances Discussion

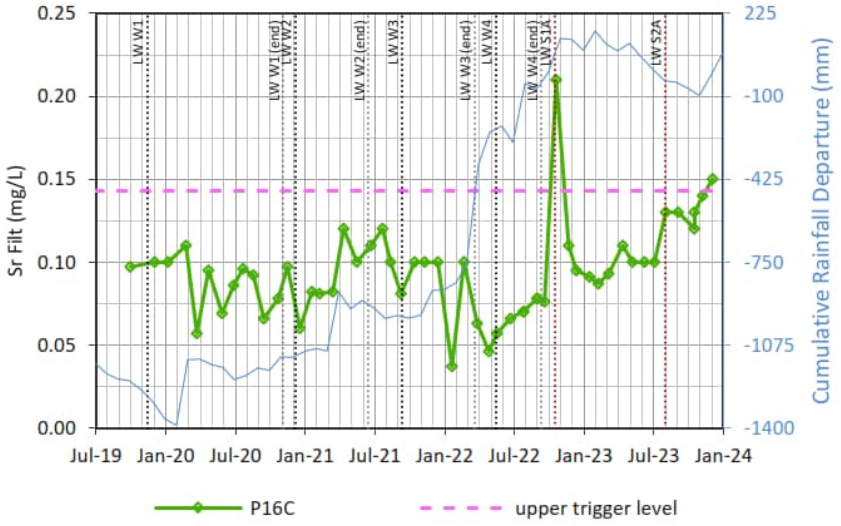
Site	Discussion
P12A	A TARP Level 2 exceedance for the upper pH trigger was observed between January 2023 and August 2023 before the pH level decreased to normal conditions between September 2023 and November 2023. Concentrations of dissolved lead have historically remained low except for isolated elevations with TARP Level 2 exceedances reported in February 2020, February 2022, and July 2022 to September 2022. Dissolved lead concentrations were variable in 2023 with TARP Level 2 exceedances observed in March, April, June, July, August and October before decreasing to normal levels in November.
P12C	TARP Level 2 exceedance of dissolved manganese was observed in July 2023 before the concentration of dissolved manganese decreased to normal conditions in August 2023, and remained at normal conditions in November 2023.
P14B	Concentrations of dissolved strontium have fluctuated since the first TARP Level 2 exceedance in June 2023 decreasing below the trigger level in September 2023 and November 2023 before increasing again above the TARP Level 2 in December 2023. These minor fluctuations are likely representative of natural conditions. 
P15A	Dissolved strontium previously exceeded the TARP Level 2 trigger in June 2023 then returned to baseline conditions before increasing to exceed the TARP Level 2 trigger again in December 2023. These fluctuations are consistent with historical baseline data and not believed to be resultant from mining activities.

Site	Discussion
	
P15B	Short-term increase (TARP Level 2 exceedance) in electrical conductivity (EC) occurred in 2023 during July, September, and December. These fluctuations are consistent with historical baseline data and not believed to be resultant from mining activities.  TARP Level 2 exceedance of dissolved strontium was observed during the entire reporting period. The concentration of dissolved strontium has fluctuated over the past 12 months and likely represents the natural fluctuation in the groundwater. It is not uncommon to see release of strontium from geological strata with increased rainfall in this area.

Site	Discussion
	
P15C	A short-term increase (TARP Level 2 exceedance) in the concentration of dissolved iron was observed in July and August 2023 before returning to and remaining at baseline conditions for the remainder of the monitoring period. A singular TARP Level 2 exceedance in dissolved aluminium concentrations was observed in October 2023 before returning to baseline conditions for the remainder of the monitoring period.
P15D	TARP Level 2 exceedance of dissolved iron was observed during the entire reporting period. The trigger level for dissolved iron concentration at P15D is considered too conservative. A revision of the trigger level for dissolved iron at P15D to 2.5 mg/L has been recommended (SLR, 2023a). Using the revised trigger level, a TARP Level 1 still would not apply in the current reporting period. Fluctuations in dissolved iron concentrations observed during the reporting period appear consistent with observed concentrations during a similar time in mid-late 2022, and is in alignment with natural variation. 

Site	Discussion
	Short-term increase (TARP Level 2 exceedance) in dissolved manganese occurred from September 2023 to December 2023 (the end of the monitoring period). Again, this is not inconsistent with historical fluctuations and is likely resultant of natural variations. 
P16A	pH exceeded the upper trigger level in October 2023 only before returning to normal conditions for the rest of the monitoring period in November and December 2023. Fluctuating dissolved concentrations of nickel were reported during the monitoring period with TARP Level 2 exceedances of nickel observed in July 2023, October 2023 and December 2023 Concentrations of nickel have fluctuated over the past 12 months with periods of high concentration followed by periods of baseline variability. Current levels are considered to be relatively baseline and represent natural conditions. 

Site	Discussion
P16B	TARP Level 2 exceedance of strontium was observed throughout the monitoring period in July 2023, October to December 2023. No strontium concentration data is available in August or September 2023. It is not uncommon to see release of strontium from geological strata with increased rainfall in this area.  A short-term TARP Level 2 exceedance of zinc was observed in October 2023 only during the monitoring period. The previous TARP Level 2 exceedance for zinc occurred in May 2022.
P16C	A short-term increase (TARP Level 2 exceedance) in EC was observed in September 2023. The EC at P16C otherwise remained within normal conditions throughout the monitoring period since January 2022. It is likely this high reading is erroneous. 

Site	Discussion
	Strontium exceeded the TARP Level 2 trigger in December 2023 for the first time since October 2022. Dissolved strontium has been steadily increasing since April 2022. 
GW104090	TARP Level 2 exceedance of EC was observed in July 2023. No EC data is available in August, September, November or December 2023. The most recent EC data (October 2023) showed a decrease from July 2023 to below the trigger level. Since January 2022, EC has remained below the trigger level. TARP Level 2 exceedance of barium was observed in July 2023. No barium concentration data was available in August, September, November or December 2023 however barium concentration data in October showed a decrease to below the TARP Level 2 trigger level. Between January 2022 and September 2023, barium concentrations have remained above the trigger level (0.143mg/L) although concentrations have been decreasing over this time. TARP Level 2 exceedance of strontium was observed in July and October 2023. No strontium concentration data is available for the remaining months of the monitoring period. Since January 2022, strontium concentrations have remained above the trigger level (1.21 mg/L). It is noted that minimal baseline data exists at GW104090 (SLR, 2023a) and therefore the trigger level may not be appropriate. Additional monitoring is required to inform the potential post-mining strontium trends at GW104090.
GW105228	A TARP Level 2 exceedance for both copper and zinc were observed for the first time on October 2023. No data was available for the remainder of the monitoring period. The revised trigger level at GW105228 to 0.25 mg/L to align with the lithium trigger level at GW115860 (SLR, 2023a) has been applied. Using a revised trigger level of 0.25 mg/L at GW105228, a TARP Level

Site	Discussion
	1 applies in the current reporting period (for the available June and October data). No lithium concentration data is available in July, August, September and December 2023.
GW115860	TARP Level 2 exceedance of EC and dissolved zinc were observed in July 2023. No EC or dissolved zinc data was available in August, September, November and December 2023 however both EC and dissolved zinc was reported below the trigger level in October 2023. Since October 2022, EC has remained below the trigger level. Additional monitoring is required to inform the potential post-mining EC and zinc trends at GW115860. TARP Level 2 exceedance of dissolved zinc was observed in July 2023. No dissolved zinc data is available in August and September 2023. Since April 2022, the concentration of dissolved zinc has remained below the trigger level. Additional monitoring is required to inform the potential post-mining zinc trends at GW115860. TARP Level 2 exceedance of dissolved strontium was observed in July 2023. No dissolved strontium data is available in August, September, November or December 2023 however dissolved strontium was observed to have decreased below the trigger level in October 2023. Except for July 2022, the concentration of dissolved strontium has remained below the trigger level. Additional monitoring is required to inform the potential post-mining strontium trends at GW115860.

3.4.2 General Trends

Overall, improvement in groundwater quality is being observed across most of the shallow open standpipes within the monitoring network (where data was available). There has been a significant reduction (from 12 to 5) in the number of sites trigger TARP Level 2 over this reporting period, compared to that active at the conclusion of the last six-monthly reporting (June 2023).

4.0 Summary of Groundwater Level Conditions

The Western Domain LW3 – LW4 Water Management Plan was developed in September 2021, prior to the commencement of mining defines the post-mining monitoring period for water level monitoring, as:

> *"minimum continuous 24-hourly readings with monthly logger download and dip meter for 12 months following completion of LW W4. This period may be extended as per the decision by the Environmental Response Group"*

Noting the conclusion of mining at LW W4 on the 13th September 2022, the 12-month post-mining period was reached on 13th September 2023. The final report has been generated to close out the 2023 year, and summarise the final conditions at the monitoring bores. Review of the data in conjunction with other environmental technical disciplines at the Environmental Response Group meetings, concluded that there was no requirements for corrective action.

Given this, an overall summary of each site has been provided in **Table 10**.

Table 10 Monitoring Bore Summary – Water Levels.

Bore ID	Status	Current TARP Level	Ongoing Monitoring Plan
P12	Active Monitoring	12A – TARP Level 1 12B – TARP Level 1 12C – TARP Level 1 (as of February 2024)	Continuous water level monitoring via loggers, with quarterly downloads. Quarterly water quality monitoring.
P13	Decommissioned in September 2021 (as reported in the Tahmoor Western Domain Quarterly Groundwater Report, Oct – Dec 2021) Last water level reading date 29 September 2021.	P13A – TARP Level 1 P13B – TARP Level 1 P13C – TARP Level 1	Bore decommissioned
P14	Active Monitoring	P14A – TARP Level 1 P14B – TARP Level 1 P14C – TARP Level 1 P14D – TARP Level 1	Continuous water level monitoring via loggers, with quarterly downloads. Quarterly water quality monitoring (land access extension secured until 2028)
P15	Monitoring concluded, loggers removed Feb 2024.	P15A – TARP Level 1 P15B – TARP Level 1 P15C – TARP Level 1 P15D – TARP Level 1	To be decommissioned early 2024
P16	Active Monitoring	P16A – TARP Level 1 P16B – TARP Level 1	Continuous water level monitoring via loggers,

Bore ID	Status	Current TARP Level	Ongoing Monitoring Plan
		P16C – TARP Level 2	with quarterly downloads. Quarterly water quality monitoring.
P17	Decommissioned in September 2021 (as reported in the Tahmoor Western Domain Quarterly Groundwater Report, Oct – Dec 2021). Last water level reading date 29 September 2021.	P17 – TARP Level 1	Bore decommissioned
TNC036	Active Monitoring	All sensors TARP Level 1	Ongoing monitoring into 2024, to be decommissioned 2024.
TNC040	Active Monitoring	All sensors TARP Level 1	Ongoing monitoring
WD01	Bore decommissioned	All sensors TARP Level 1	Bore decommissioned
WD02	Active Monitoring	NA	Ongoing monitoring

5.0 Mine Inflows

Since 2009, observed inflows to Tahmoor Mine have ranged from approximately 2 to 7 ML/d. In October 2022, the Western Domain blocks were sealed. Since this time, the average groundwater inflow from Tahmoor underground workings is reported as 2.3 ML/d.

The cumulative groundwater inflows, as calculated from the mine water balance and pump-out records is presented in Figure 5.

The reporting period occurs within the water year 2023-24. As of 31 December 2023, the cumulative groundwater make for water year 2023-24 is 673 ML, which remains below the groundwater entitlement of 1,642 ML/y (Figure 5).

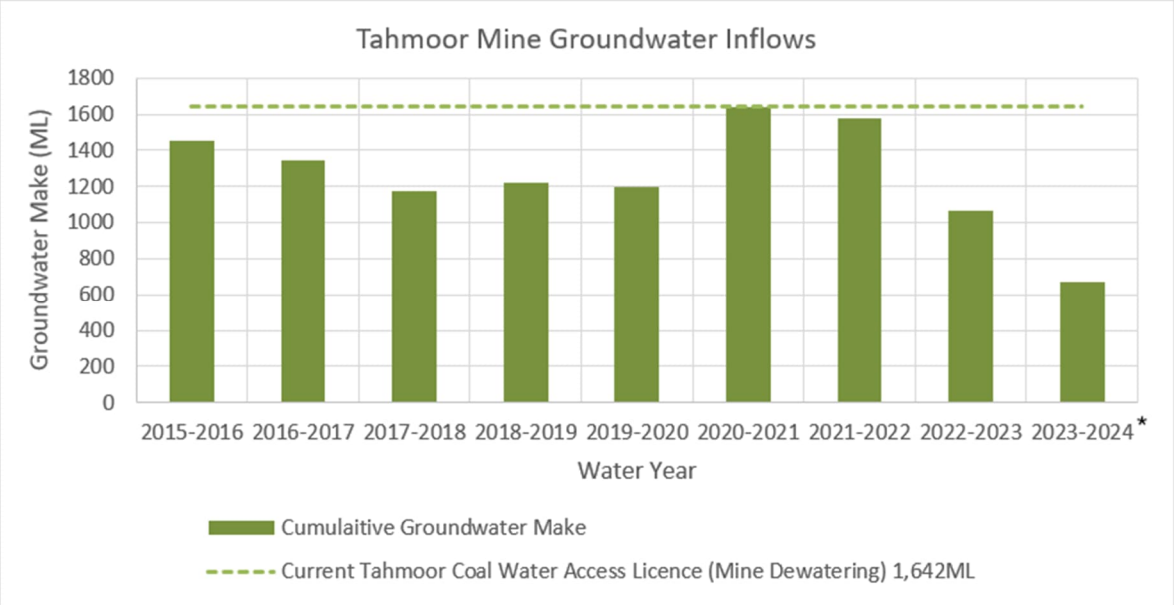


Figure 5 Tahmoor Mine Groundwater Inflows

(*July 2023 – December 2023)

6.0 Previous Actions

Table 8 provides a summary of the recommendations made in the most recent quarterly review (July – September 2023) and a status update.

Table 11 Status of recommendations made in July – December 2023 compliance reporting.

Item	Previous Recommendation	Progress of Recommendation
1	Where a TARP Level 1 applied during the reporting period, continue the groundwater monitoring program and reporting of groundwater level and quality data in the next groundwater review report.	Completed as part of this six-monthly report.
2	Where TARP Level 2 applied during the reporting period, continue the groundwater monitoring program and reporting of groundwater level and quality data in the next groundwater review report.	Completed as part of this six-monthly report.
	In addition, it is recommended to: o Groundwater Quality – for all sites with Level 2 TARPs in place, closely monitor concentrations against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Completed as part of this six-monthly report. At the conclusion of this reporting period (December 2023) there are six active TARPS Level 2 sites (P14B, P15A, P15B, P16A, P16B and P16C). Overall, baseline conditions are generally apparent across the area.
	o Groundwater Levels - for all sites with Level 2 TARPs in place, closely monitor groundwater levels against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Completed as part of this Six-monthly report. The previous six-monthly reports and quarterly reports showed active Level 2 TARPS at two monitoring sites. At the conclusion of this reporting period (December 2023) the same two exceedances are still active (P12C and P16C). These sites have shown significant recovery and are very close to meeting TARP Level 1 criteria. Overall there is a notable recovery and return to baseline conditions across the area during the reporting period. In February 2024, manual water level at P12C demonstrated return to baseline conditions.
	o Groundwater Pressures – continue to evaluate groundwater levels against model predictions and the rate of depressurisation over time. For all sites with Level 2 TARPs in place, closely monitor groundwater	Completed as part of this Six-monthly report. The recent quarterly report showed active Level 2 TARPS at three monitoring sites (July - Sept 2023). At the conclusion of this reporting period, there are no active exceedances.

Item	Previous Recommendation	Progress of Recommendation
	pressures levels against TARP trigger levels for the site and associated control sites as set out in the TARPs (Tahmoor Coal, 2021).	Overall there is a notable recovery and return to baseline conditions across the area.

7.0 Conclusion

The conclusion of this reporting period signifies the end of 15 months post-mining monitoring period, 3 months beyond the period dictated in the Water Management Plan.

Overall, there has been significant recovery across the area, and review with the ERG confirms no requirement for Corrective Management Plans or ongoing reporting. The quality triggers are not deemed to be likely due to mining impacts, and the water level trigger (P16C) has shown significant recovery and are very near Level 1 TARPs. It is expected to recover in accordance with nearby bores when rainfall returns to average conditions.

Consequently, the post-mining period has demonstrated recovery of the aquifer to Level 1 TARP conditions (“normal” conditions).

A number of bores have been selected for ongoing monitoring as part of requirements associated with other operations at Tahmoor Mine. This includes P14 nested suite, P16 nested suite, WD02 and TNC040.

8.0 References

HydroSimulations/SLR, 2019. Tahmoor LW W1-W2 Extraction Plan: Groundwater Technical Report. Report HS2019/14c for Tahmoor Coal Pty. Ltd., July 2019.

SCT Operation Pty Ltd, 2023, *Height of Fracturing and Depressurisation above Longwall West 2 Panel at Tahmoor Western Domain*, report ID: TAH5157A, prepared for Tahmoor Coal, SIMEC Mining.

SLR, 2021. Tahmoor Coal LW W3-W4 Extraction Plan: Groundwater Technical Report. Prepared for Tahmoor Coal Pty Ltd, Report No: 665.10010.00006-R01-v3.0.

SLR, 2023a. Western Domain Quarterly Groundwater Report: Oct – Dec 2022. Prepared for Tahmoor Coal Pty. Ltd., March 2023, Report No: 610.30977.0000-M01-v3.0.

SLR, 2023b. Western Domain Quarterly Groundwater Report: Jan – Mar 2023. Prepared for Tahmoor Coal Pty. Ltd., June 2023, Report No: 640.30614.00000.

SLR, 2023c. Western Domain Quarterly Groundwater Report: Jul – September 2023. Prepared for Tahmoor Coal Pty. Ltd., November 2023, Report No: 665.10010.00207

Tahmoor Coal Pty Ltd, 2021. Tahmoor North - Western Domain, LW W3-W4 Water Management Plan. TAH-HSEC-326 (September 2021, Ver4)

Appendix A TARPs (Tahmoor Coal, 2021)

Six - Monthly Groundwater Reporting: July – December 2023

Tahmoor Western Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.030985.00001

Table A1 - Trigger Action Response Plan – Groundwater Levels and Pressures

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Groundwater Levels at monitoring bores and private groundwater bores.	GROUNDWATER LEVEL – Monitoring bores **Locations** (refer to Figure 3-5) Impact sites – P12, P13, P14, P15, P16, and any additional bore(s) (to be drilled) Control sites – P17, and possibly P11 **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter. Baseline data available since May 2019. During mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter. Post mining - Minimum continuous 24-hourly readings with monthly logger download and dip meter for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). GROUNDWATER LEVEL – Private groundwater bores **Locations** (refer to Figure 3-5) Control sites - GW72402, GW105228, GW105467, GW115860 and GW105546 and any other private bores where access is negotiated with landholder. **Frequency** Pre-mining - Standing Water Level (where available) and yield data. Pre-mining testing completed in bore census (GeoTerra, 2019). During mining - Manual monitoring (flow rate and, where available, standing water level) on a 3-monthly basis. Post mining - Manual monitoring (flow rate and, where available, standing water level) on a 3-monthly basis for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• Groundwater level remains consistent within baseline variability and/or pre-mining trends, with reductions in groundwater level less than two metres and does not trigger Level 2 to Level 4 Significance Levels (refer to Table 6-2).	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Greater than 2 m water level reduction following the commencement of extraction at LW W1 (and LW W2, W3, W4) (refer to Table 6-2 for TARP Significance Level 2). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data. • Review relevant surface water level, groundwater level and streamflow data to assess comparative trends. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Water level declines below the water level of TARP Significance Level 3 (refer Table 6-2, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Review relevant surface water level, groundwater level and streamflow data to assess comparative trends. • Compare against base case and deterministic model scenarios. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Water level reduction greater than the maximum modelled drawdown (refer to Table 6-1 for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Review relevant surface water level, groundwater level and streamflow data to assess comparative trends. • Convene Tahmoor Coal Environmental Response Group to review response. • Compare against base case and deterministic model scenarios.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • For monitoring bores: If it is concluded that there has been a mining-related impact, then implement an investigation including review and assessment of streamflow records for downstream monitoring sites in comparison with suitable reference sites. • For private groundwater bores: If it is concluded that there has been a mining-related impact, then implement actions in accordance with the make good provisions (Section 6.2.4 of the Water Management Plan) in consultation with DPIE and the affected landholder.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Shallow Groundwater Pressures at VWPs TNC036, TNC040, WD01 and WD02 (once installed).	GROUNDWATER PRESSURE **Locations** Impact sites – TNC36, WD01 and WD02 (once installed) (refer to Section 5.2.2). Control sites - Groundwater bores/VWPs TNC40 (refer to Figure 3-5). **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download. During mining - Minimum continuous 24-hourly readings with monthly logger download. Post mining - Minimum continuous 24-hourly readings with monthly logger download for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No observable mining induced change at VWP intakes located at or above (i.e. shallower than) 200 m depth.	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Greater than 5 m water level reduction in VWP intakes located at or above (i.e. shallower than) 200 m depth following the commencement of extraction at LW W1 (and LW W2, W3 and W4) (refer to Table 6-2 for TARP Significance Level 2). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program. • Ongoing review of water level data. • Convene with Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Water level declines below the water level of TARP Significance Level 3 (refer Table 6-2, calculated as the average of TARP Significance Level 2 and Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or external anthropogenic factors.	• Continue monitoring program • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Compare against base case and deterministic model scenarios. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Water level reduction greater than the maximum modelled drawdown (refer to Table 6-2 for TARP Significance Level 4) following the commencement of extraction at LW W1 (and LW W2, W3 and W4). AND • The reduction in water level is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Ongoing review of water level data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response. • Compare against base case and deterministic model scenarios.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • If it is concluded that there has been a mining-related impact, implement an investigation report.

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Deep Groundwater Pressures at VWPs TNC036.	GROUNDWATER PRESSURE **Locations** Impact site – TNC36 (refer to Figure 3-5). Control site - Groundwater bores/VWPs TNC40 (refer to Figure 3-5). **Frequency** Pre-mining - Minimum continuous 24-hourly readings with monthly logger download. During mining - Minimum continuous 24-hourly readings with monthly logger download. Post mining - Minimum continuous 24-hourly readings for 12 months after LW W4 completed. Monthly logger downloaded for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• Observed data does not exceed predicted (modelled) impacts at VWP intakes located below (i.e. deeper than) 200 m depth (excluding those monitoring the Bulli Coal Seam).	• Continue monitoring program. • Ongoing review of water level data.	• No response required.
		Level 2		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) is within 30 m of predicted (modelled) drawdown.	• Continue monitoring program. • Ongoing review of water level data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 6 months or more.	• Continue monitoring program. • Ongoing review of water level data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group. • Consider increasing download frequency at groundwater bores where Level 3 has been reached to a fortnightly basis. Consider increasing review frequency to fortnightly.
		Level 4		
		• Calculated or observed drawdown (based on 2009-2015 baseline data) for VWP intakes below 200 m depth (excluding those within the Bulli Coal Seam) exceeds predicted (modelled) drawdown by 30 m for a period of 12 months or more.	• Continue monitoring and review as per monitoring program. • Convene Tahmoor Coal Environmental Response Group to undertake an investigation to assess whether change in behaviour is related to LW W1-W2 mining effects.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • If it is concluded that there has been a mining-related impact, implement an investigation report.

Table A2 Trigger Action Response Plan – Groundwater Quality

Feature	Methodology and relevant monitoring	Management		
		Trigger	Action	Response
Groundwater Quality at monitoring bores and private groundwater bores.	GROUNDWATER QUALITY – Monitoring bores **Locations** (refer to Figure 3-5) Impact sites – P12, P13, P14, P15, P16, and any additional bore(s) (to be drilled) Control sites – P17 **Frequency** Pre-mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters). During mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters). Post mining - Field water quality and laboratory analysis monthly (refer to Section 5.2.1 for parameters) for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details). GROUNDWATER QUALITY – Private groundwater bores **Locations** (refer to Figure 3-5) Control sites - GW72402, GW105228, GW105467, GW115860 and GW105546 and any other private bores where access is negotiated with landholder. **Frequency** Pre-mining - Field water quality (EC, pH) and iron staining. Pre-mining testing completed during bore census (GeoTerra, 2019). During mining - Field water quality and laboratory analysis on a 3-monthly basis (refer to Section 5.2.1 for parameters). Post mining - Field water quality and laboratory analysis on a 3-monthly basis (refer to Section 5.2.1 for parameters) for 12 months following the completion of LW W4. This period may be extended as per the decision by the Environmental Response Group (refer to Section 5.2 for further details).	Level 1		
		• No observable change in salinity, pH or metals outside of the baseline variability.	• Continue monitoring program. • Ongoing review of water quality data.	• No response required.
		Level 2		
		• Short term increase (< 3 months) in salinity and/or metals, or change in pH outside of baseline variability*. The effect does not persist after a significant rainfall recharge event. AND/OR • A similar trend or response has been noted at other monitored bores or private groundwater bores.	• Continue monitoring program. • Ongoing review of water quality data. • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 3		
		• Short term increase (< 3 months) in salinity and/or metals or change in pH outside of baseline variability*. The effect persists after a significant rainfall recharge event. AND/OR • The change in water quality is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring program. • Ongoing review of water quality data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response.	• As defined by the Environmental Response Group.
		Level 4		
		• Medium to long term increase in salinity and / or metals or a change in pH outside of baseline variability* with the effect persisting for greater than 3 months or after a significant rainfall recharge event. AND • The reduction in water quality is determined not to be controlled by climatic or anthropogenic factors.	• Continue monitoring and review as per monitoring program. • Continue review of water quality data and consideration of mining and external stresses (in groundwater monthly report). • Convene Tahmoor Coal Environmental Response Group to review response.	• Report to DPIE and relevant government agencies within 7 days of investigation completion (according to Table 6-1 of the Extraction Plan Main Document). • For monitoring bores: If it is concluded that there has been a mining-related impact, then implement an investigation report. • For private groundwater bores: If it is concluded that there has been a mining-related impact, then implement actions in accordance with the make good provisions (Section 6.2.4 of the Water Management Plan) in consultation with the affected landholder.

Footnote:

* The baseline variability was estimated using available data and refers to the proposed trigger levels (refer to Section 6.2.2 and Table 6.2 of the Groundwater Technical Report.

Appendix B Groundwater Monitoring Network

Six - Monthly Groundwater Reporting: July – December 2023

Tahmoor Western Domain

Tahmoor Coal Pty Ltd

SLR Project No.: 640.030985.00001

13 March 2024

Table A-1: Western Domain Groundwater Monitoring Network

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
Shallow Groundwater Levels (monitoring bores/standpipe piezometers)					
P12A	Tahmoor Coal	277771	6216561	14.6 - 19.6	EX
P12B	Tahmoor Coal	277776	6216560	31.6 - 34.6	EX
P12C	Tahmoor Coal	277781	6216559	61.6 - 64.6	EX
P13A	Tahmoor Coal	278180	6216550	19.5 - 22.5	D
P13B	Tahmoor Coal	278175	6216554	33.5 - 37.5	D
P13C	Tahmoor Coal	278170	6216558	64.5 - 67.5	D
P14A	Tahmoor Coal	278398	6216536	4.5 - 6.0	EX
P14B	Tahmoor Coal	278393	6216534	13.6 - 16.6	EX
P14C	Tahmoor Coal	278397	6216542	28.6 - 31.6	EX
P14D	Tahmoor Coal	278391	6216540	58.6 - 61.6	EX
P15A	Tahmoor Coal	278550	6216426	16.1-17.6	EX
P15B	Tahmoor Coal	278545	6216423	18.6-20.1	EX
P15C	Tahmoor Coal	278556	6216427	30.5-32.0	EX
P15D	Tahmoor Coal	278561	6216431	66 (bore depth)	EX
P16A	Tahmoor Coal	277351	6215147	24.5 - 27.5	EX
P16B	Tahmoor Coal	277350	6215140	42.5 - 45.5	EX
P16C	Tahmoor Coal	277347	6215135	72.5 - 75.5	EX
P17	Tahmoor Coal	277941	6217153	19.6 - 22.6	D
GW072402	Private	277708	6216852	8.2 - 72.0	EX
GW105228	Private	278490	6216858	23.0 - 63.0	EX
GW105467	Private	277253	6215247	73.0 - 79.0	EX
GW105546	Private	277018	6215732	48.0 - 56.0	EX
GW115860	Private	278543	6216760	20, 48 and 55	EX

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
Shallow Groundwater Pressures (VWPs < 200 mBGL)					
P40(A-D)	Tahmoor Coal	277620.6	6216160.1	HBSS-39	EX
				HBSS-44	EX
				HBSS-49	EX
				HBSS-85	EX
P41(A-F)	Tahmoor Coal	279167	6216068	WMFM-53 (vertical)	EX
				HBSS-71 (vertical)	EX
				HBSS-88 (vertical)	EX
				HBSS-106 (vertical)	EX
				HBSS-124 (vertical)	EX
				140 (vertical)	EX
TNC036	Tahmoor Coal	277269	6215382	HBSS-65	EX
				HBSS-97	EX
				BGSS-169	EX
TNC040	Tahmoor Coal	279004	6214521	WMFM-27	EX
				HBSS-65	EX
				HBSS-111	F
WD01	Tahmoor Coal	278099	6214828	HBSS-70	EX
				HBSS-90	EX
				HBSS-190	F
WD02	Tahmoor Coal	278246	6215178	WD02-130	EX
				WD02-200	Ex
Deep Groundwater Pressures (VWPs > 200 mBGL)					
TNC036	Tahmoor Coal	277269	6215382	BGSS-214	EX
				BGSS-298.5	F
				BGSS-412.5	EX
				BUSM-463.5	F
TNC040	Tahmoor Coal	279004	6214521	HBSS-225	F
				BHCS-252	F
				BGSS-352	F
				SCSS-482	F
				BUCO-501.9	F
TNC043	Tahmoor	280077	6212671	HBSS-213	D

Monitoring bore or VWP ID	Owner	Easting[1] (GDA94)	Northing[1] (GDA94)	Bore screen or VWP sensor depth (mBGL)	Status
	Coal			BGSS-240	D
				BGSS-332.6	D
				BGSS-405.2	D
				BUCO-476.3	D
WD01	Tahmoor Coal	278099	6214828	210-HBSS	EX
				230-Newport Fm	F
				300-BGSS	F
				330-BGSS	F
				350-BGSS	F
WD02	Tahmoor Coal	278246	6215178	WD02-240	EX
				WD02-280	EX
				WD02-305	EX
				WD02-330	EX
				WD02-335	EX
				WD02-410	EX

WNFM – Wianamatta Group, HBSS – Hawkesbury Sandstone, BHCS – Bald Hill Claystone, BGSS – Bulgo Sandstone, SPCS – Stanwell Park Claystone, SCSS – Scarborough Sandstone, WBCS - Wombarra Claystone, CCSS – Coal Cliff Sandstone, BUCO– Bulli Coal Seam, WWCO – Wongawilli Coal Seam

VWP – Vibrating Wire Piezometer, OSP – Open Stand-pipe

EX – Existing, F -Failed, D – Destroyed

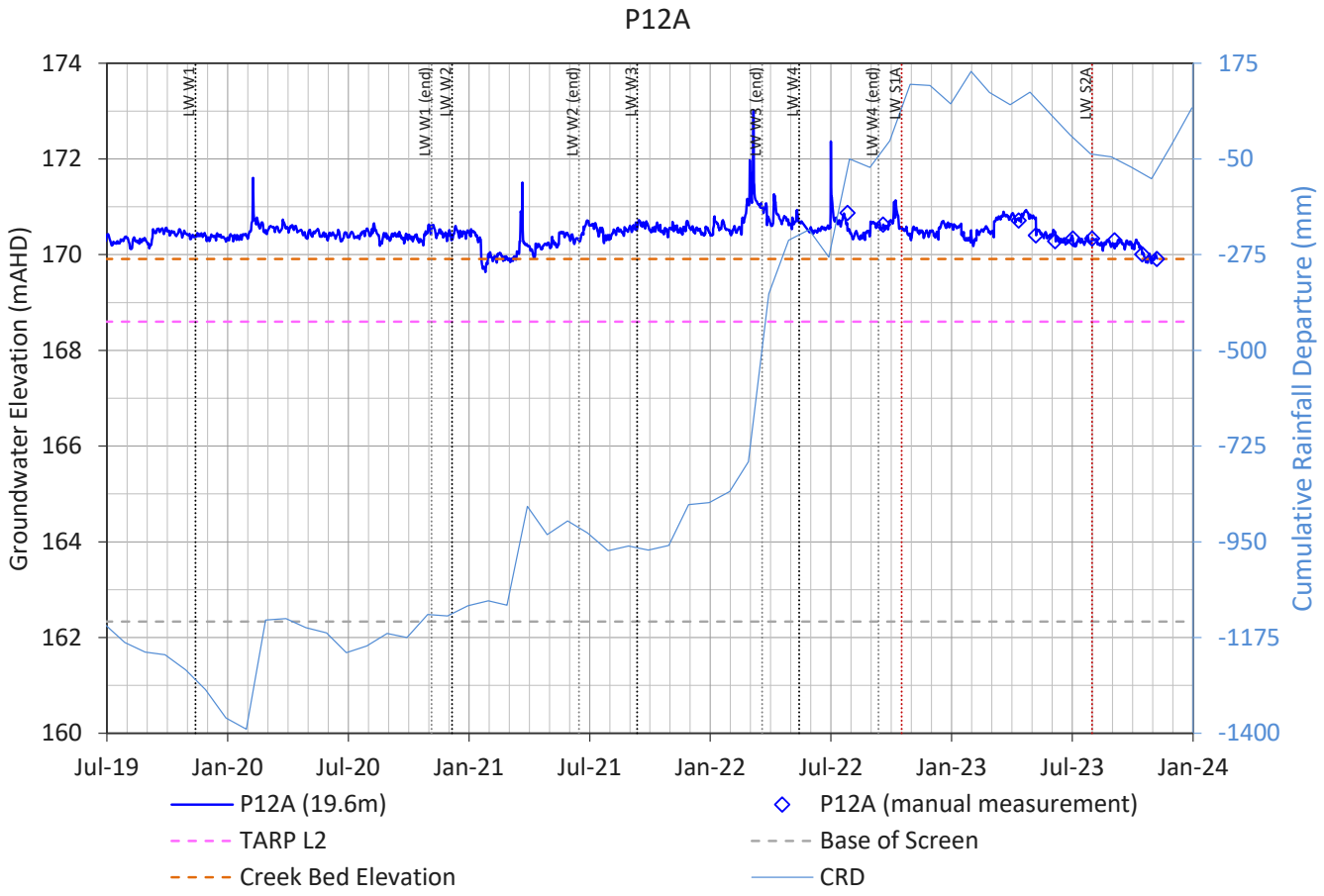
Appendix C Hydrographs – Groundwater Level TARPs

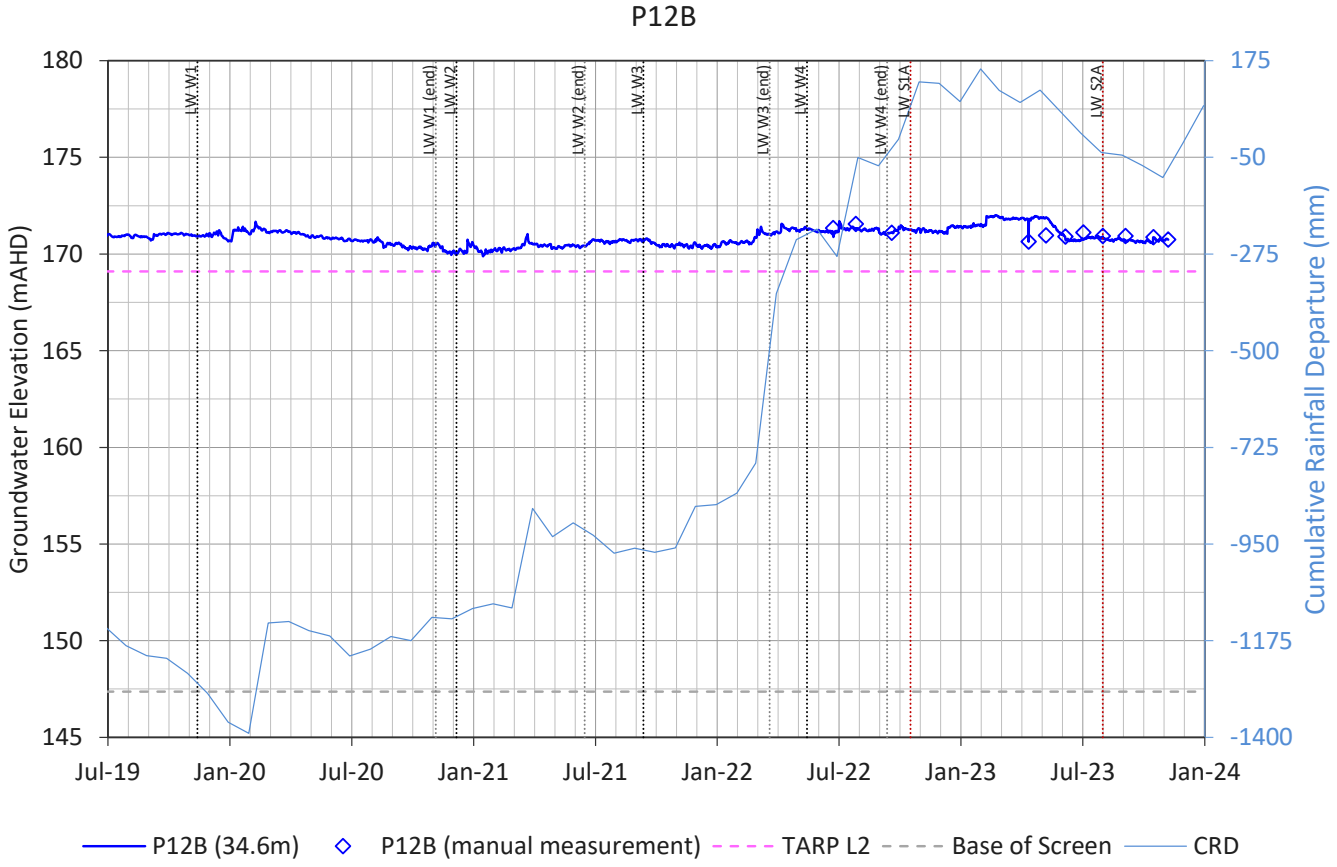
Six - Monthly Groundwater Reporting: July – December 2023

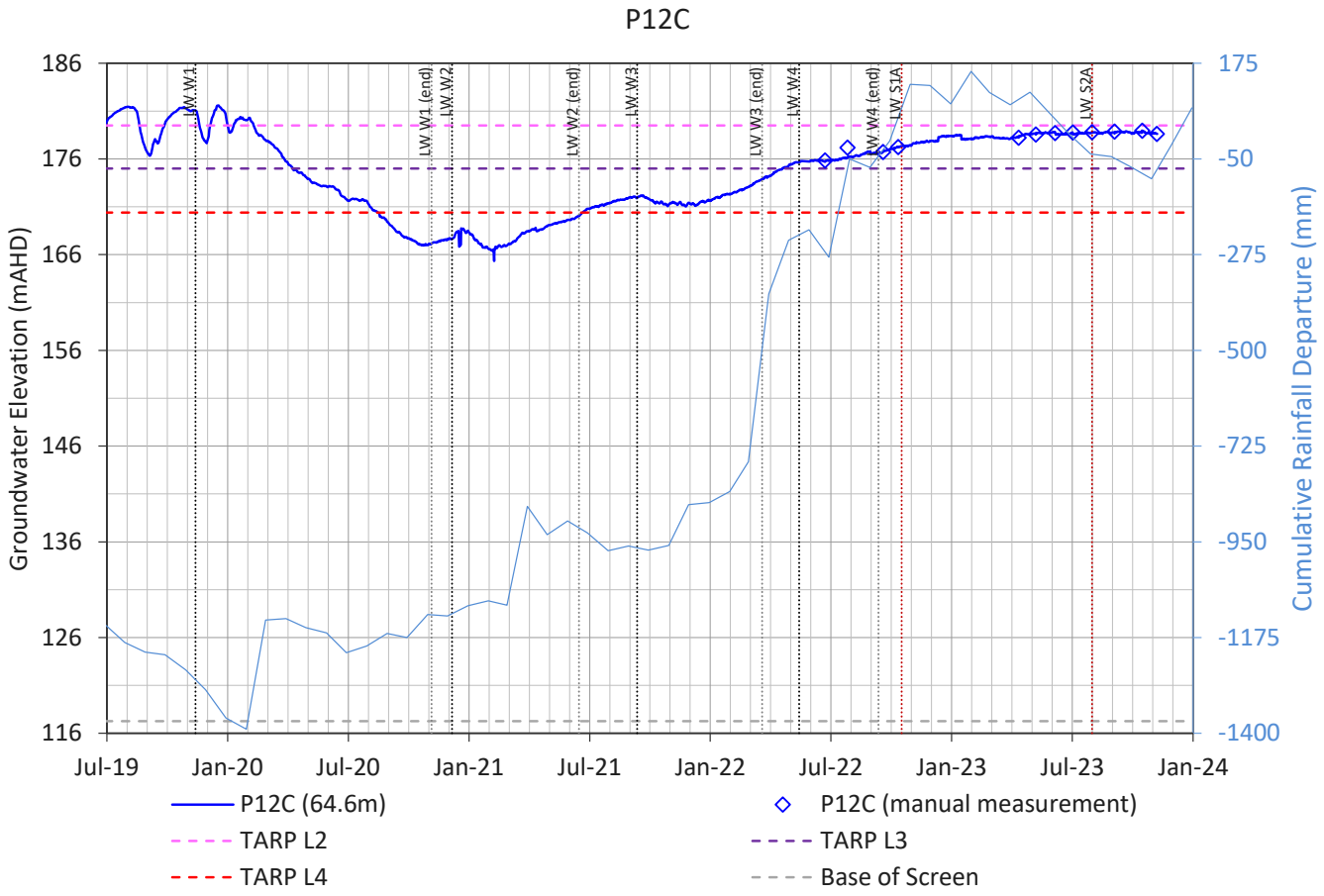
Tahmoor Western Domain

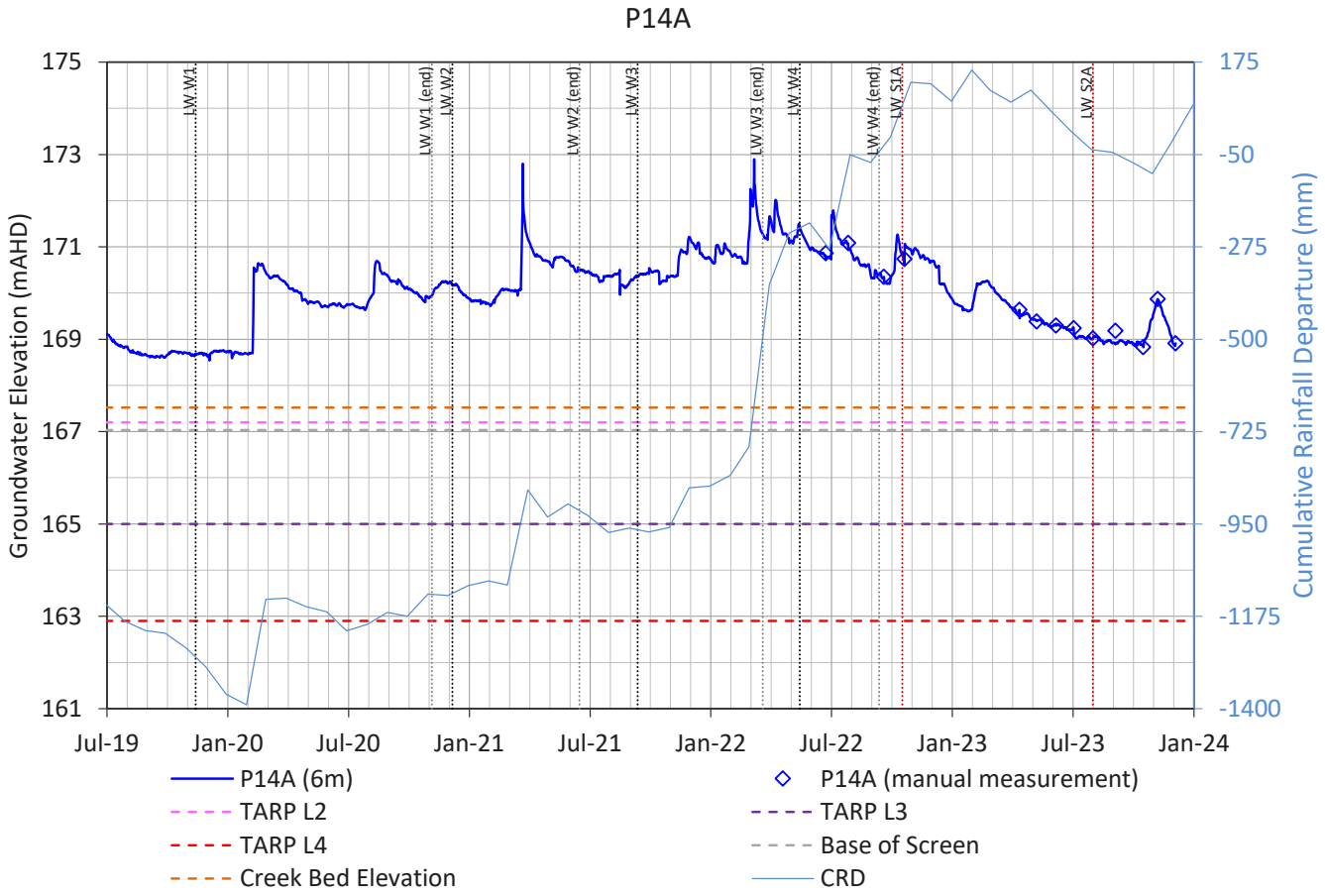
Tahmoor Coal Pty Ltd

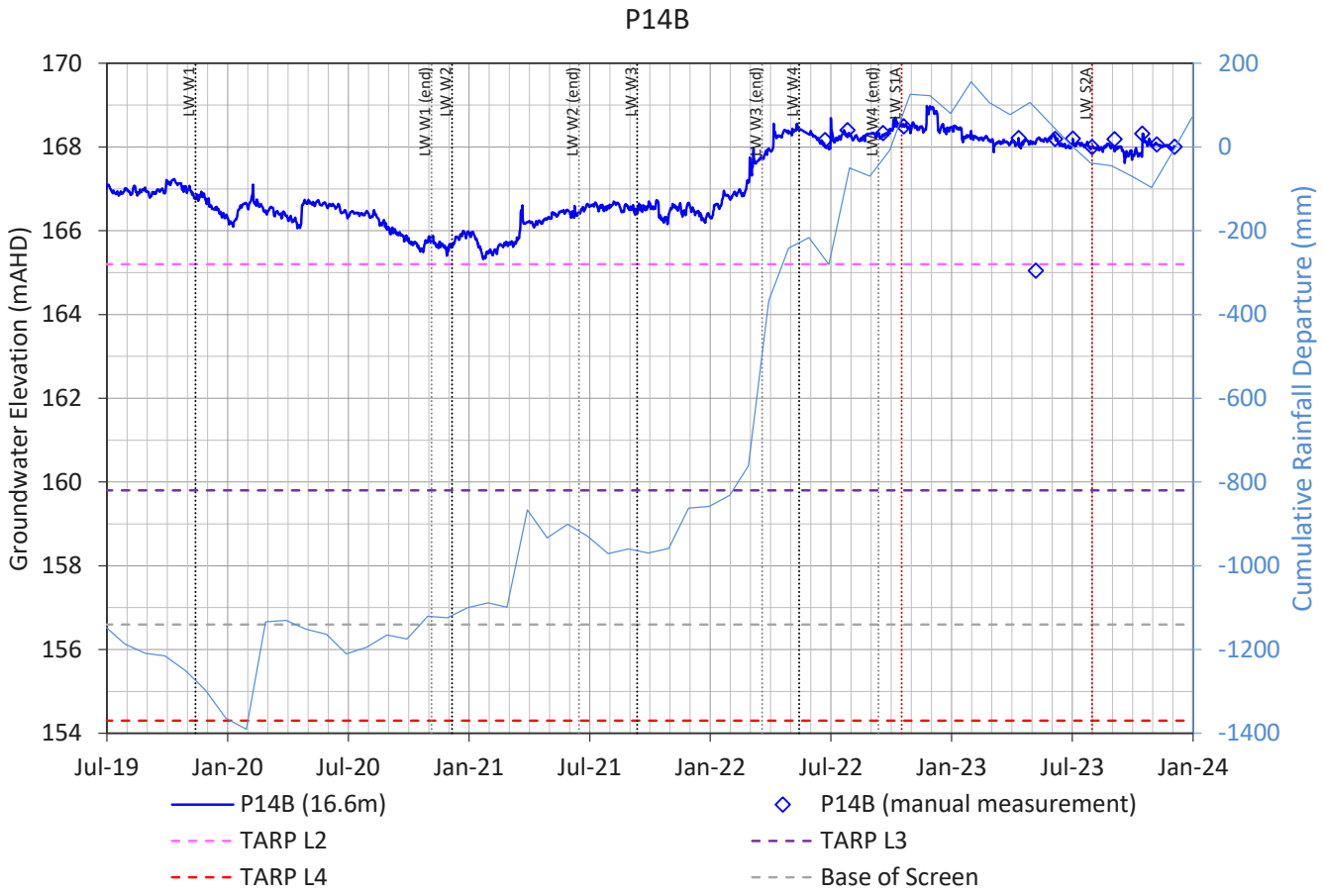
SLR Project No.: 640.030985.00001

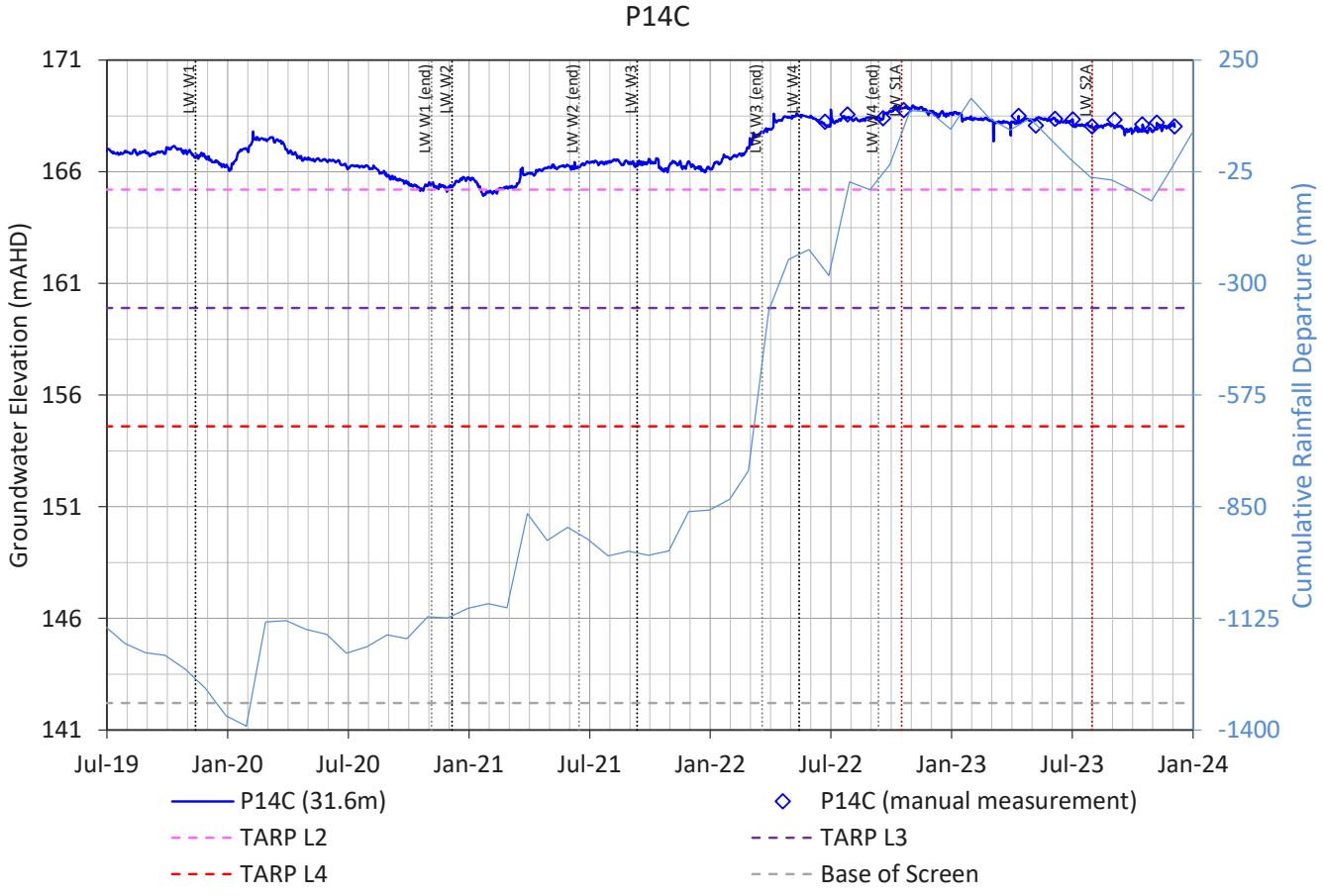

P12A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
174
172
170
168
166
164
162
160
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A (19.6m)
P12A (manual measurement)
TARP L2
Base of Screen
Creek Bed Elevation
CRD

