MALABAR

ANNUAL REVIEW 2022

MAXWELL UNDERGROUND MINE

Annual Review 2022

Name of operation	Maxwell Underground Mine
Name of operator	Maxwell Ventures (Management) Pty Ltd
Development consent / project approvals	SSD 9526, PA 06_0202, DA 106-04-00
Name of holder of development consent / project approval	Maxwell Ventures (Management) Pty Ltd
Mining leases	A173, CL229, CL395, ML1531, ML1820, ML1822
Name of holder of mining leases	Maxwell Ventures (Management) Pty Ltd
Water licences	WAL41559, WAL41491*, WAL41234, WAL43166, WAL39739, WAL43160, WAL39792, 20BL171953, 20BL171954, 20BL171955, 20BL171956, 20BL171957, 20BL174016, 20BL174017, 20BL174018
Name of holder of water licences	Maxwell Ventures (Management) Pty Ltd *WAL 41491 is held by AGL Macquarie Pty Ltd
Forward Program start date	3 February 2022
Forward Program end date	2 February 2025
Annual Review start date	1 January 2022
Annual Review end date	31 December 2022

I, James Johnson, certify that this audit report is a true and accurate record of the compliance status of the Maxwell Underground Coal Mine Project for the period 1 January 2022 to 31 December 2022 and that I am authorised to make this statement on behalf of Maxwell Ventures (Management) Pty Ltd.

Note.

a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.
b) The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	James Johnson
Title of authorised reporting officer	General Manager Development & Operations
Signature of authorised reporting officer	
Date	31 March 2023

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1 STATEMENT OF COMPLIANCE

A statement of compliance is provided in **Table 1** and further details regarding any non-compliance is provided in **Table 2**.

Table 3 includes the compliance status key as per the Annual Review Guideline published by the Department of Planning and Environment (DPE) in October 2015.

Table 1. Statement of compliance

Were all conditions of the relevant approvals complied with?	
SSD 9526	No
PA 06_0202	Yes
DA 106-04-00	Yes
CL229	Yes
CL395	Yes
ML1531	Yes
ML1820	Yes
ML1822	Yes
A173	Yes
EPL 1323	No
EPBC 2018/8287	Yes

Table 2. Non-compliance

Relevant approval	Condition	Condition description	Compliance status	Relevant section of the Annual Review
EPL 1323	M2.1	Requirement to monitor	Administrative	11
SSD 9526	B36	The Applicant must implement all reasonable and feasible measures to avoid off-site discharges from the Access Road Dam or the Rail Loop Dam. However, should discharges from these dams be	Non- compliant	11

		required, any such discharge must only be undertaken in accordance with the Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.		

Table 3. Compliance status key

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

2 ACRONYMS

Acronym	Definition
A	Authorisation issued under the *Mining Act 1973*
AC	Alternating current
AQGGMP	Air Quality and Greenhouse Gas Management Plan
ANZEC	Australia and New Zealand Environment Council
APZ	Asset Protection Zone
As	Arsenic
AS	Australian Standard
AWS	Automatic Weather Station
BAM	Biodiversity Assessment Methodology
bcm	Bank cubic metres
BCT	Biodiversity Conservation Trust
BMP	Biodiversity Management Plan
BOM	Bureau of Meteorology
$CaCO_3$	Calcium carbonate
CCC	Community Consultative Committee
Cl	Chloride
CL	Coal Lease issued under the *Mining Act 1973.*
CMP	Contaminated Materials Protocol
CO_2	Carbon dioxide
dB(A)	A-weighted decibels
DA	Development Approval
DEM	Digital Elevation Model
D/S	Downstream
DPE	NSW Department of Planning and Environment
EA	Drayton Mine Expansion Environmental Assessment 2007
EC	Electrical conductivity
EIS	Environmental Impact Statement
EL	Exploration Licence
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection Licence
FY	Financial year (from 1 July to 30 June each year)
GHG	Greenhouse gas

Acronym	Definition
g/m^2/month	Grams per square metre per month
GJ	Gigajoules
GW	Groundwater
ha	Hectares
HTE	High Threat Exotic weed
HVEC	Hunter Valley Energy Coal
IEA	Independent Environmental Audit
IPC	Independent Planning Commission
K	Potassium
$L_{A1\ (1\ min)}$	A-weighted sound pressure level that is exceeded for one per cent of the 1-minute measurement period
$L_{Aeq\ (time\ period)}$	A-weighted equivalent continuous sound pressure level over the time period
LEM	Landform Evolution Model
Ltd	Limited
m	Metres
m^2	Square metres
m^3	Cubic metres
mAHD	Elevation in metres in respect to the Australian Height Datum
Mb	Molybdenum
MB	Monitoring bore
Mg	Magnesium
mg/L	Milligrams per litre
MEA	Mine entry area
MEG	Regional NSW – Mining, Exploration and Geoscience
MI	Maxwell Infrastructure
ML	Megalitres
ML	Mining Lease issued under the *Mining Act 1992*
MLA	Mining Lease Application
MOD1	Modification 1
MOD2	Modification 2
MOP	Mining Operations Plan
m/s	Metres per second
mS/cm	Microsiemens per centimetre
MSC	Muswellbrook Shire Council
MWOO	Mixed Waste Organic Outputs

Acronym	Definition
MP	Management Plan
NBMP	Noise and Blasting Management Plan
NC	No change
Na	Sodium
NGER	National GHG and Energy Reporting
NM	Noise monitor
NR	Not reported
NSW	New South Wales
NTU	Nephelometric turbidity unit
OEH	NSW Office of Environment and Heritage
OPC	Oil pollution control (dam)
PA	Project Approval
pH	Potential of hydrogen (a measure of acidity/alkalinity)
PM_{10}	Particulate matter 10 micrometres or less in diameter
$PM_{2.5}$	Particulate matter 2.5 micrometres or less in diameter
POEO Act	Protection of the Environment Operations Act 1997
Pty	Proprietary
Q	Quarter of a year
REC	Recommendation
RCE	Rehabilitation Cost Estimate
RMP	Rehabilitation Management Plan
ROM	Run of mine
Sb	Antimony
SCMP	Spontaneous Combustion Management Plan
Se	Selenium
SEARs	Secretary's Environmental Assessment Requirements
SO4	Sulphate
sp.	Species
SSD	State Significant Development
STP	Sewage treatment plant
SW	Surface water
t	Tonnes
tCO_2-e	Tonnes of carbon dioxide equivalent
TDS	Total dissolved solids
TEOM	Tapered Element Oscillating Microbalance

Acronym	Definition
TLTS	Too low to sample
TSP	Total suspended particulates
TSS	Total suspended solids
UG	Underground
µg/L	Micrograms per litre
µg/m^3	Micrograms per cubic metre
µS/cm	Microsiemens per cm
UHAQMN	Upper Hunter Air Quality Monitoring Network
U/S	Upstream
VWP	Vibrating wire piezometer
WAL	Water Access Licence issued under the *Water Management Act 2000*
WMP	Water Management Plan

3 INTRODUCTION

Maxwell Ventures (Management) Pty Ltd, a wholly owned subsidiary of Malabar Resources Limited (Malabar) owns and operates the Maxwell Underground Mine (Maxwell UG Mine). The site is in the Upper Hunter Valley of New South Wales (NSW), east-southeast of Denman and south-southwest of Muswellbrook. The site is approved to extract a maximum of 8 million tonnes of run-of-mine (ROM) coal per year over a period of 26 years with construction commencing in May 2022.

The site consists of the following areas:

- Underground area comprising the proposed area of underground mining operations and the mine entry area (MEA) to support underground mining and coal handling activities and provide for personnel and materials access;
- Maxwell Infrastructure (formerly Drayton mine) comprising previous open cut mining areas, existing coal handling and preparation plant (CHPP), train load-out facilities and rail loop, Antiene rail spur and other infrastructure and services; and
- Transport and services corridor between the underground area and Maxwell Infrastructure comprising the proposed site access road, covered overland conveyor, power supply and other ancillary infrastructure and services.

The area within and surrounding the site, which has previously been known as Mt Arthur South, Saddlers Creek and Drayton South, has long been identified as having a significant in-situ coal resource. The regional context of the site is shown in **Figure 1**.