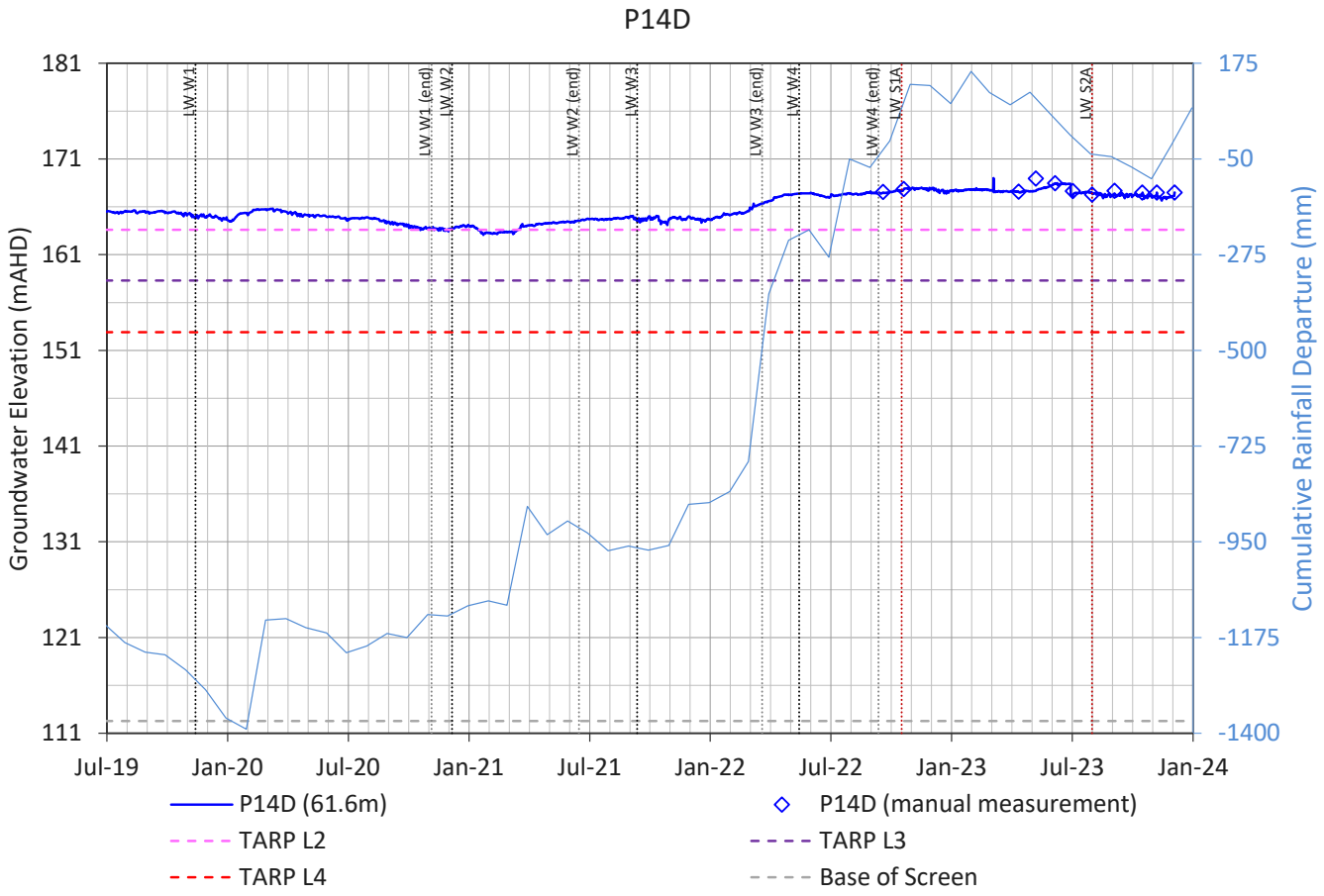

P12B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
180
175
170
165
160
155
150
145
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B (34.6m)
P12B (manual measurement)
TARP L2
Base of Screen
CRD

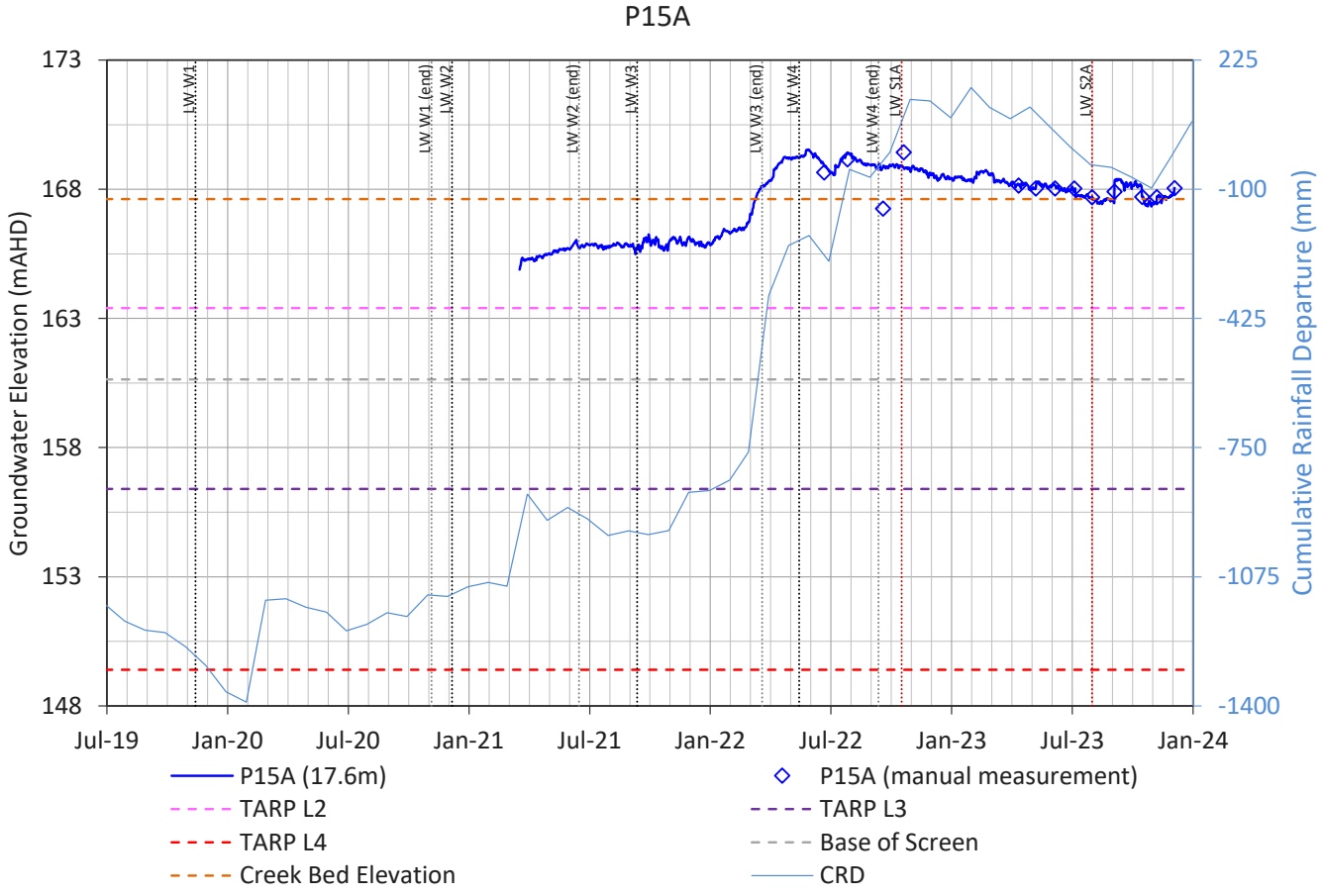

P12C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
186
176
166
156
146
136
126
116
175
-50
-275
-500
-725
-950
-1175
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
P12C (64.6m)
P12C (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

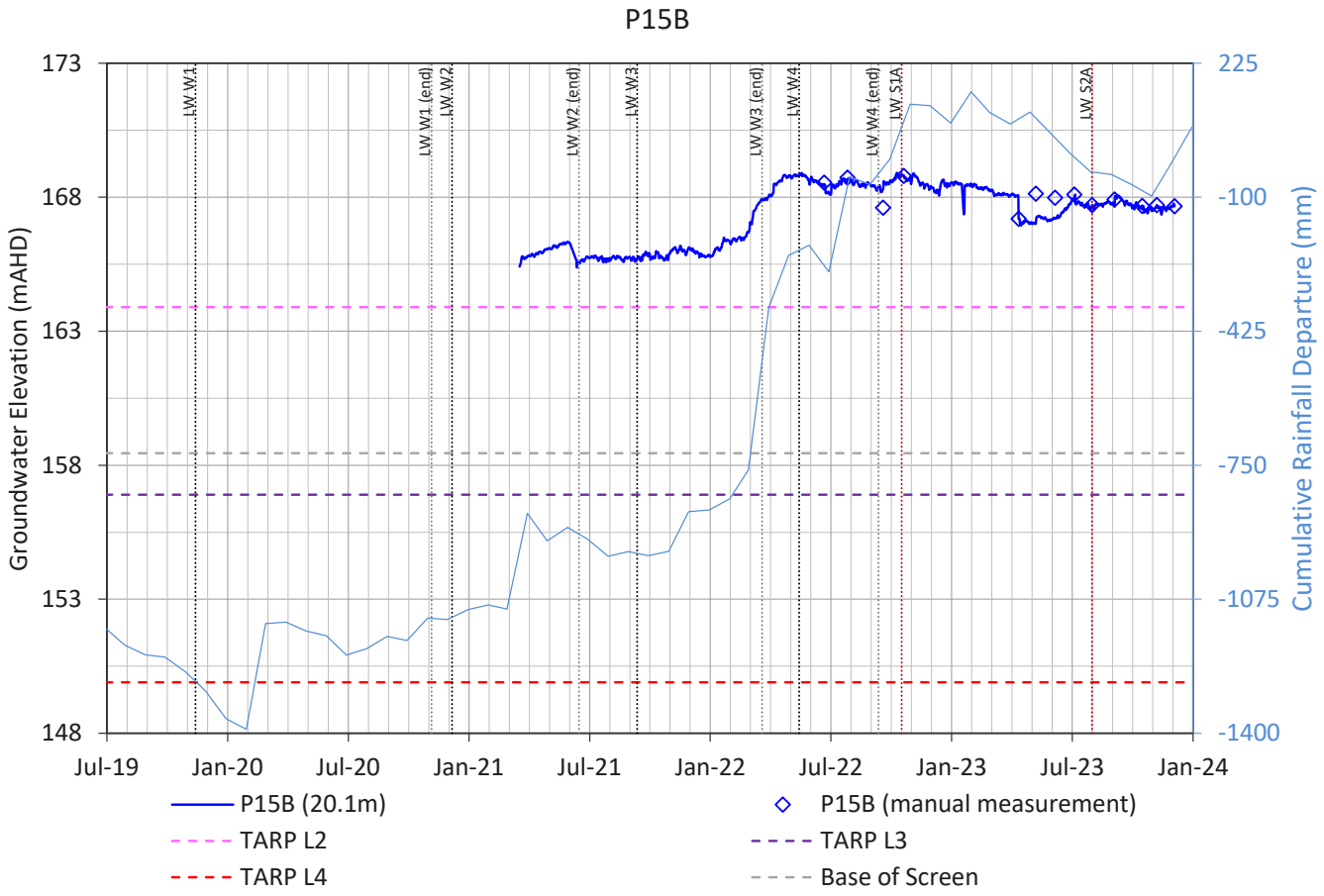

P14A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
175
173
171
169
167
165
163
161
175
-50
-275
-500
-725
-950
-1175
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
P14A (6m)
P14A (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen
Creek Bed Elevation
CRD

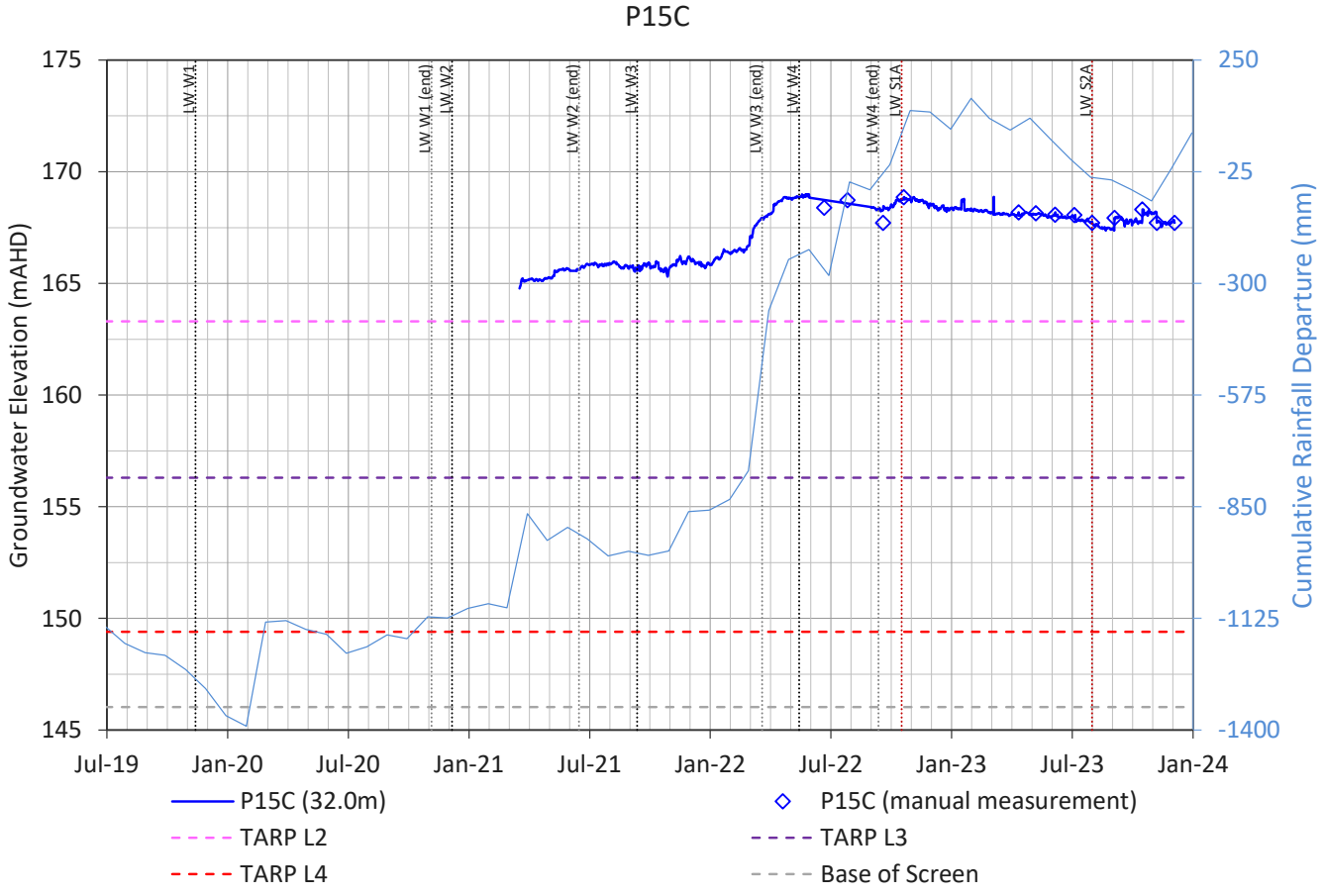

P14B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
170
168
166
164
162
160
158
156
154
200
0
-200
-400
-600
-800
-1000
-1200
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B (16.6m)
P14B (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

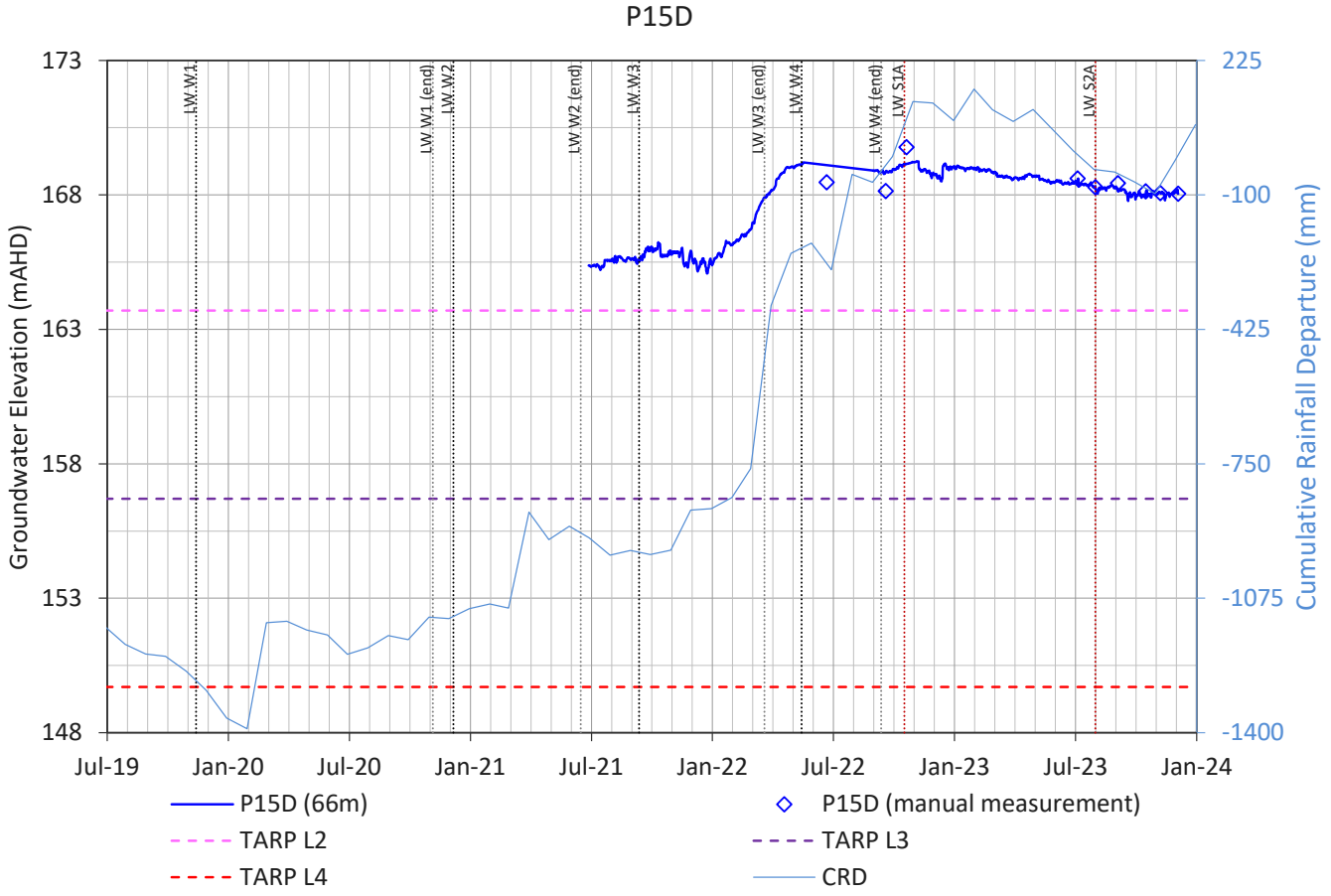

P14C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
171
166
161
156
151
146
141
250
-25
-300
-575
-850
-1125
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C (31.6m)
P14C (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

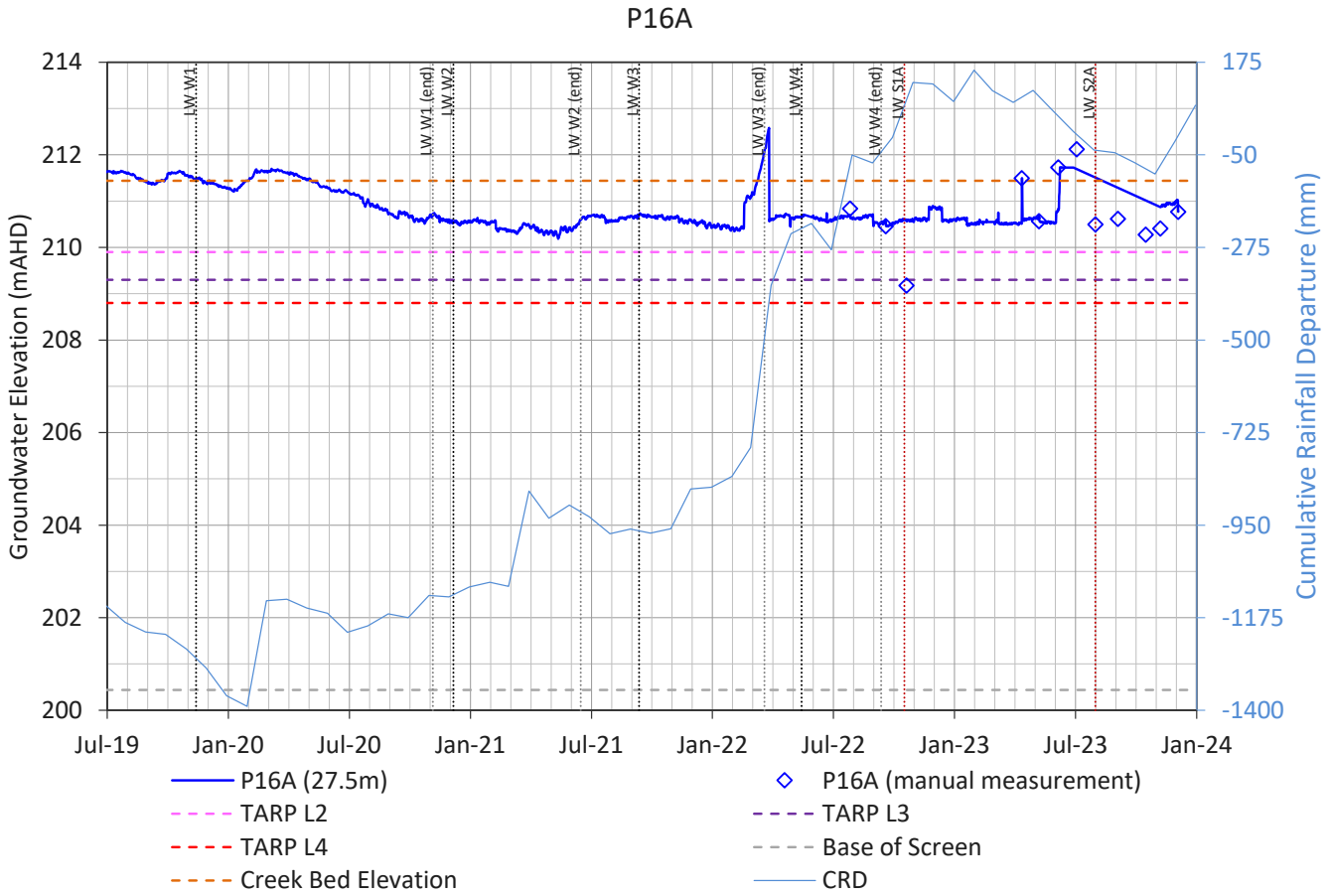

P14D
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
181
171
161
151
141
131
121
111
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D (61.6m)
P14D (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

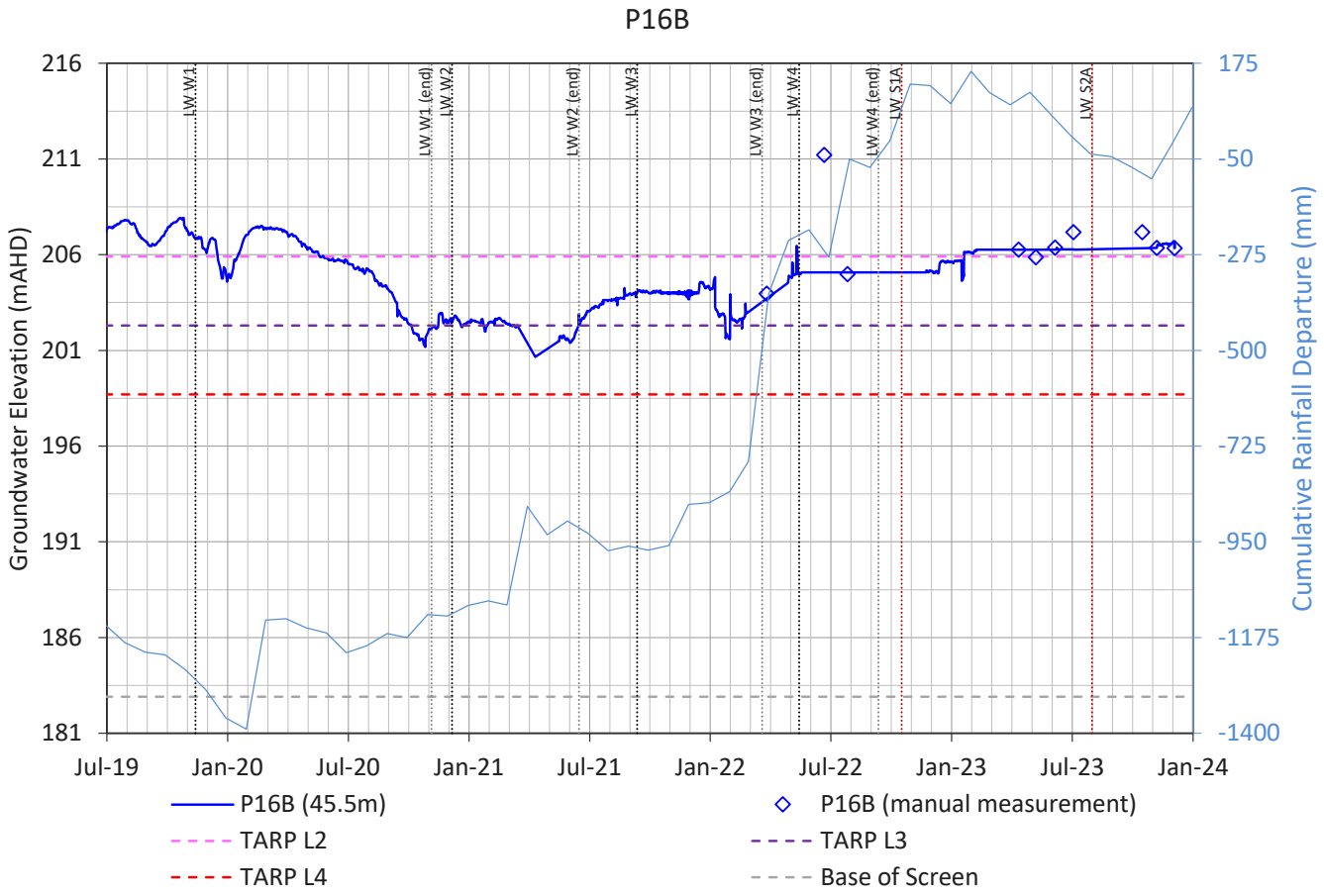

P15A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
173
168
163
158
153
148
225
-100
-425
-750
-1075
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A (17.6m)
P15A (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen
Creek Bed Elevation
CRD

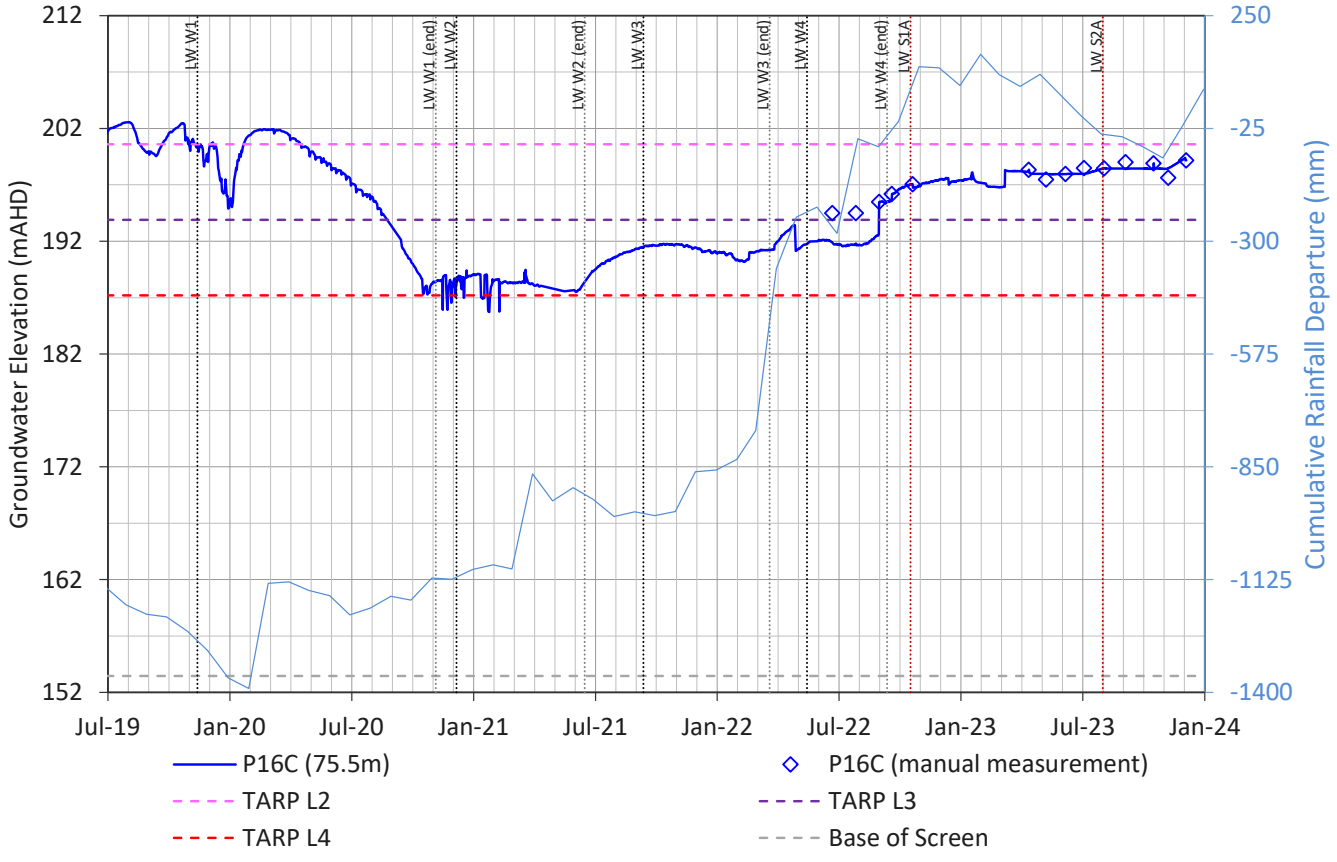

P15B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
173
168
163
158
153
148
225
-100
-425
-750
-1075
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B (20.1m)
P15B (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

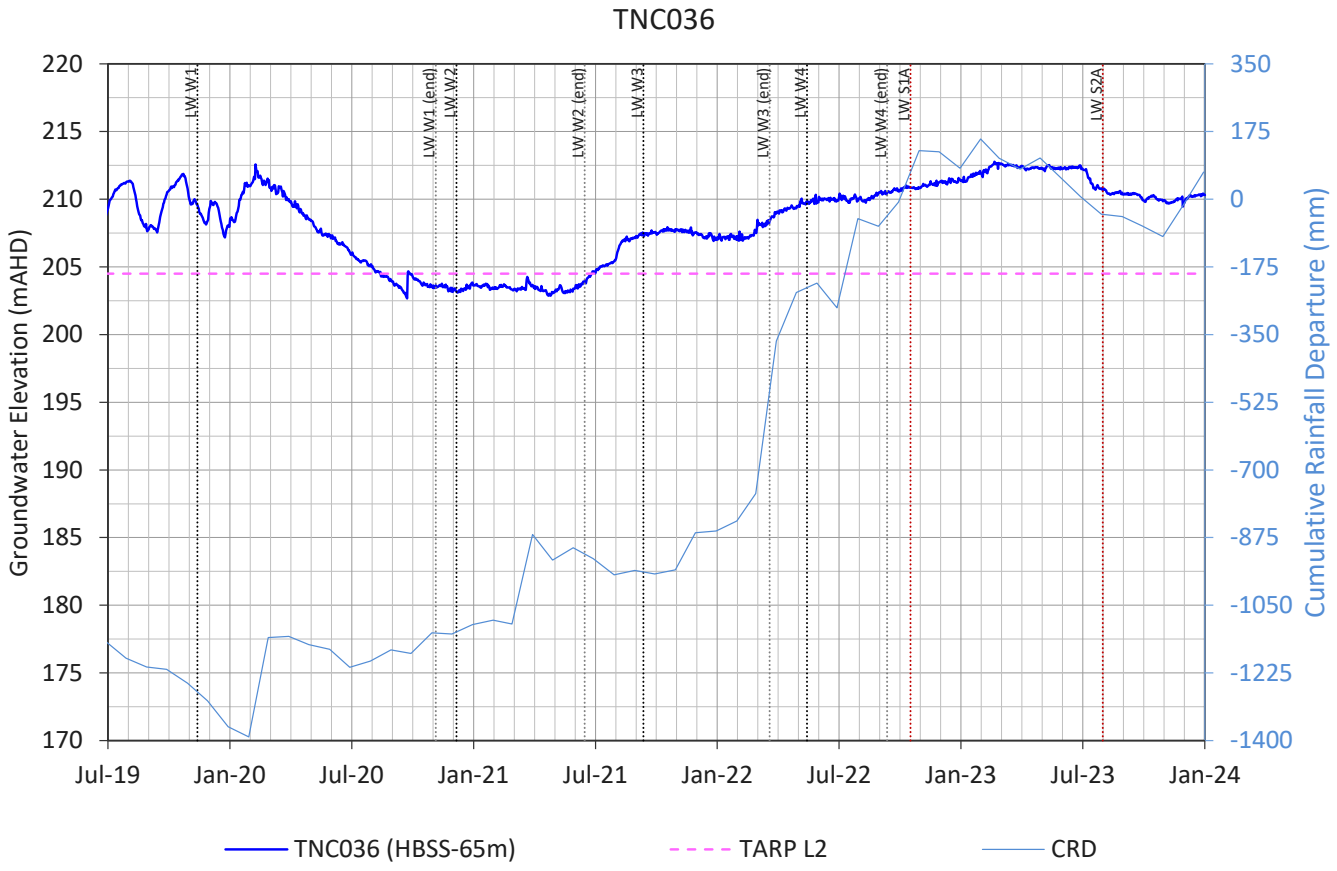

P15C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
175
170
165
160
155
150
145
250
-25
-300
-575
-850
-1125
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C (32.0m)
P15C (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

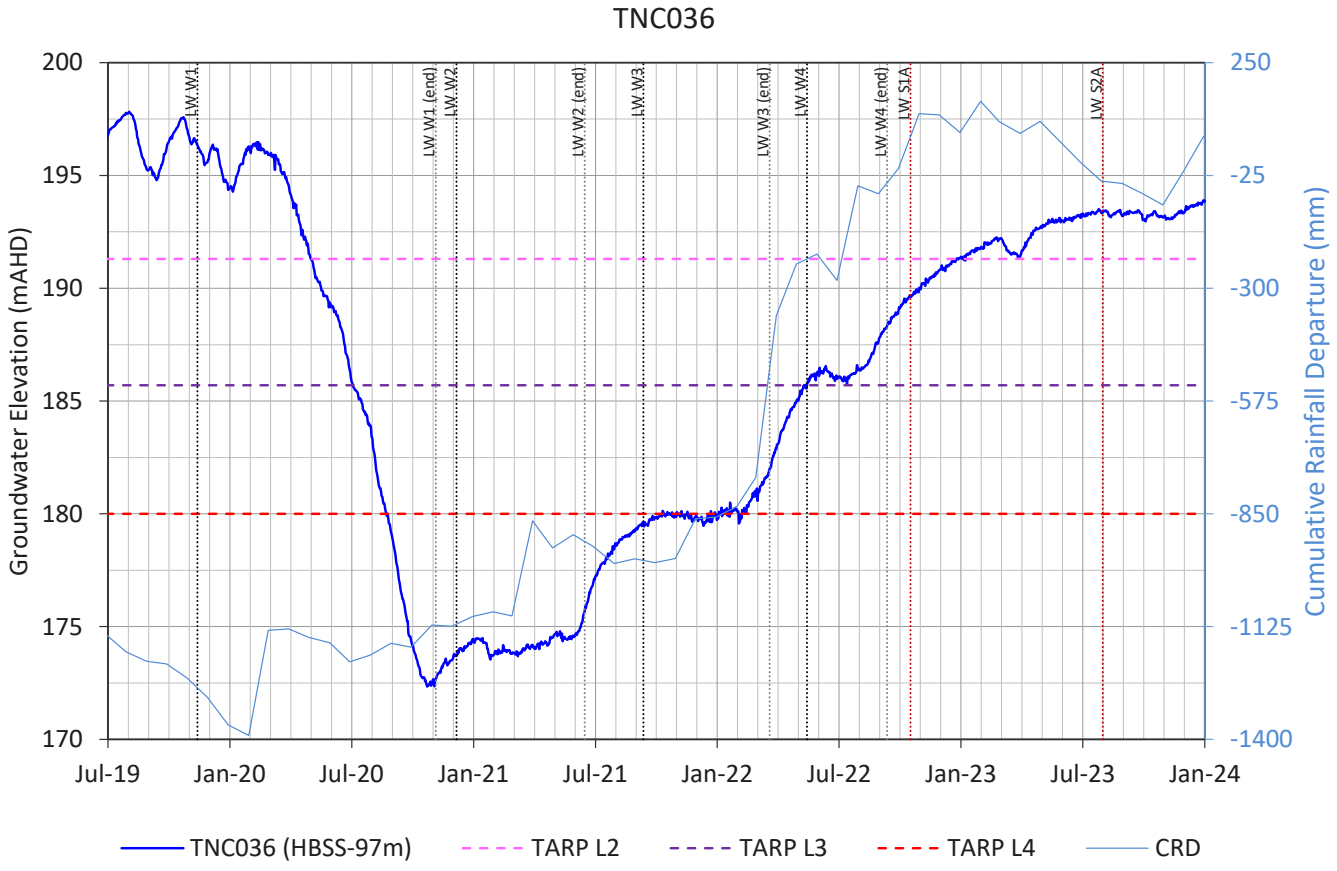

P15D
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
173
168
163
158
153
148
225
-100
-425
-750
-1075
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P15D (66m)
P15D (manual measurement)
TARP L2
TARP L3
TARP L4
CRD

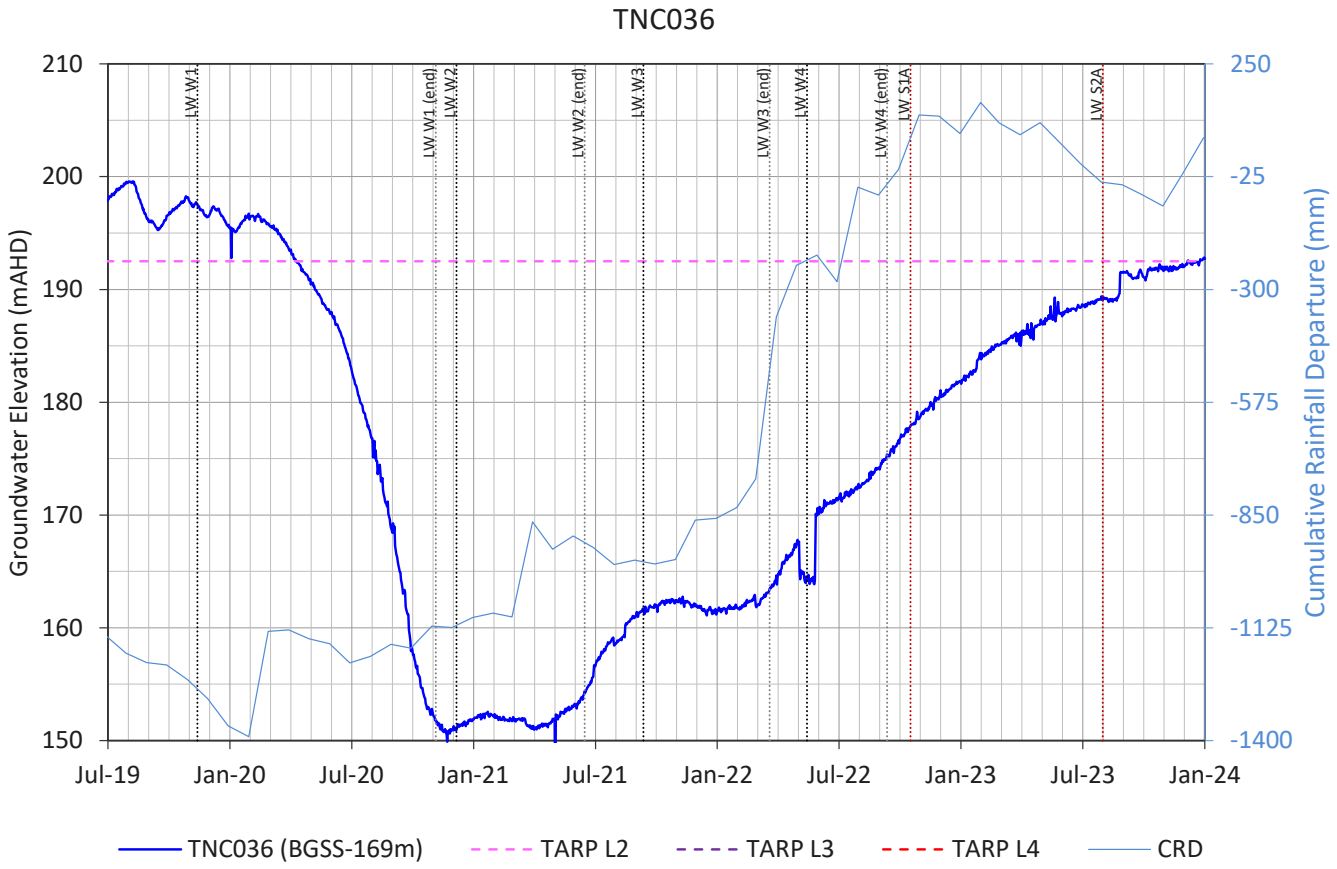

P16A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
214
212
210
208
206
204
202
200
175
-50
-275
-500
-725
-950
-1175
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P16A (27.5m)
P16A (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen
Creek Bed Elevation
CRD

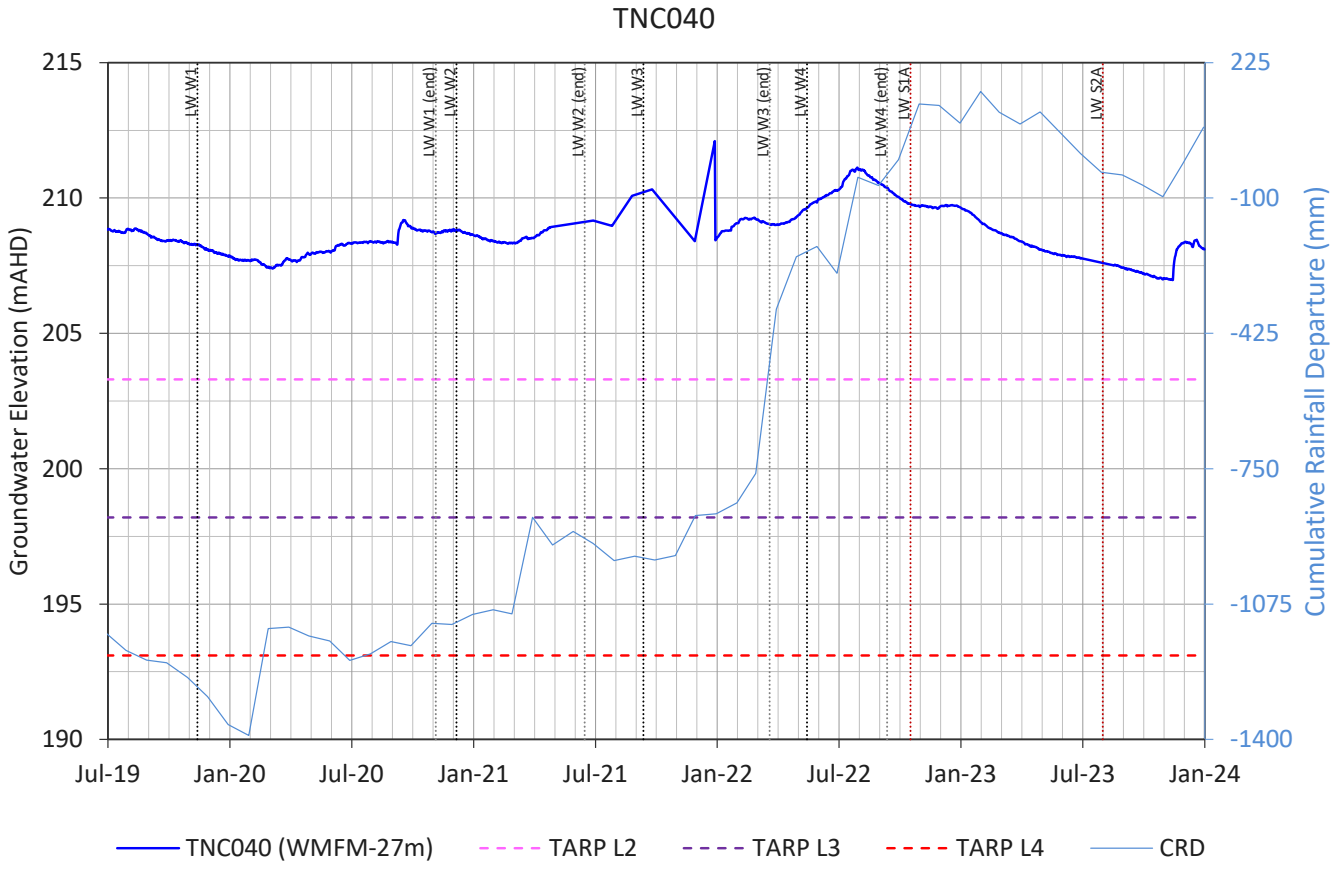

P16B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
216
211
206
201
196
191
186
181
175
-50
-275
-500
-725
-950
-1175
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A
LW.S2A
P16B (45.5m)
P16B (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

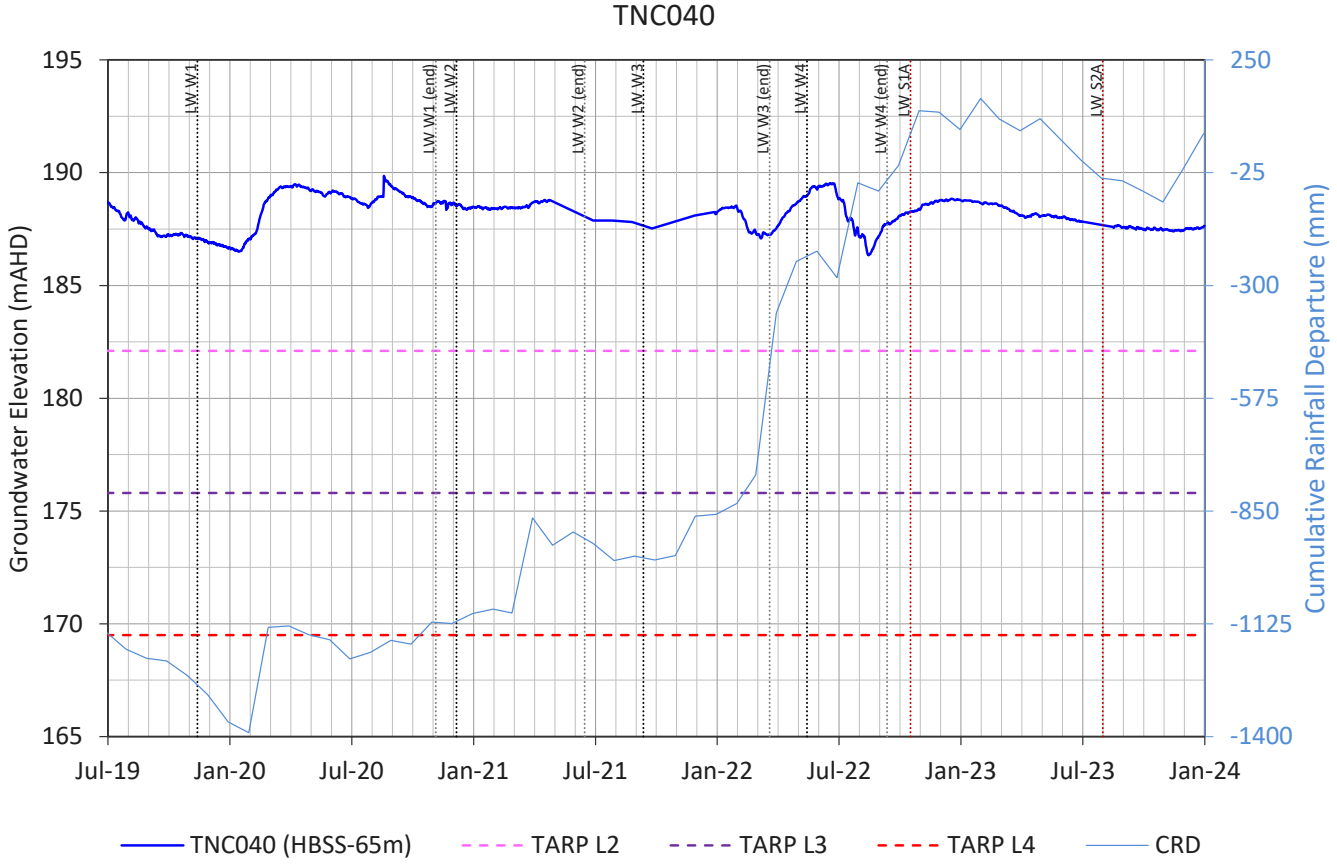

P16C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
212
202
192
182
172
162
152
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A
LW.S2A
P16C (75.5m)
P16C (manual measurement)
TARP L2
TARP L3
TARP L4
Base of Screen