Prospecting for coal commenced in the late 1940s, with exploration intensifying during the 1960s and 1970s. Open cut coal extraction and mining activities commenced at Maxwell Infrastructure in 1983 and ceased in October 2016. The previous open cut mining area is currently in the rehabilitation phase of the mine operations.

The site is bordered by Mt Arthur Coal to the west and AGL Macquarie's Bayswater and Liddell Power Stations adjoining the eastern and southern boundaries. The Antiene rural residential area exists to the north of the site. The relevant approval boundaries, lease boundaries and biodiversity offset areas for the site are shown in **Figure 2**.

The development consent for State Significant Development 9526 (SSD 9526) was granted on 22 December 2020 under clause 8A of the *State Environmental Planning Policy (State and Regional Development) 2011* and section 4.5(a) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The development consent was modified on 19 November 2021 (MOD1) to allow for the repositioning of infrastructure primarily at the MEA and realignment of a section of the site access road. The development consent was further modified (MOD2) on 19 October 2022 to allow for the following:

- Re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent.
- Reduction in the width of some of the longwall panels in the Woodlands Hill Seam.
- Repositioning of the upcast ventilation shaft site and associated infrastructure with no increase of the total area disturbed.
- Other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site) with no increase of the total area disturbed.

The site also incorporates the development formerly authorised under the Maxwell Infrastructure Project Approval (PA) 06_0202. Development Consent DA 106-04-00 for the existing rail loop and Antiene Rail Spur was granted on 2 November 2000 under Section 76(A)9 and 80 of the EP&A Act and is still current.