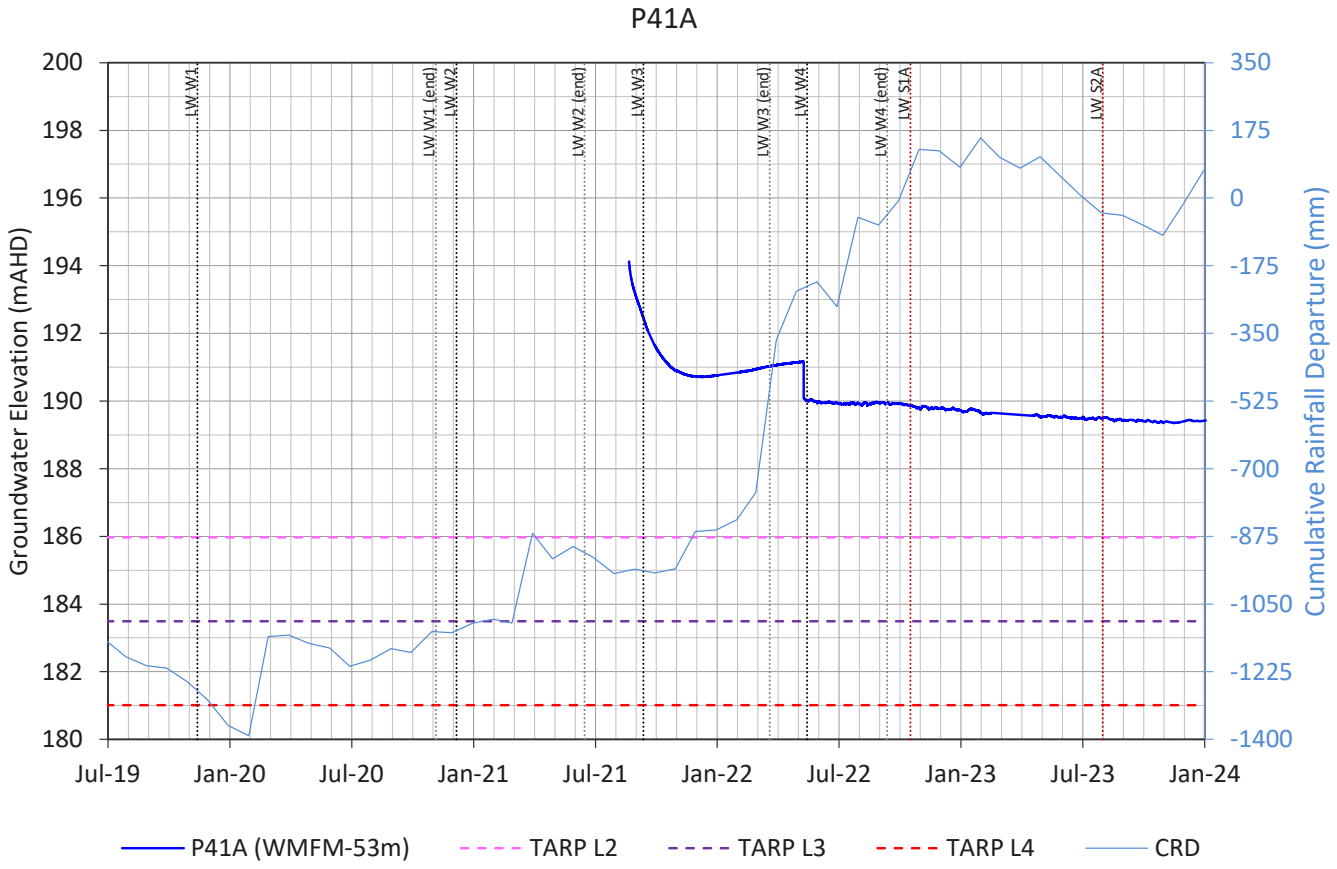

TNC036
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
220
215
210
205
200
195
190
185
180
175
170
350
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TNC036 (HBSS-65m)
TARP L2
CRD

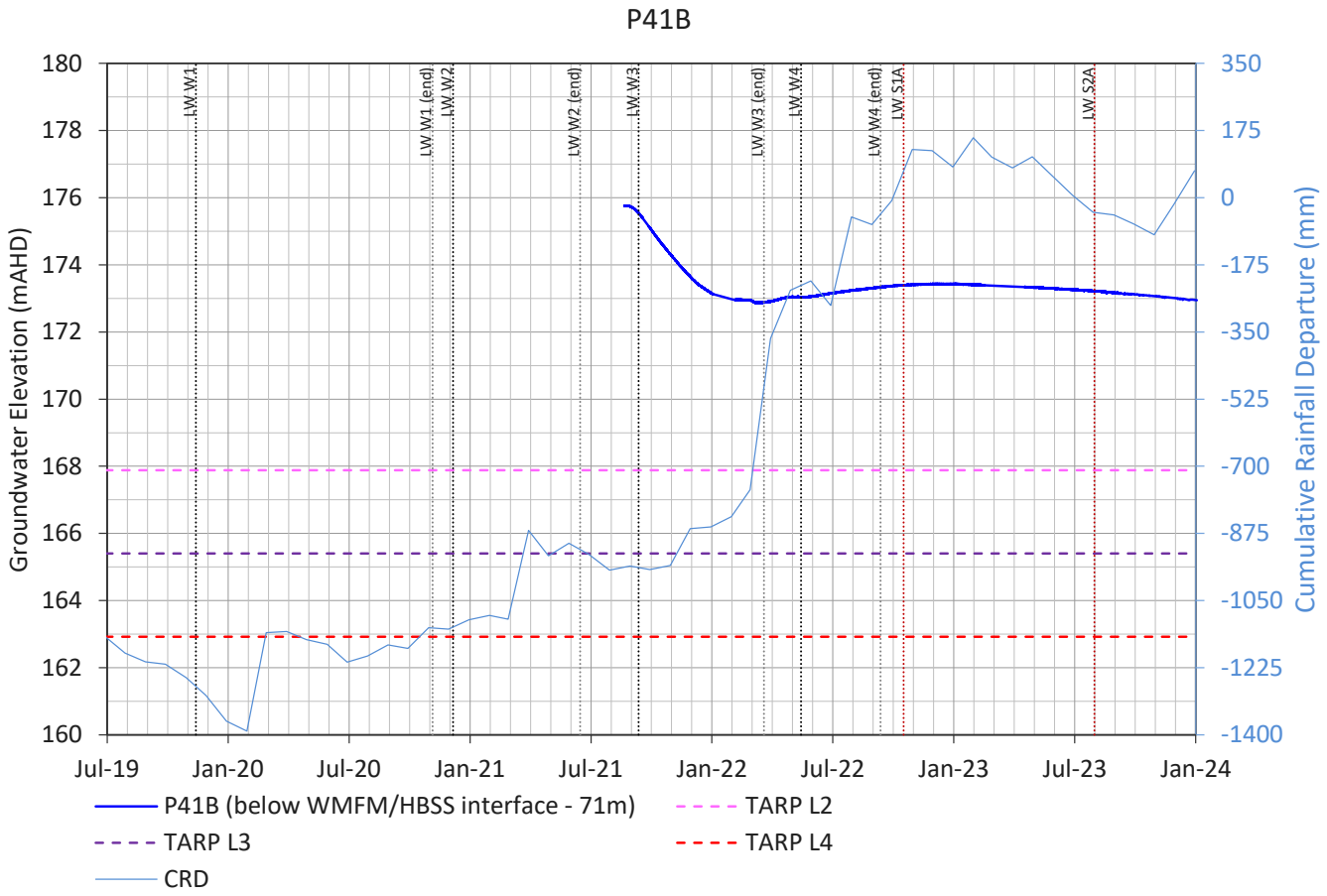

TNC036
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
200
195
190
185
180
175
170
250
-25
-300
-575
-850
-1125
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TNC036 (HBSS-97m)
TARP L2
TARP L3
TARP L4
CRD

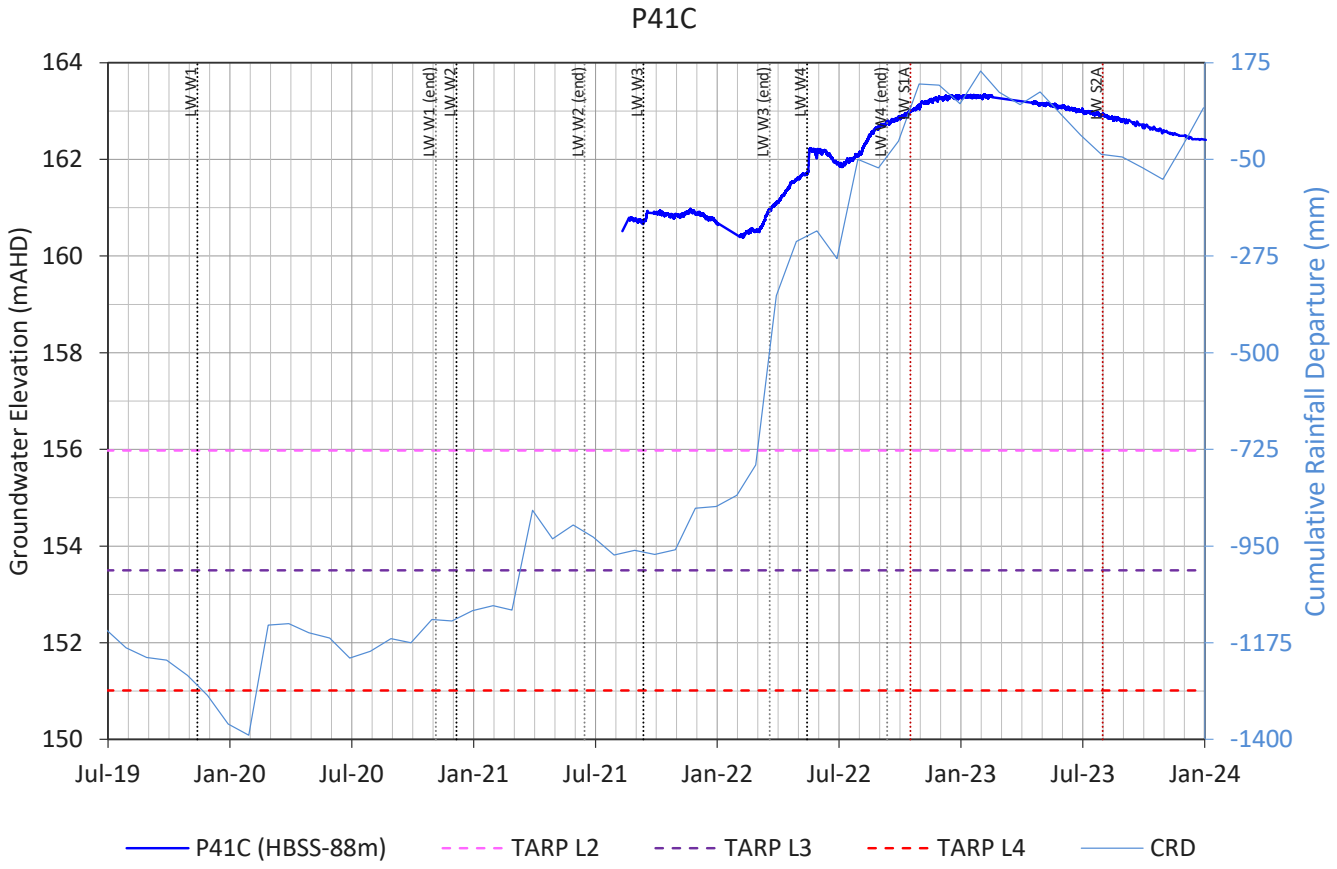

TNC036
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
210
200
190
180
170
160
150
250
-25
-300
-575
-850
-1125
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TNC036 (BGSS-169m)
TARP L2
TARP L3
TARP L4
CRD

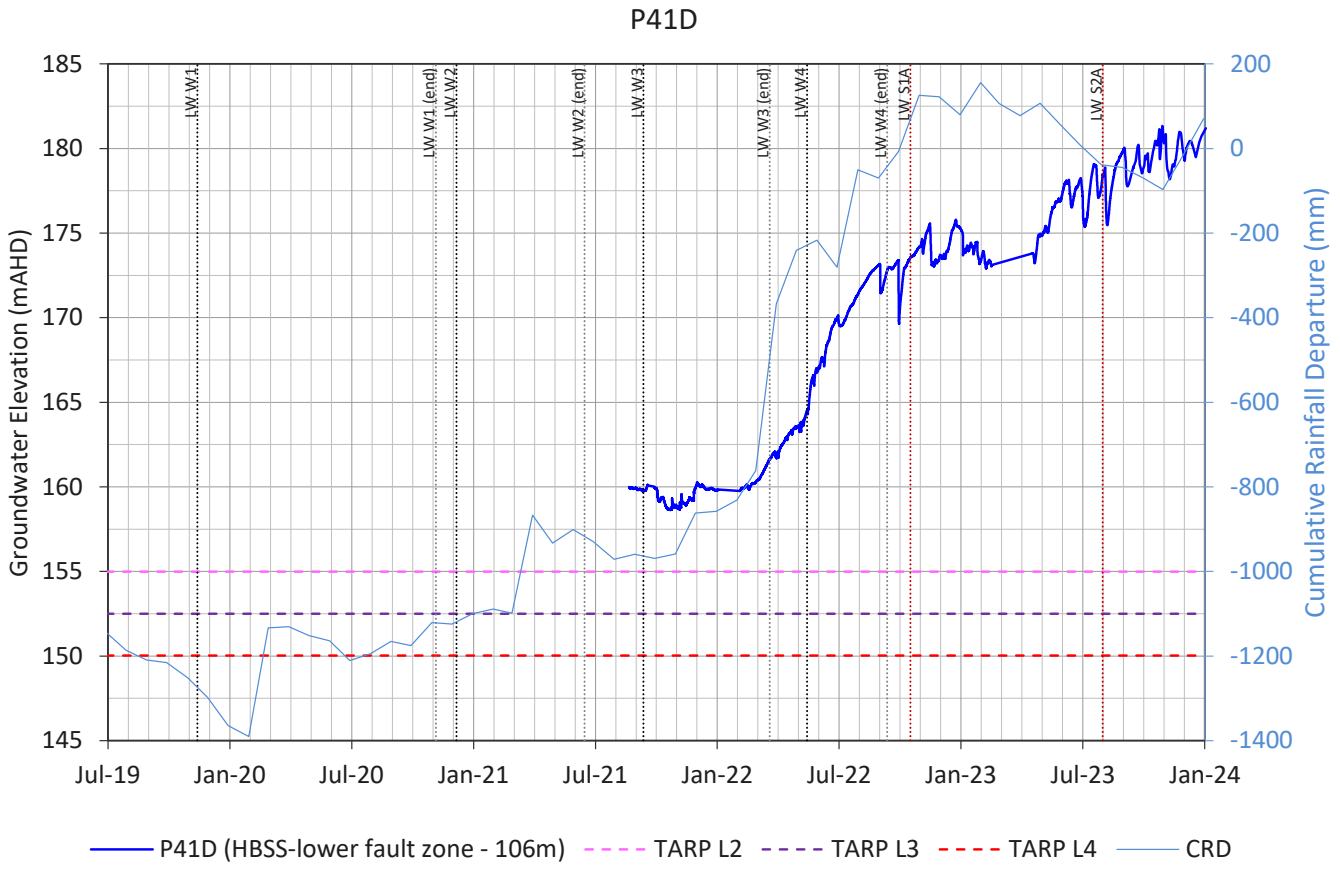

TNC040
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
215
210
205
200
195
190
225
-100
-425
-750
-1075
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TNC040 (WMFM-27m)
TARP L2
TARP L3
TARP L4
CRD

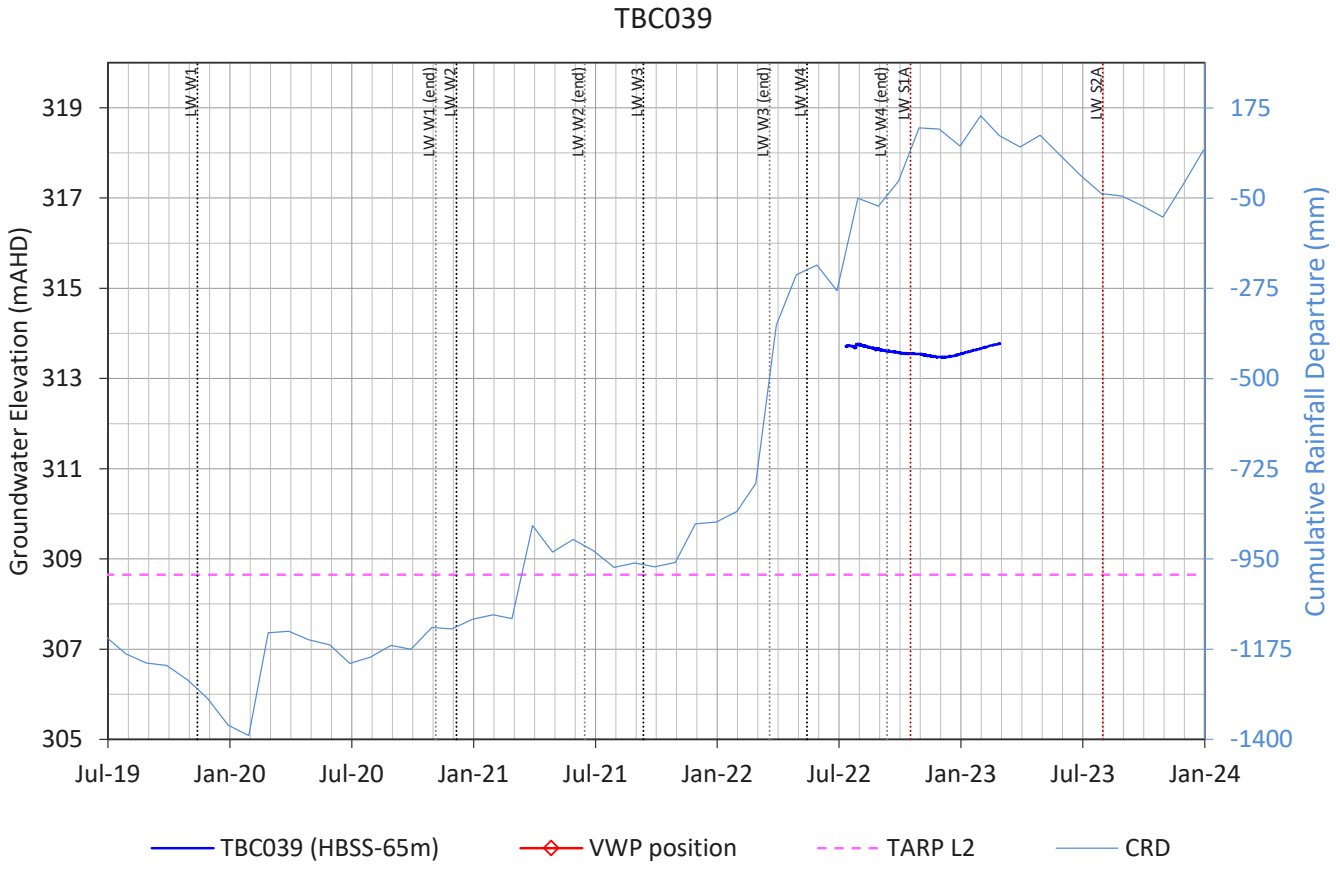

TNC040
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
195
190
185
180
175
170
165
250
-25
-300
-575
-850
-1125
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TNC040 (HBSS-65m)
TARP L2
TARP L3
TARP L4
CRD

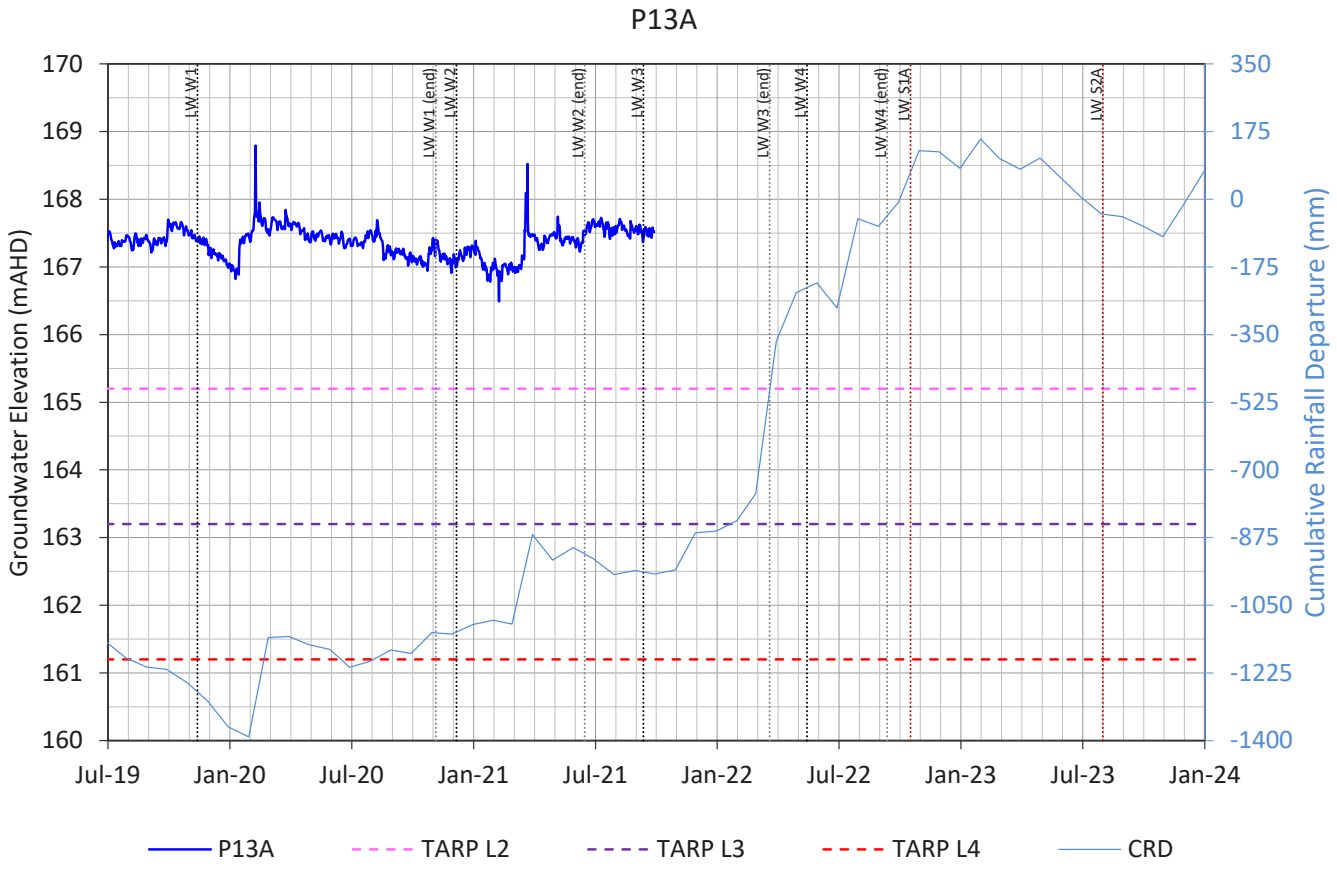

P41A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
200
198
196
194
192
190
188
186
184
182
180
350
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P41A (WMFM-53m)
TARP L2
TARP L3
TARP L4
CRD

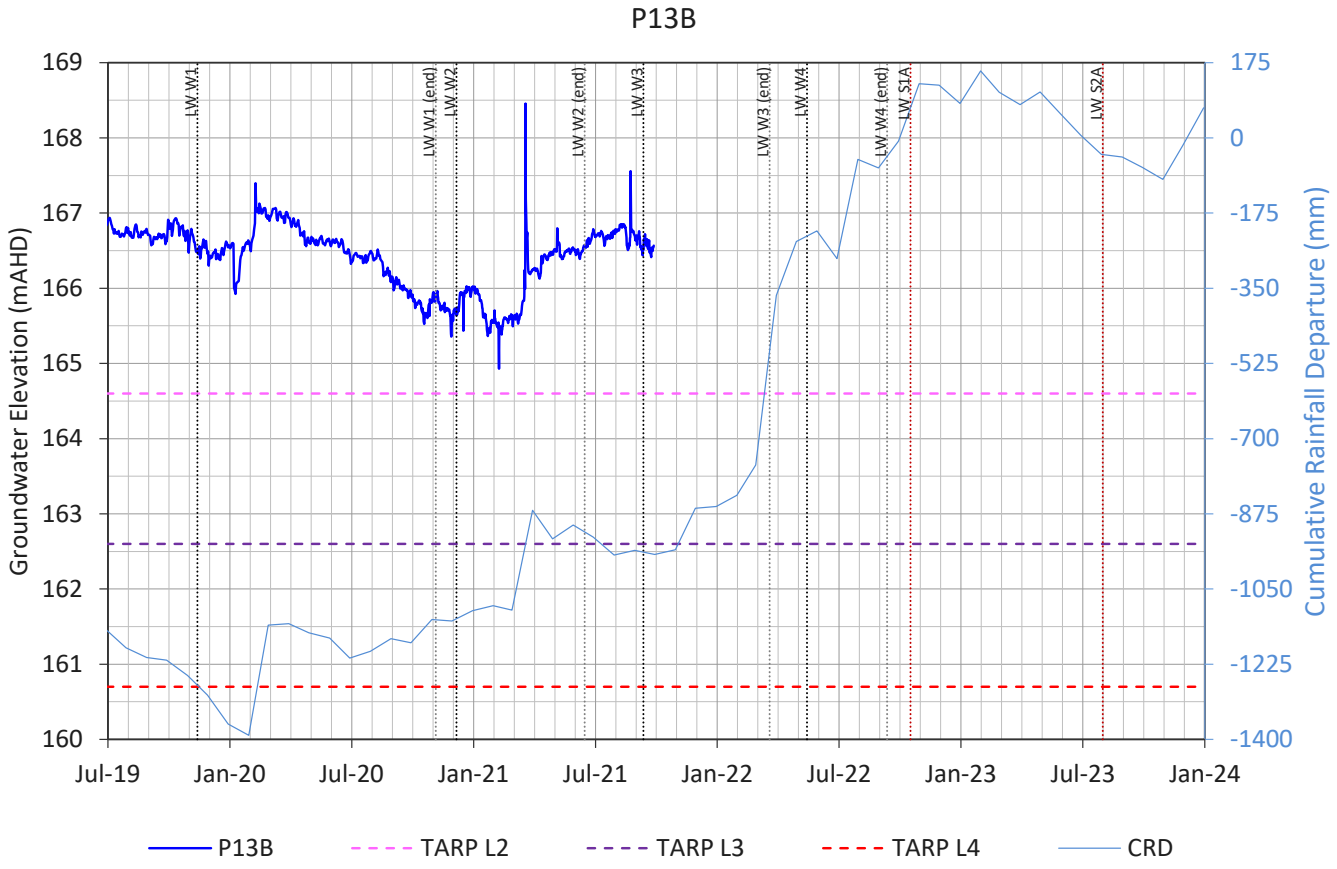

P41B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
180
178
176
174
172
170
168
166
164
162
160
350
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
LW.W1.
LW.W1 (end)
LW.W2.
LW.W2 (end)
LW.W3.
LW.W3 (end)
LW.W4.
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P41B (below WMFM/HBSS interface - 71m)
TARP L2
TARP L3
TARP L4
CRD

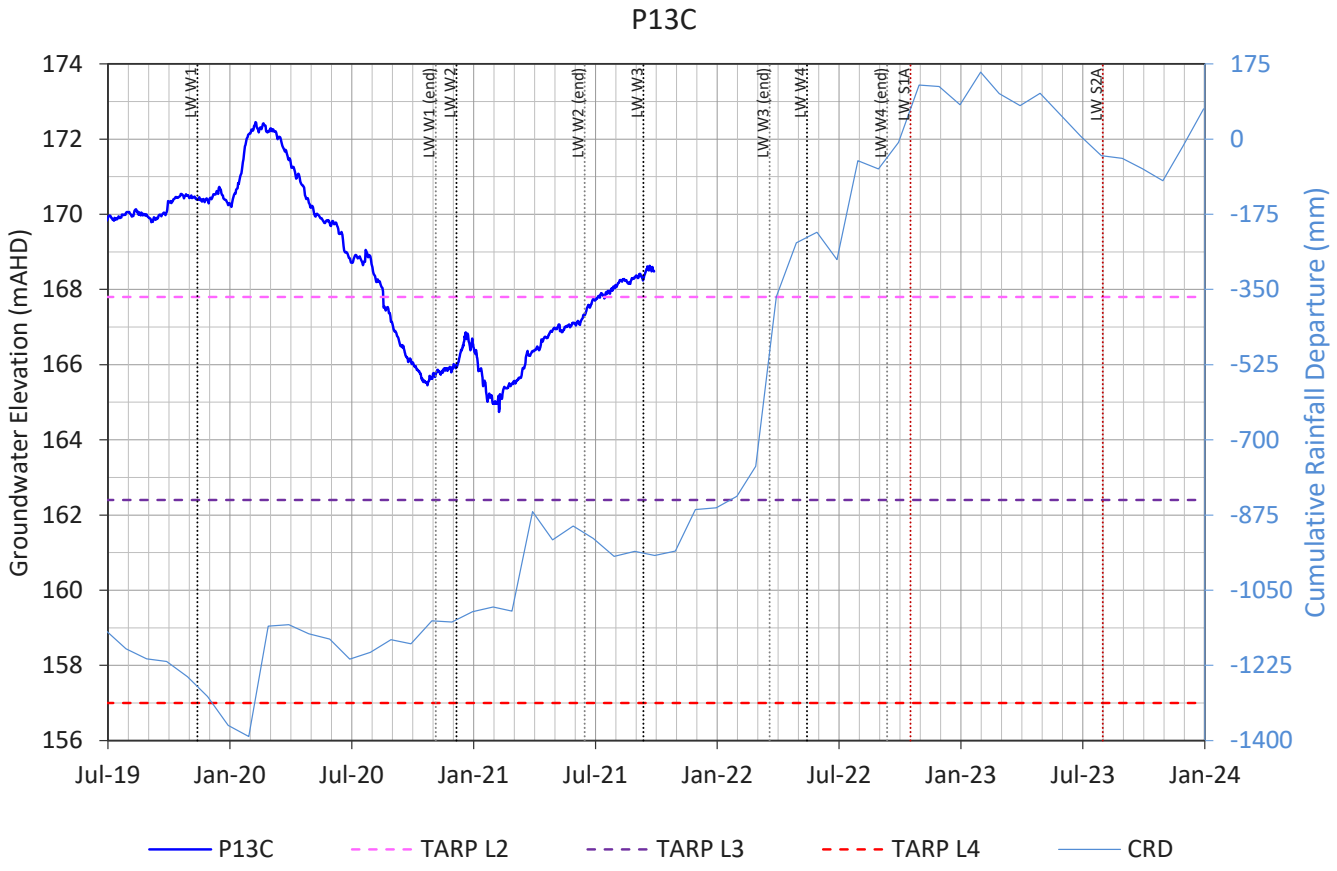

P41C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
164
162
160
158
156
154
152
150
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1.
LW.W1 (end)
LW.W2.
LW.W2 (end)
LW.W3.
LW.W3 (end)
LW.W4.
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P41C (HBSS-88m)
TARP L2
TARP L3
TARP L4
CRD

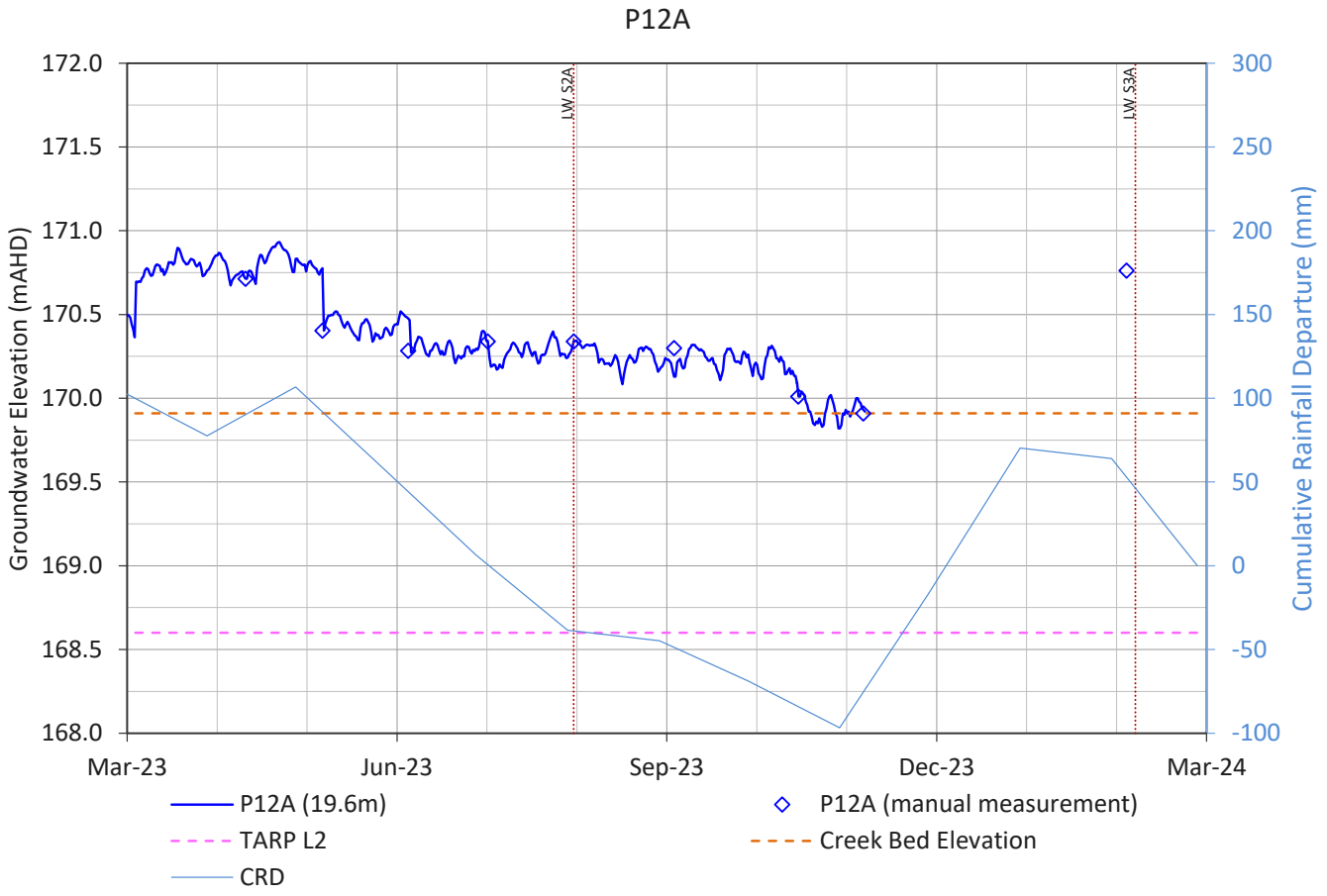

P41D
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
185
180
175
170
165
160
155
150
145
200
0
-200
-400
-600
-800
-1000
-1200
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P41D (HBSS-lower fault zone - 106m)
TARP L2
TARP L3
TARP L4
CRD

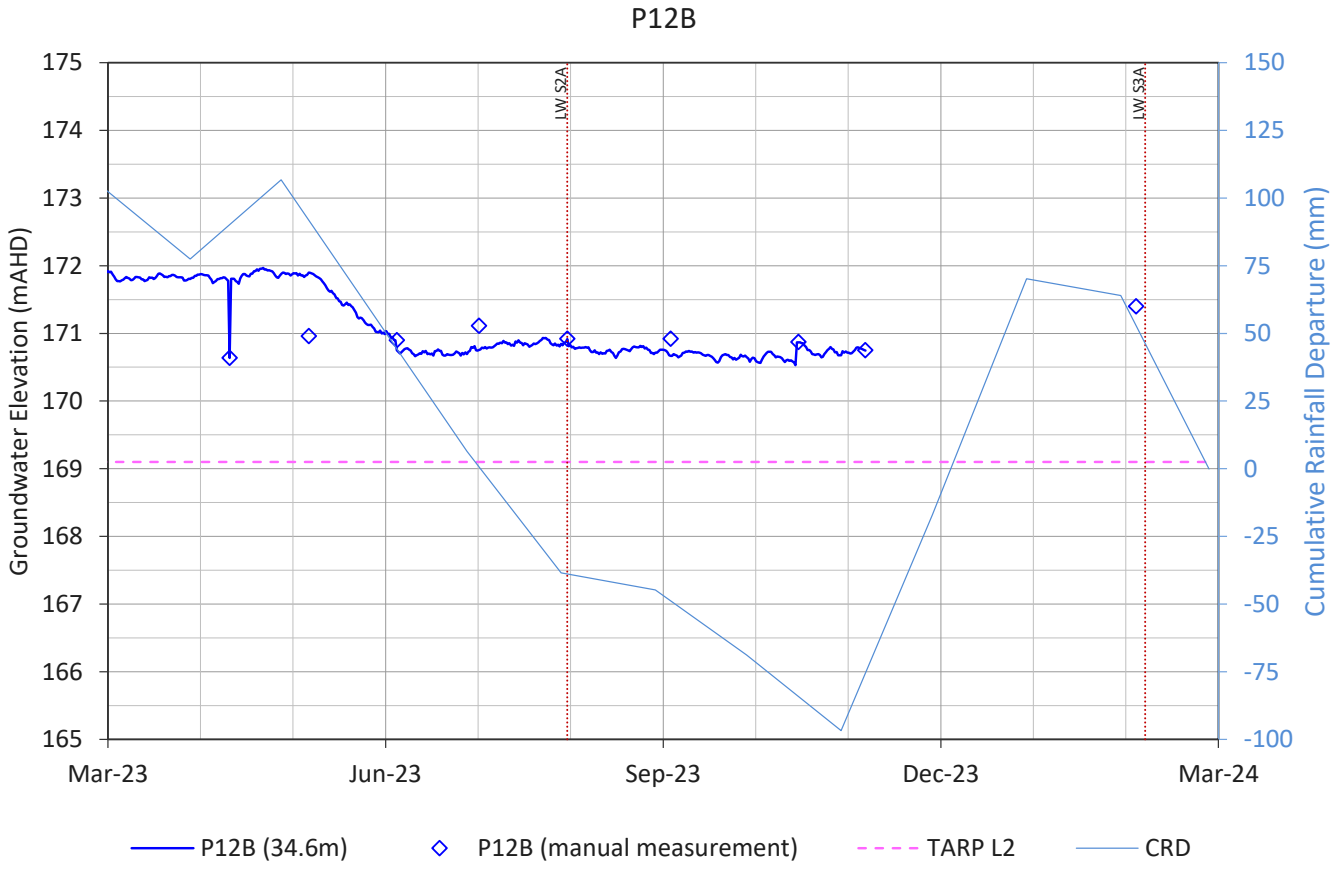

TBC039
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
319
317
315
313
311
309
307
305
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
TBC039 (HBSS-65m)
VWP position
TARP L2
CRD

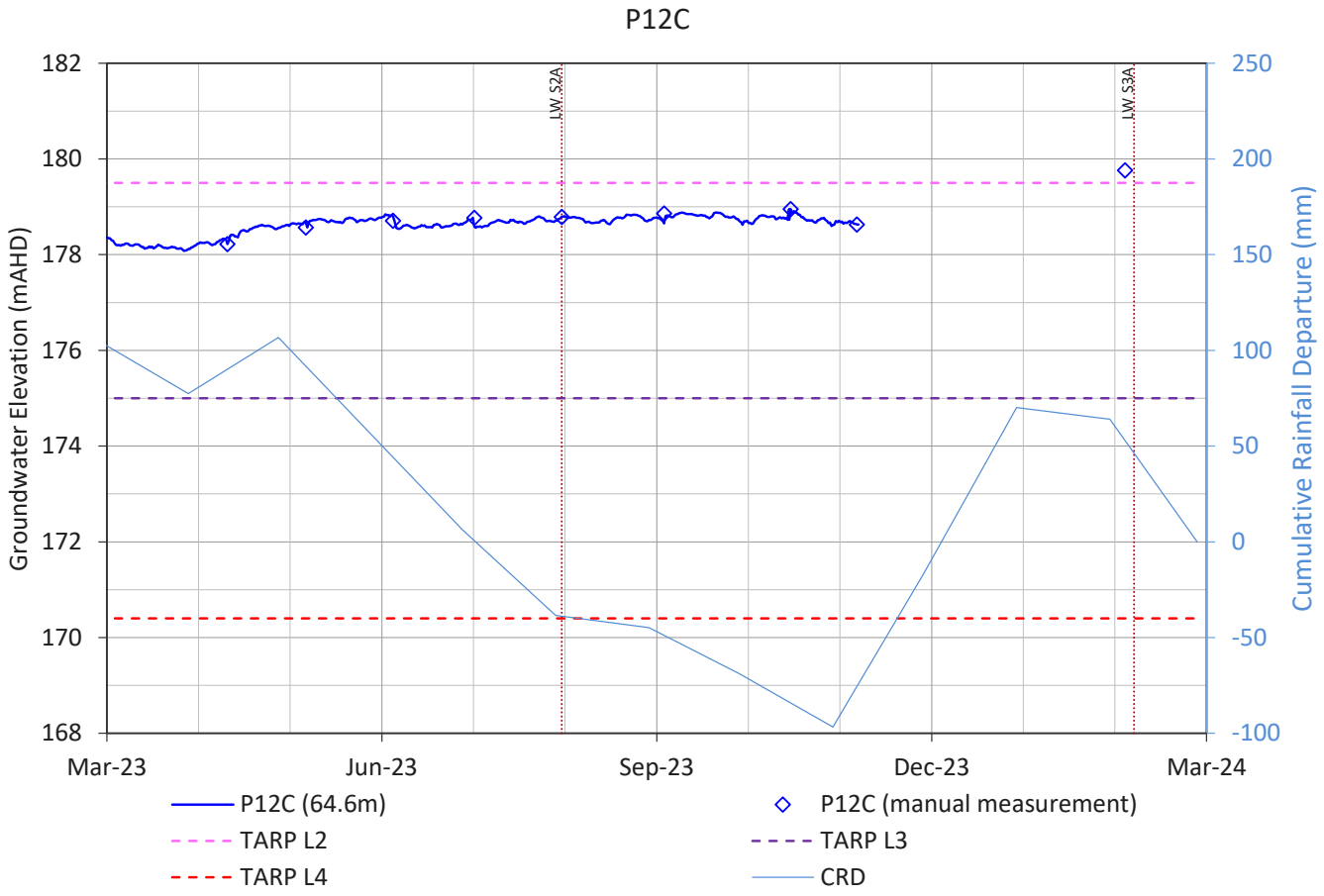

P13A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
170
169
168
167
166
165
164
163
162
161
160
350
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P13A
TARP L2
TARP L3
TARP L4
CRD

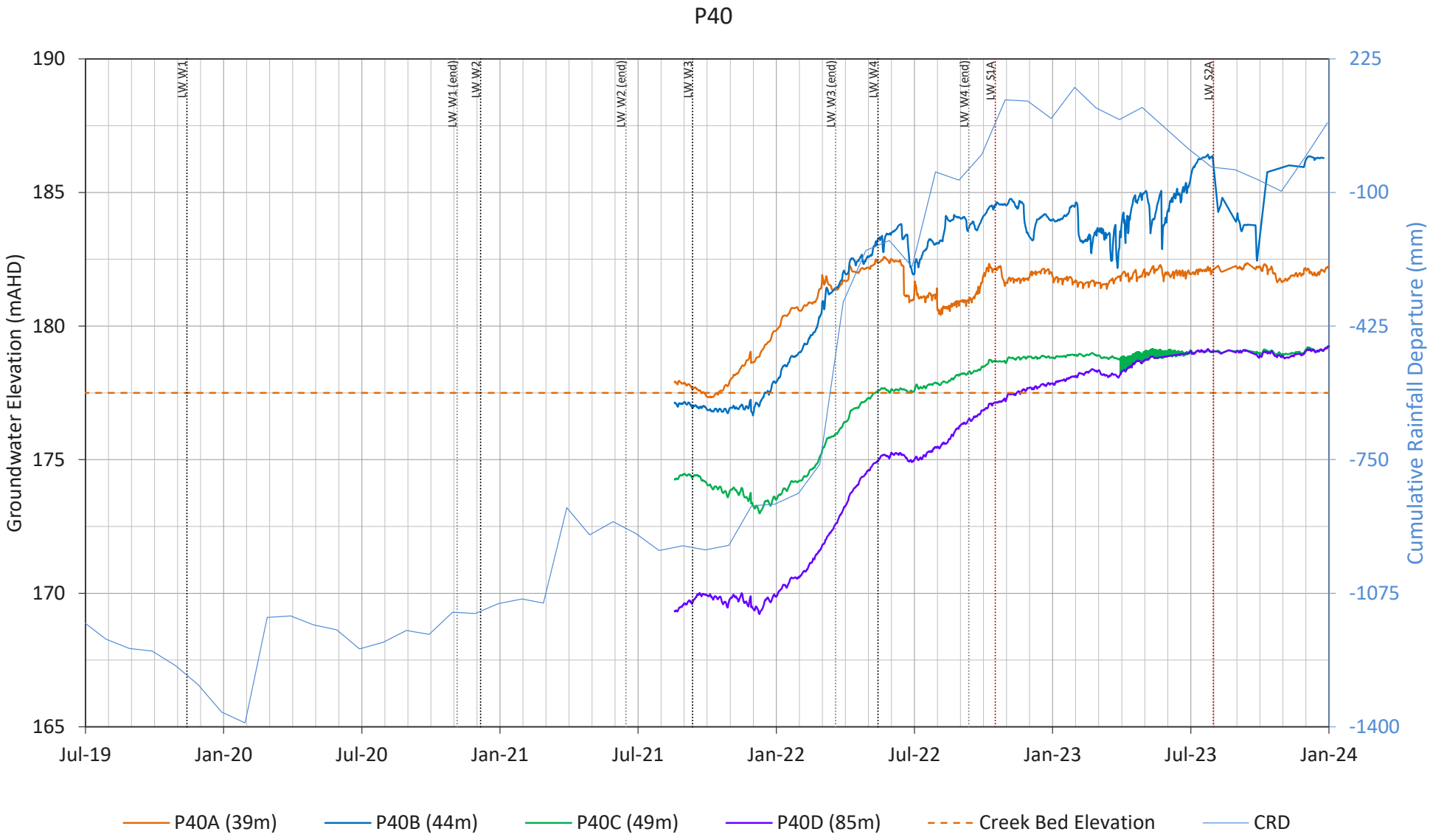

P13B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
169
168
167
166
165
164
163
162
161
160
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
LW.W1.
LW.W1.(end)
LW.W2.
LW.W2.(end)
LW.W3.
LW.W3.(end)
LW.W4.
LW.W4.(end)
LW.S1A.
LW.S2A.
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P13B
TARP L2
TARP L3
TARP L4
CRD

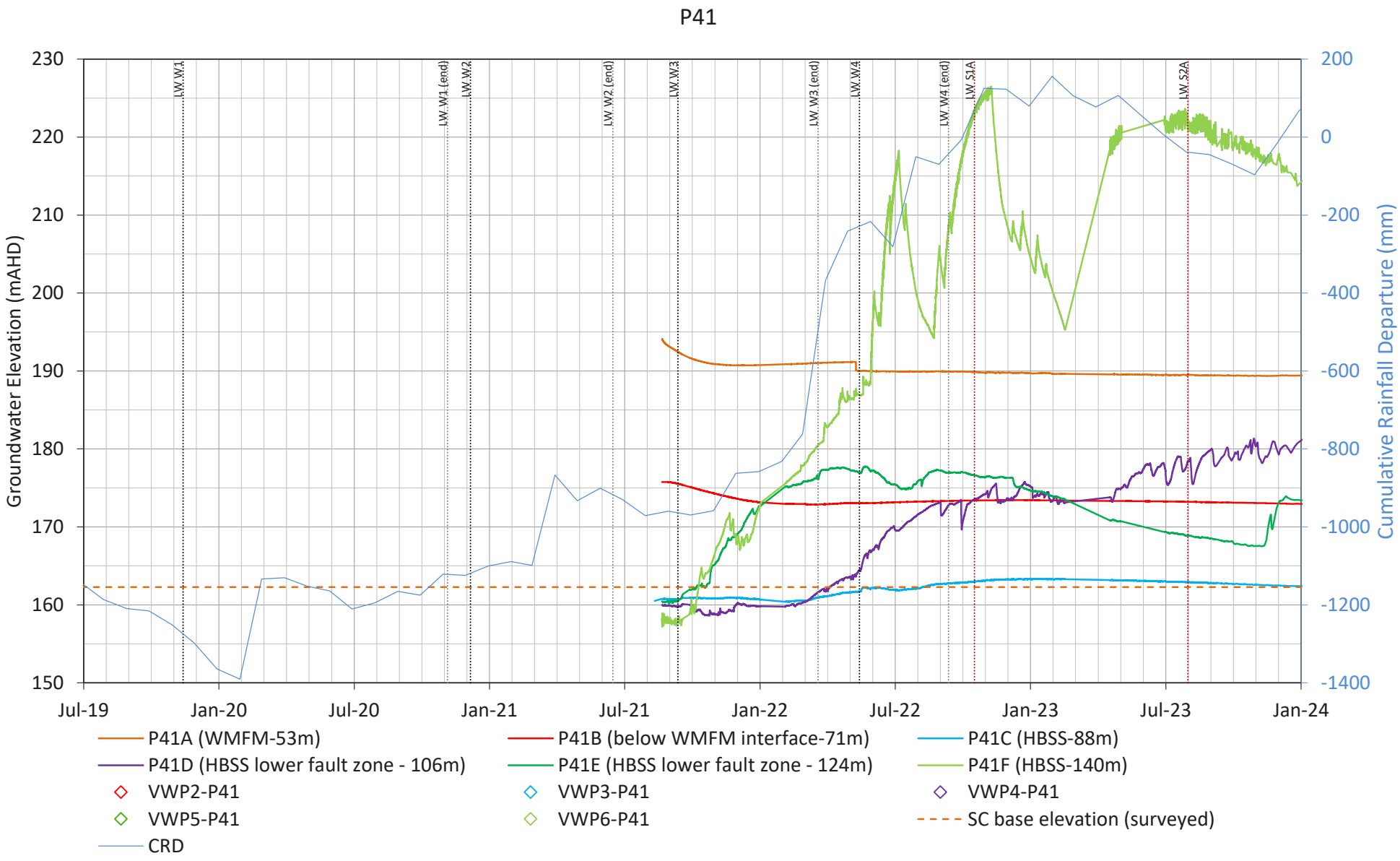

P13C
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
174
172
170
168
166
164
162
160
158
156
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P13C
TARP L2
TARP L3
TARP L4
CRD

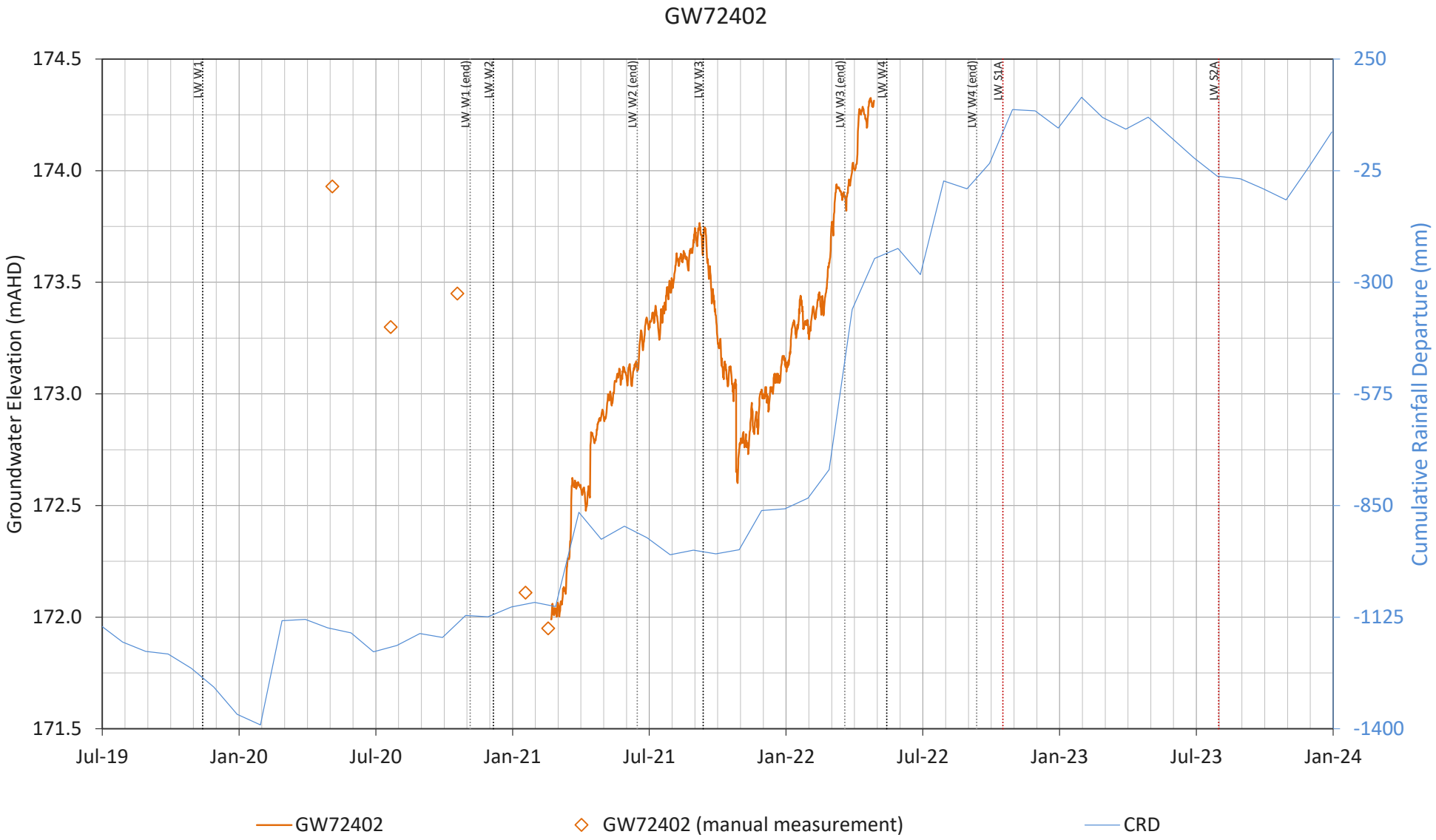

P12A
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
172.0
171.5
171.0
170.5
170.0
169.5
169.0
168.5
168.0
300
250
200
150
100
50
0
-50
-100
LW S2A
LW S3A
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
P12A (19.6m)
P12A (manual measurement)
TARP L2
Creek Bed Elevation
CRD

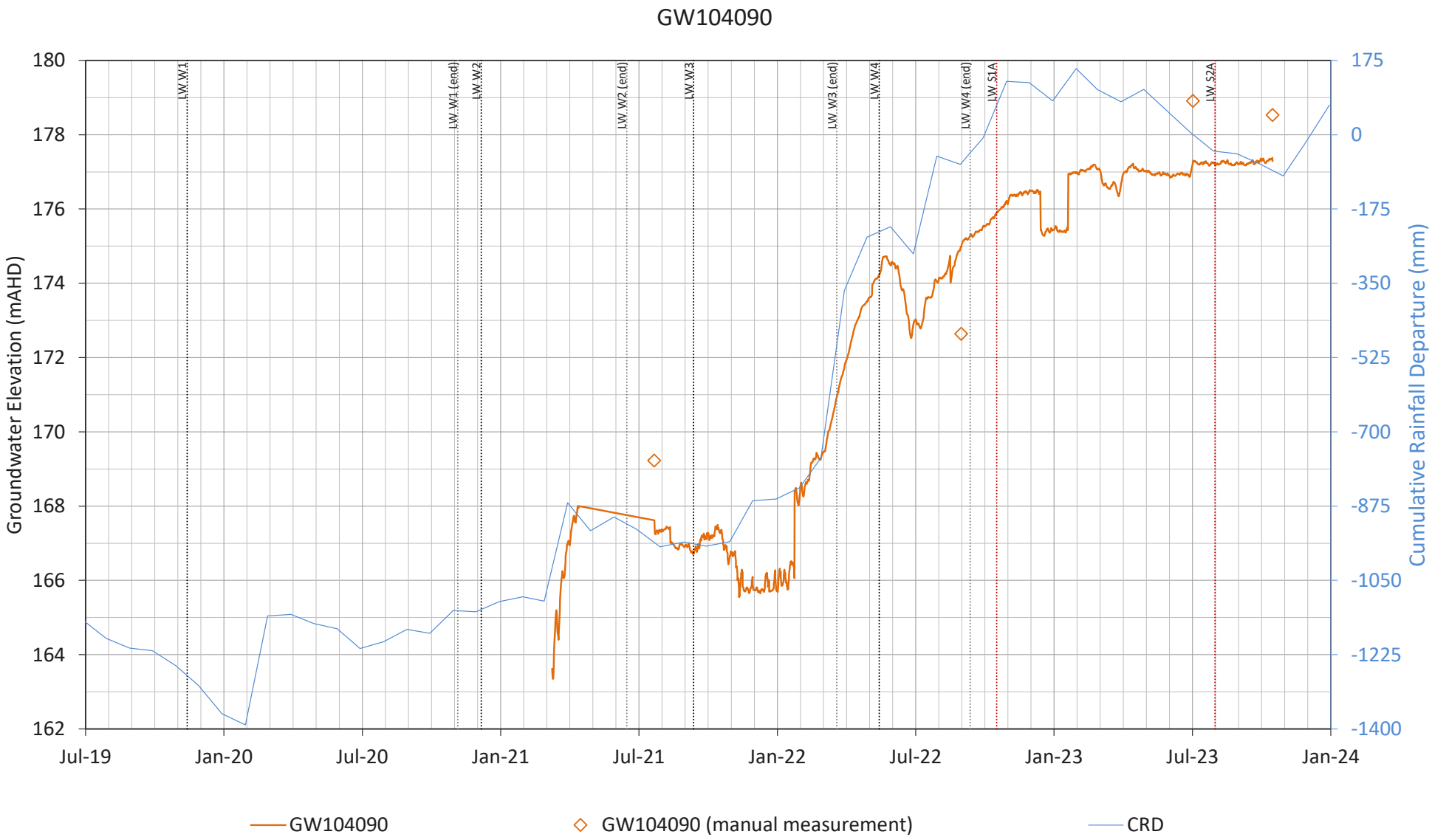

P12B
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
175
174
173
172
171
170
169
168
167
166
165
150
125
100
75
50
25
0
-25
-50
-75
-100
LW S2A
LW S3A
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
P12B (34.6m)
P12B (manual measurement)
TARP L2
CRD

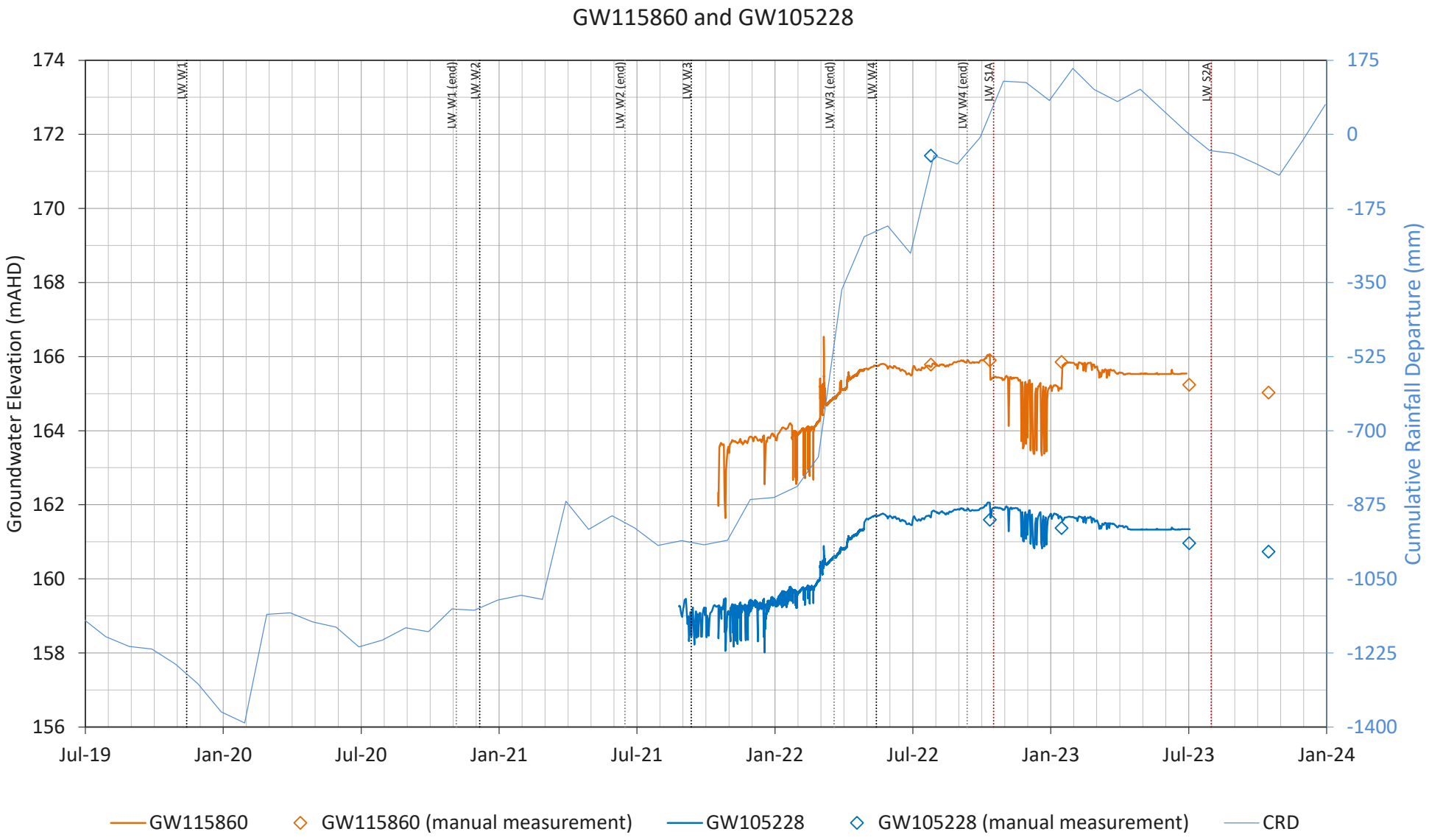

P12C
182
180
178
176
174
172
170
168
250
200
150
100
50
0
-50
-100
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
LW S2A
LW S3A
Mar-23
Jun-23
Sep-23
Dec-23
Mar-24
P12C (64.6m)
P12C (manual measurement)
TARP L2
TARP L3
TARP L4
CRD

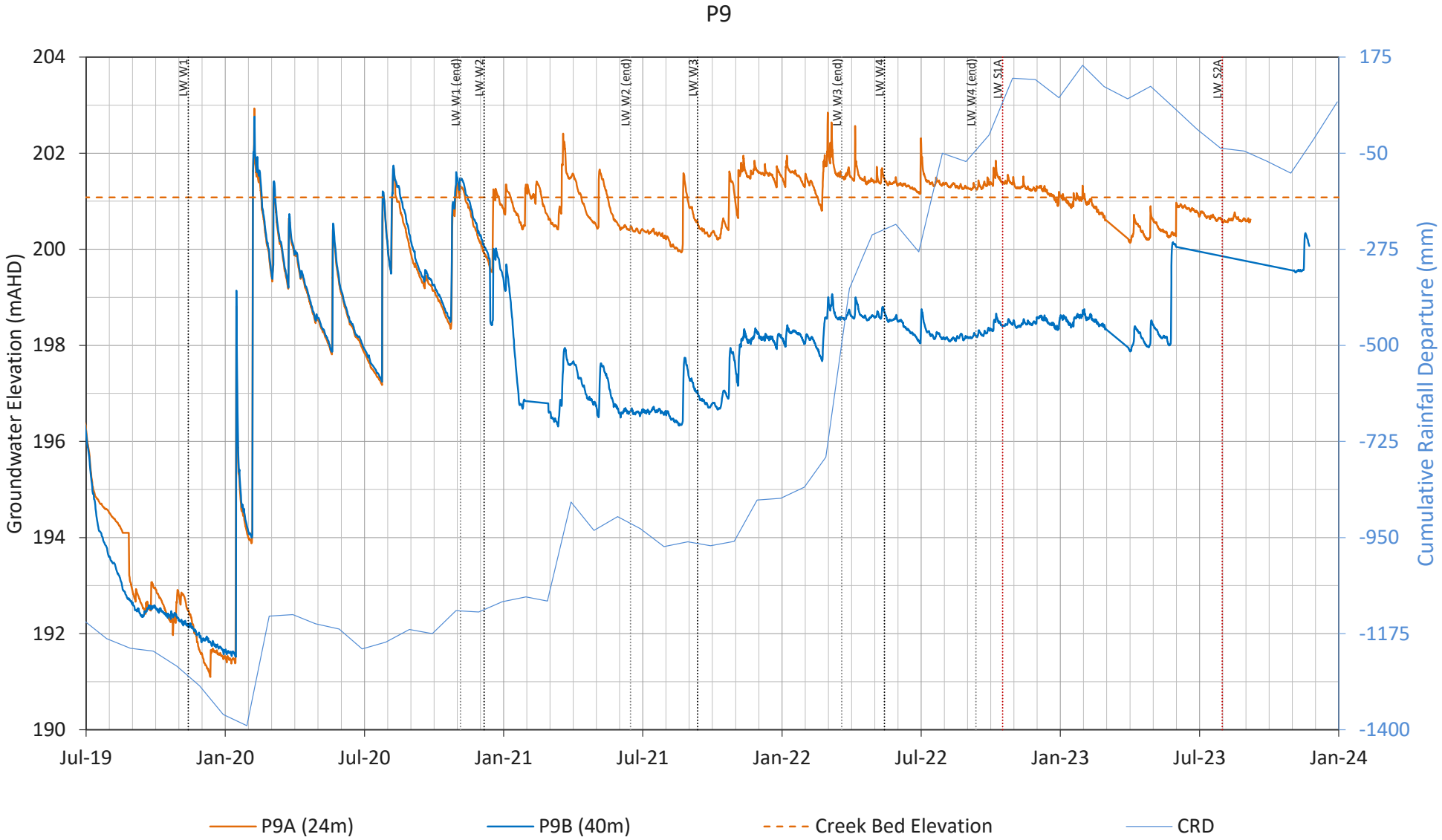

P40
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
190
185
180
175
170
165
225
-100
-425
-750
-1075
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P40A (39m)
P40B (44m)
P40C (49m)
P40D (85m)
Creek Bed Elevation
CRD

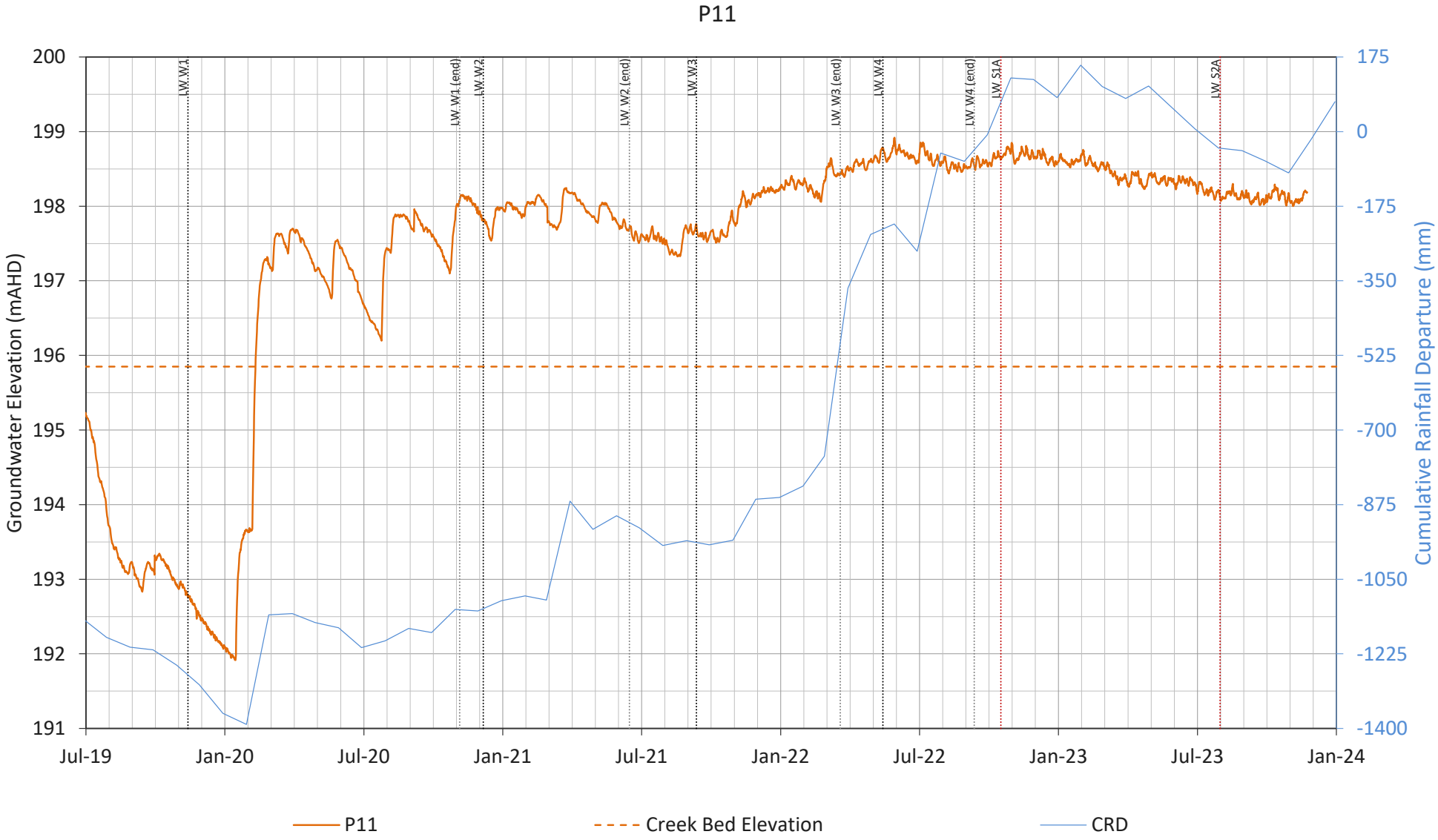

P41
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
230
220
210
200
190
180
170
160
150
200
0
-200
-400
-600
-800
-1000
-1200
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P41A (WMFM-53m)
P41B (below WMFM interface-71m)
P41C (HBSS-88m)
P41D (HBSS lower fault zone - 106m)
P41E (HBSS lower fault zone - 124m)
P41F (HBSS-140m)
VWP2-P41
VWP3-P41
VWP4-P41
VWP5-P41
VWP6-P41
SC base elevation (surveyed)
CRD

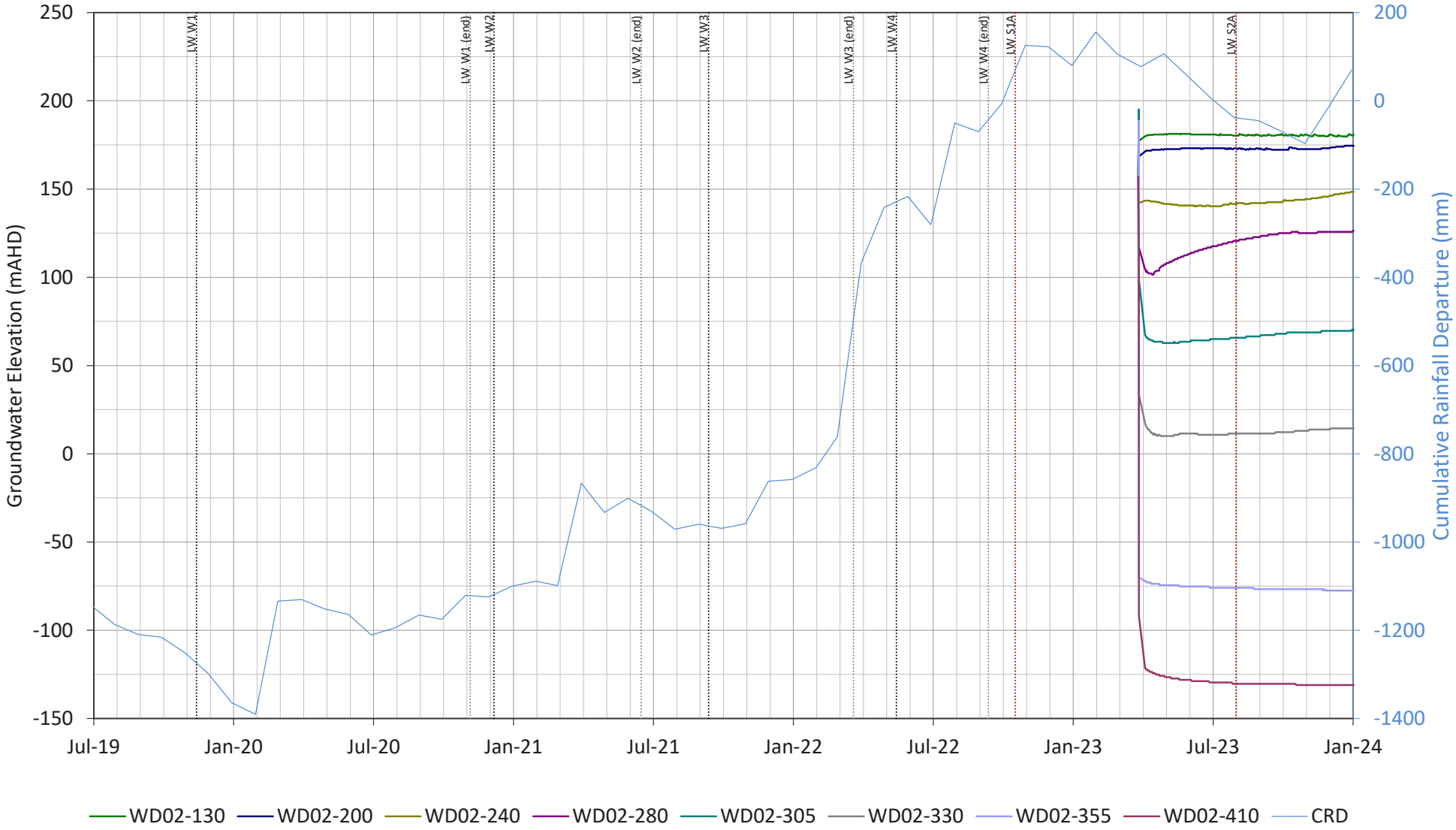

GW72402
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
174.5
174.0
173.5
173.0
172.5
172.0
171.5
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
GW72402
GW72402 (manual measurement)
CRD

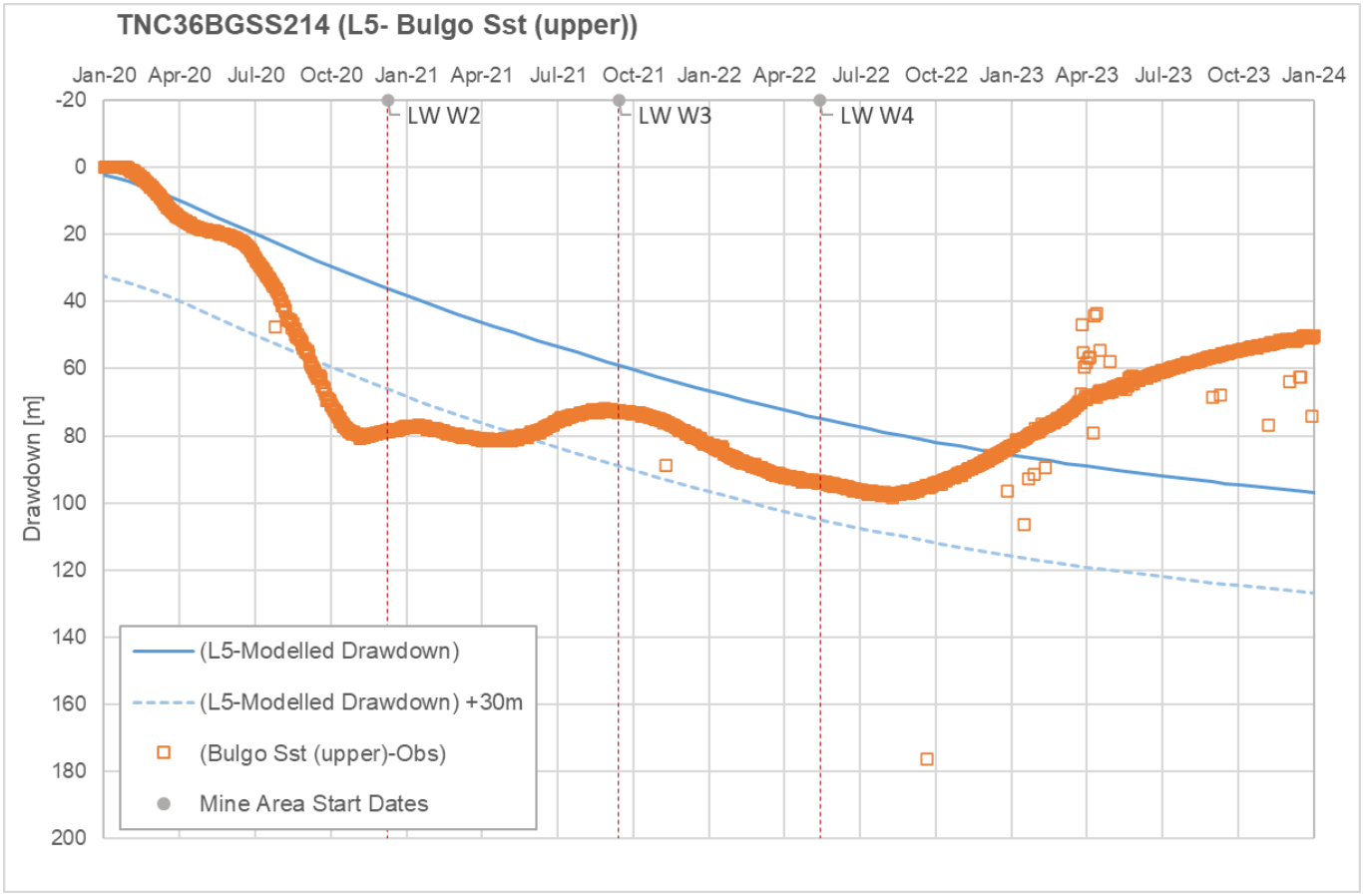

GW104090
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
180
178
176
174
172
170
168
166
164
162
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
GW104090
GW104090 (manual measurement)
CRD

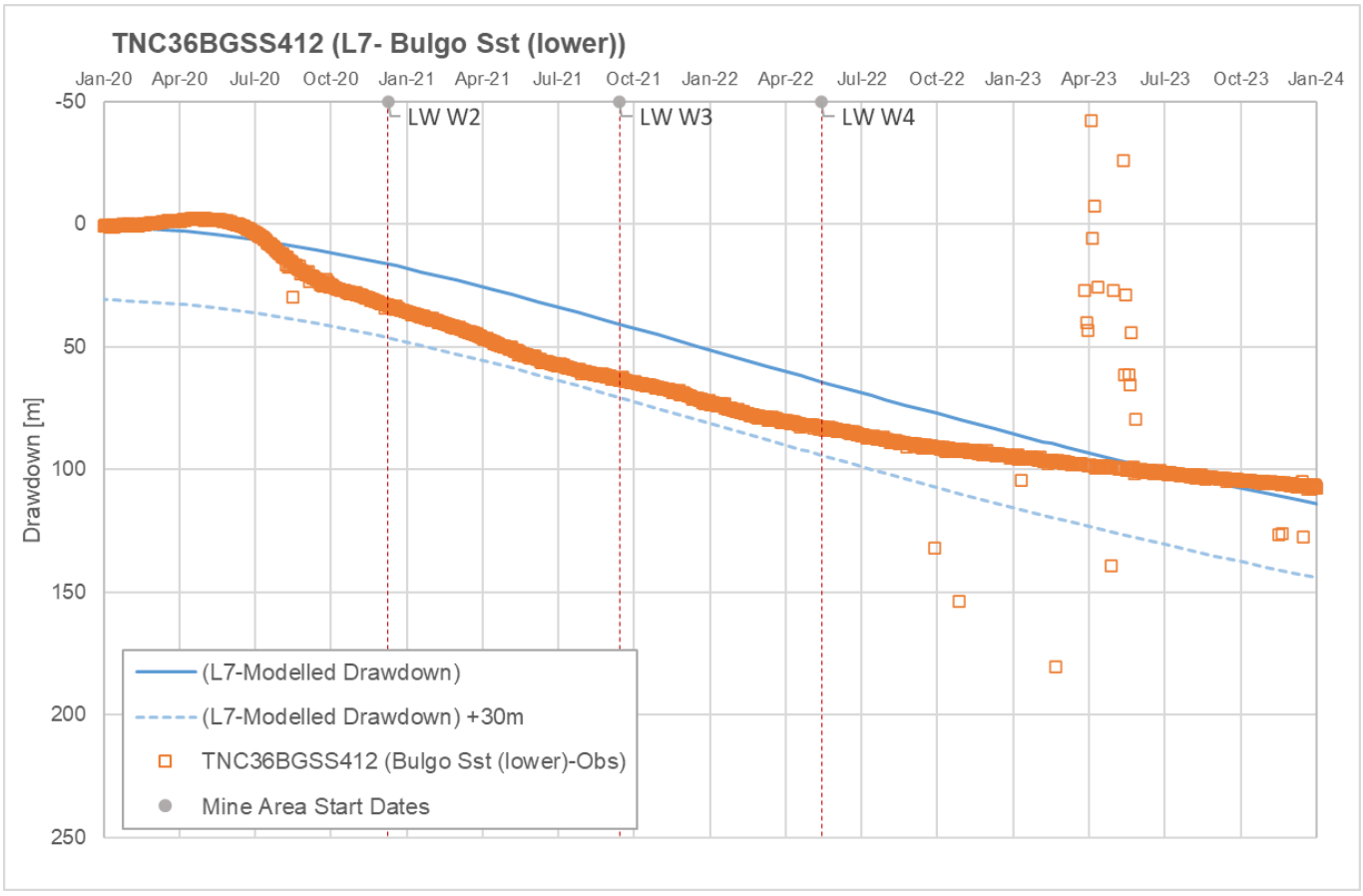

GW115860 and GW105228
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
174
172
170
168
166
164
162
160
158
156
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
GW115860
GW115860 (manual measurement)
GW105228
GW105228 (manual measurement)
CRD


P9
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
204
202
200
198
196
194
192
190
175
-50
-275
-500
-725
-950
-1175
-1400
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P9A (24m)
P9B (40m)
Creek Bed Elevation
CRD


P11
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
200
199
198
197
196
195
194
193
192
191
175
0
-175
-350
-525
-700
-875
-1050
-1225
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W4 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
P11
Creek Bed Elevation
CRD


Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
250
200
150
100
50
0
-50
-100
-150
200
0
-200
-400
-600
-800
-1000
-1200
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
WD02-130
WD02-200
WD02-240
WD02-280
WD02-305
WD02-330
WD02-355
WD02-410
CRD


TNC36BGSS214 (L5- Bulgo Sst (upper))
Jan-20 Apr-20 Jul-20 Oct-20 Jan-21 Apr-21 Jul-21 Oct-21 Jan-22 Apr-22 Jul-22 Oct-22 Jan-23 Apr-23 Jul-23 Oct-23 Jan-24
LW W2
LW W3
LW W4
Drawdown [m]
-20
0
20
40
60
80
100
120
140
160
180
200
(L5-Modelled Drawdown)
(L5-Modelled Drawdown) +30m
(Bulgo Sst (upper)-Obs)
Mine Area Start Dates


TNC36BGSS412 (L7- Bulgo Sst (lower))
Jan-20 Apr-20 Jul-20 Oct-20 Jan-21 Apr-21 Jul-21 Oct-21 Jan-22 Apr-22 Jul-22 Oct-22 Jan-23 Apr-23 Jul-23 Oct-23 Jan-24
LW W2
LW W3
LW W4
Drawdown [m]
-50
0
50
100
150
200
250
(L7-Modelled Drawdown)
(L7-Modelled Drawdown) +30m
TNC36BGSS412 (Bulgo Sst (lower)-Obs)
Mine Area Start Dates

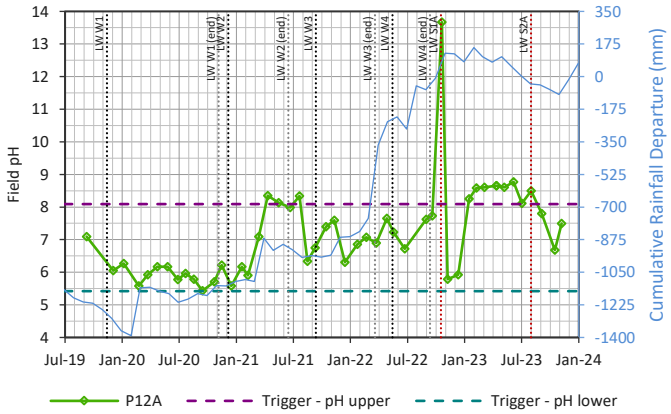
Appendix D Plots – Groundwater Quality TARPs

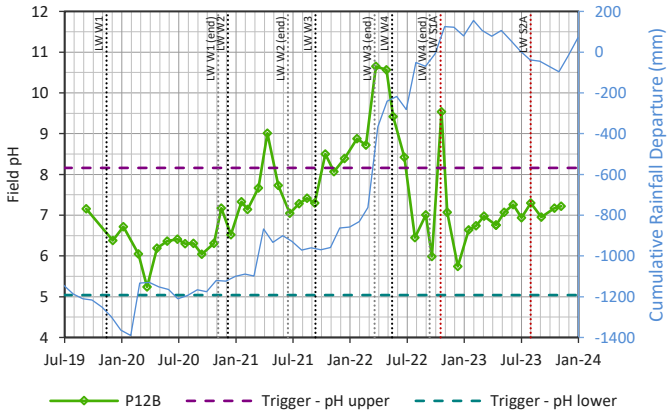
Six - Monthly Groundwater Reporting: July – December 2023

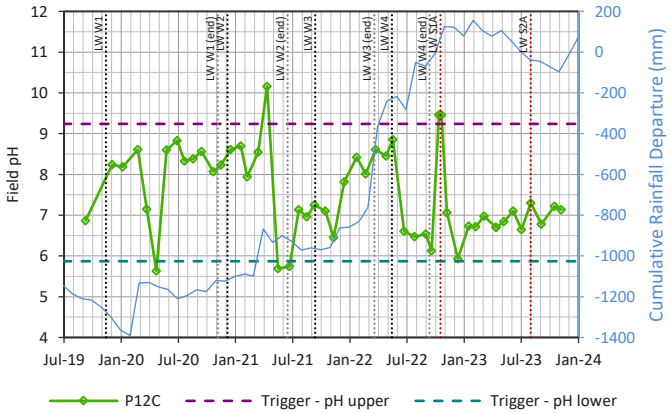
Tahmoor Western Domain

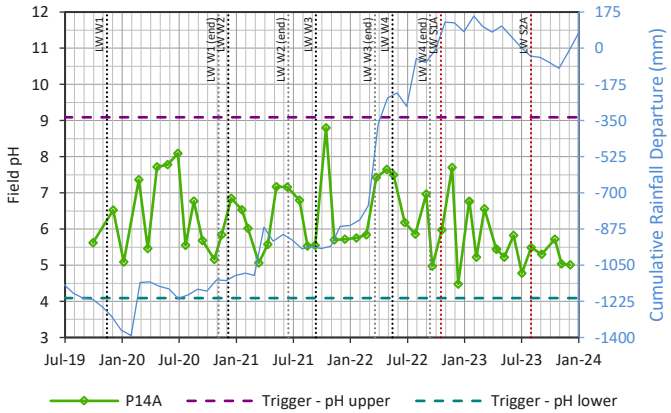
Tahmoor Coal Pty Ltd

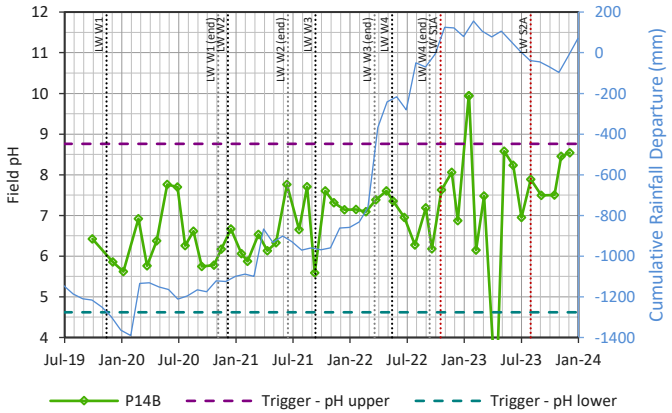
SLR Project No.: 640.030985.00001

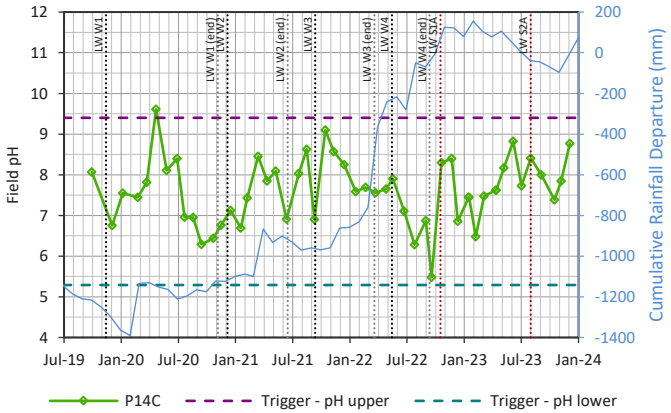

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A
Trigger - pH upper
Trigger - pH lower

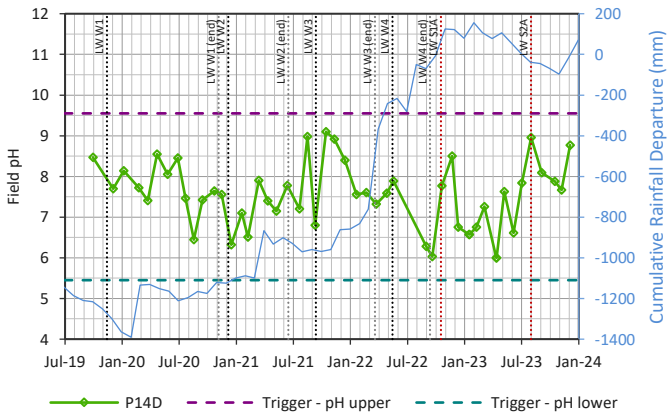

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
Trigger - pH upper
Trigger - pH lower

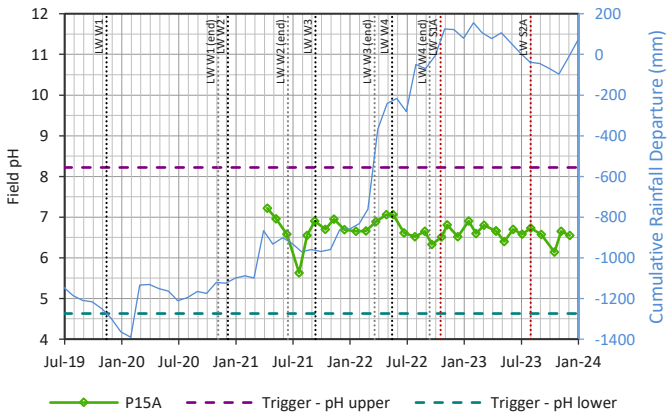

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12C
Trigger - pH upper
Trigger - pH lower

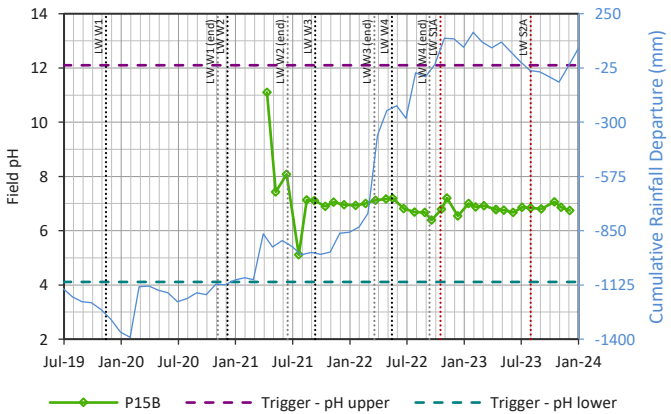

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
Trigger - pH upper
Trigger - pH lower

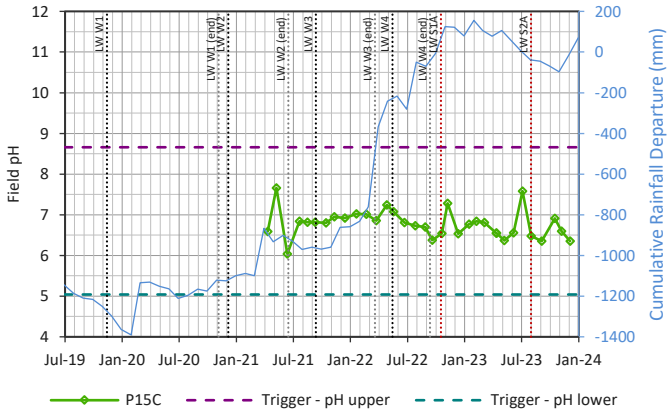

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B
Trigger - pH upper
Trigger - pH lower

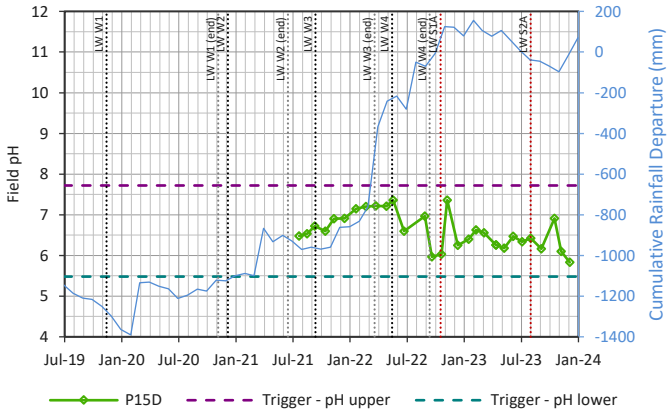

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
Trigger - pH upper
Trigger - pH lower

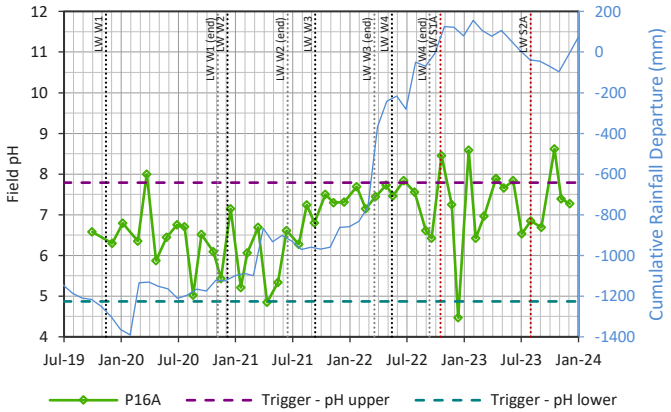

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
Trigger - pH upper
Trigger - pH lower

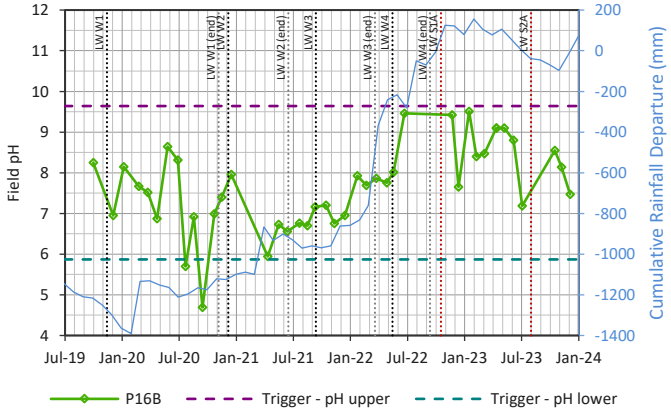

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
Trigger - pH upper
Trigger - pH lower

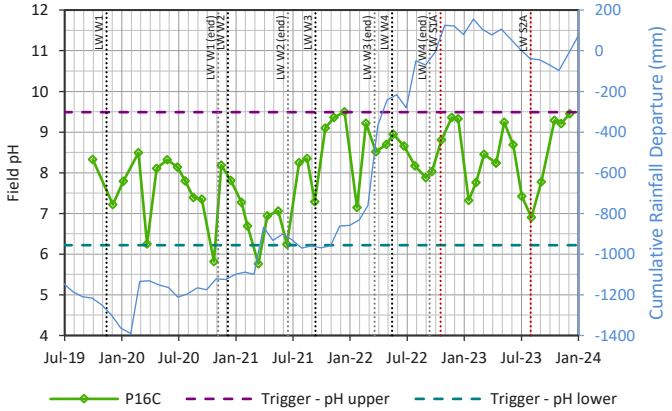

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
Trigger - pH upper
Trigger - pH lower

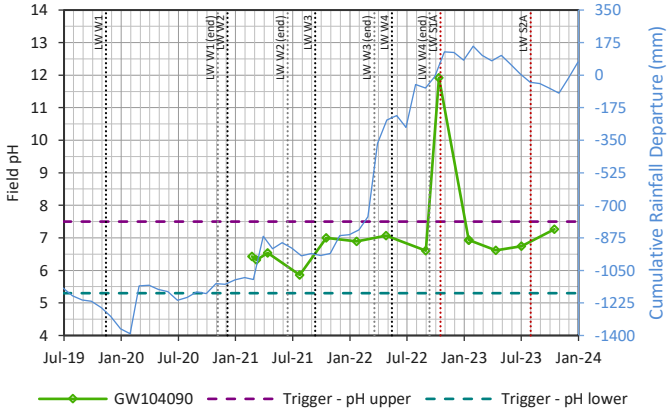

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C
Trigger - pH upper
Trigger - pH lower

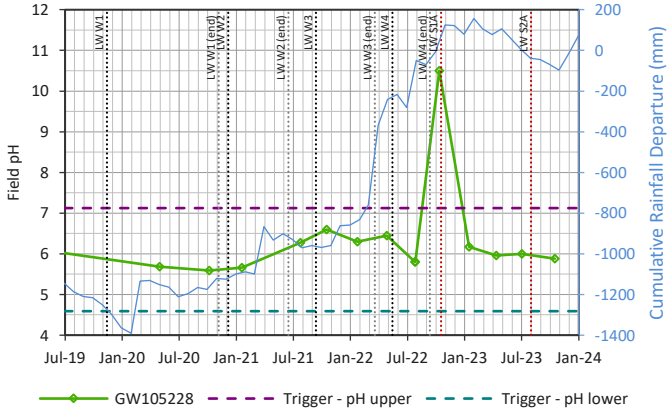

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15D
Trigger - pH upper
Trigger - pH lower

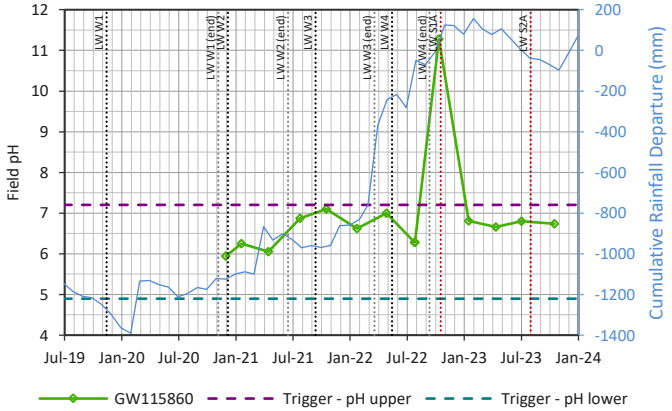

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16A
Trigger - pH upper
Trigger - pH lower

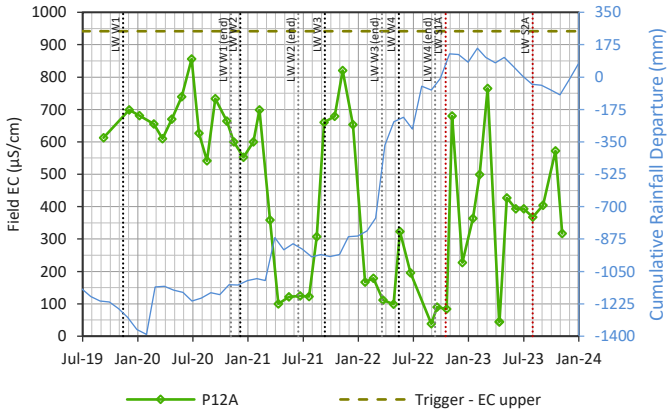

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
Trigger - pH upper
Trigger - pH lower

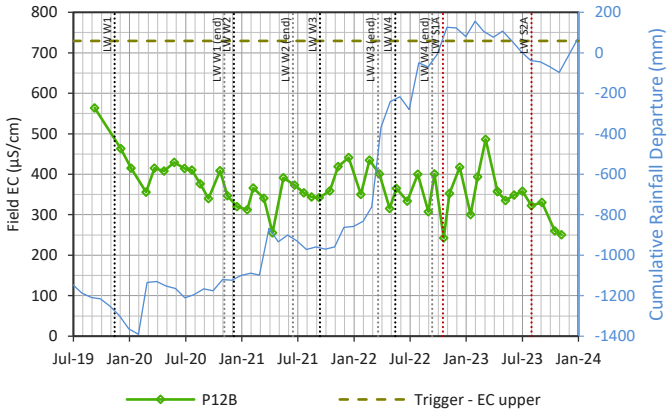

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
Trigger - pH upper
Trigger - pH lower