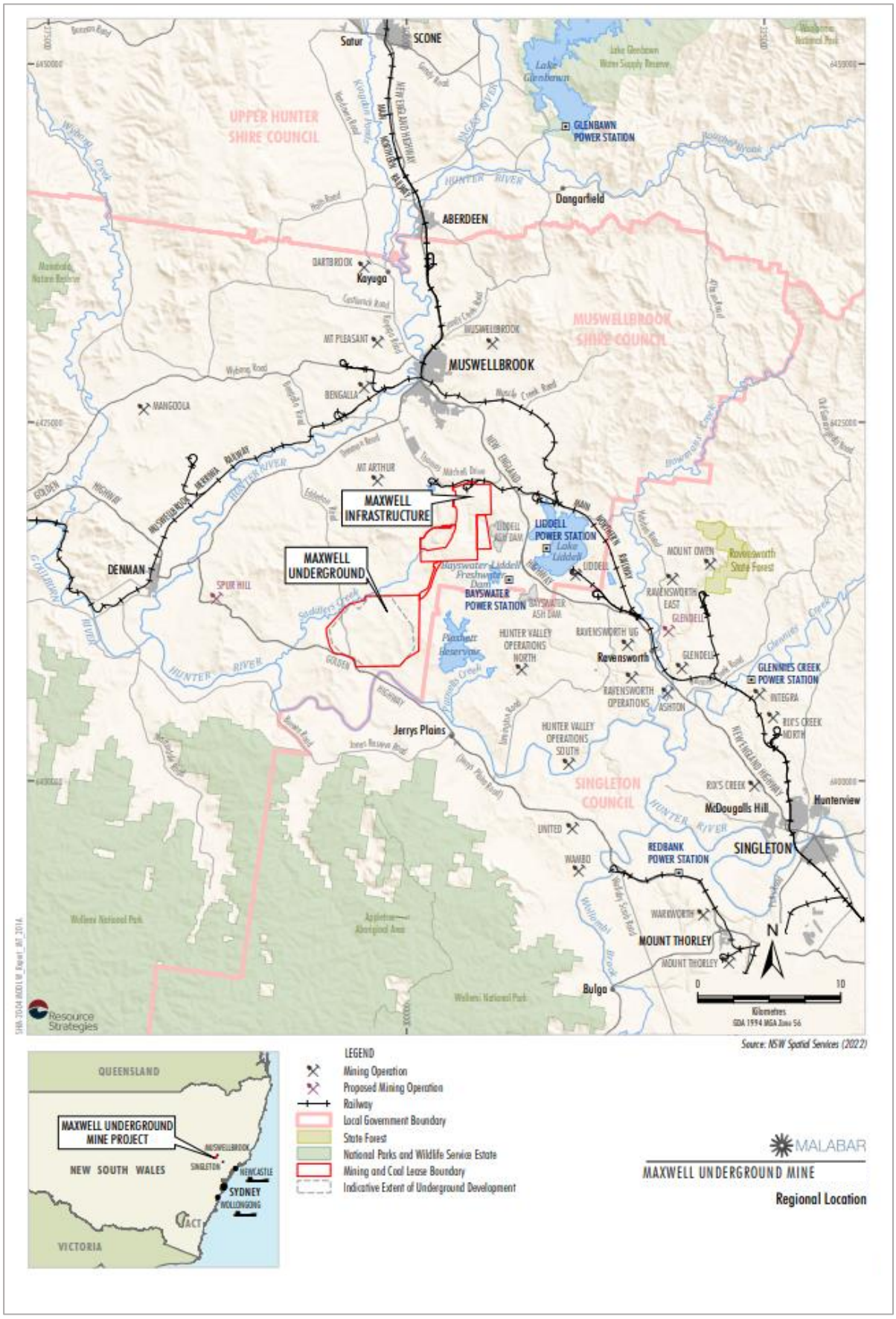

Figure 1. Regional context

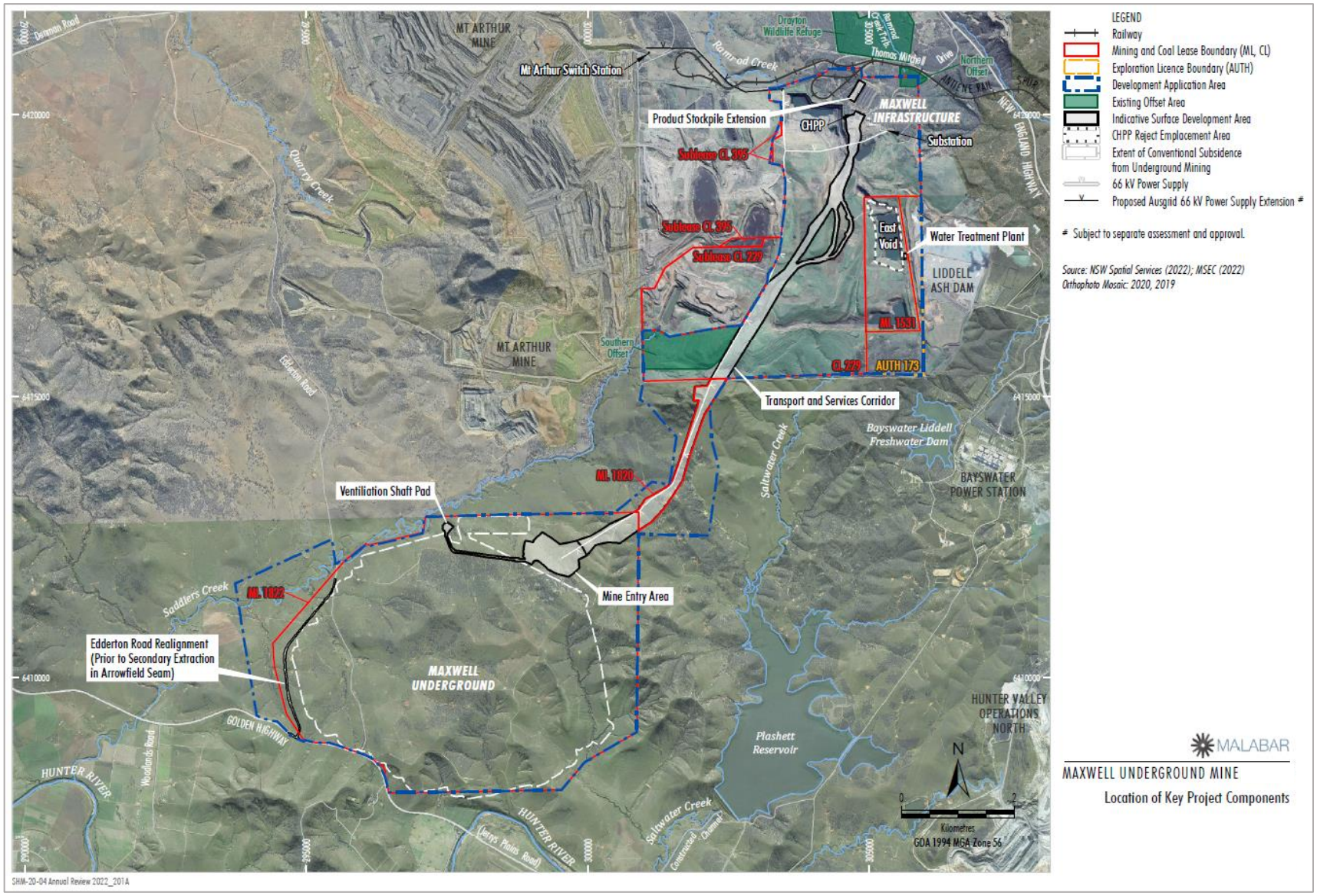

Figure 2. Maxwell UG Mine boundaries

This report details the compliance status of the site with respect to development consents and mining leases from 1 January 2022 to 31 December 2022. It has been prepared in accordance with the Annual Review Guideline published by the DPE in October 2015. It also fulfils the Annual Review requirements under the conditions of development consents SSD 9526 and DA 106-04-00 and Annual Environmental Management Report requirements under the conditions of mining leases CL 229, CL 395 and ML 1531. These conditions and where they have been addressed in the report are listed in **Appendix 1**.

Names and contact details of the key personnel who are responsible for environmental management at the site are provided in **Table 4**.

Table 4. Site contacts

Name	Role	Contact details
James Johnson	General Manager Development & Operations	(02) 6542 0283 jjohnson@malabarresources.com.au
Donna McLaughlin	Health, Safety, Environment and Community Manager	(02) 6542 0283 dmclaughlin@malabarresources.com.au
Alex Newton	Environment and Approvals Coordinator	(02) 6542 0283 anewton@malabarresources.com.au

4 APPROVALS

Operations at the Maxwell Infrastructure site commenced in 1983. A Development Consent granted by the Muswellbrook Shire Council in 2002 (DA 163/2002) allowed for the production of up to 5.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal. The Antiene Rail Spur was utilised to transport export thermal coal to the Port of Newcastle via the Main Northern Railway.

On 1 February 2008, PA 06_0202 was granted for the extension of open cut mining operations with a maximum extraction rate of 8 Mtpa of ROM coal, and for the continued use and maintenance of surface infrastructure. A modification to PA 06_0202 was granted by the then Minister for Planning on 16 October 2009 to