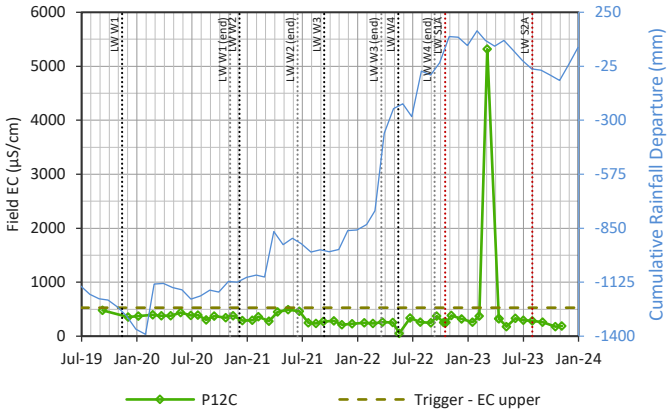

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW104090
Trigger - pH upper
Trigger - pH lower

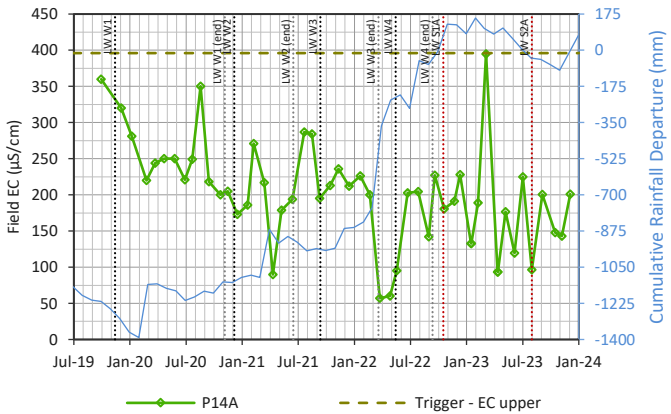

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW105228
Trigger - pH upper
Trigger - pH lower

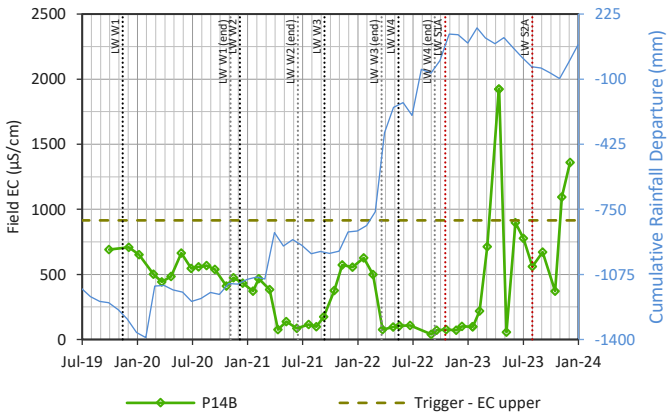

Field pH
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW115860
Trigger - pH upper
Trigger - pH lower

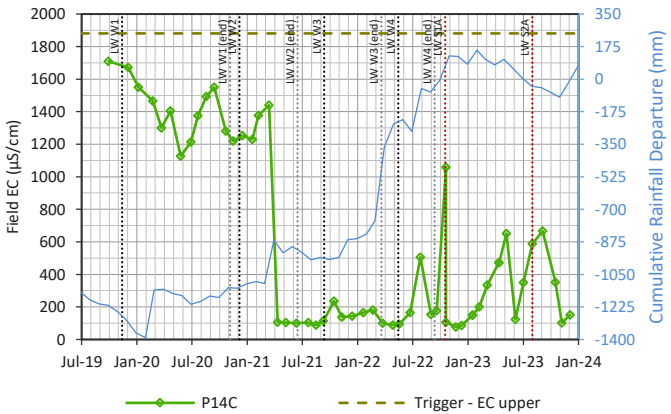

Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A
Trigger - EC upper

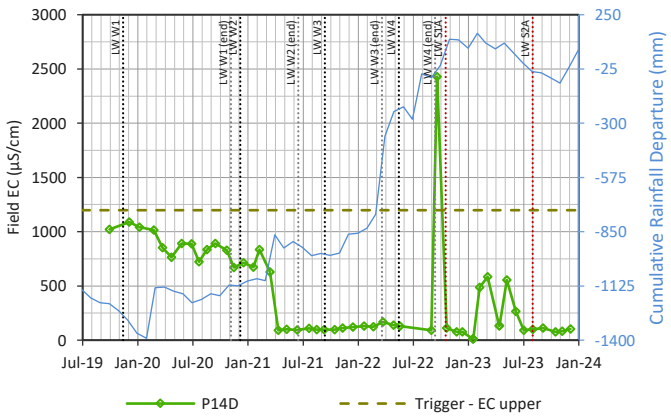

Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12C
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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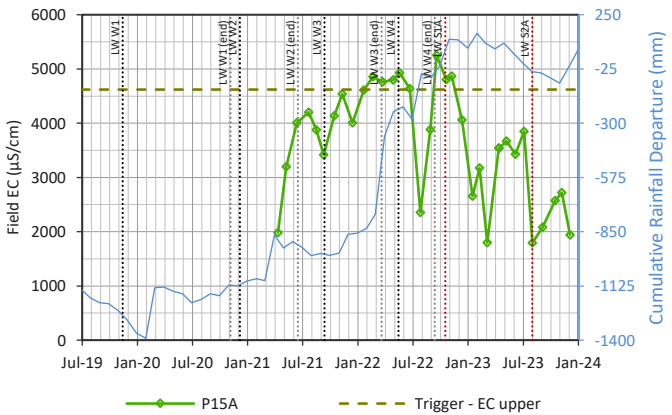
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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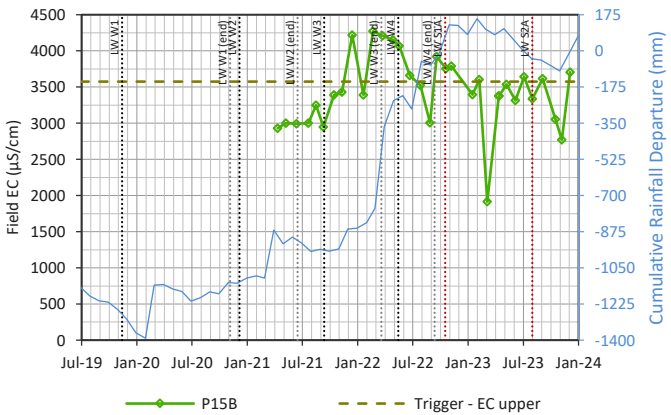
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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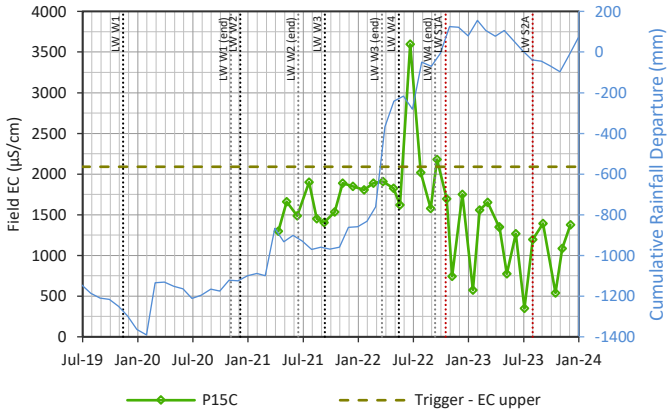
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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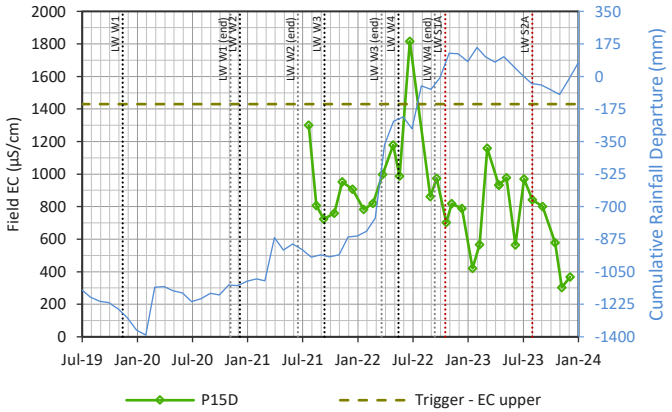
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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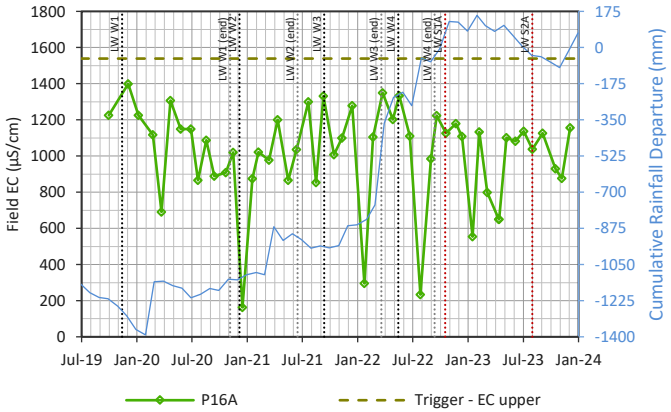
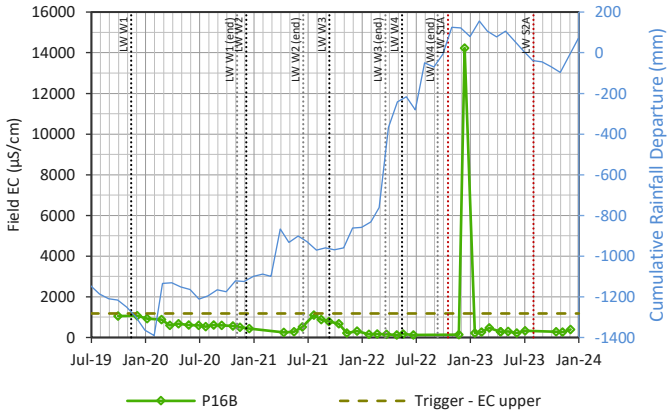
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15D
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16A
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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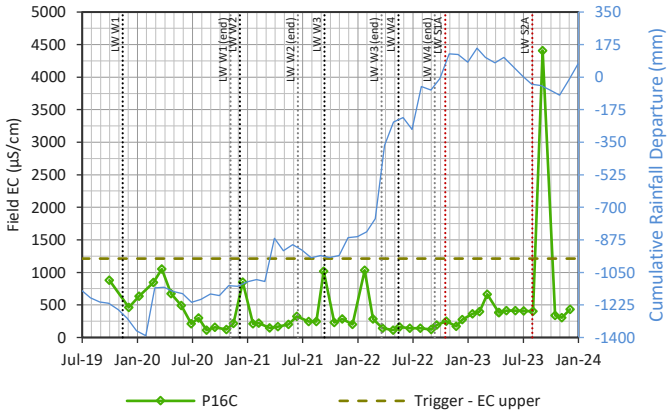
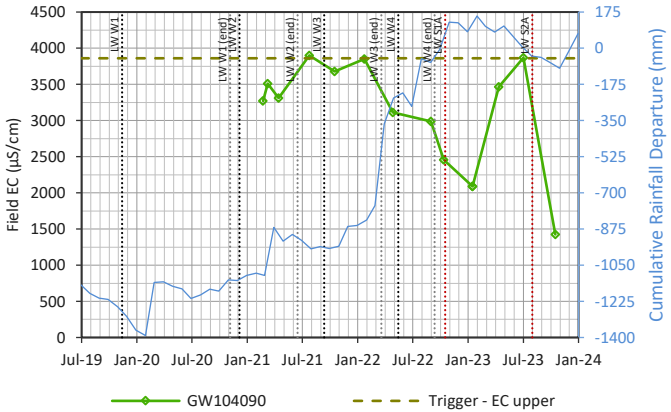
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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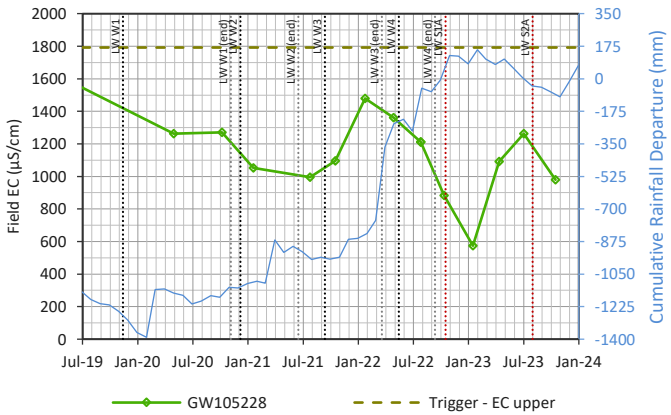
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW104090
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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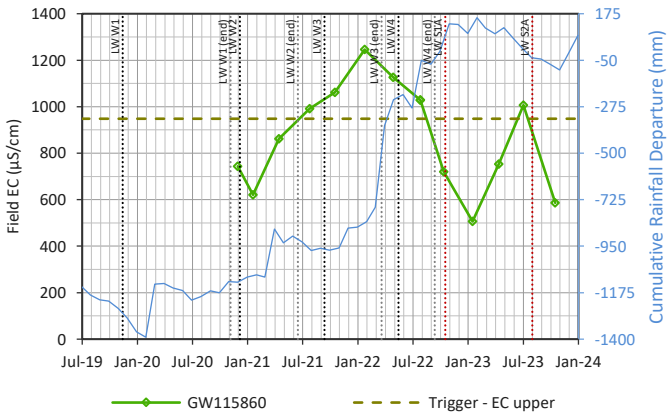
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW105228
Trigger - EC upper


Field EC (µS/cm)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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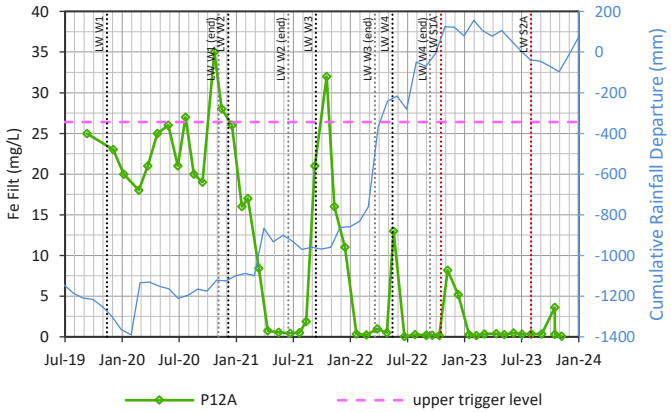
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW115860
Trigger - EC upper


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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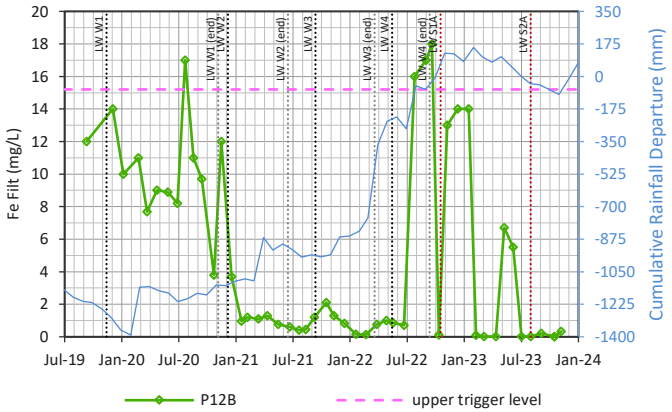
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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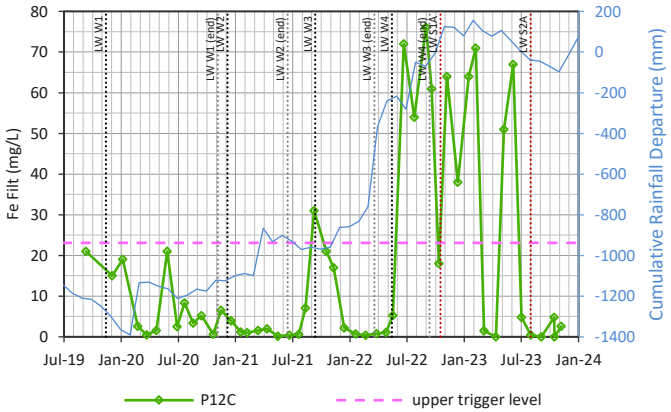
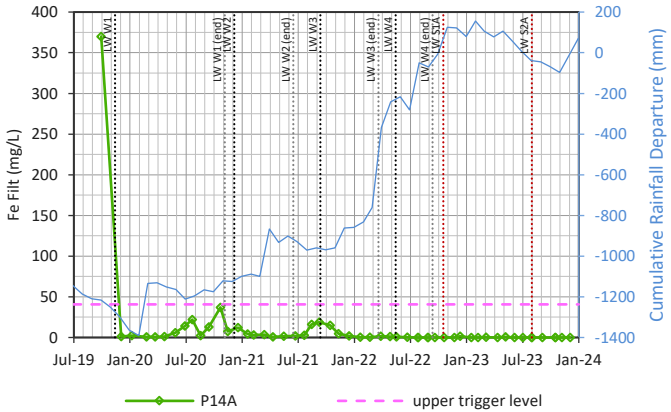
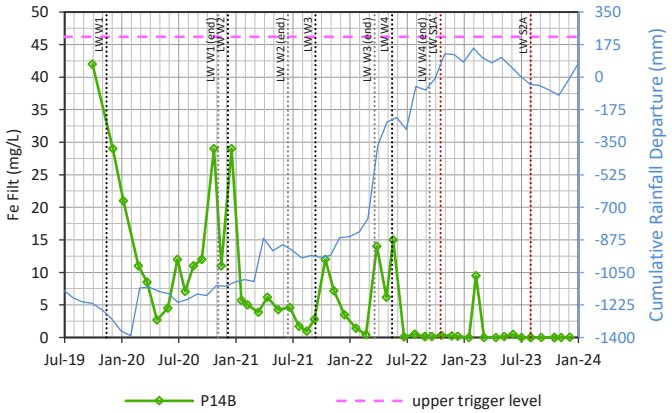
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12C
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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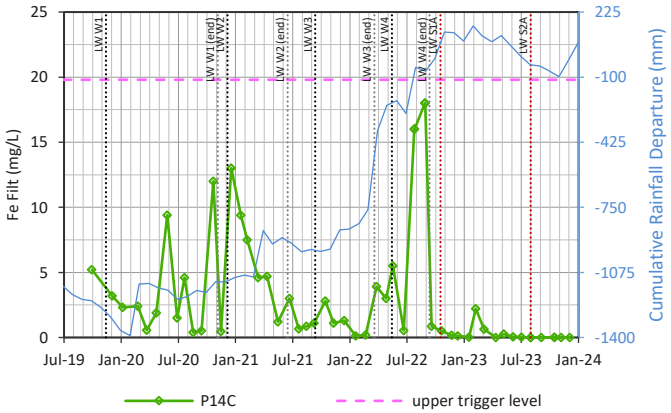
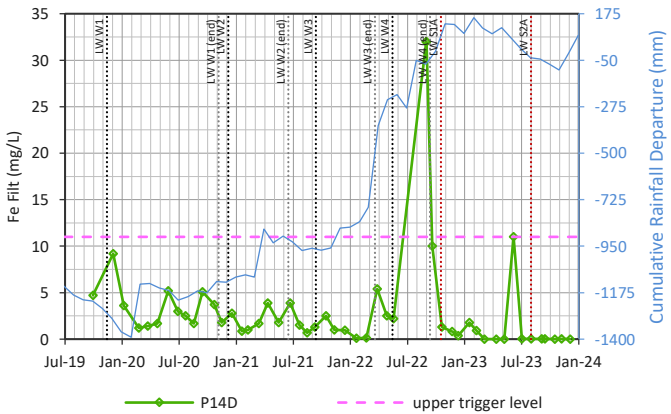
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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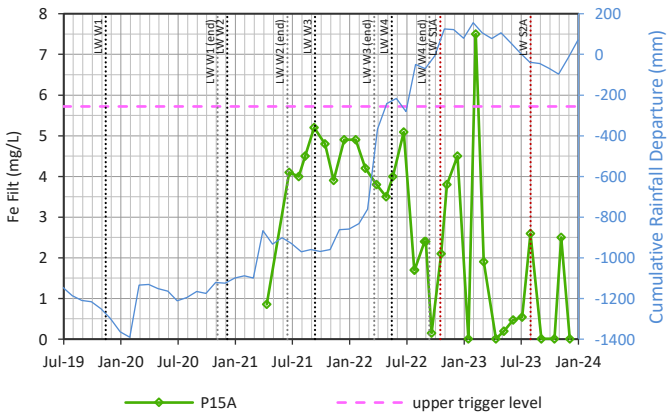
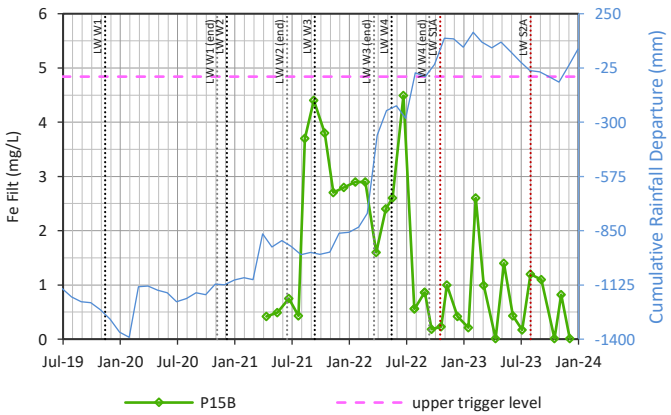
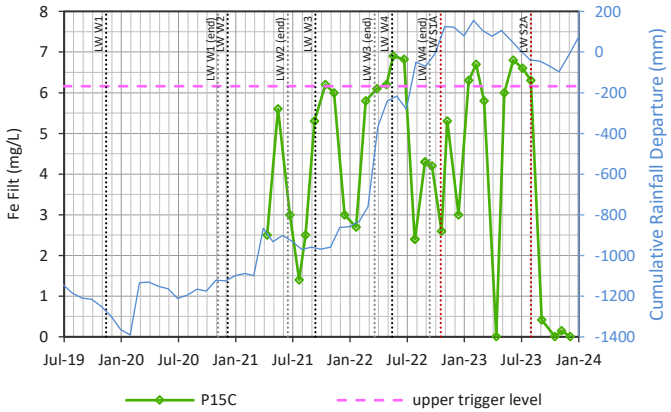
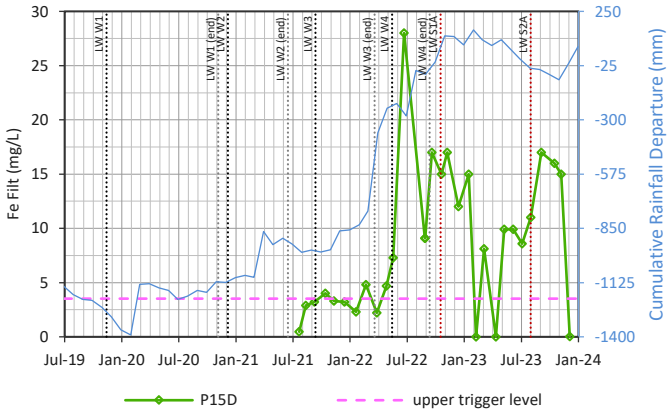
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
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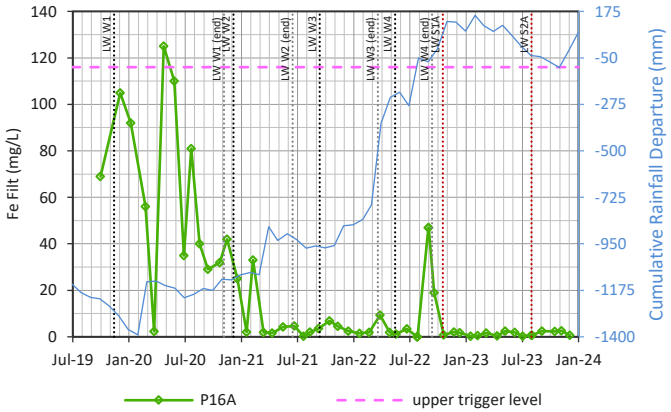
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15D
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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Jan-21
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Jan-22
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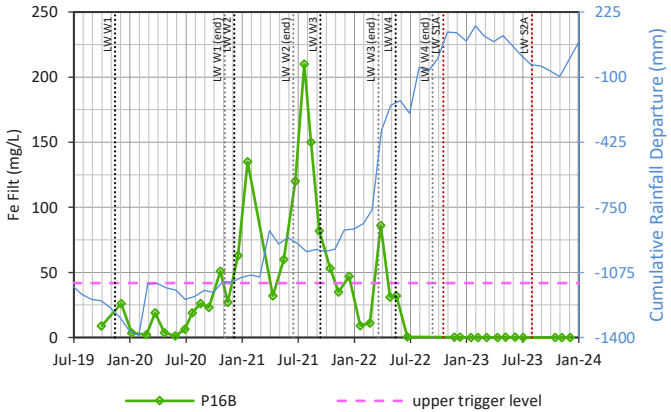
Jan-23
Jul-23
Jan-24
P16A
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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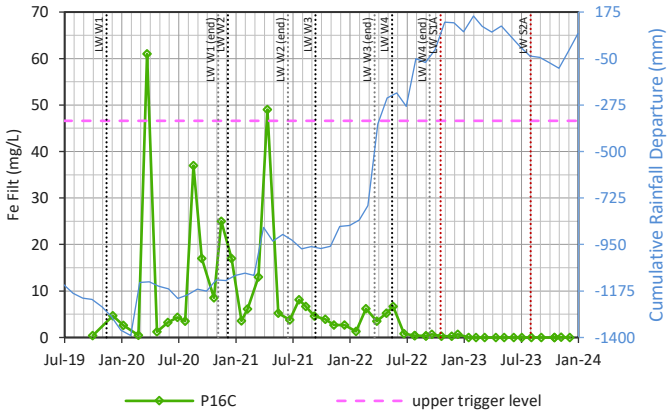
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
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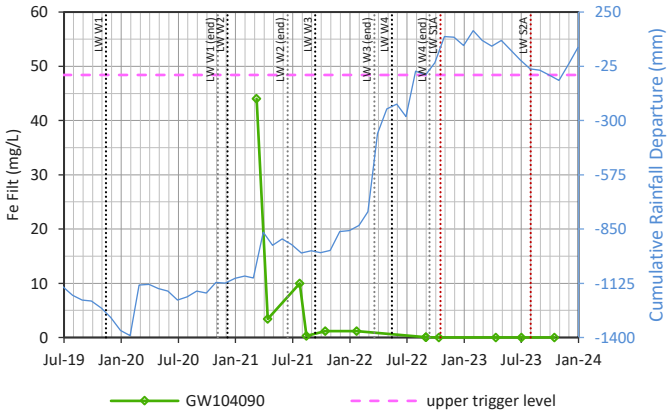
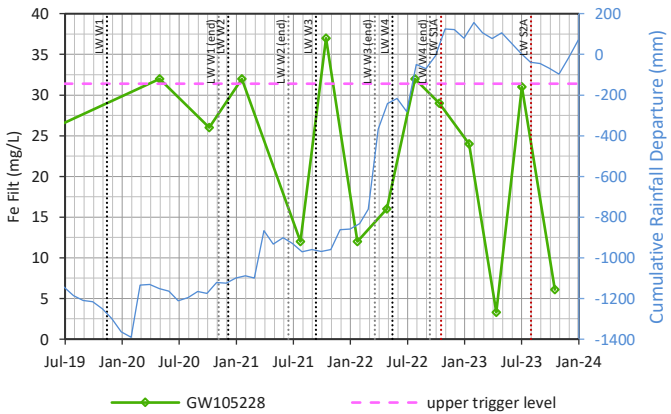
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW104090
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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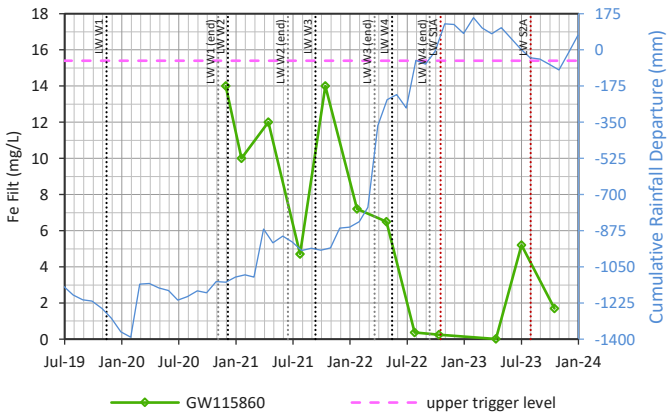
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
GW105228
upper trigger level


Fe Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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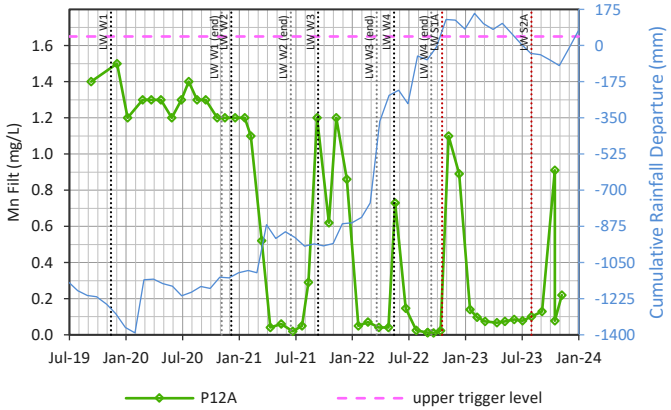
Jan-23
Jul-23
Jan-24
GW115860
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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Jan-22
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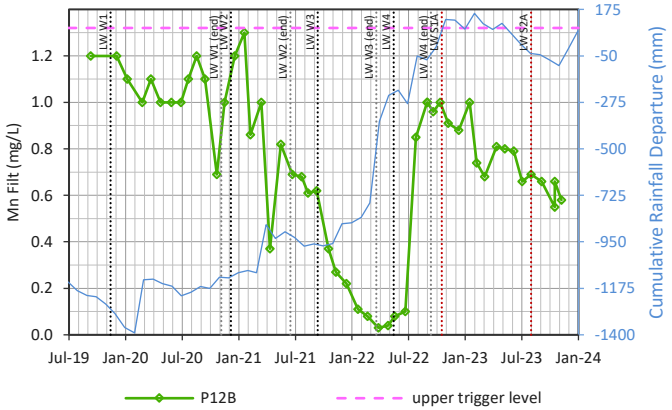
Jan-23
Jul-23
Jan-24
P12A
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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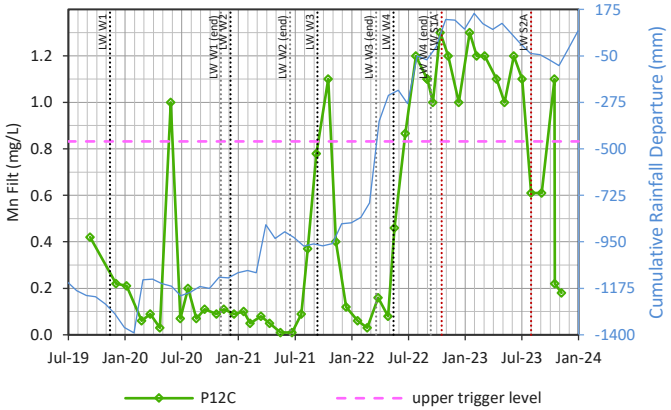
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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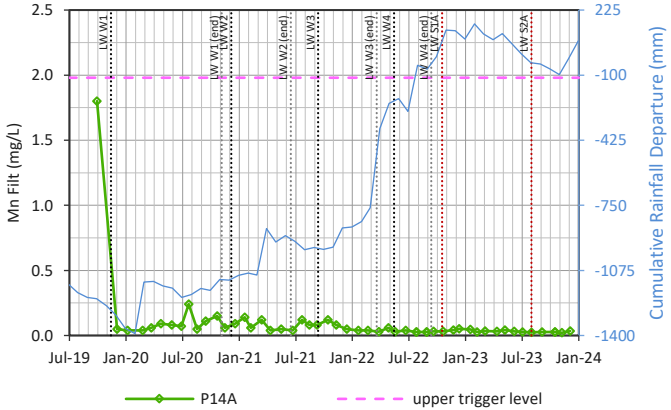
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12C
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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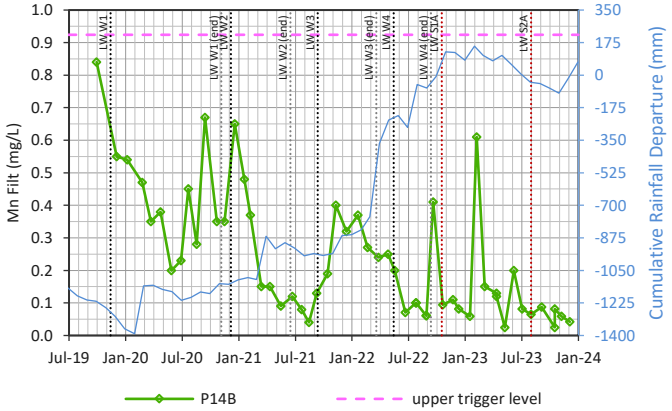
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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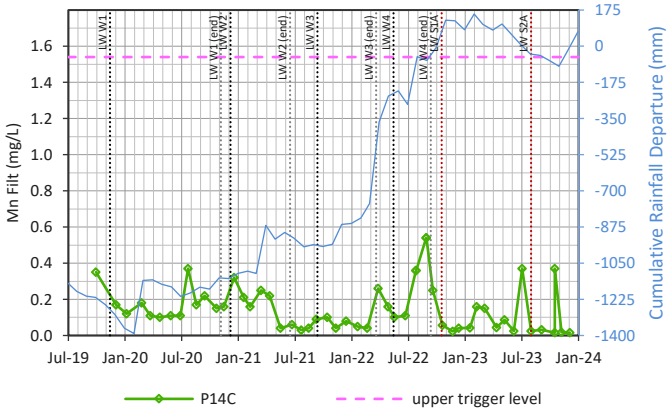
Jan-23
Jul-23
Jan-24
P14B
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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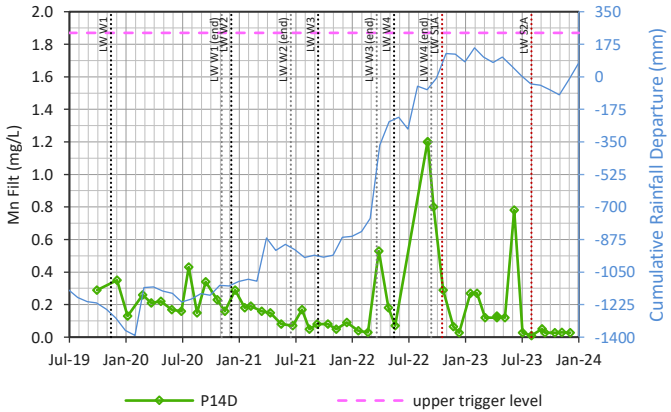
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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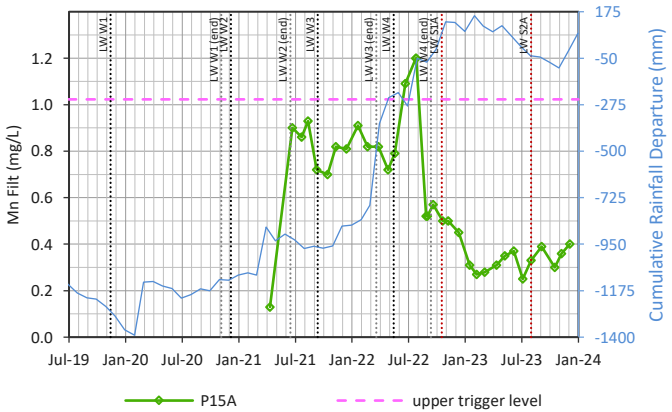
Jan-23
Jul-23
Jan-24
P14D
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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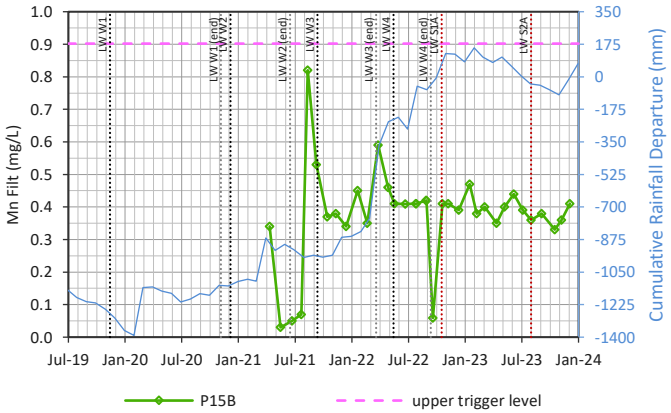
Jul-23
Jan-24
P15A
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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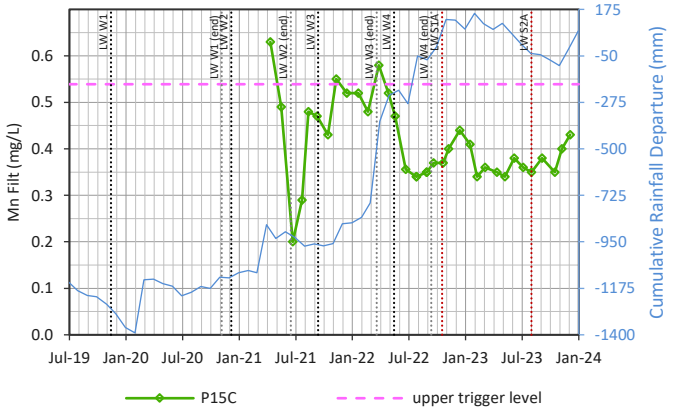
Jul-23
Jan-24
P15B
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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Jan-22
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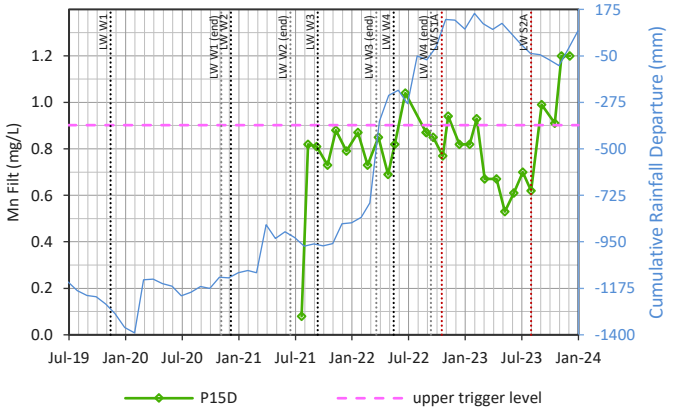
Jan-23
Jul-23
Jan-24
P15C
upper trigger level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Cumulative Rainfall Departure (mm)
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LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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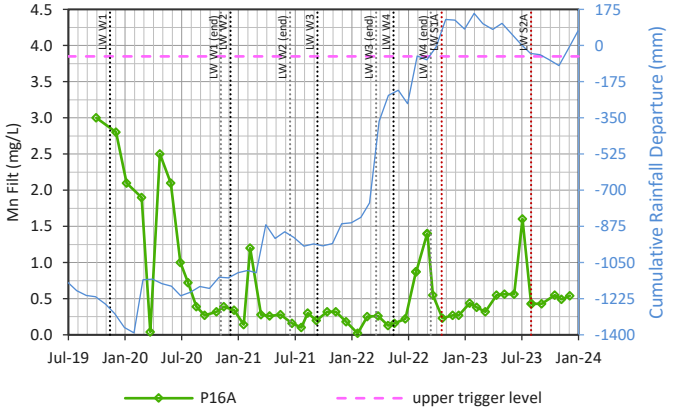
Jan-23
Jul-23
Jan-24
P15D
upper trigger level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Cumulative Rainfall Departure (mm)
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LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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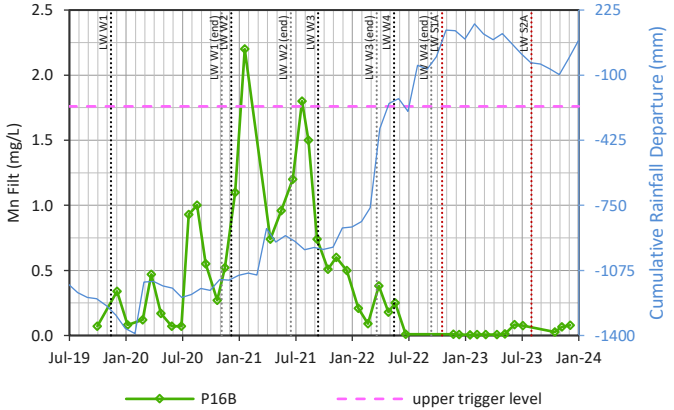
Jan-23
Jul-23
Jan-24
P16A
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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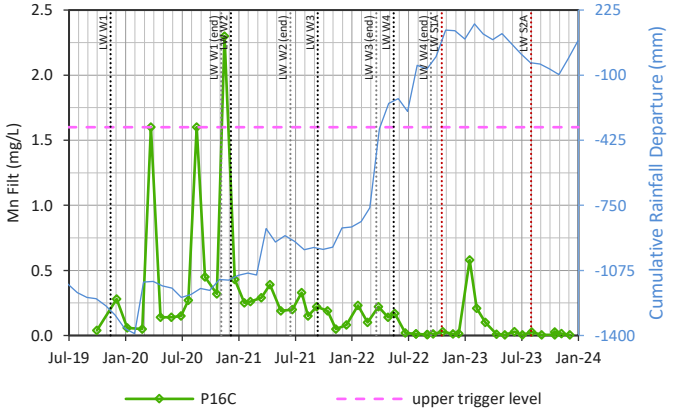
Jul-23
Jan-24
P16B
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
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LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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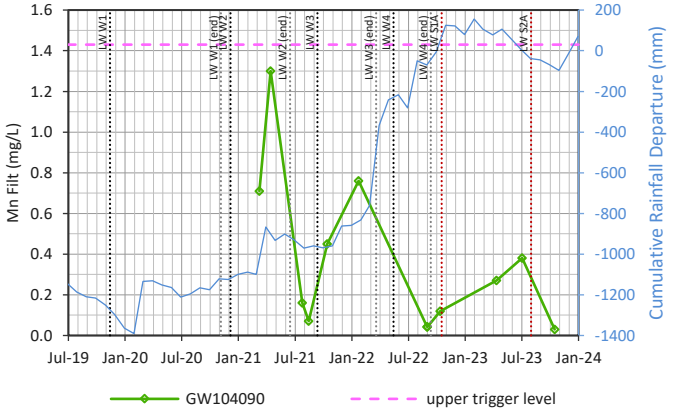
Jan-23
Jul-23
Jan-24
P16C
upper trigger level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Cumulative Rainfall Departure (mm)
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LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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Jul-23
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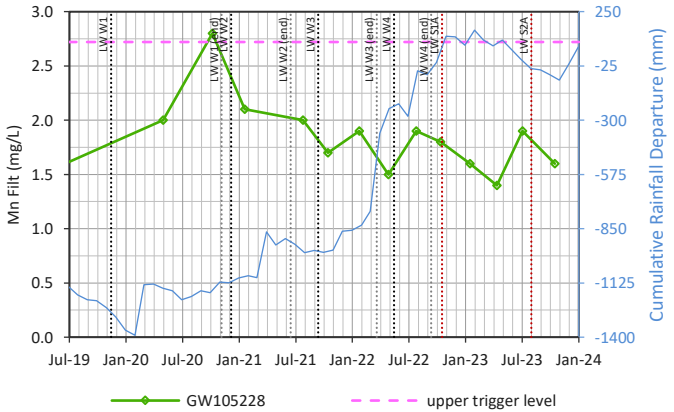
GW104090
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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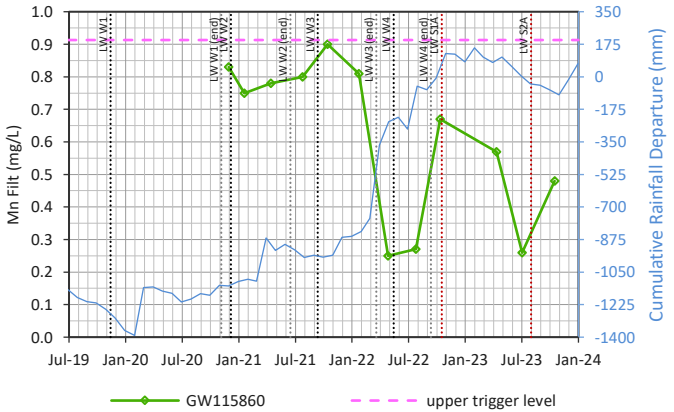
Jan-23
Jul-23
Jan-24
GW105228
upper trigger level


Mn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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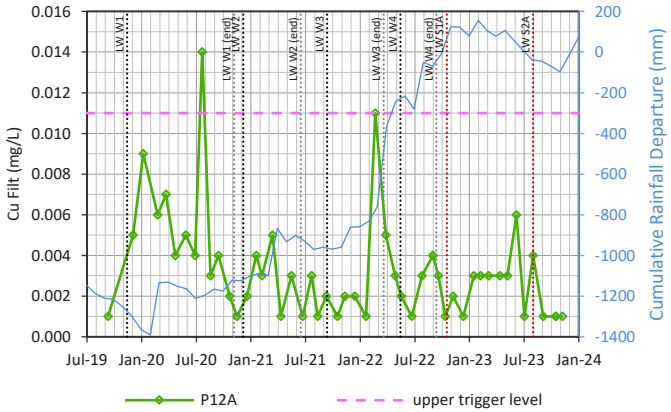
Jul-22
Jan-23
Jul-23
Jan-24
GW115860
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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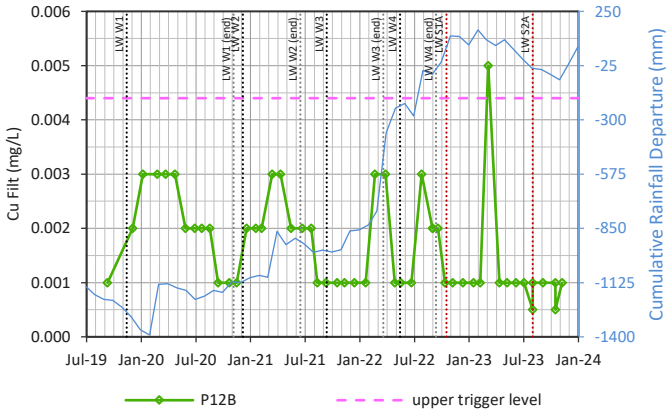
Jan-23
Jul-23
Jan-24
P12A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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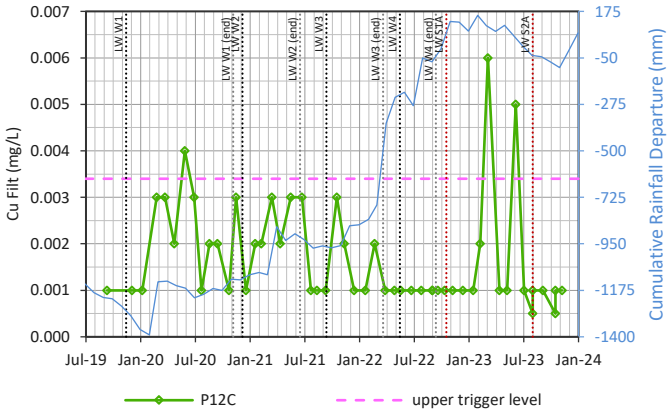
Jan-23
Jul-23
Jan-24
P12B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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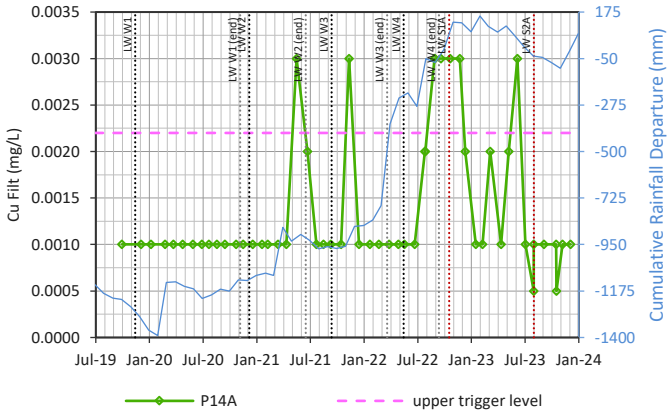
Jul-22
Jan-23
Jul-23
Jan-24
P12C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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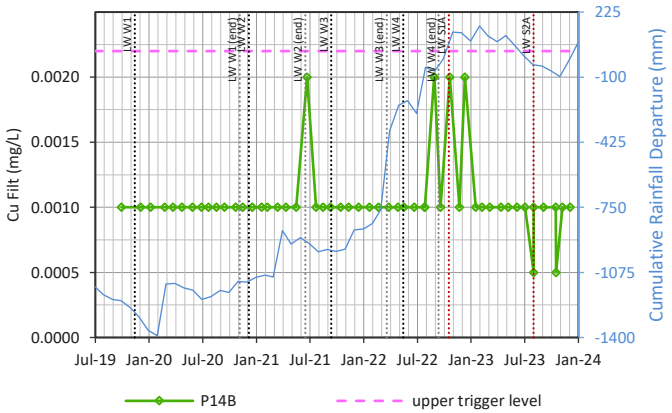
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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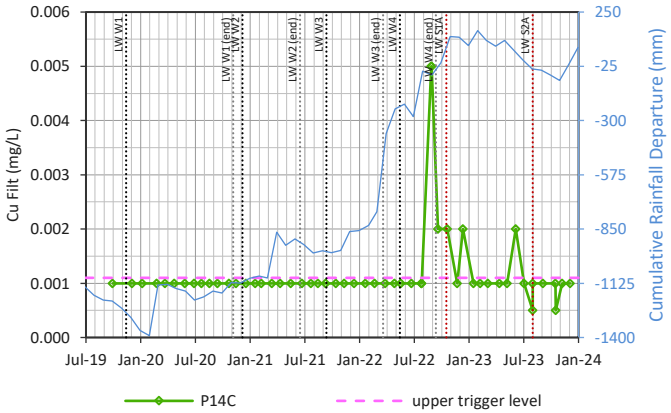
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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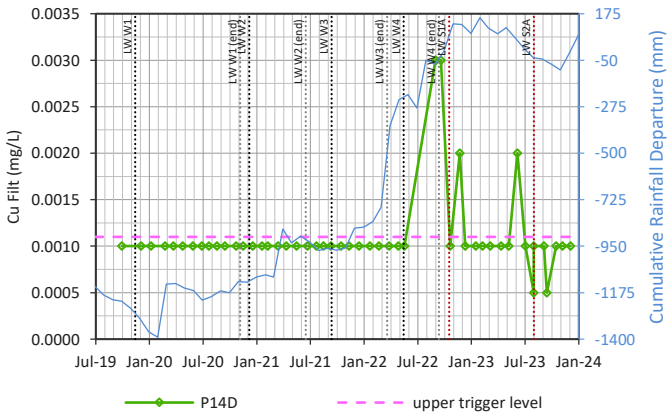
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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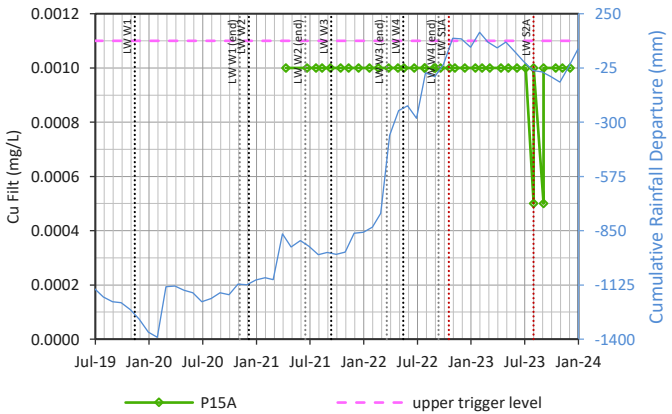
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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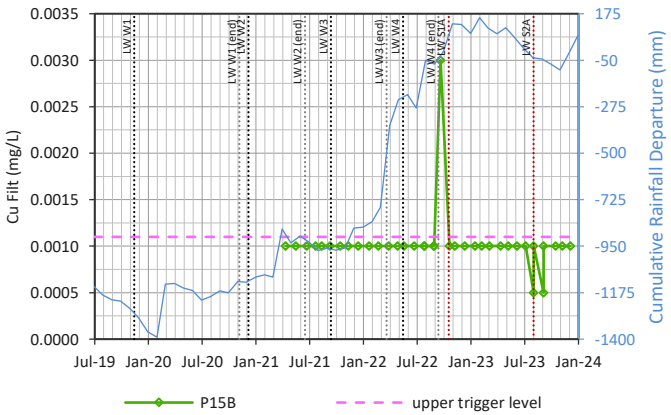
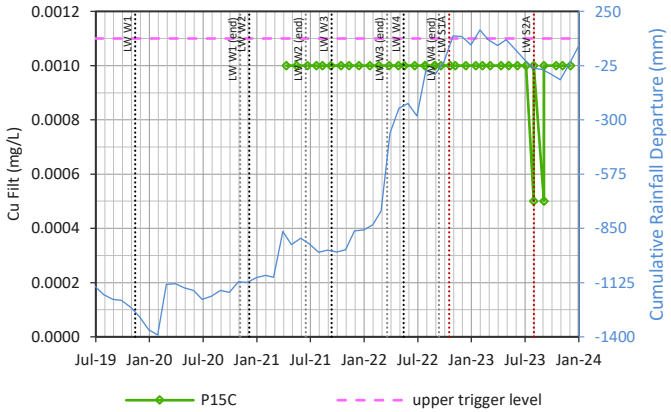
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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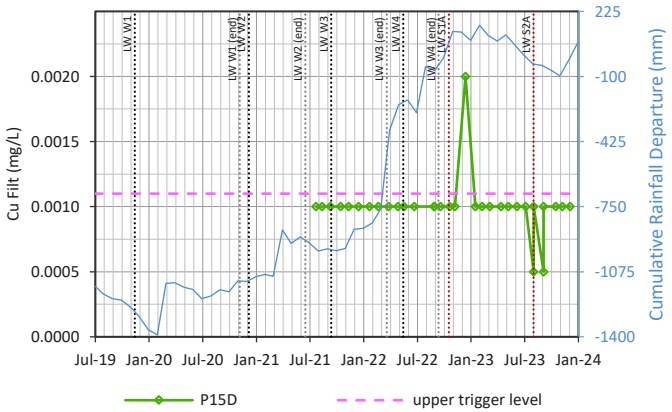
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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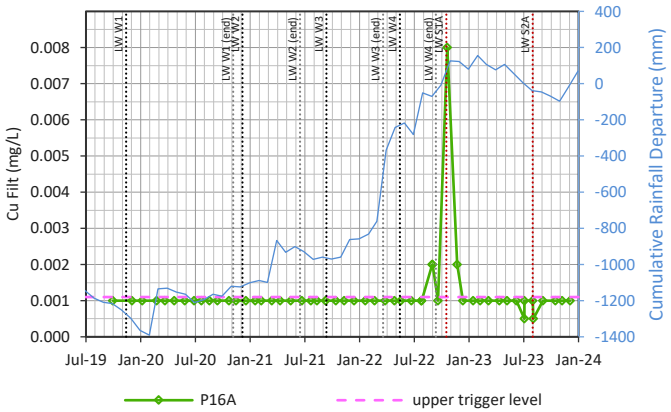
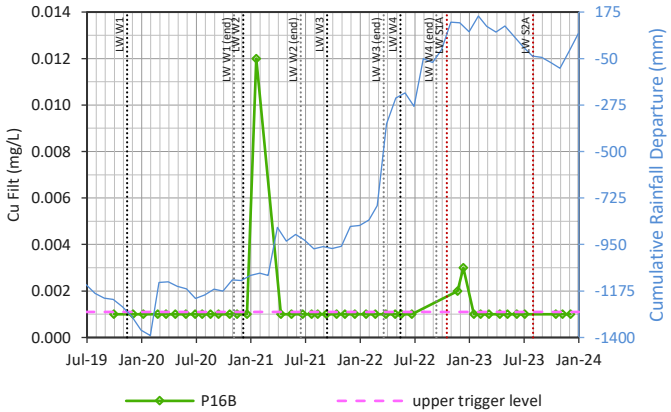
Jul-23
Jan-24
P15D
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16A
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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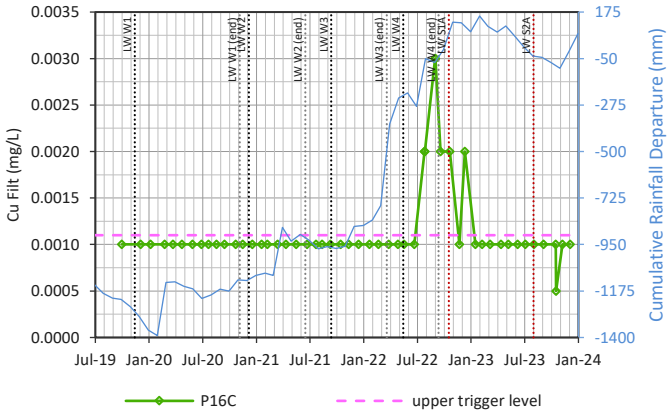
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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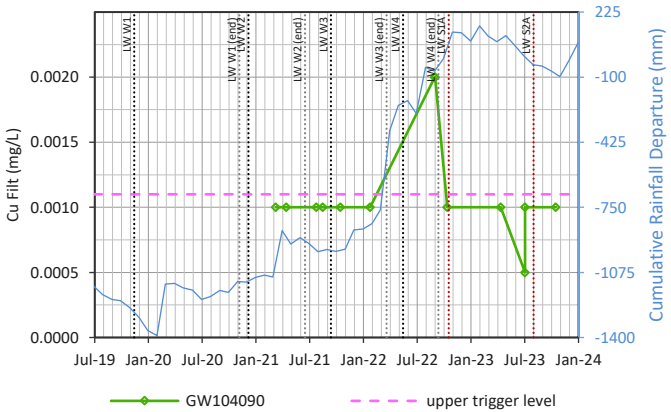
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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Jan-23
Jul-23
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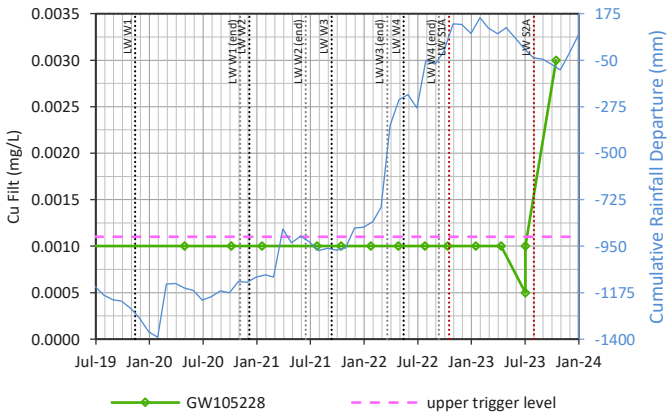
GW104090
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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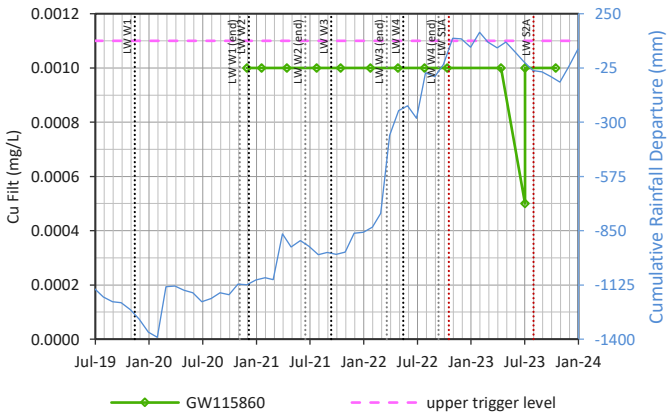
Jan-23
Jul-23
Jan-24
GW105228
upper trigger level


Cu Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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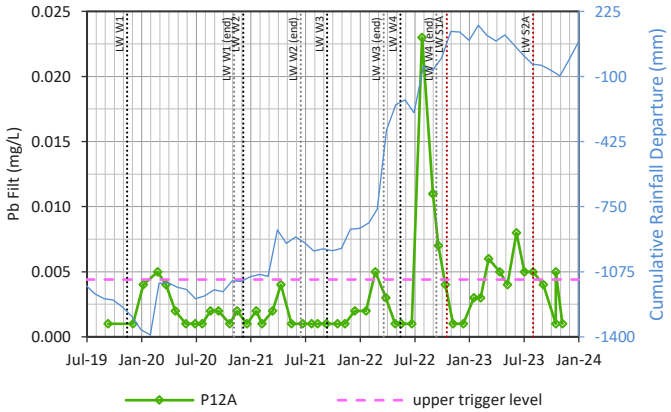
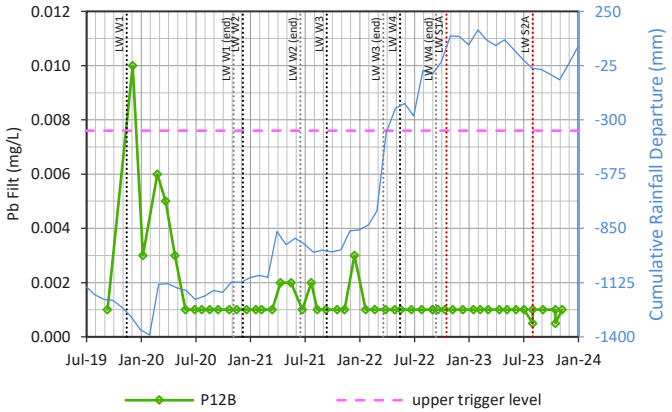
Jul-23
Jan-24
GW115860
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
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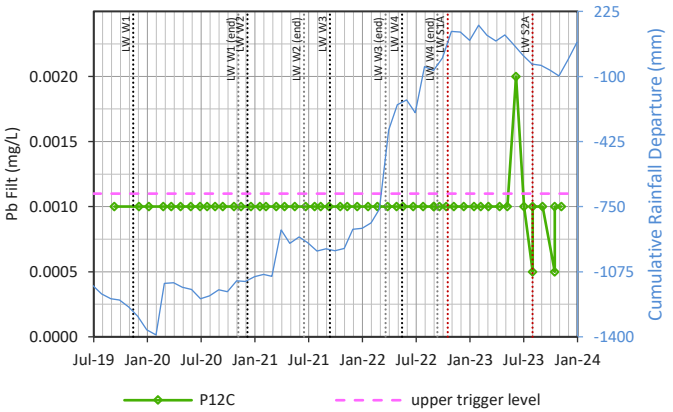
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
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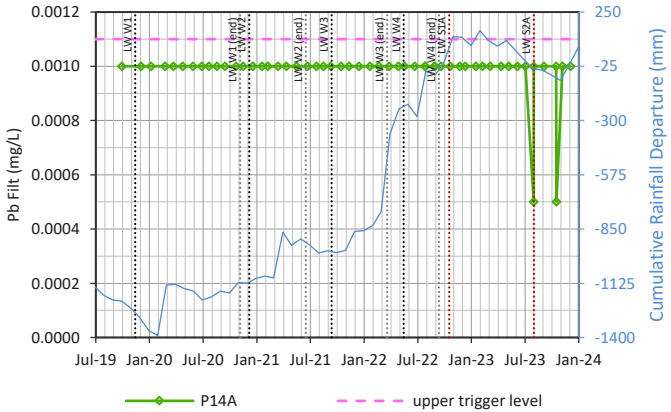
Jan-23
Jul-23
Jan-24
P12C
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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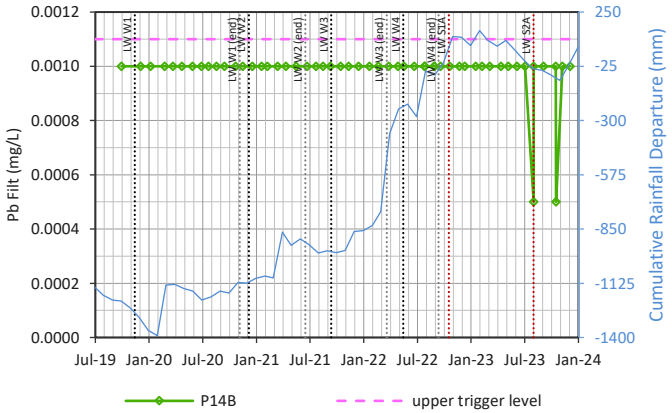
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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Jan-22
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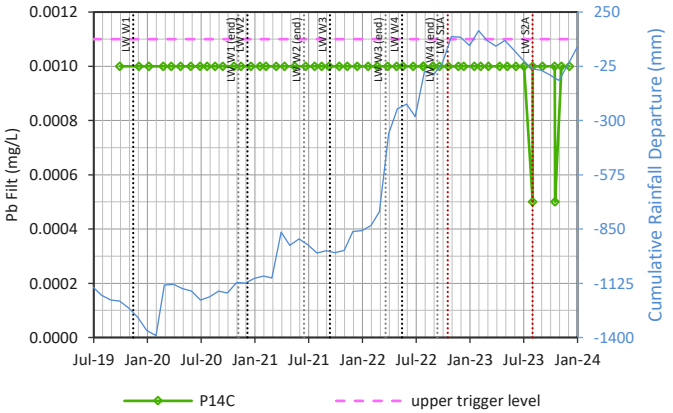
Jan-23
Jul-23
Jan-24
P14B
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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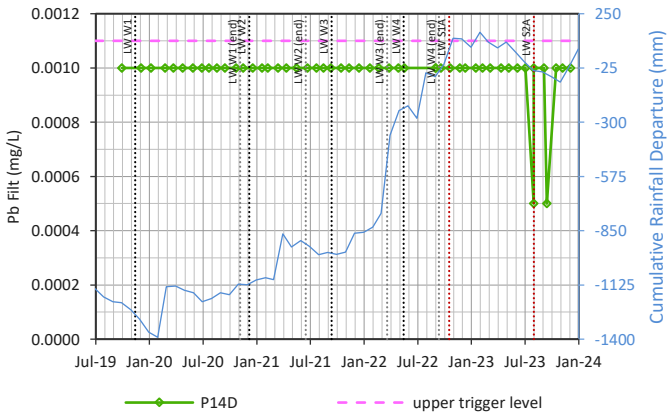
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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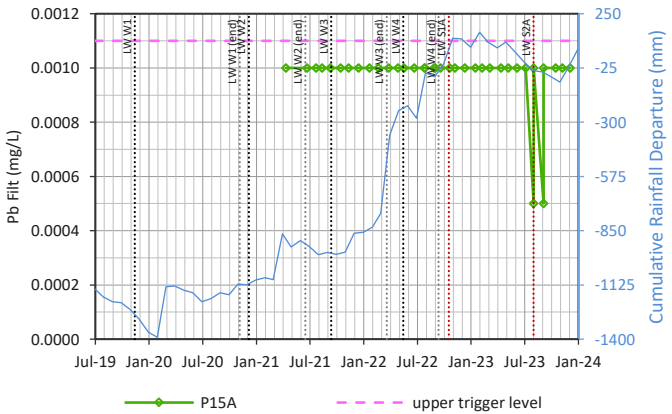
Jan-23
Jul-23
Jan-24
P14D
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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Jan-22
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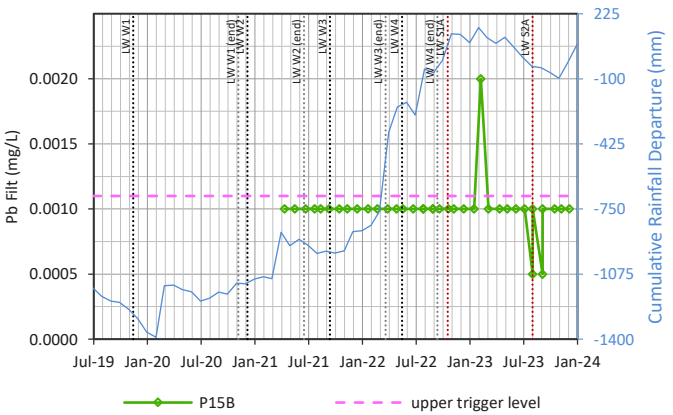
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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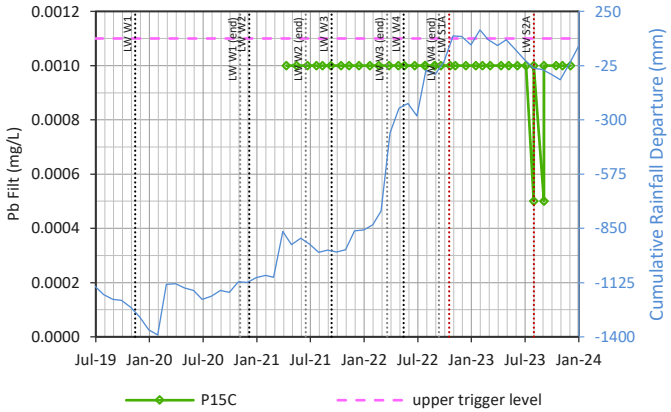
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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Jan-21
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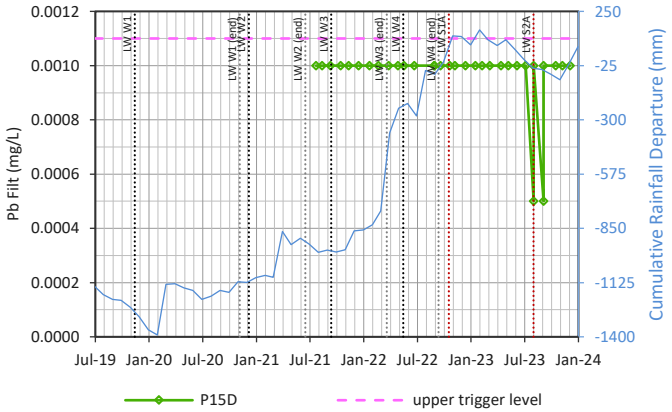
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15C
upper trigger level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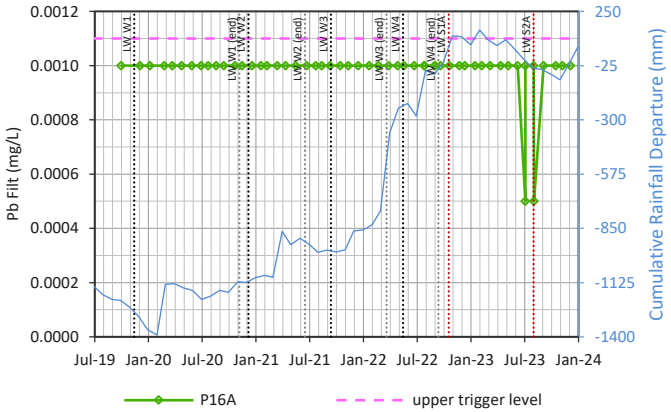
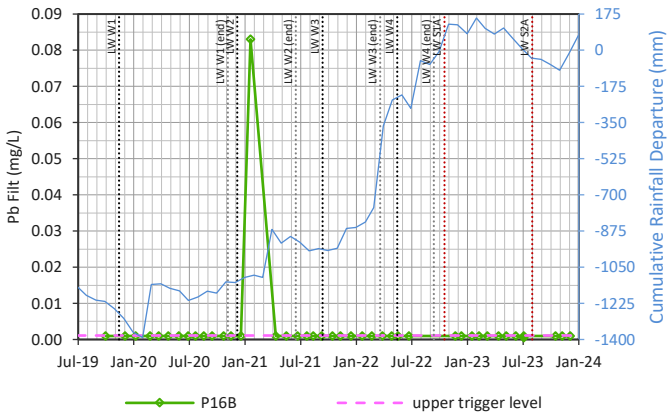
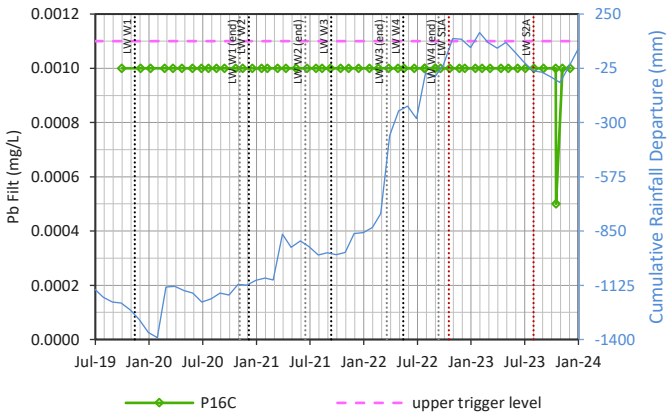
Cumulative Rainfall Departure (mm)
P15D
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
P16A
upper trigger level


Pb Filt (mg/L)
Cumulative Rainfall Departure (mm)
P16B
upper trigger level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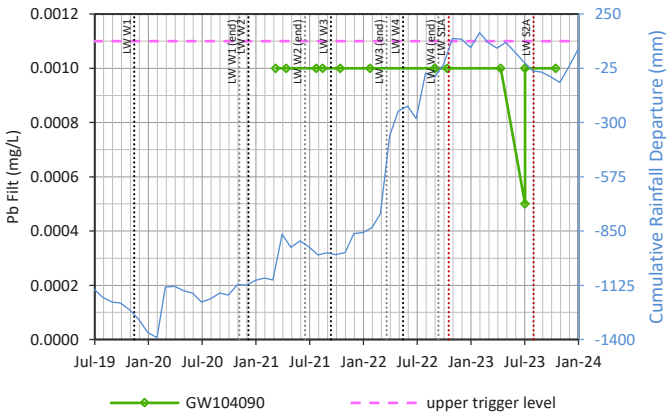
Cumulative Rainfall Departure (mm)
P16C
upper trigger level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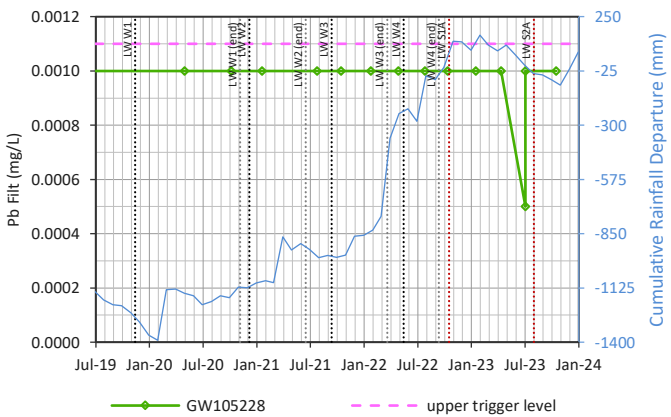
Cumulative Rainfall Departure (mm)
GW104090
upper trigger level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Cumulative Rainfall Departure (mm)
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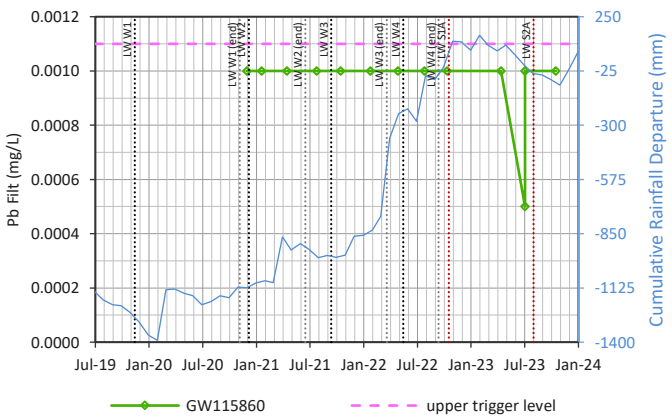
upper trigger level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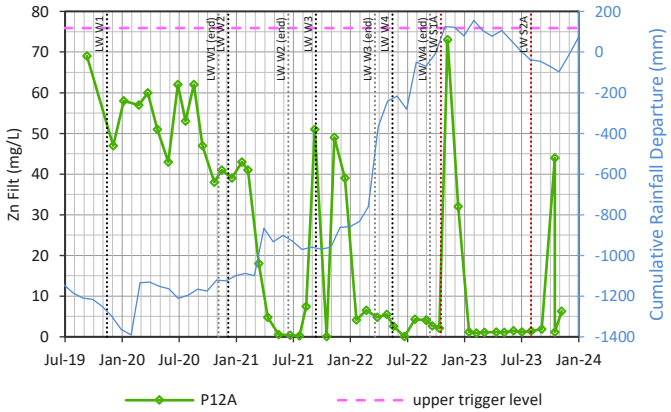
Cumulative Rainfall Departure (mm)
GW115860
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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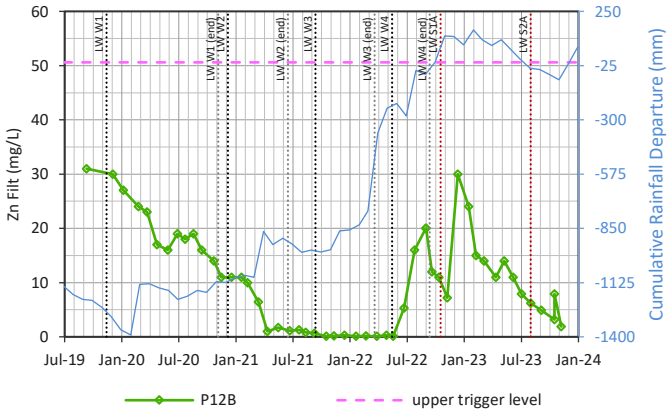
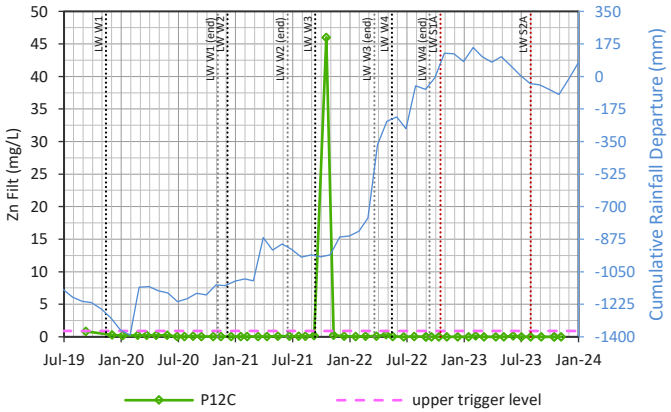
Jul-22
Jan-23
Jul-23
Jan-24
P12A
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
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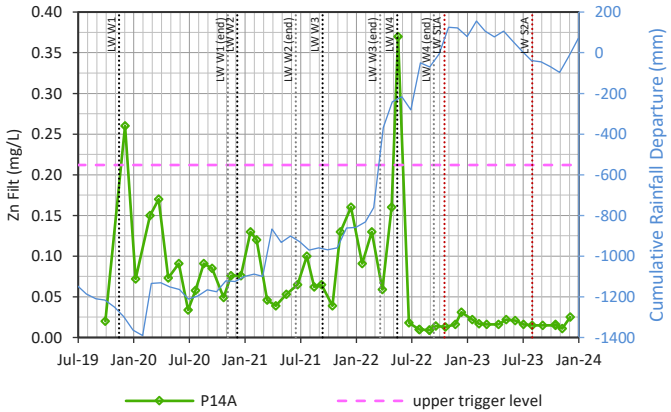
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12C
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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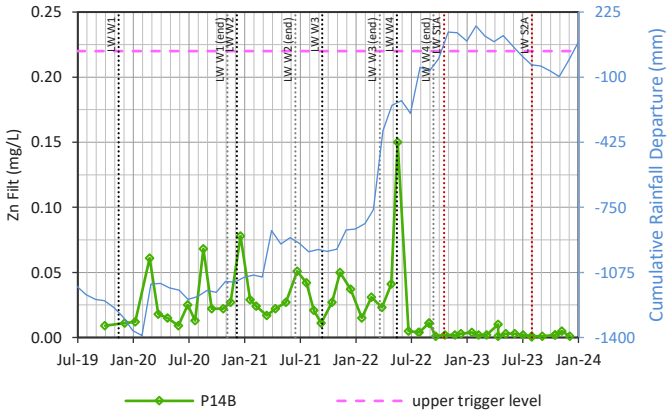
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
upper trigger level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Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
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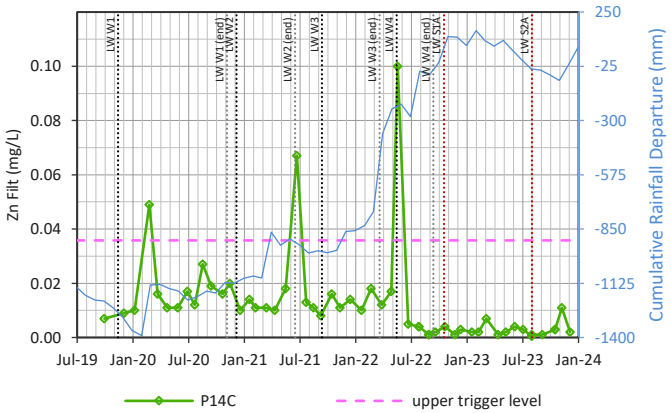
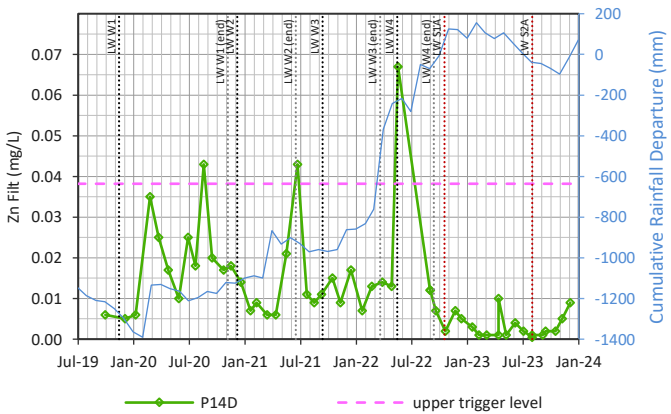
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14B
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
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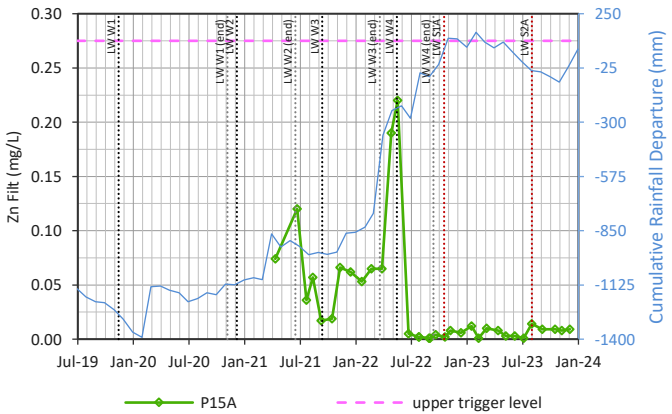
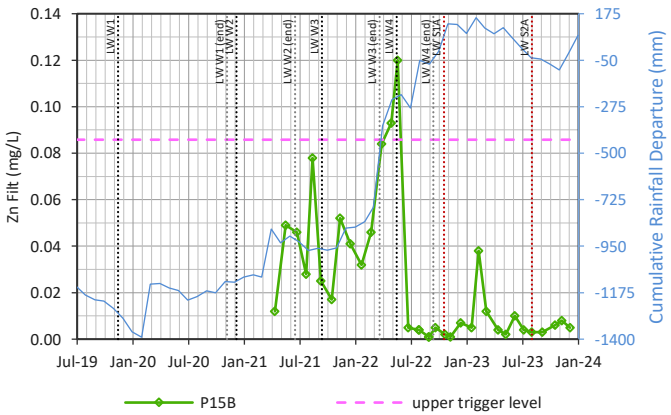
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Zn Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
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Jan-22
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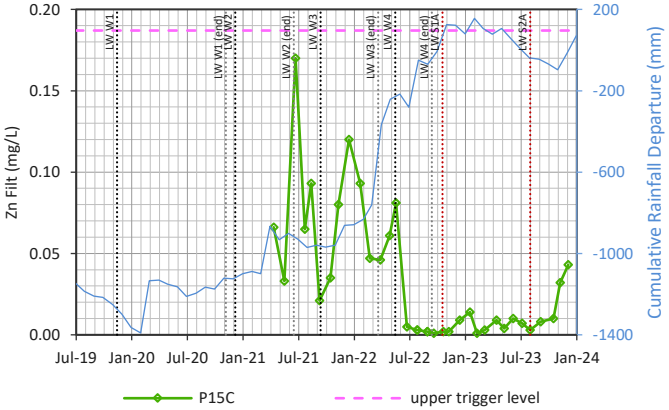
Jul-23
Jan-24
P15B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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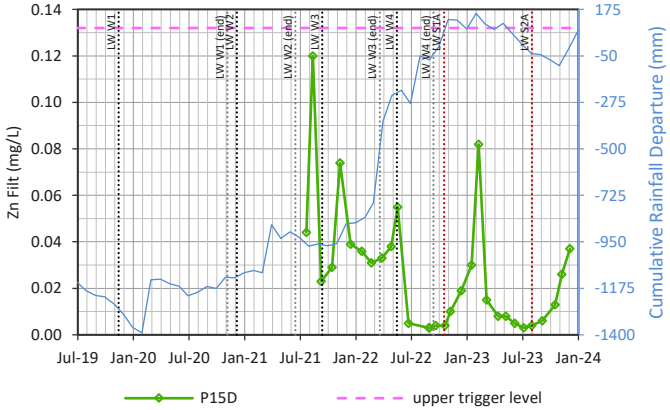
Jan-23
Jul-23
Jan-24
P15C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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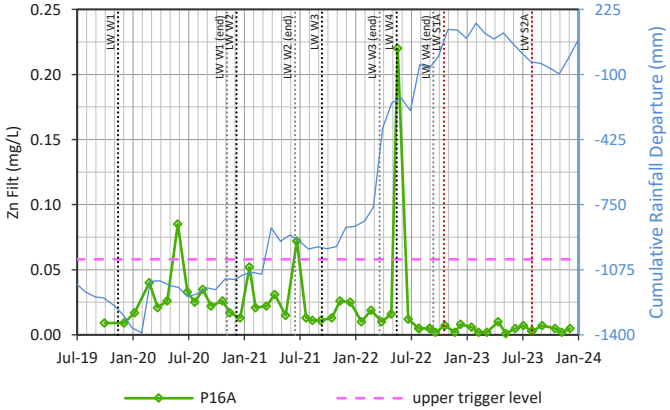
Jul-23
Jan-24
P15D
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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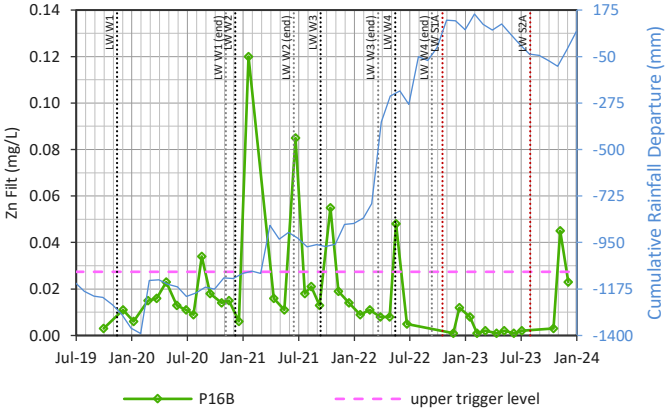
Jan-23
Jul-23
Jan-24
P16A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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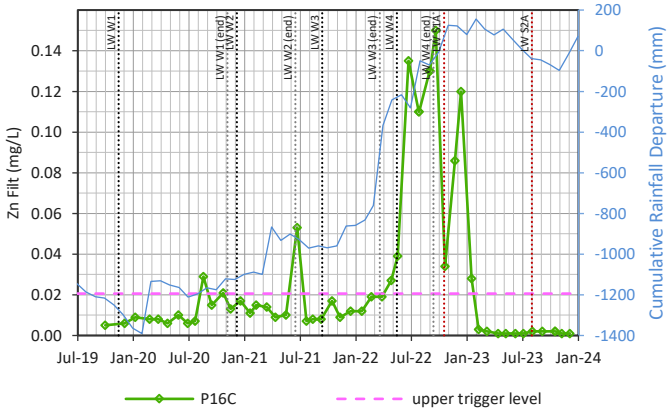
Jul-23
Jan-24
P16B
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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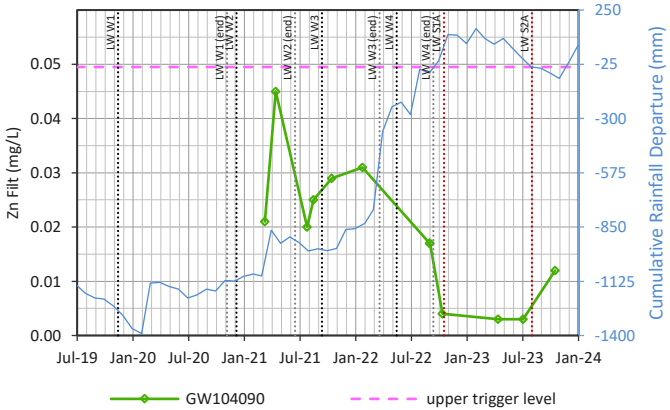
P16C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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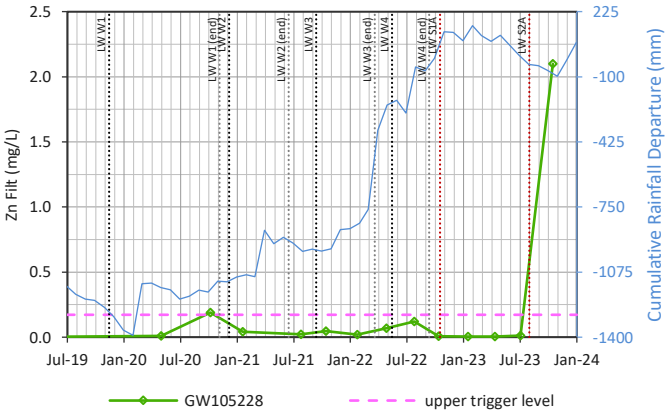
GW104090
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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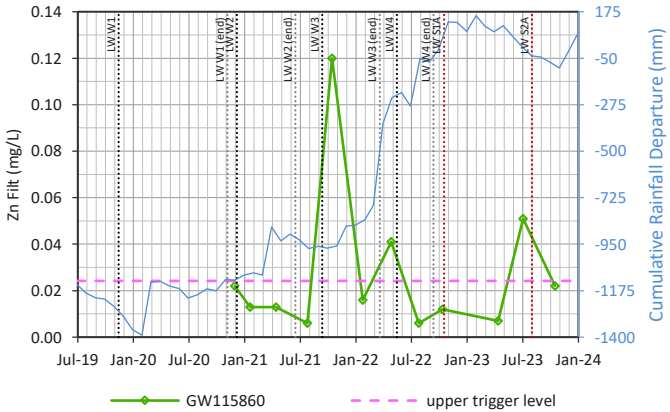
GW105228
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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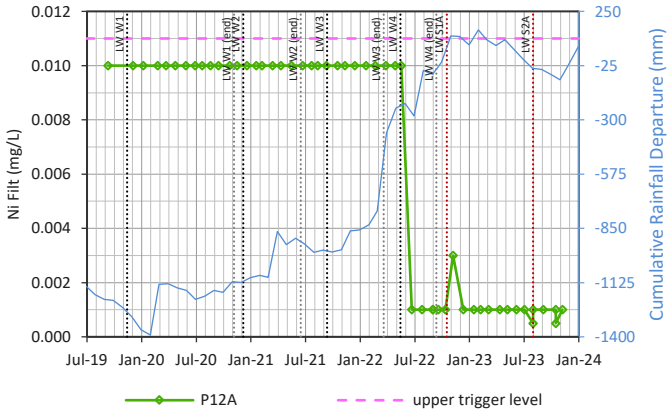
GW115860
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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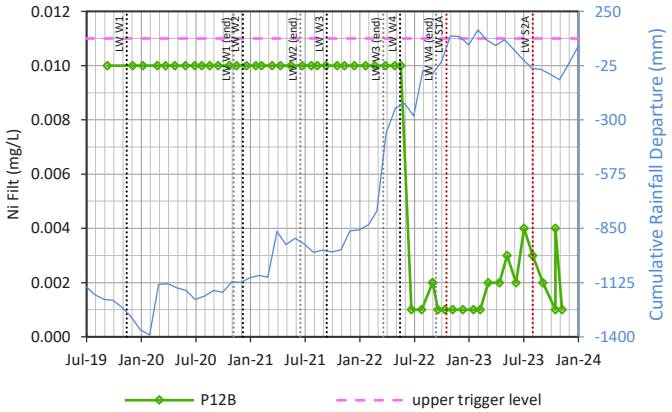
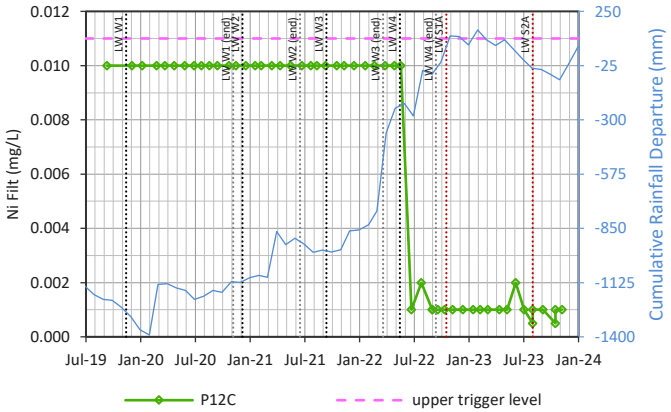
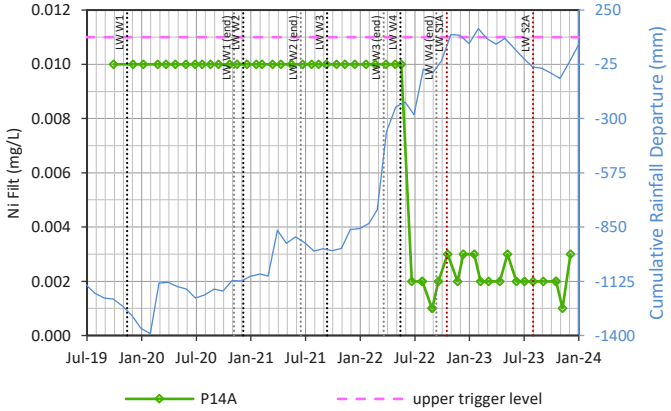
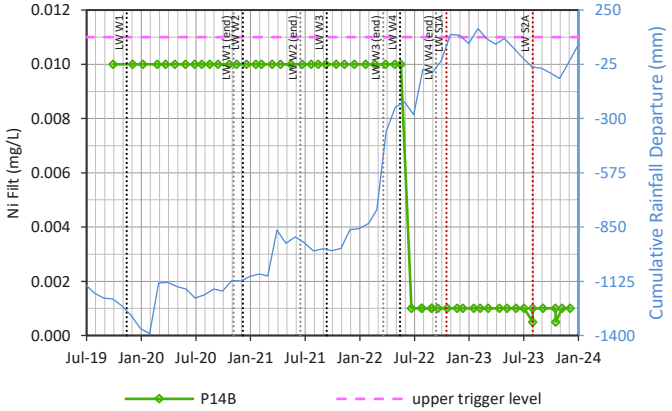
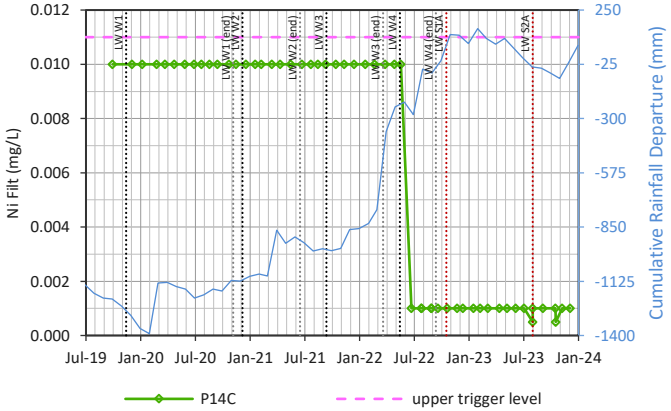
Jan-23
Jul-23
Jan-24
P12A
upper trigger level

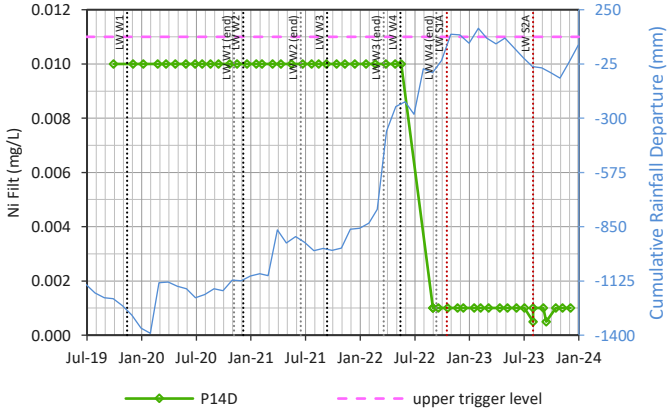

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P12B
upper trigger level

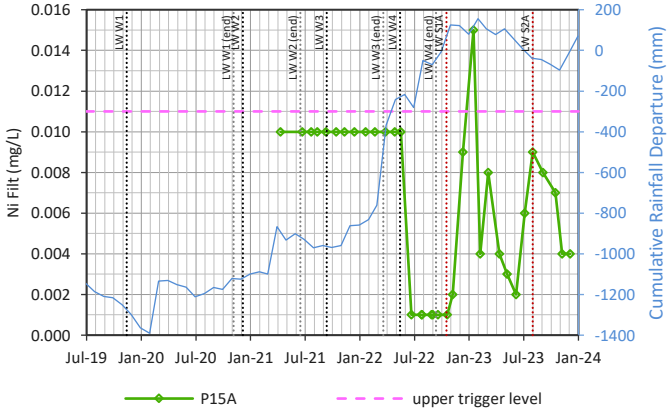

Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P12C
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P14A
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P14B
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P14C
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P14D
upper trigger level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Cumulative Rainfall Departure (mm)
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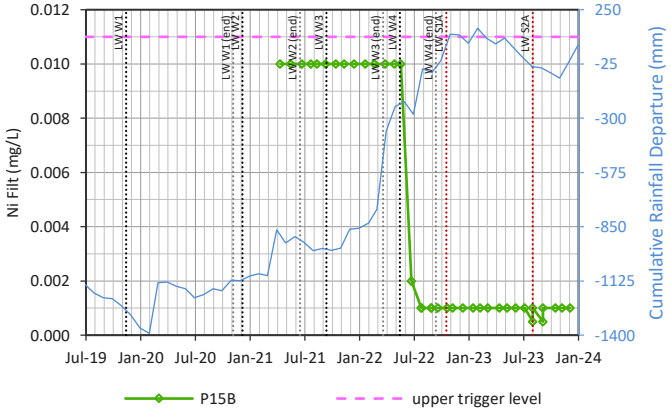
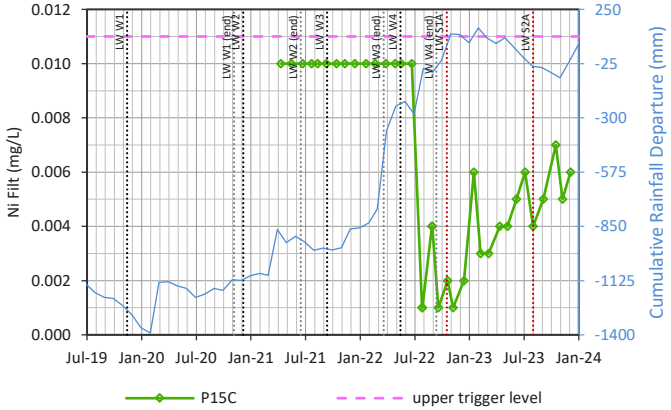
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
P15B
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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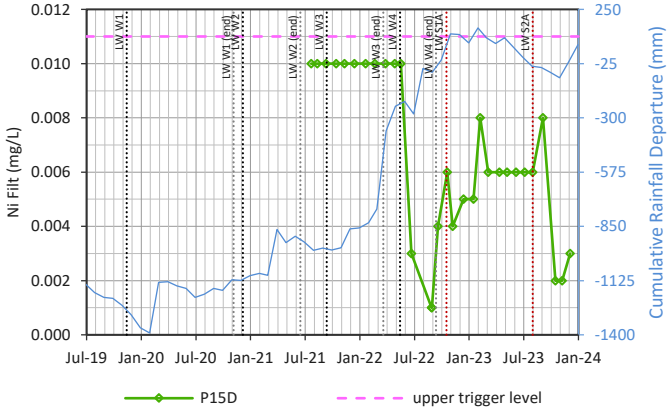
Jan-23
Jul-23
Jan-24
P15C
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-23
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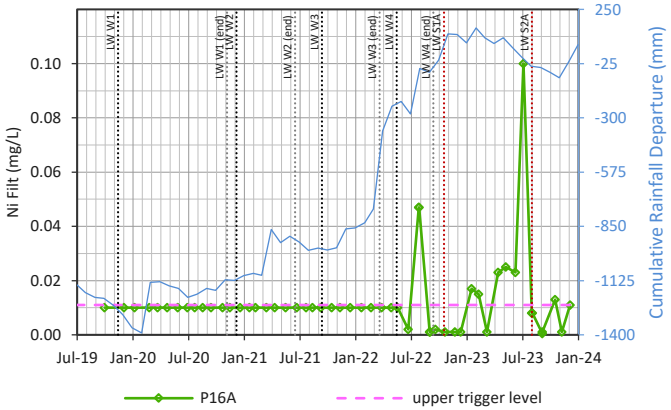
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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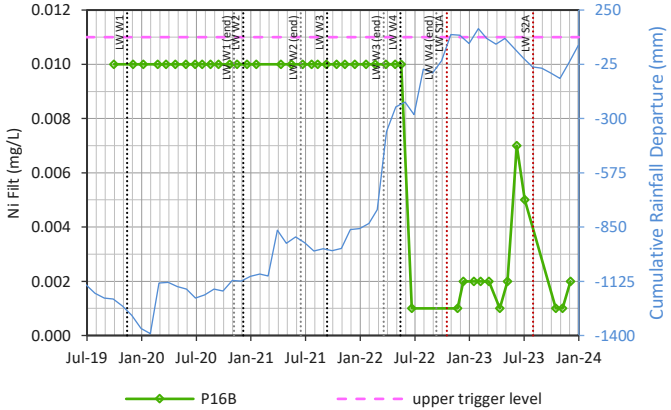
Jan-23
Jul-23
Jan-24
P16A
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-23
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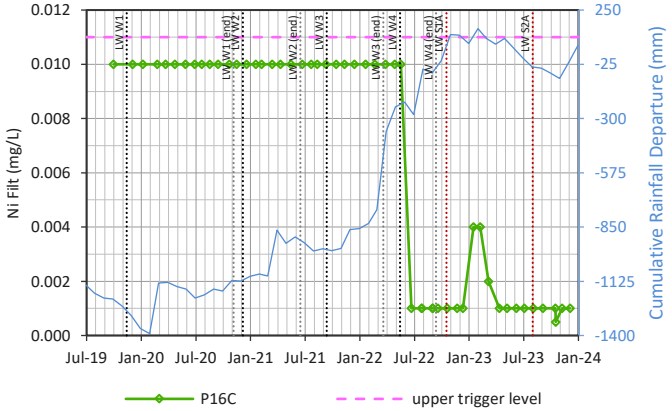
P16B
upper trigger level