allow for an extension of the approved mining disturbance footprint and establishment of a new conservation area. A second modification to PA 06_0202 was granted by the then Minister for Planning and Infrastructure on 17 February 2012 to facilitate the development of an explosives storage facility and allow the disposal of tailings within the East Void.

Open cut mining at the Maxwell Infrastructure site ceased in October 2016 under the ownership of Anglo-American. Approval for coal extraction subsequently lapsed on 31 December 2017. On 26 February 2018, the ownership of the Maxwell Infrastructure site was formally transferred to Maxwell.

In August 2018, Maxwell submitted a request to the Department of Planning and Environment (DPE) for Secretary's Environmental Assessment Requirements for the Maxwell UG Mine. Maxwell proposed to develop an underground coal mine and utilise substantial existing facilities at the Maxwell Infrastructure site. Development consent for the Maxwell UG Mine SSD 9526 was granted on 22 December 2020 under clause 8A of the *State Environmental Planning Policy (State and Regional Development) 2011* and section 4.5(a) of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The development consent SSD 9526 was modified (MOD1) on 19 November 2021 to allow for the following:

- Repositioning of the underground portal;
- Realignment of a small section of the proposed access road at the Maxwell Infrastructure site to utilise an existing haul road and minimise impacts to established mine rehabilitation;
- Repositioning of an approved clean water diversion for the MEA;
- Repositioning of the water treatment facility from the MEA to the Maxwell Infrastructure site; and
- Other minor works and ancillary infrastructure components within the existing approved surface development areas (e.g. works associated with the reconfiguration of the MEA, pumps/pipelines associated with the water treatment facility).