Ni Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jan-23
Jul-23
Jan-24
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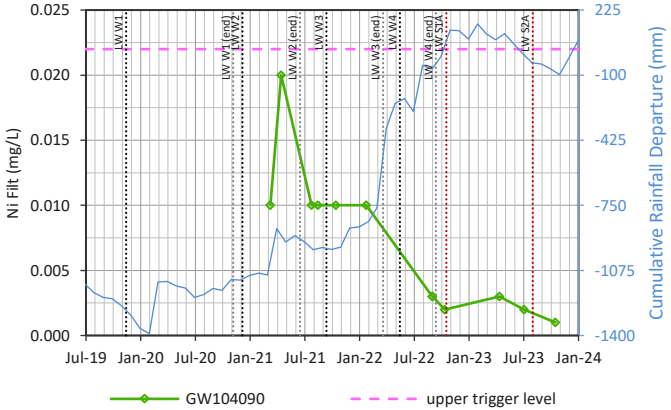
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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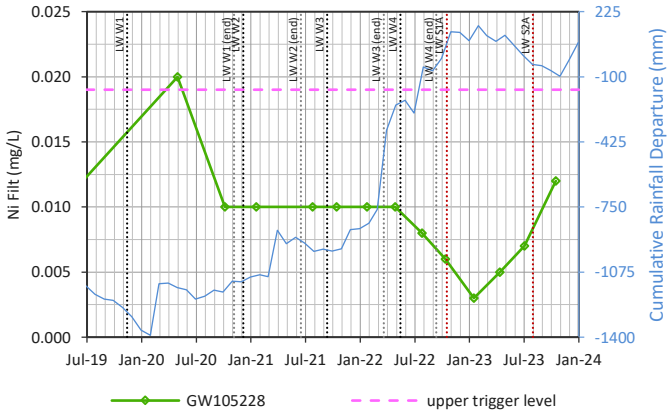
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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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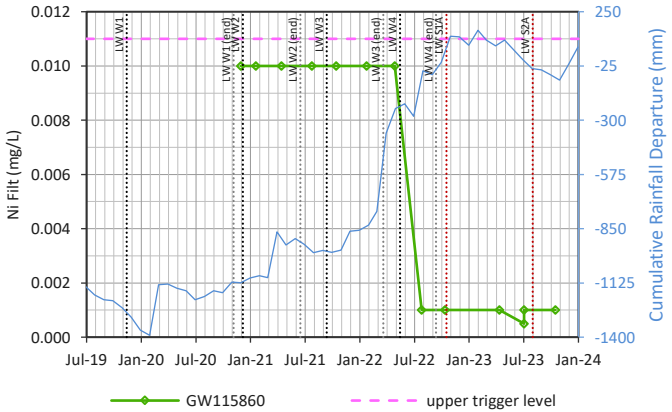
GW105228
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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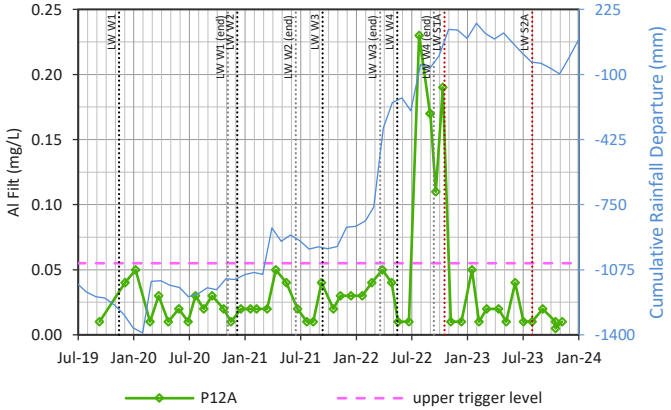
GW115860
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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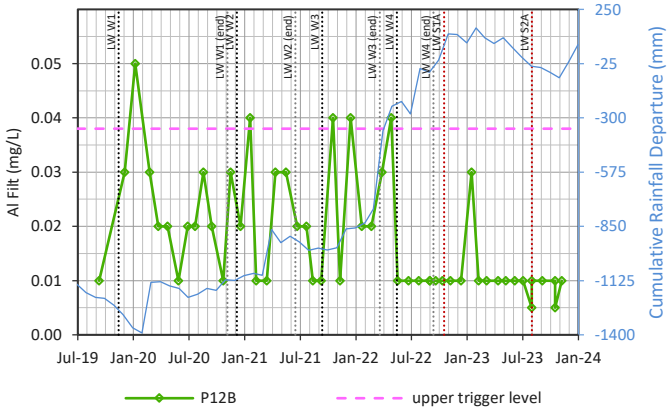
Jan-23
Jul-23
Jan-24
P12A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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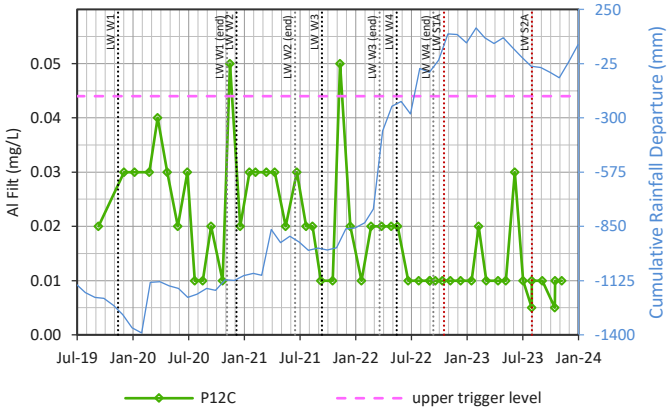
Jan-23
Jul-23
Jan-24
P12B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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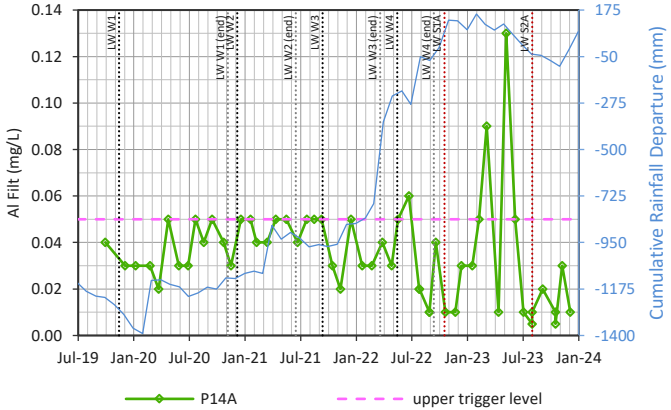
Jul-23
Jan-24
P12C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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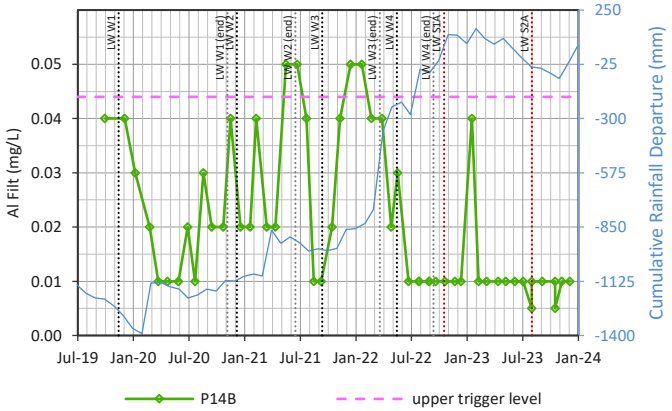
Jul-23
Jan-24
P14A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jan-22
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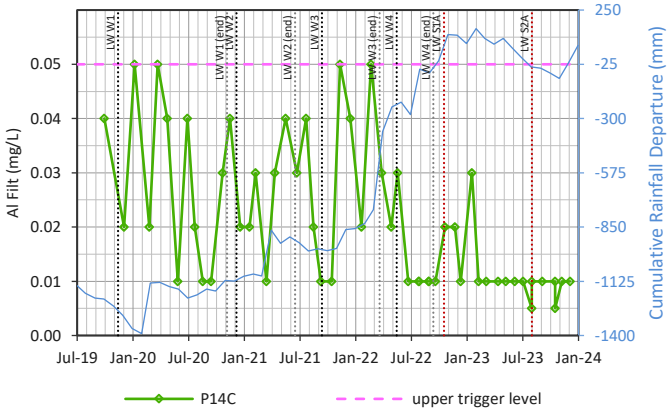
Jan-23
Jul-23
Jan-24
P14B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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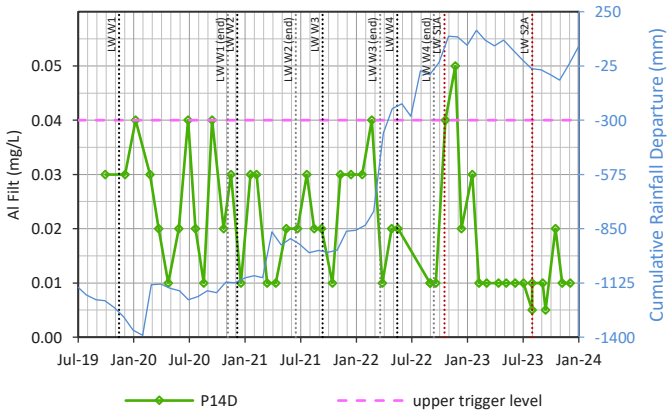
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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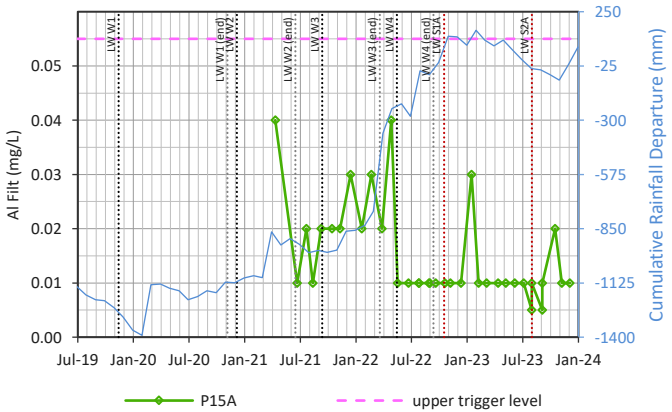
Jul-23
Jan-24
P14D
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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Jul-23
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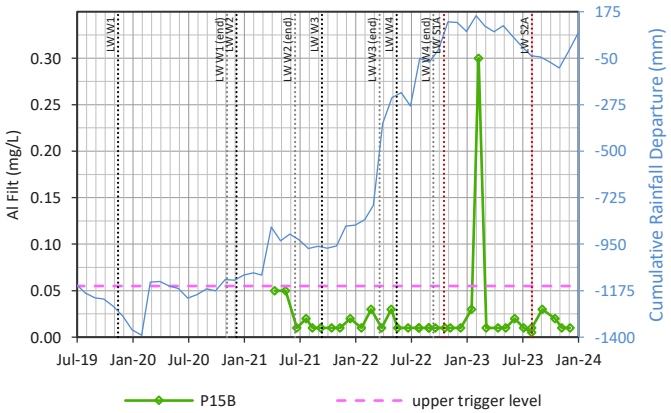
P15A
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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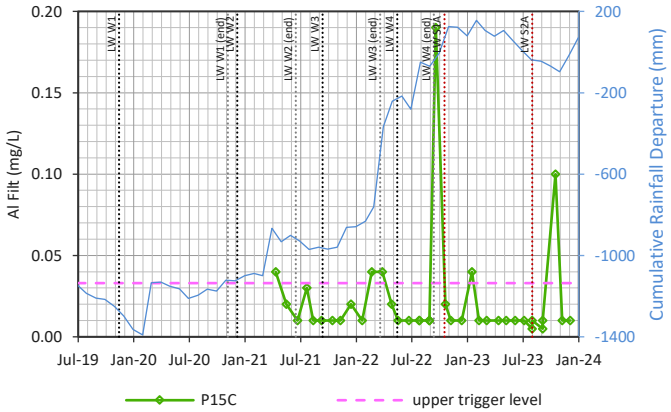
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-23
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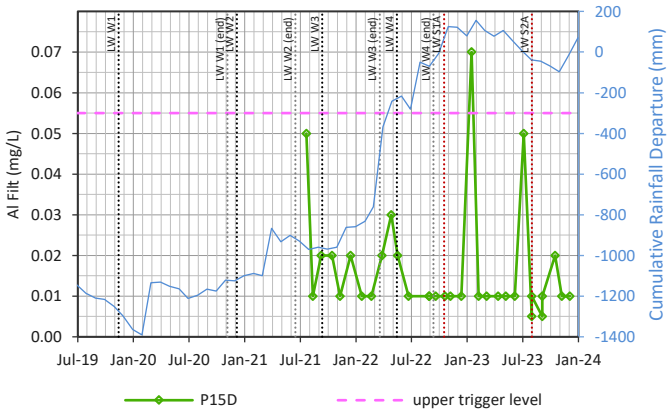
P15C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jan-22
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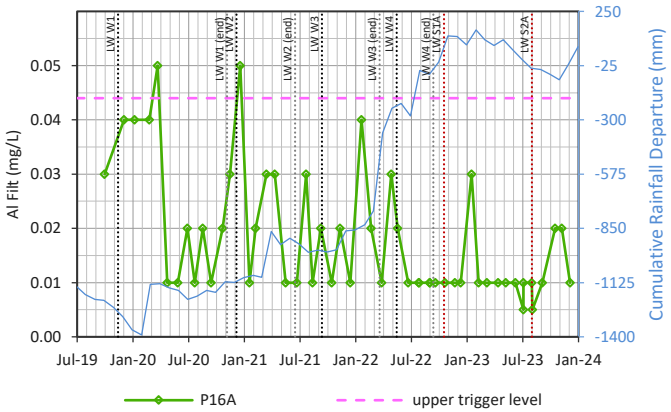
Jan-23
Jul-23
Jan-24
P15D
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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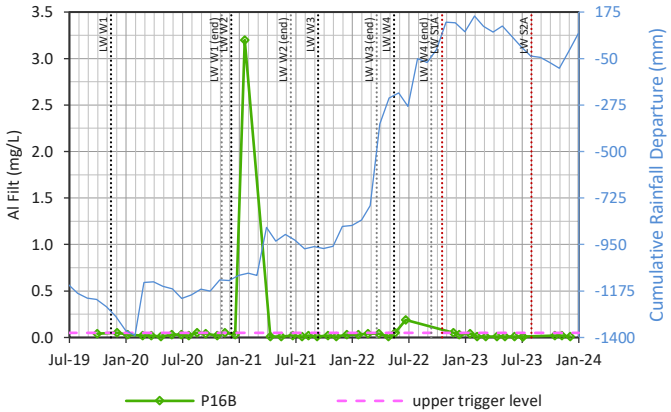
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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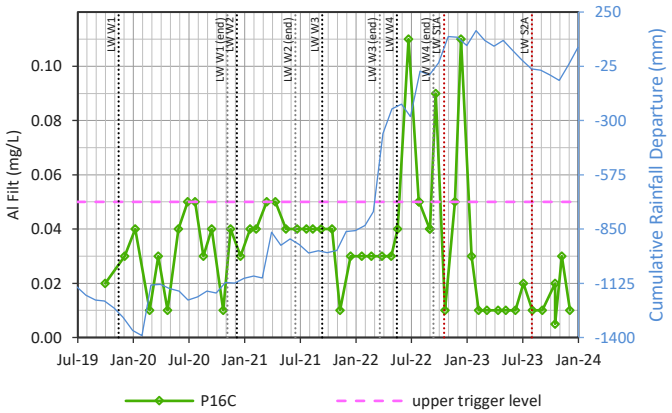
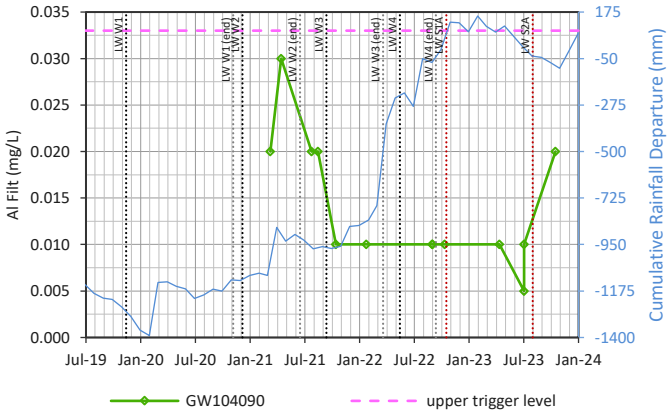
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jan-23
Jul-23
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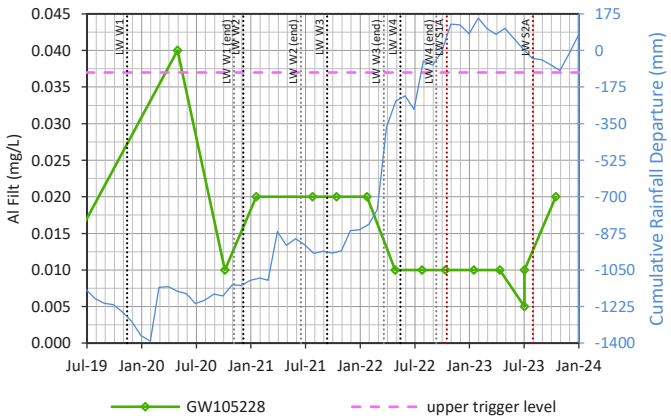
GW104090
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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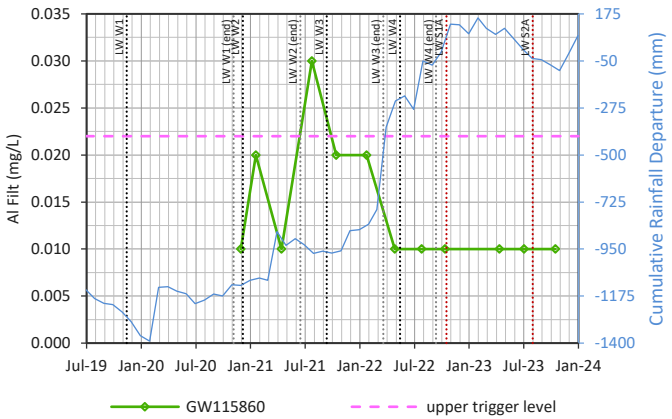
Jan-23
Jul-23
Jan-24
GW105228
upper trigger level


Al Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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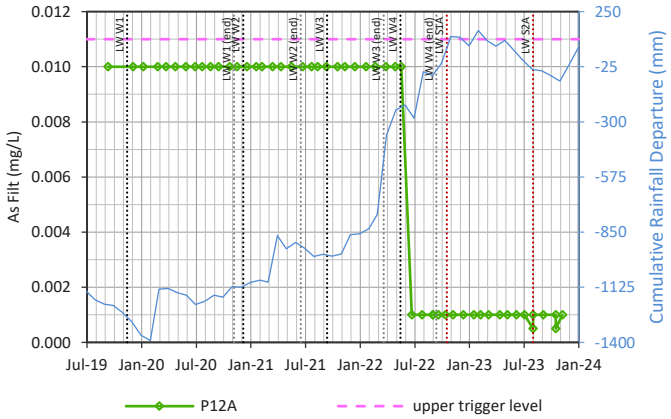
GW115860
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
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0.004
0.002
0.000
250
-25
-300
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-850
-1125
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Jul-19
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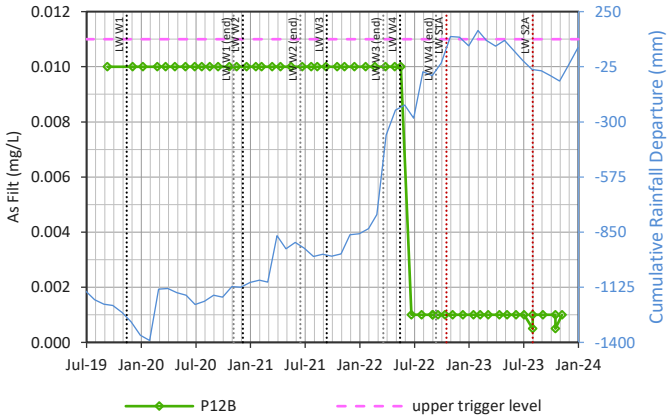
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12A
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.010
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0.006
0.004
0.002
0.000
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-25
-300
-575
-850
-1125
-1400
Jul-19
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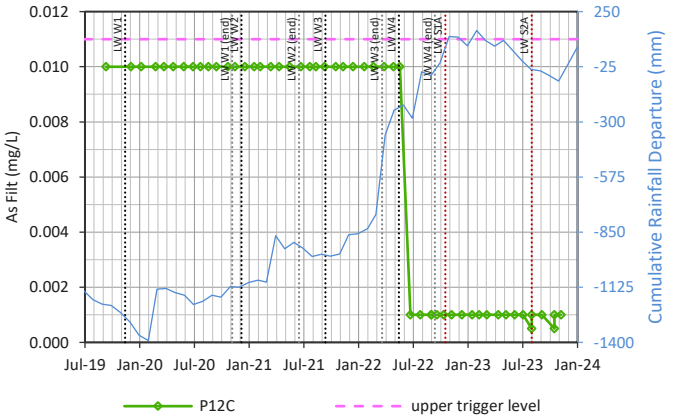
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12B
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.004
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-850
-1125
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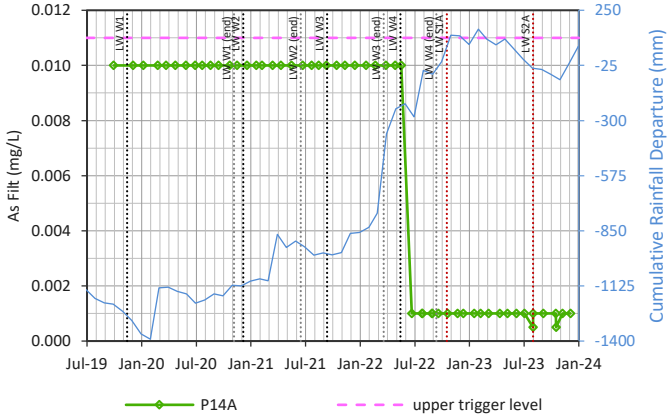
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12C
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.004
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Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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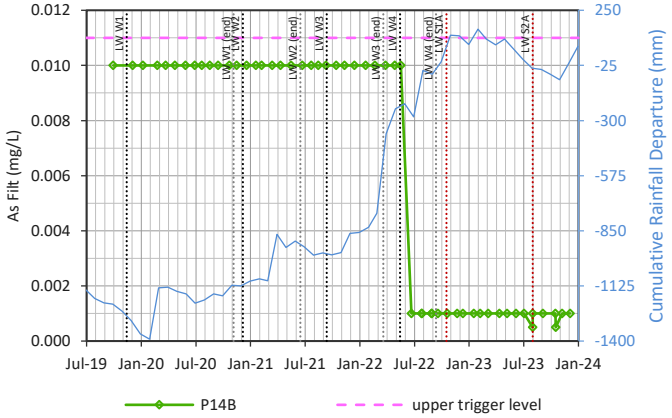
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.002
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Jan-24
LW W1
LW W1 (end)
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LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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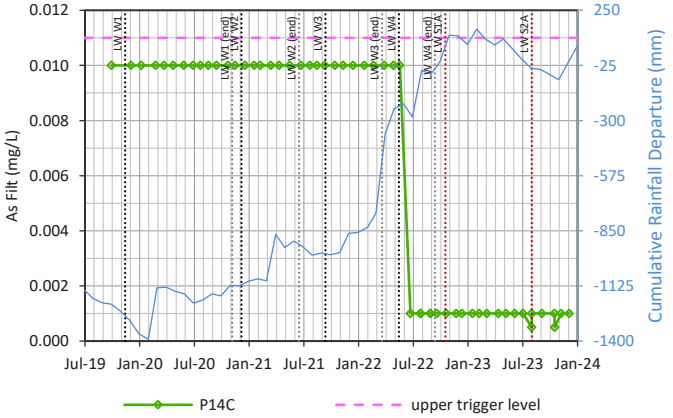
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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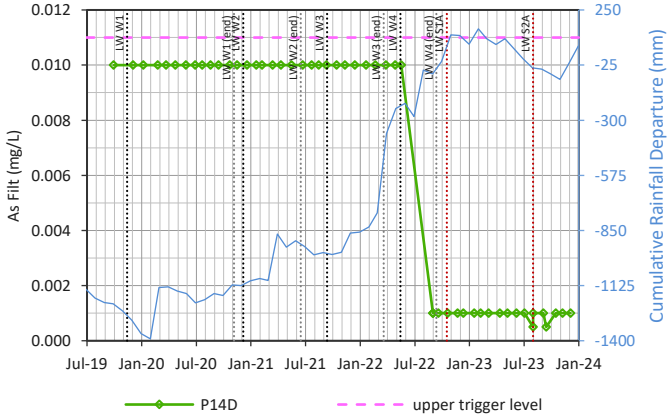
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14C
upper trigger level


As Filt (mg/L)
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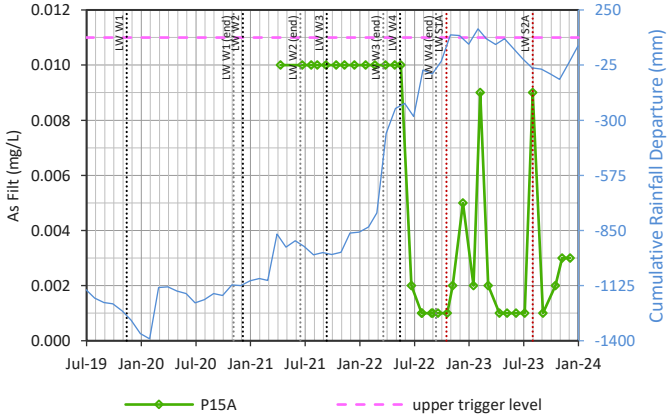
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14D
upper trigger level


As Filt (mg/L)
Cumulative Rainfall Departure (mm)
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Jul-23
Jan-24
LW W1
LW W1 (end)
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LW W3
LW W3 (end)
LW W4
LW W4 (end)
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LW S2A
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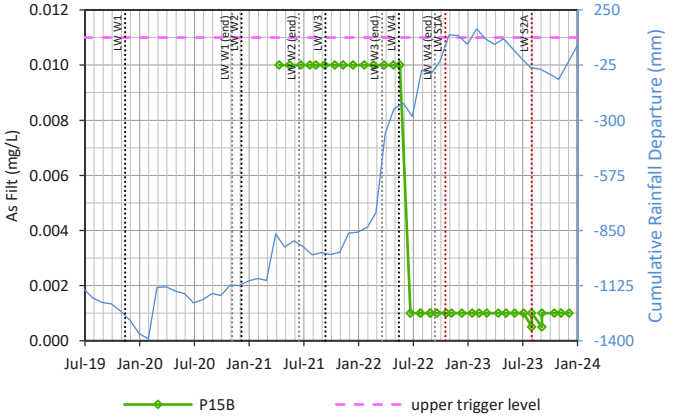
upper trigger level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Cumulative Rainfall Departure (mm)
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Jul-23
Jan-24
LW W1
LW W1 (end)
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LW W4
LW W4 (end)
LW S1A
LW S2A
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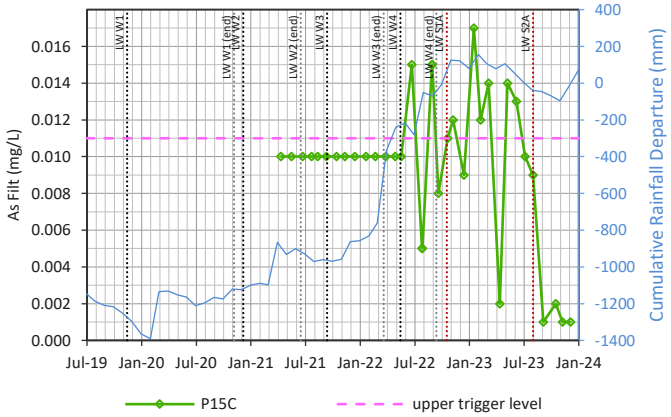
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W2
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LW W3
LW W3 (end)
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LW W4 (end)
LW S1A
LW S2A
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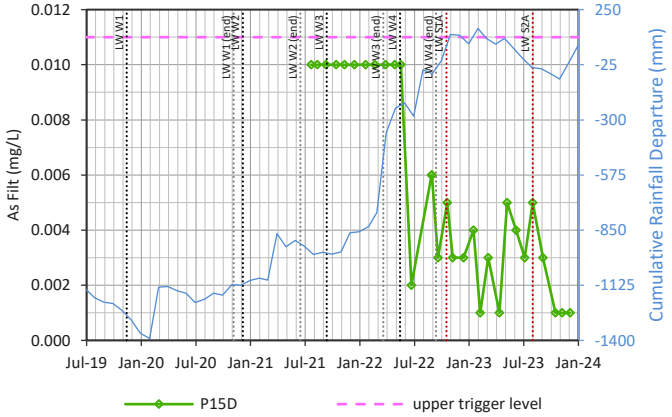
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-23
Jan-24
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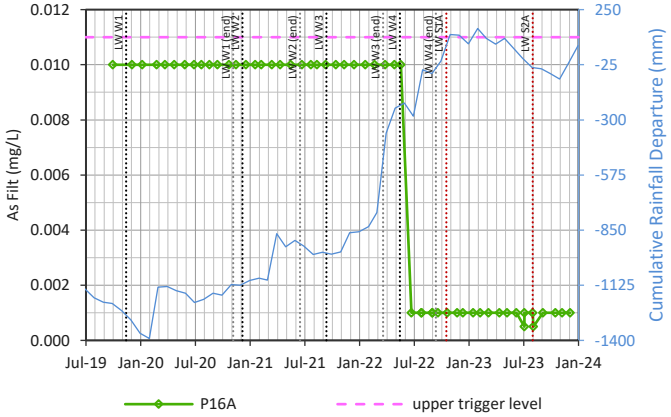
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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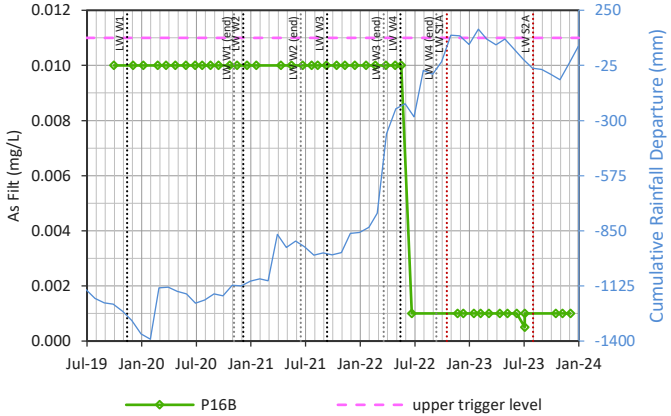
Jan-24
P16A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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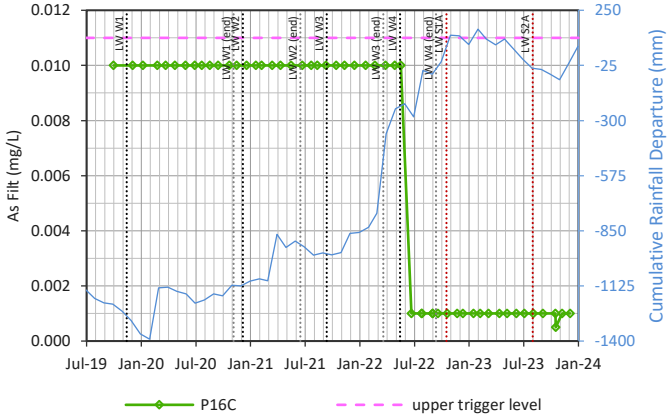
Jan-24
P16B
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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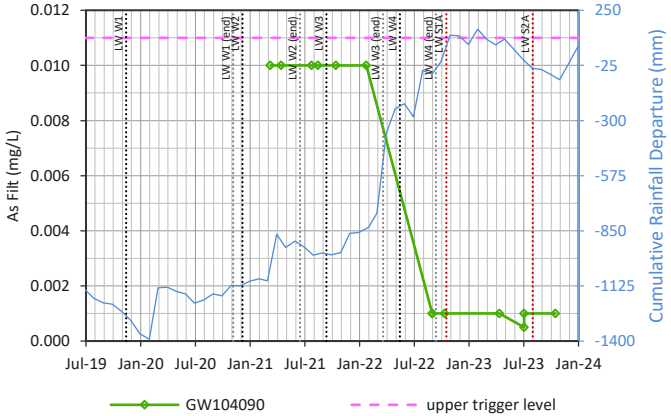
Jan-24
P16C
upper trigger level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LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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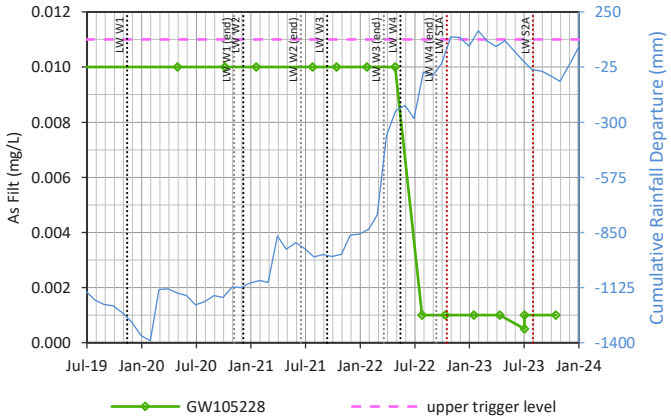
Jul-23
Jan-24
GW104090
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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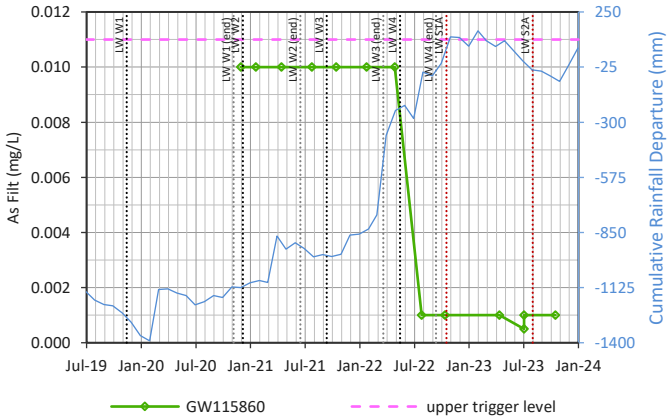
Jan-24
GW105228
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
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LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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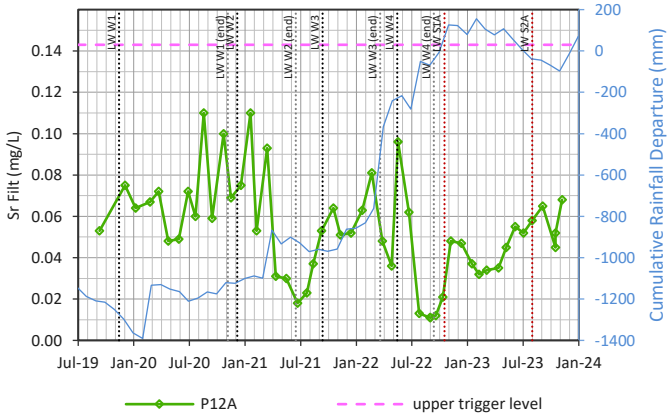
Jan-24
GW115860
upper trigger level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Cumulative Rainfall Departure (mm)
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LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
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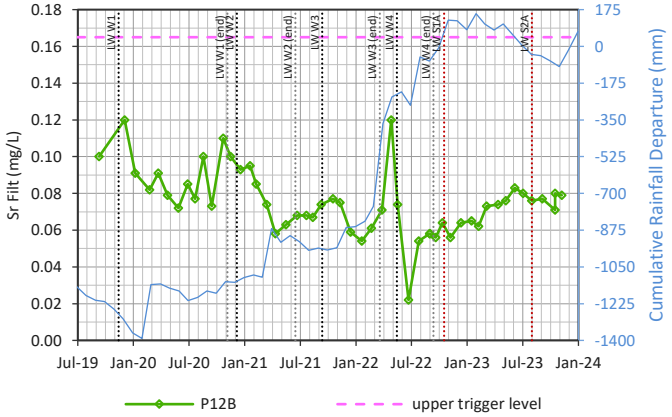
Jan-24
P12A
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
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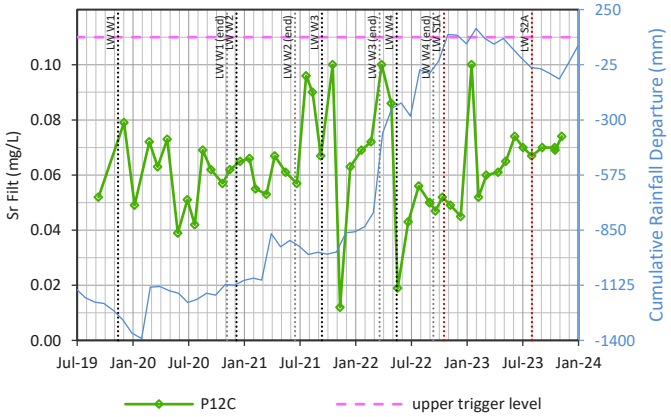
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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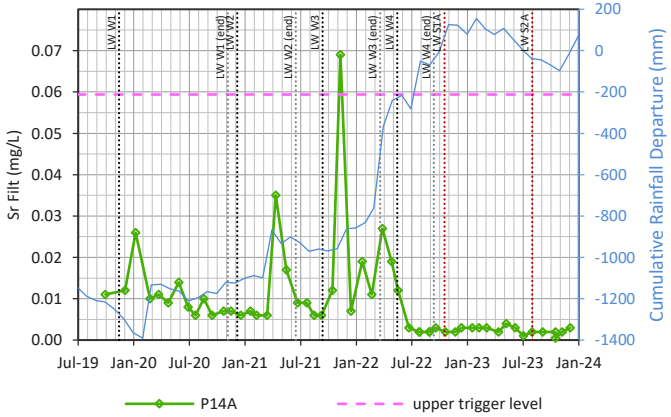
Jan-23
Jul-23
Jan-24
P12C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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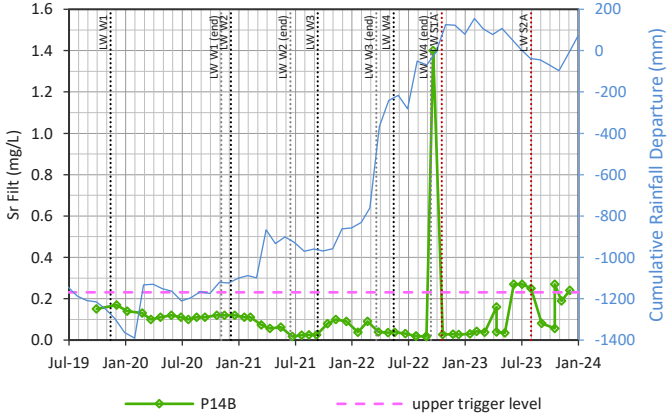
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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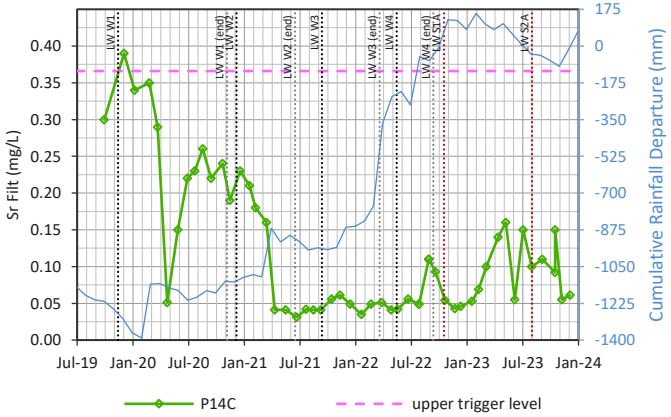
Jan-23
Jul-23
Jan-24
P14B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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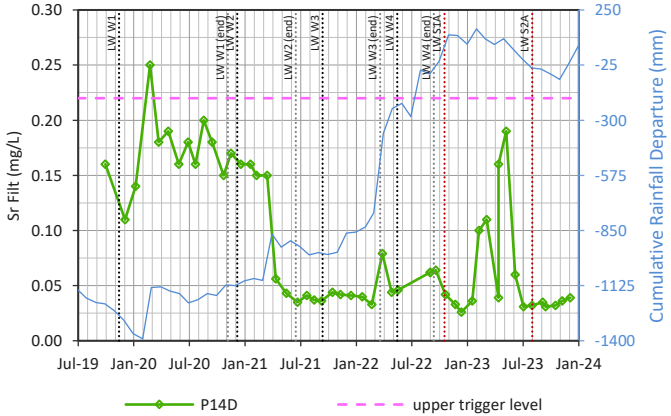
Jan-23
Jul-23
Jan-24
P14C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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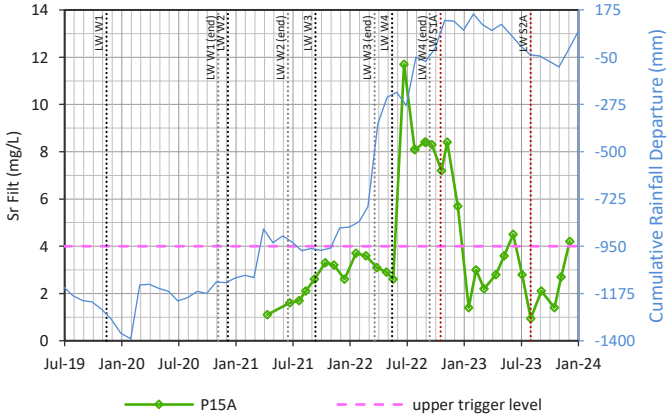
Jul-23
Jan-24
P14D
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
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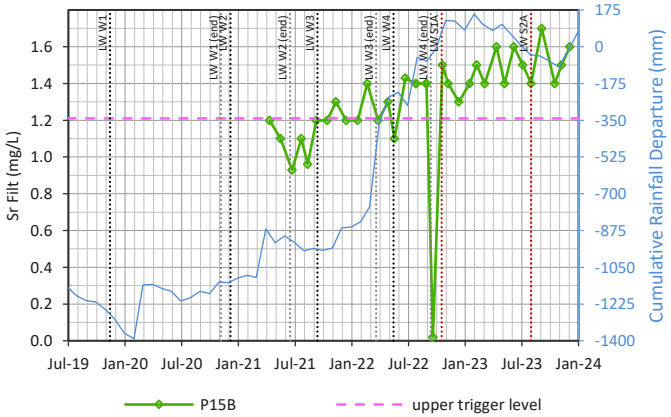
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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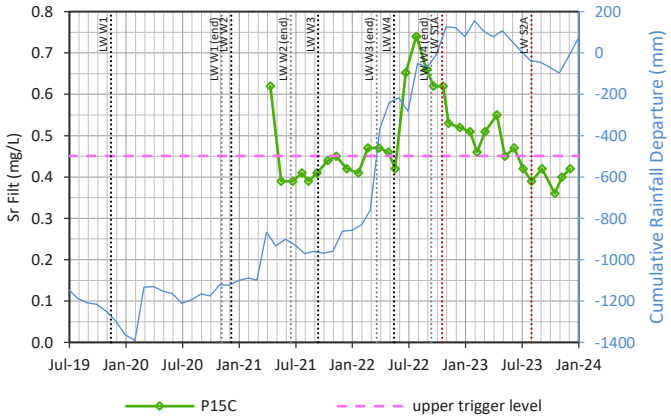
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
Jul-19
Jan-20
Jul-20
Jan-21
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Jan-22
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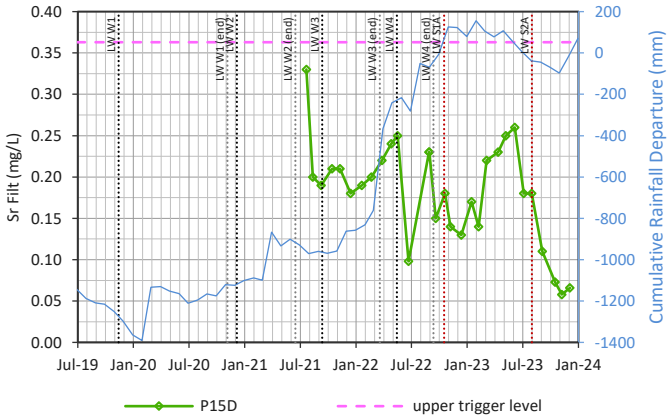
Jan-23
Jul-23
Jan-24
P15C
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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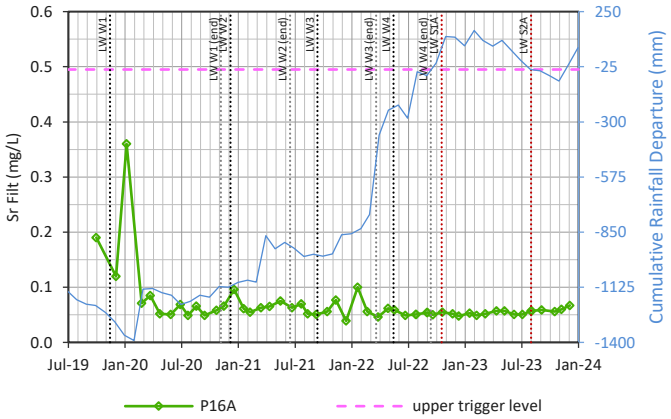
Jan-23
Jul-23
Jan-24
P15D
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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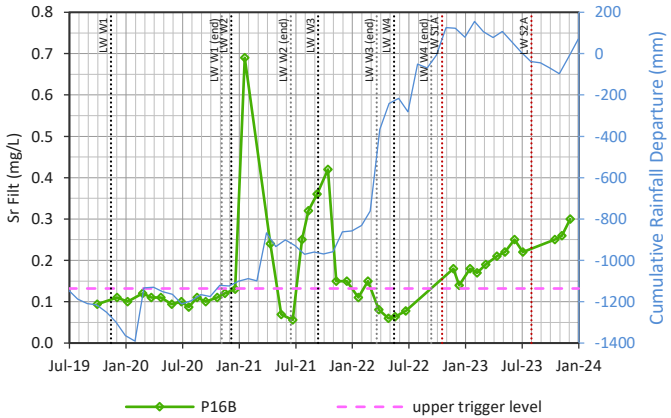
Jul-23
Jan-24
P16A
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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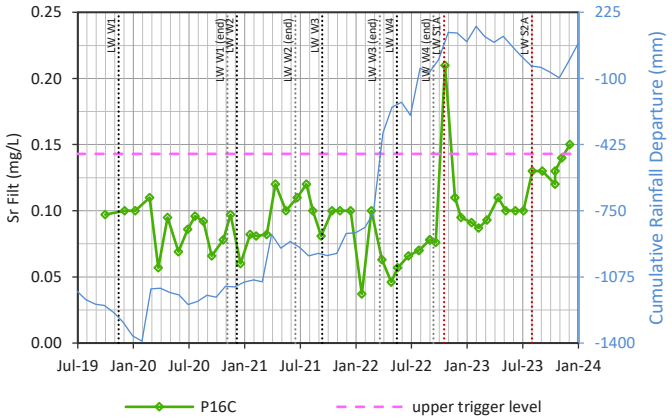
Jul-23
Jan-24
P16B
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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Jan-22
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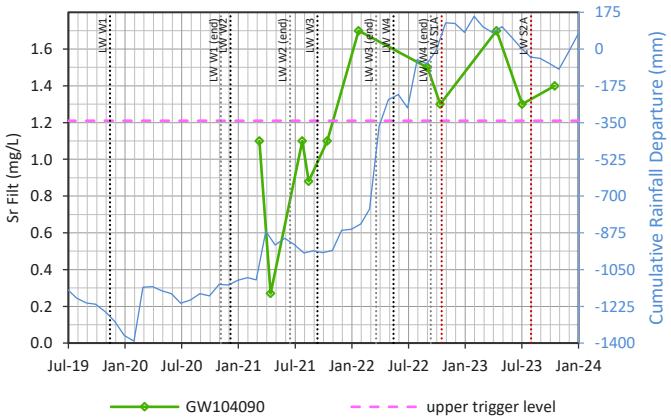
Jan-23
Jul-23
Jan-24
P16C
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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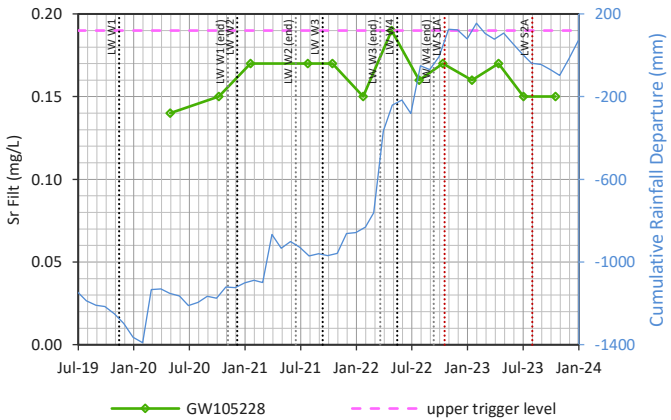
GW104090
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW.W1
LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
LW.W3 (end)
LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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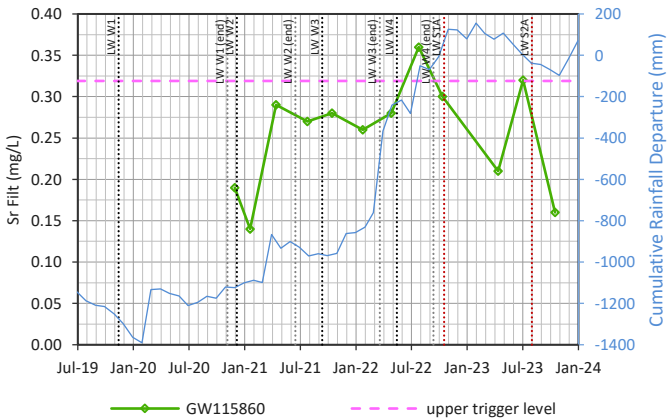
GW105228
upper trigger level