The development consent SSD 9526 was further modified (MOD2) on 19 October 2022 to allow for the following:

- Re-orientation of the longwall panels in the Woodlands Hill, Arrowfield and Bowfield Seams resulting in a minor increase in the approved underground mining extent;
- Reduction in the width of some of the longwall panels in the Woodlands Hill Seam;
- Repositioning of the upcast ventilation shaft site and associated infrastructure with no increase of the total area disturbed; and
- Other minor works and ancillary infrastructure components (e.g. access road and ancillary water management infrastructure for the repositioned ventilation shaft site) with no increase of the total area disturbed.

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The development formerly authorised under the Drayton Mine Extension Project Approval (PA) 06_0202 was surrendered in July 2022. Development Consent DA 106-04-00 for the existing rail loop and Antiene Rail Spur was granted on 2 November 2000 under Section 76(A)9 and 80 of the EP&A Act and is still current.

Environment Protection Licence (EPL) 1323 was varied during the reporting period to allow for a change of air quality monitoring equipment at the Maxwell UG Mine. The variation was approved by the NSW Environment Protection Authority (EPA) on 18 July 2022. EPL 1323 was further varied during the reporting period to increase the scale of scheduled activities to allow for commencement of operations. This variation was approved by the EPA on 28 October 2022. EPL 1323 was further varied during the reporting period to include 'crushing, grinding and separating' as a scheduled activity and to amend the premises boundary to include the Antiene Rail Spur. This variation was approved by the EPA on 13 December 2022.

Open cut mining operations previously occurred within Mining Lease (ML) 1531, Coal Lease (CL) 229 and CL 395, targeting the Broughams, Grasstrees, Thiess, Puxtrees and Balmoral Seams within the Rowan Formation of the Greta Coal Measures. Maxwell holds pre-existing leases CL 229, CL 395 and ML 1531. On 10 November 2021, Maxwell was granted ML 1820 for ancillary mining activities and ML 1822 was granted on 18 November 2021 for underground coal mining.

A sub-lease is executed between Maxwell and Hunter Valley Energy Coal (HVEC) and registered against a portion of CL 229 and CL 395. In accordance with the sub-lease, HVEC is responsible for the rehabilitation of the area under the sub-lease, and it is therefore excluded from the scope of this Annual Review.

On 19 August 2020, Maxwell received development consent for SSD 9820 under the State Significant Development provisions of the EP&A Act for the Maxwell Solar Farm. The approved Maxwell Solar Farm activities include the development of a ground-mounted photovoltaic solar panels with an installed capacity of approximately 25 Megawatts (AC). The solar farm would be located on approximately 130 hectares (ha) of rehabilitated open cut mine land within the site. Maxwell proposes to apply to excise the land for the Maxwell Solar Farm from CL229 prior to construction of the solar farm.

Current development consents, leases and licences relevant to the site are listed in **Table 5**.

Table 5. Statutory approvals

Statutory Approval Reference	Description
SSD 9526	Development Consent issued under Section 4.36 of the *Environmental Planning and Assessment Act 1979* for the Maxwell UG Mine
DA 106-04-00	Development Consent issued under Section 76 (A), 9 and 80 of Part 4 of the *Environmental Planning and Assessment Act 1979* for use of the existing Drayton Rail Loop and Antiene Rail Spur.
CL229	Coal Lease issued under the *Mining Act 1973.*
CL395	Coal Lease issued under the *Mining Act 1973.*
ML1531	Mining Lease issued under the *Mining Act 1992.*

Statutory Approval Reference	Description
ML1820	Mining Lease issued under the *Mining Act 1992* for ancillary mining activities.
ML1822	Mining Lease issued under the *Mining Act 1992* for underground coal mining.
A173	Authorisation issued under the *Mining Act 1992*.
EPL 1323	Environment Protection Licence (EPL) issued under Section 55 of the *Protection of the Environment Operations Act 1997* (POEO Act) for mining for coal and coal works.
EPBC 2018/8287	Approval under sections 130(1) and 133(1) of the *Environment Protection and Biodiversity Conservation Act 1999*.
WAL41559	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL41491	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL41234	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL43166	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL39739	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL43160	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
WAL39792	Water Access Licence issued under the *Water Management Act 2000* for aquifer water extraction.
20BL171953	Bore licence issued under the *Water Act 1912* for a test bore.
20BL171954	Bore licence issued under the *Water Act 1912* for a test bore.
20BL171955	Bore licence issued under the *Water Act 1912* for a test bore.
20BL171956	Bore licence issued under the *Water Act 1912* for a test bore.
20BL171957	Bore licence issued under the *Water Act 1912* for a test bore.
20BL174016	Bore licence issued under the *Water Act 1912* for a monitoring bore.
20BL174017	Bore licence issued under the *Water Act 1912* for a monitoring bore.
20BL174018	Bore licence issued under the *Water Act 1912* for a monitoring bore.

5 OPERATIONS SUMMARY

5.1 Mining Operations

The Maxwell UG Mine is an underground mining operation that will produce high-quality coals over a period of approximately 26 years. It involves the extraction of up to 8 mtpa of ROM coal from four seams within the Wittingham Coal Measures, using the following underground mining methods:

- Underground bord and pillar mining with partial pillar extraction in the Whynot Seam; and
- Underground longwall extraction in the Woodlands Hill Seam, Arrowfield Seam and Bowfield Seam.

Substantial existing infrastructure at the Maxwell Infrastructure site will be utilised for the handling, processing and transportation of coal. This includes the existing CHPP, train load-out facilities and other infrastructure and services including water management infrastructure, administration buildings and workshops.

Construction of the Maxwell UG Mine commenced in May 2022. Initial construction works included installation of sediment controls and a clean water diversion drain, clearing and construction for the temporary access road within ML 1820 and ML 1822, upgrades to the existing road within CL229 and stockpiling of topsoil. Once the temporary access road was installed, construction works commenced at the MEA and included construction of the following:

- Light and heavy vehicle parking areas.
- Temporary offices, mobile crib rooms and temporary bathhouse facilities.
- Equipment laydown areas and temporary workshop facilities for maintenance.
- Water tanks and pipelines to the MEA.
- Three new dams inclusive of the mine water dam, MEA dam and MEA sedimentation dam.
- Hardstand areas, dam embankments and road construction using mine establishment rock removed during construction as construction fill.
- Commencement of excavation for the Whynot and Woodlands Hill portals.

Recommissioning works commenced at the CHPP and involved inspection of all electrical sub stations, motors, and circuits for reenergisation of CHPP assets. Structural repairs were undertaken to the ROM materials handling system and minor repairs were undertaken on conveyor and lighting systems and will continue through to the next reporting period.

A production summary is presented in **Table 6** and shows waste rock being moved for construction of the MEA during the next reporting period.

Table 6. Production summary (extraction)

Material	Approved limit	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
Waste rock / overburden (bcm)	N/A	0	385,372	935,880

Material	Approved limit	Previous reporting period (actual)	This reporting period (actual)	Next reporting period (forecast)
ROM coal / ore (t)	8,000,000	0	0	365,111
Coarse reject (t)	N/A	0	0	97, 880
Fine reject (tailings) (t)	N/A	0	0	26, 369
Saleable product (t)	0	0	0	244,981

5.2 Other Operations

During the reporting period, site activities typically occurred during daylight hours, typically on a five days per week basis. There was some limited night works at the MEA. There were no coal processing or coal transport activities during the reporting period.

A drilling program in ML1822 was undertaken during the reporting period. It included six open holes for fault definition. These holes were geophysically logged. An additional four cored holes were drilled for geotechnical investigation. As part of the program, existing piezometer DD1025 was also cleaned out and grouted.

The Maxwell rail loop was used on occasion for the temporary stowage of empty rolling stock by Aurizon Operations Ltd. Although open cut mining operations have ceased at the Maxwell Infrastructure site, rehabilitation of the completed mining areas along with ancillary activities, including upkeep of roads and maintenance of equipment continued during the reporting period. These works were focused on final landform development and rehabilitation. These activities are discussed in more detail in **Section 9**.

5.3 Next Reporting Period

During the next reporting period, construction works will be focussed on the civil works for the conveyor trace, the permanent access road, portals and the drift to the Woodlands Hill seam. First workings are expected to commence in the Whynot seam bord and pillar operation.