Sr Filt (mg/L)
Cumulative Rainfall Departure (mm)
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LW.W1 (end)
LW.W2
LW.W2 (end)
LW.W3
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LW.W4
LW.W4 (end)
LW.S1A
LW.S2A
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Jul-23
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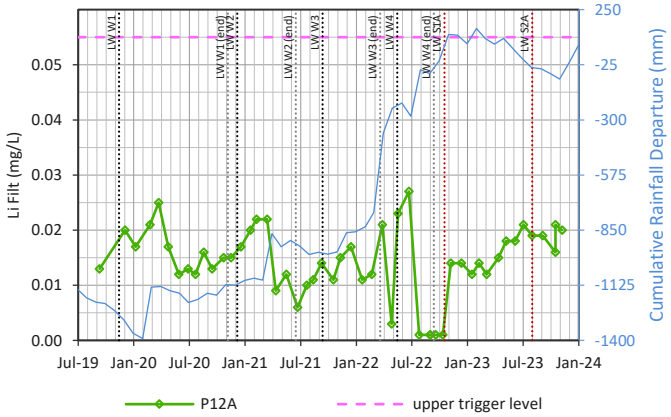
GW115860
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jan-22
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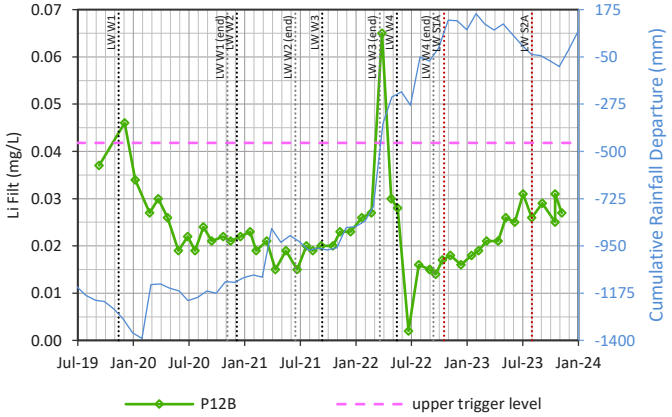
Jan-23
Jul-23
Jan-24
P12A
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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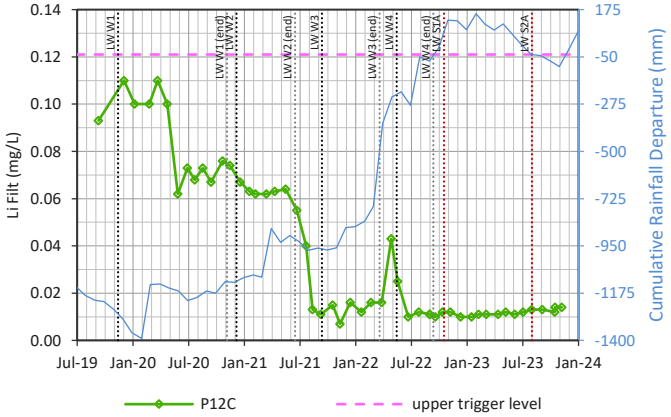
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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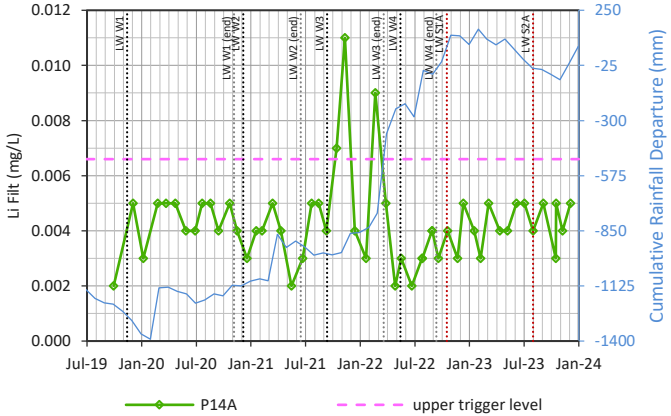
Jan-23
Jul-23
Jan-24
P12C
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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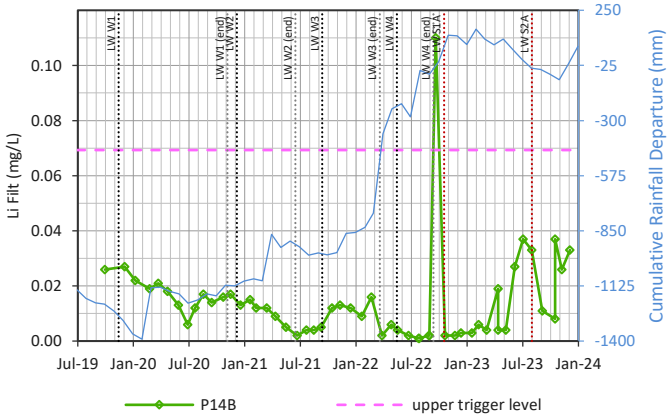
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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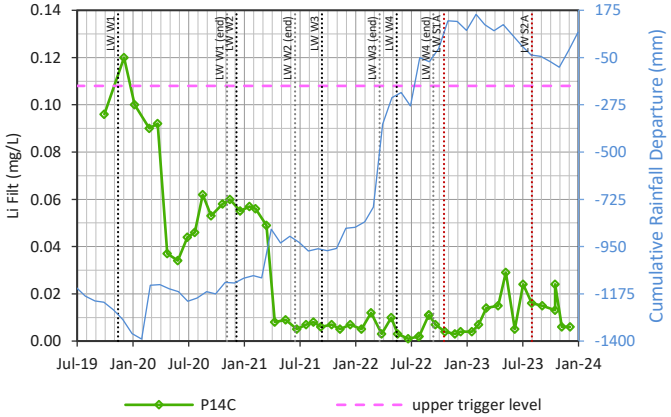
Jan-23
Jul-23
Jan-24
P14B
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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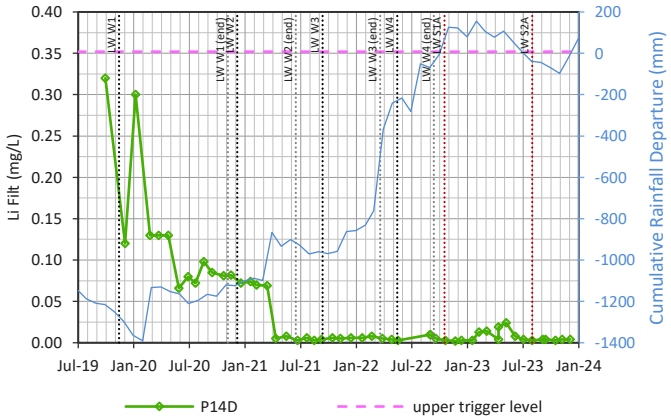
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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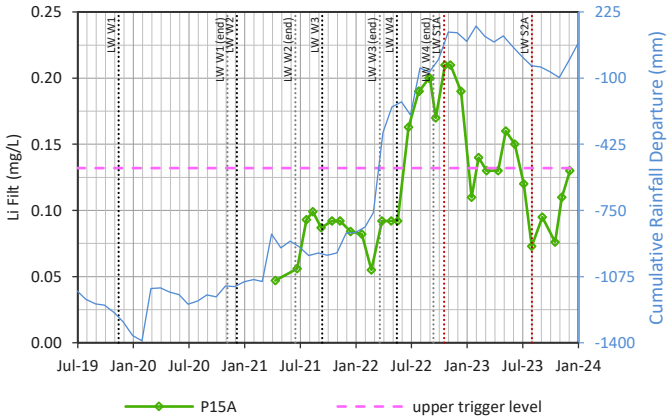
Jul-23
Jan-24
P14D
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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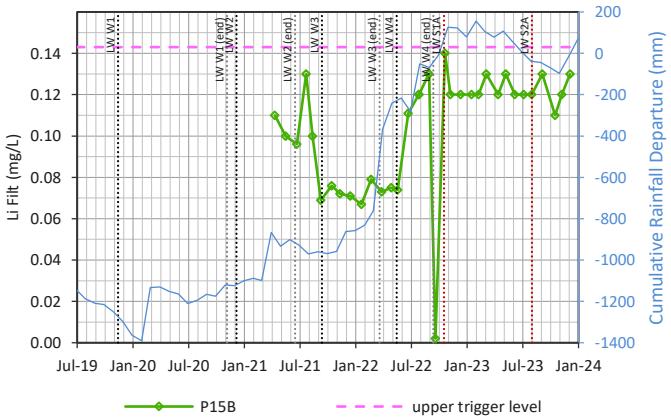
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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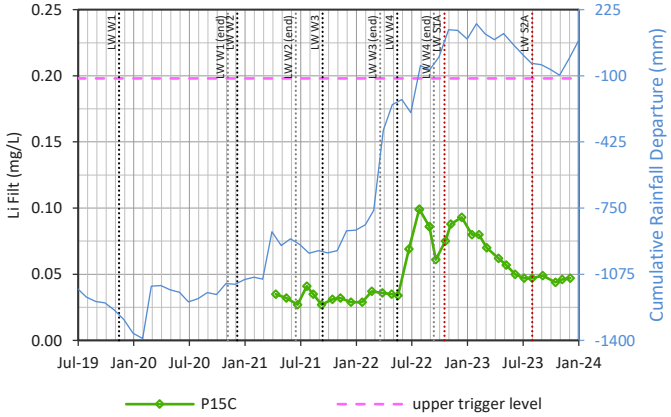
Jan-23
Jul-23
Jan-24
P15B
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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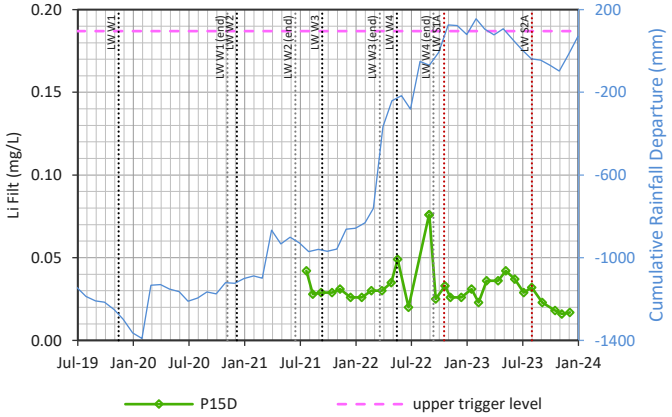
Jan-23
Jul-23
Jan-24
P15C
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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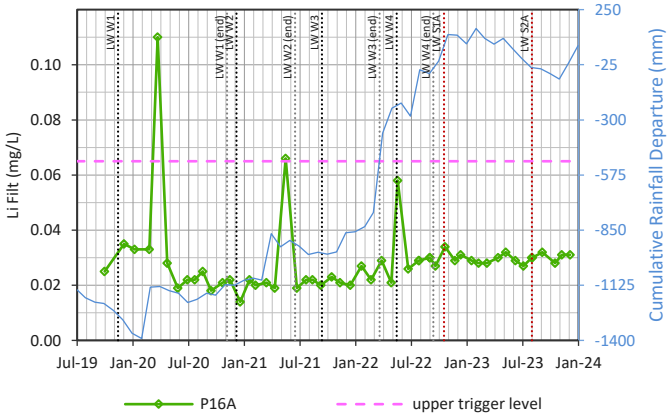
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15D
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jan-21
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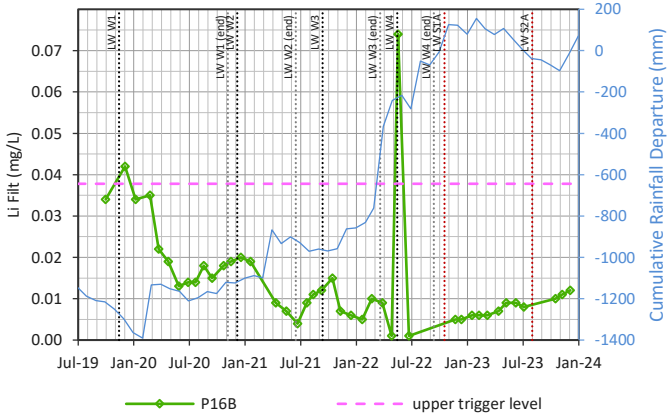
Jul-22
Jan-23
Jul-23
Jan-24
P16A
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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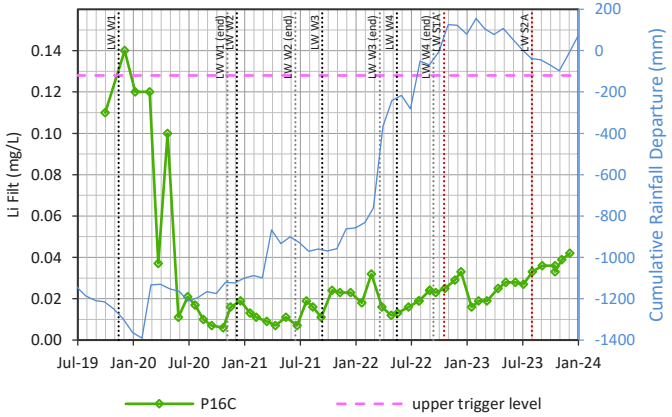
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
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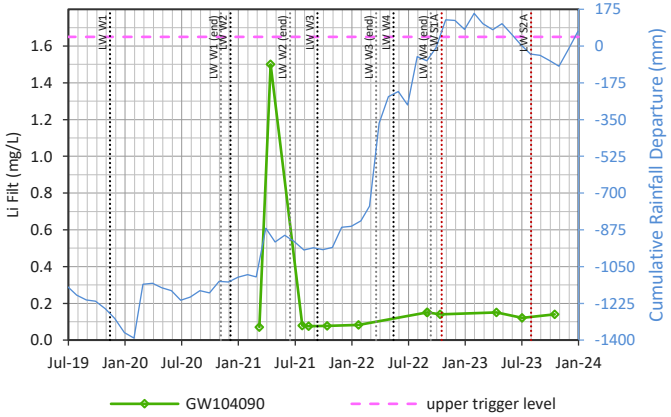
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16C
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jan-22
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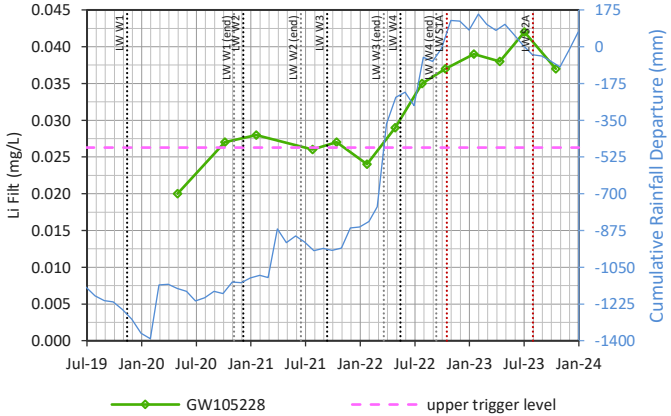
Jan-23
Jul-23
Jan-24
GW104090
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jan-23
Jul-23
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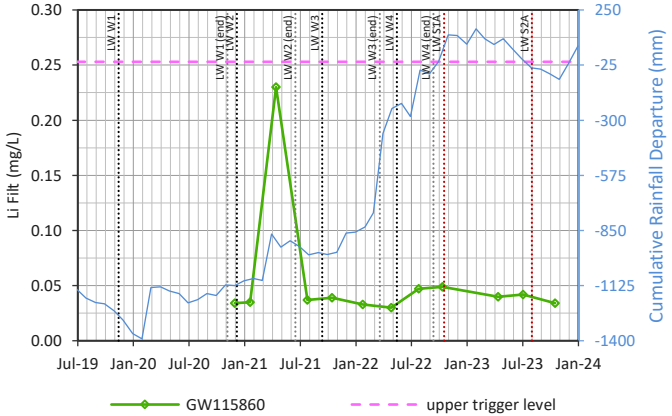
GW105228
upper trigger level


Li Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jul-21
Jan-22
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Jan-23
Jul-23
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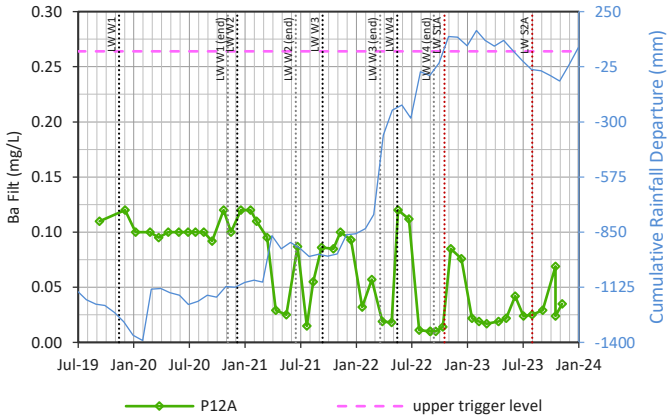
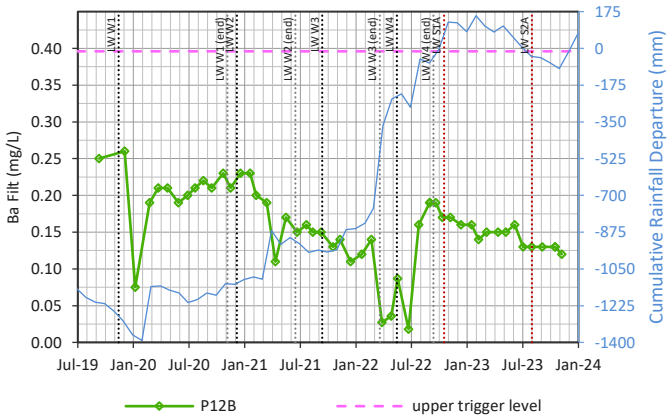
GW115860
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12A
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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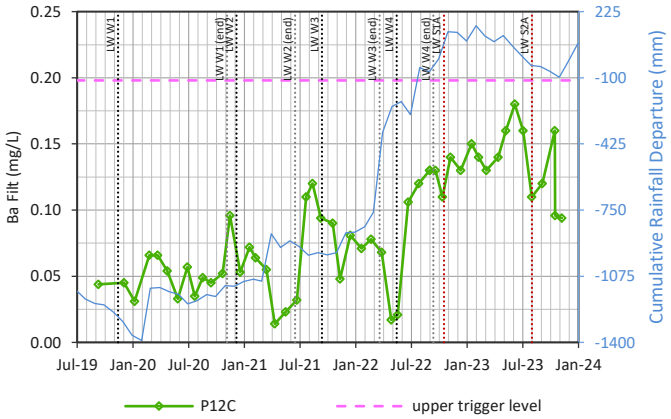
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P12B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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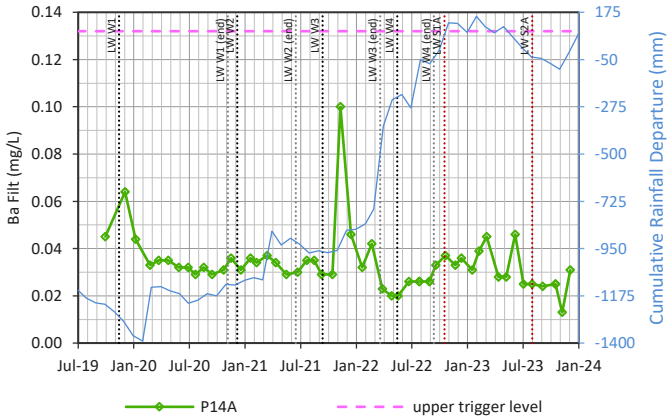
Jan-23
Jul-23
Jan-24
P12C
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-20
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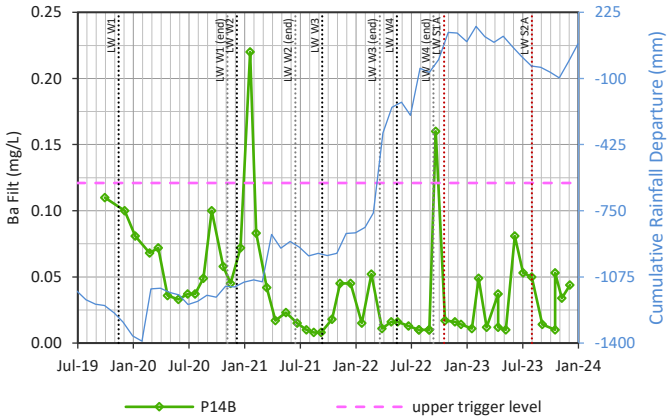
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14A
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jul-20
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Jan-22
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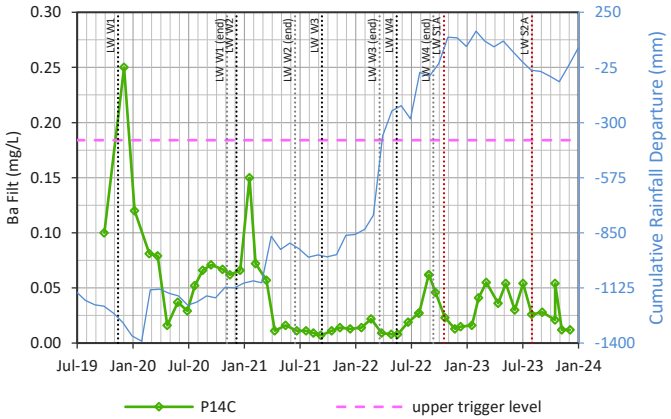
Jan-23
Jul-23
Jan-24
P14B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jan-22
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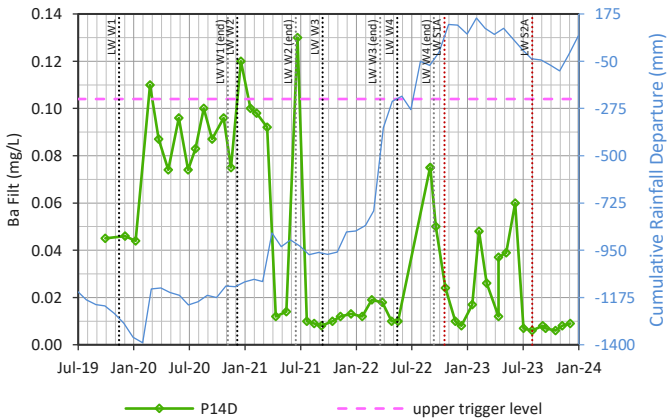
Jan-23
Jul-23
Jan-24
P14C
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jul-20
Jan-21
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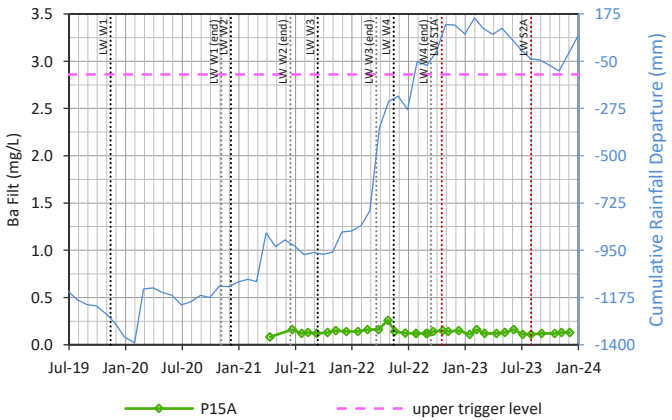
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P14D
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jul-20
Jan-21
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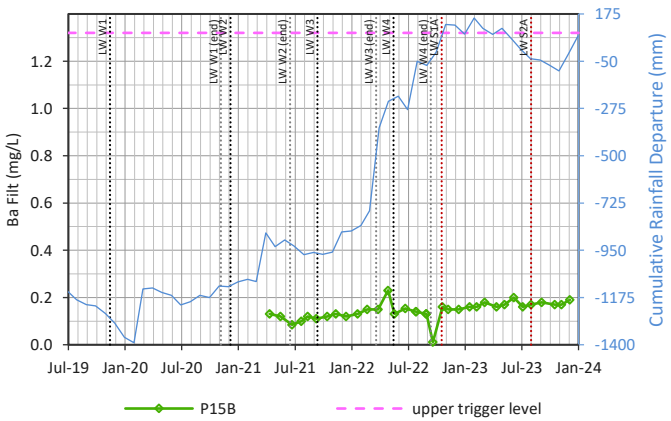
Jan-23
Jul-23
Jan-24
P15A
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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Jul-20
Jan-21
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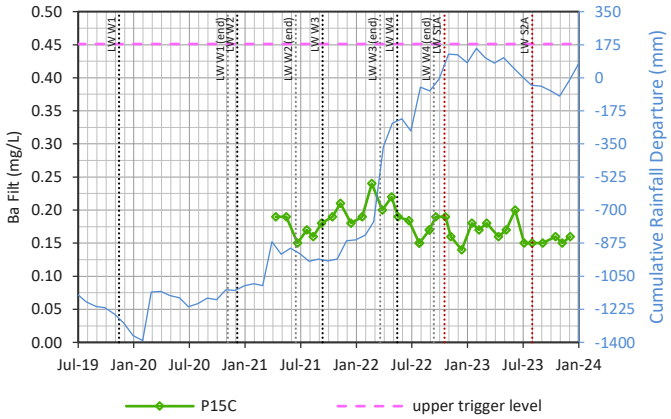
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P15B
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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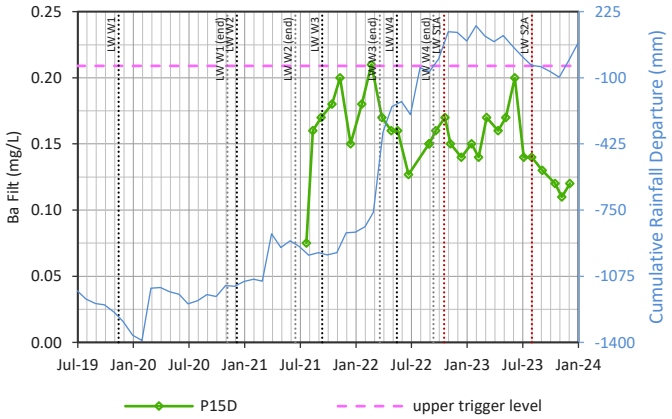
Jan-23
Jul-23
Jan-24
P15C
upper trigger level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Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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Jul-23
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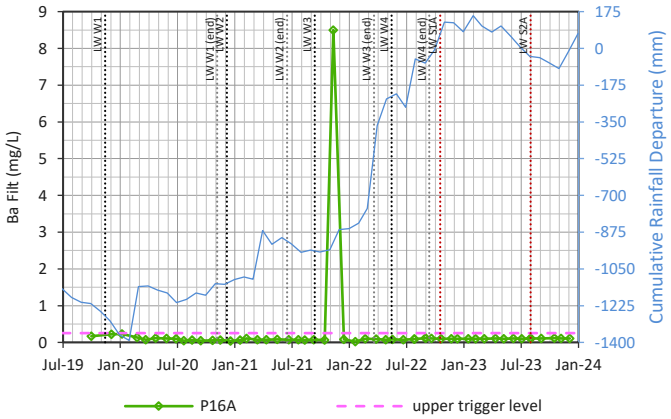
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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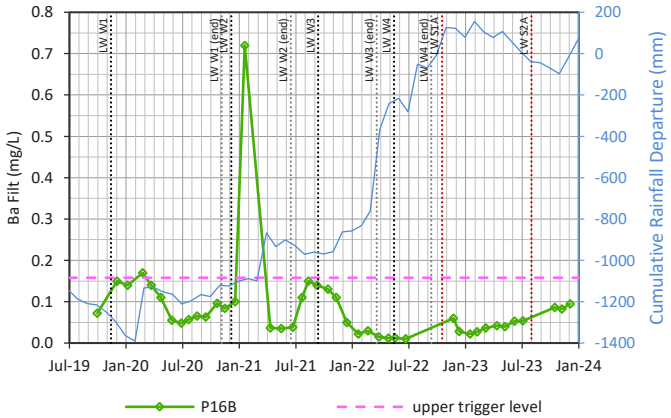
Jan-23
Jul-23
Jan-24
P16A
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
Jul-19
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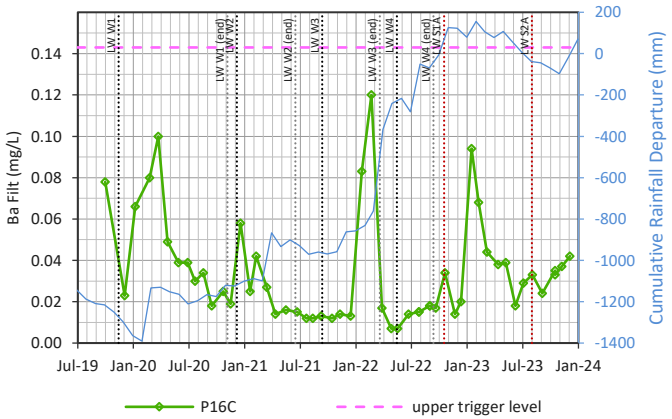
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
P16B
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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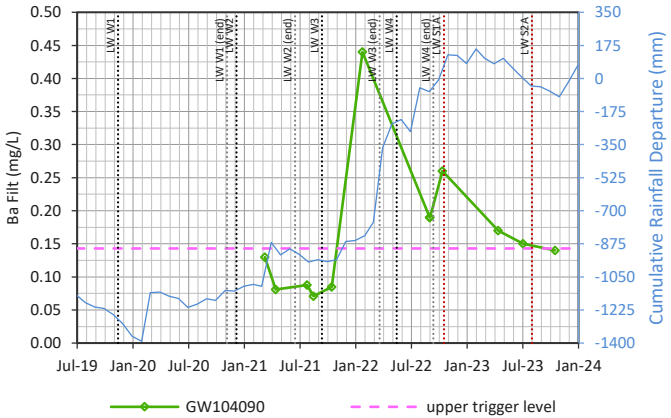
Jan-23
Jul-23
Jan-24
P16C
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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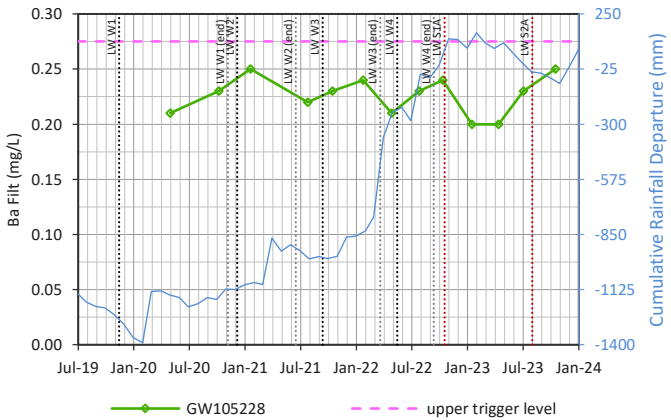
Jul-23
Jan-24
GW104090
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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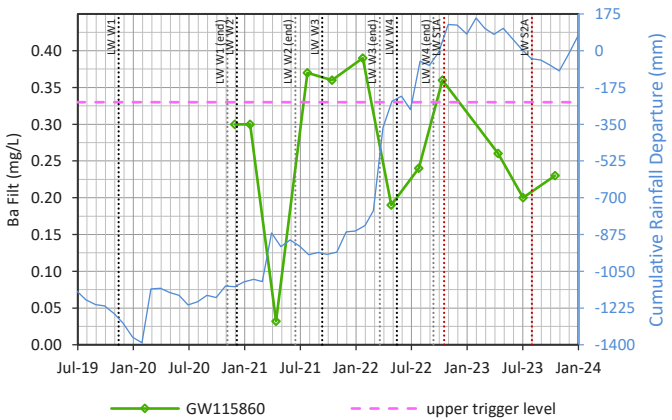
Jul-23
Jan-24
GW105228
upper trigger level


Ba Filt (mg/L)
Cumulative Rainfall Departure (mm)
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
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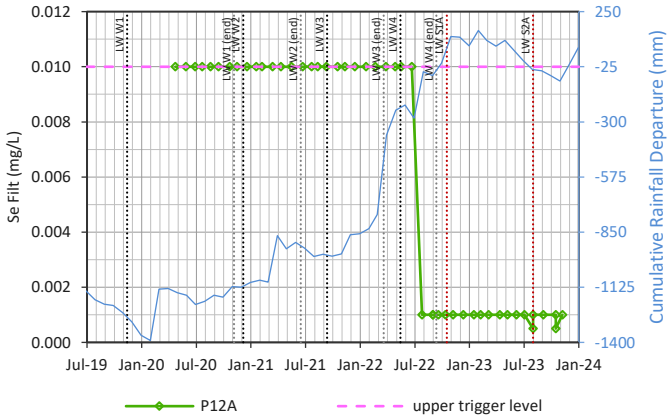
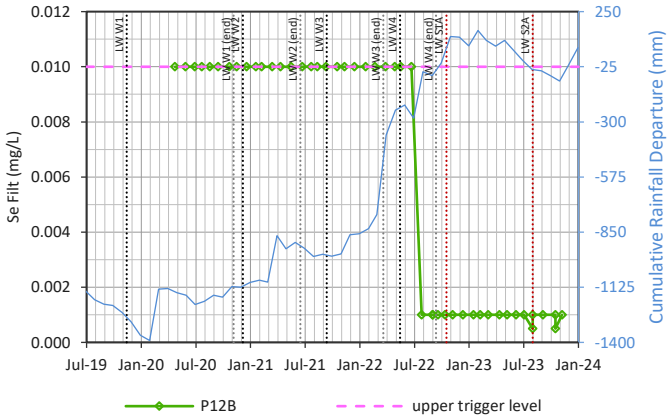
Jan-23
Jul-23
Jan-24
GW115860
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12A
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.010
0.008
0.006
0.004
0.002
0.000
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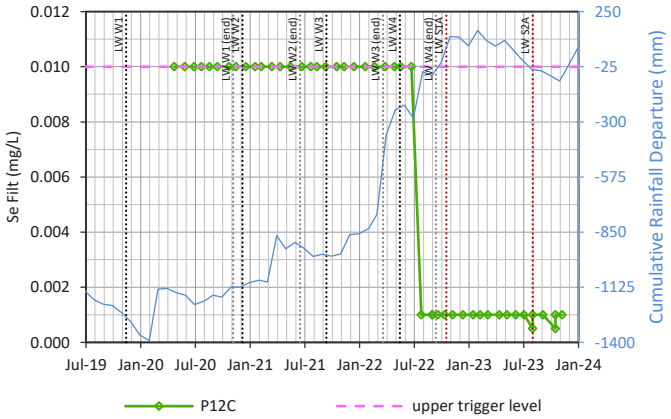
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12B
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
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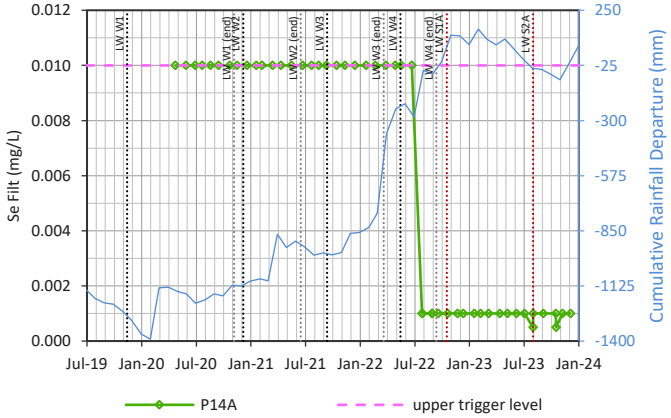
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P12C
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
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-575
-850
-1125
-1400
Jul-19
Jan-20
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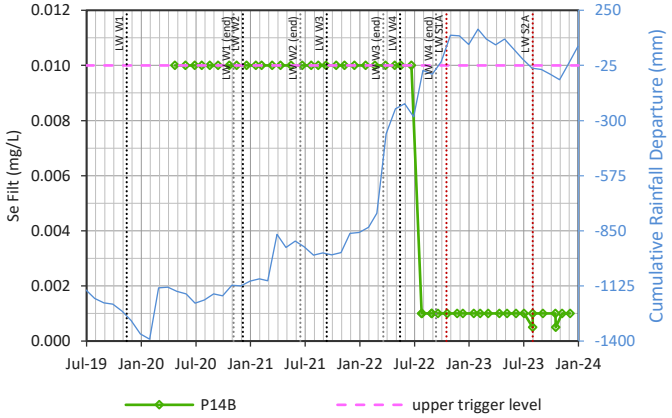
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14A
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
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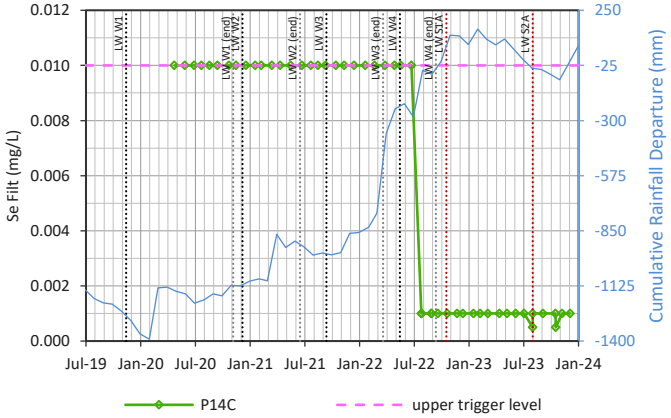
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14B
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
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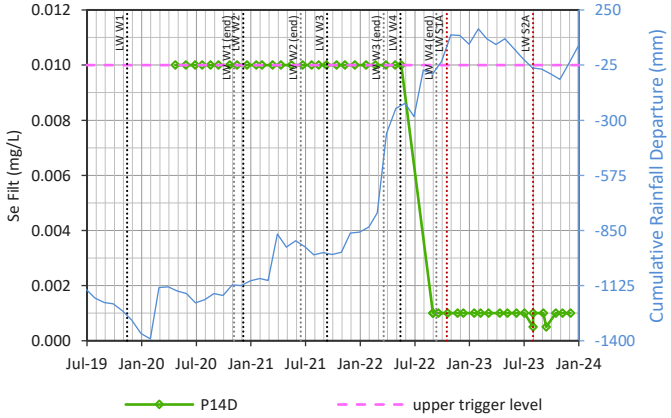
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14C
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
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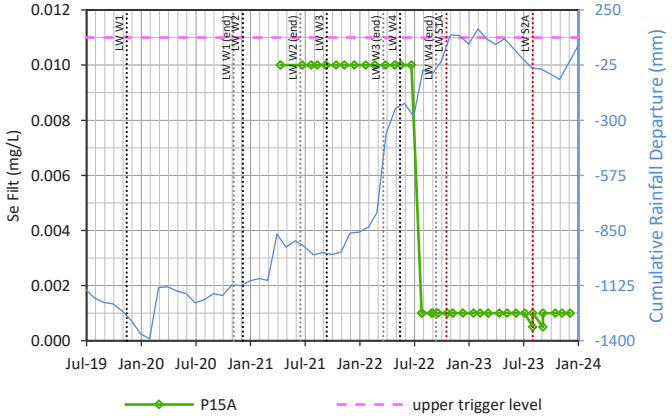
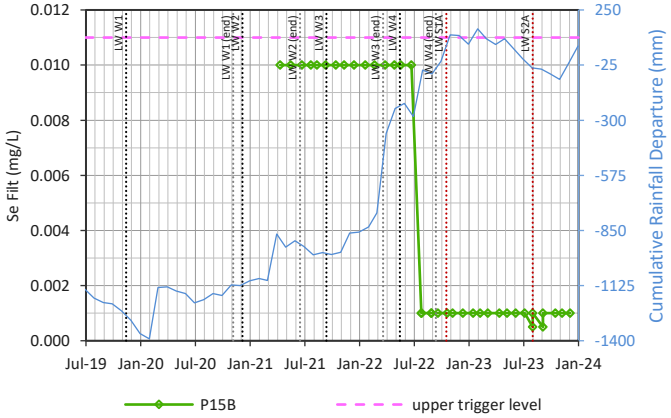
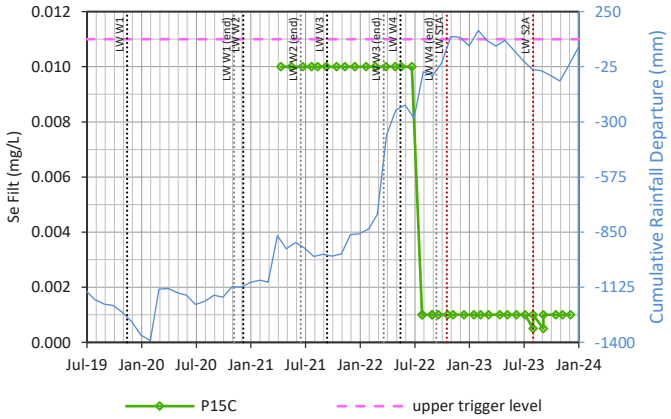
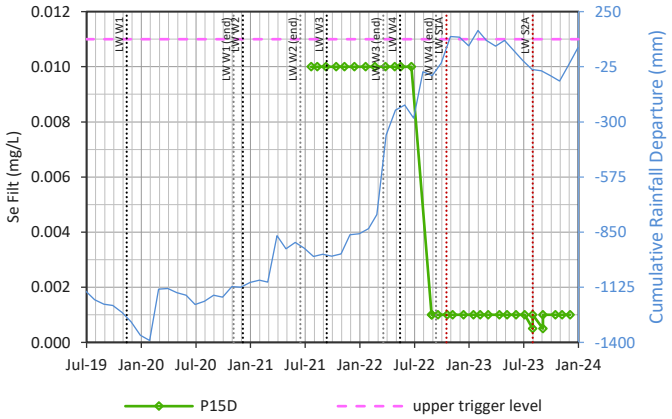
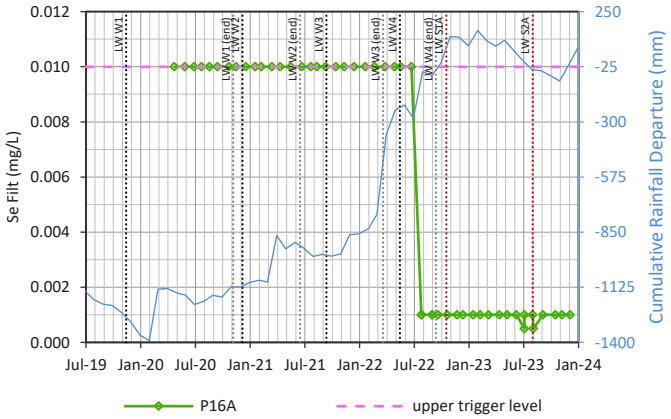
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P14D
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P15A
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P15B
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P15C
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
0.012
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P15D
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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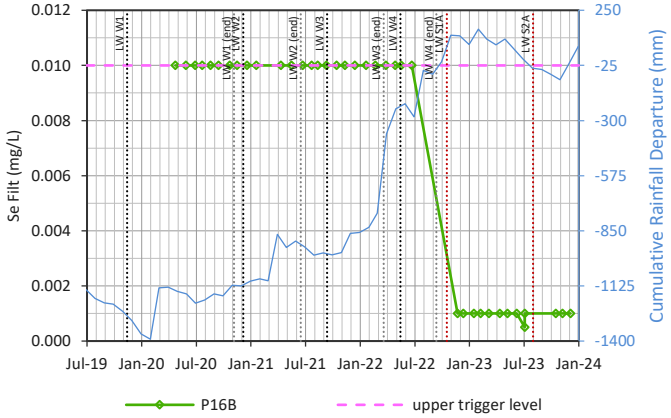
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P16A
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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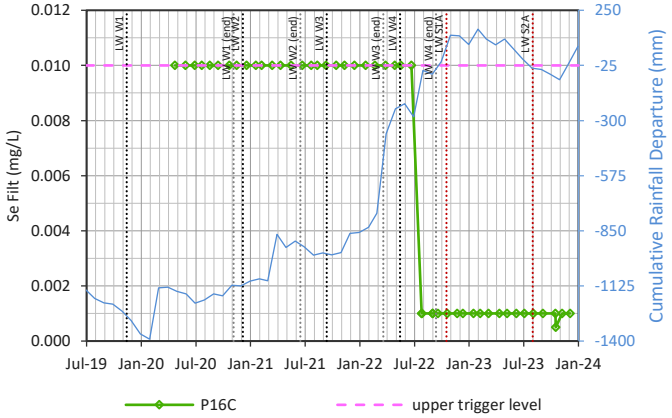
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P16B
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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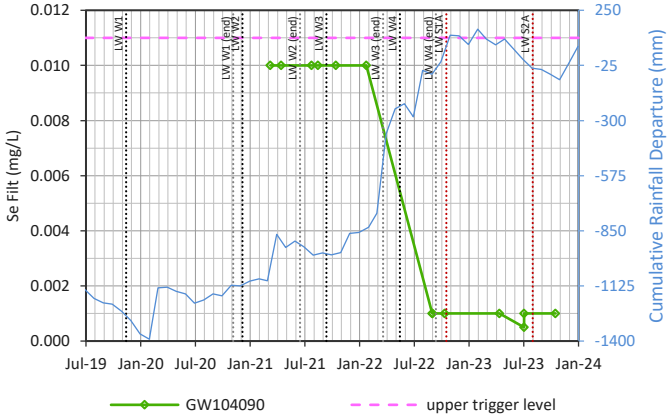
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
P16C
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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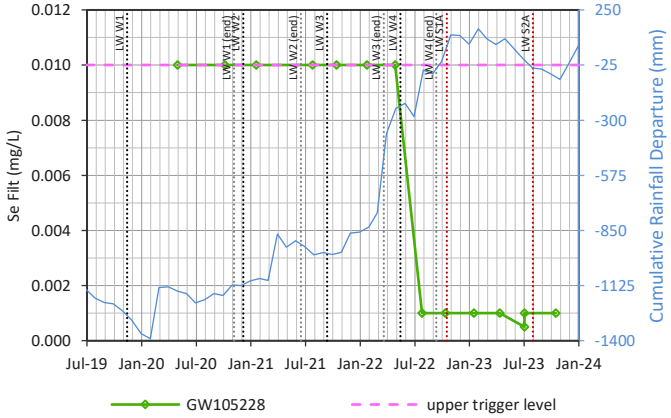
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
GW104090
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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0.008
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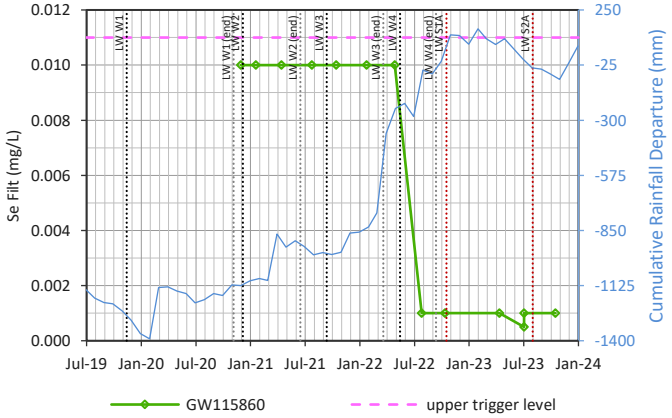
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
GW105228
upper trigger level


Se Filt (mg/L)
Cumulative Rainfall Departure (mm)
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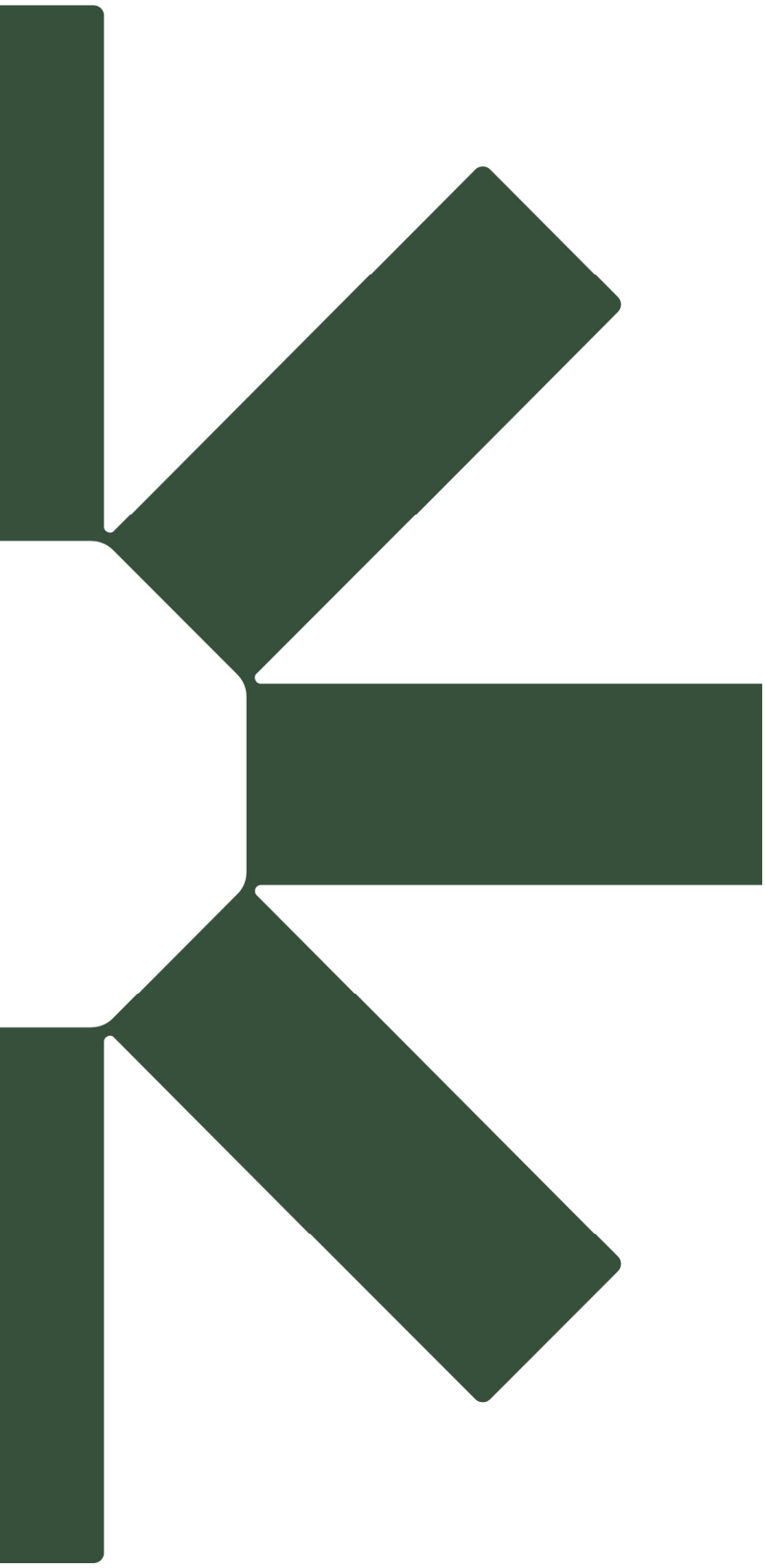
0.010
0.008
0.006
0.004
0.002
0.000
250
-25
-300
-575
-850
-1125
-1400
Jul-19
Jan-20
Jul-20
Jan-21
Jul-21
Jan-22
Jul-22
Jan-23
Jul-23
Jan-24
LW W1
LW W1 (end)
LW W2
LW W2 (end)
LW W3
LW W3 (end)
LW W4
LW W4 (end)
LW S1A
LW S2A
GW115860
upper trigger level



Making Sustainability Happen