The process control system at the CHPP will be recommissioned during the next reporting period and the stacker and reclaimer will undergo electrical, mechanical and structural repairs. The train load out facility will undergo structural, lighting and operational checks and repairs. Reject process and emplacement system will be constructed and commissioned. The rail loop will be brought back into service with improvements including ballast renewal, sleeper replacement and culvert repair. Ongoing routine inspections and maintenance will occur of the rail spur.

Surface trenching, magnetic surveys, test pits and the drilling of cored and non-cored holes are proposed to be undertaken within ML 1822. These exploration activities will assist with further defining the geological model and will provide reservoir (gas testing) characterisation. A geochemistry assessment may also be undertaken if required.

6 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

DPE provided a letter in July 2022 stating that they had reviewed the 2021 Annual Review and considered the report to generally satisfy the reporting requirements of the consent and the Department's *Annual Review Guideline* (October 2015). The letter noted that a copy of the 2021 Annual Review is now publicly available on the Malabar website.

DPE provided a letter in September 2022 requiring that Maxwell include a status update for all actions provided in the Independent Environmental Audit (IEA) report and Response to Audit Recommendations (RAR) in the next Annual Review until all actions are completed. This has been provided in **Table 7**.

Additionally, improvement measures from the 2021 Annual Review are listed in **Table 7.**

DPE provided a letter in December 2022 noting that there is community concern regarding the status and management of biodiversity offsets, and the reporting of greenhouse gas management measures by coal mines. To address these community concerns and ensure all mines are reporting consistently, the department is requesting that all coal mine annual reviews include the following information in their Annual Reviews:

Biodiversity Offsets

- Report on the status of the long-term security arrangement for biodiversity offsets required by the development consent for the mine. To include information on the type(s) of long-term security arrangements that have been implemented and/or are to be implemented for the mine. This is included in **Section 7.14** of this Annual Review.

Greenhouse Gas

- Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. To ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same. This is included in **Section 7.9** of this Annual Review.
- Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine. This is included in **Section 7.9** of this Annual Review.

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Table 7. Actions required from previous review, regulatory notices, improvement actions and IEA actions

Action required	Requested by	Action taken	Section in Annual Review
Report on the status of the long-term security arrangement for biodiversity offsets required by the development consent for the mine. To include information on the type(s) of long-term security arrangements that have been implemented and/or are to be implemented for the mine.	DPE letter of 16/12/2022	Completed. The status of the long-term security arrangements for biodiversity offsets is included in Section 7.14.	7.14
Report on greenhouse gas emissions for the reporting period and include a comparison of actual greenhouse gas emissions against the predictions in the environmental assessment(s) for the mine. To ensure that the method used to calculate the environmental assessment prediction(s) and annual emissions are calculated the same.	DPE letter of 16/12/2022	Completed. Greenhouse gas emissions for the reporting period, including a comparison of actual against the predictions in the EIS, using the same method in the EIS, has been presented.	7.9
Report all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine.	DPE letter of 16/12/2022	Completed. Information on all reasonable and feasible steps undertaken during the reporting period to improve energy efficiency and reduce greenhouse gas emissions generated by the mine has been included.	7.9

Action required	Requested by	Action taken	Section in Annual Review
Undertake an IEA under development consents SSD 9526, PA 06_0202 and DA 106-04-00.	2021 Annual Review	Completed. DPE letter of 14/09/2022 accepts the IEA report without further amendment and requires that a status update for all actions provided in the Response to Audit Recommendations be included in the next Annual Review. See below for status of each action.	6 (as stated in this table)
Real-time noise monitoring data will be calibrated with the attended noise monitoring data.	2021 Annual Review	Not completed. The mine was inaudible at all times and at all locations throughout the reporting period hence it has not been possible to conduct this task. Opportunities will be realised during the next reporting period, if significant noise is generated once the mine becomes operational.	7.4
Further surface collection of Aboriginal artefacts will be undertaken within the MOD1 disturbance areas during the next reporting period.	2021 Annual Review	Completed. Surface collection of Aboriginal artefacts has been undertaken within the MOD1 disturbance areas.	7.5

Action required	Requested by	Action taken	Section in Annual Review
Preventative maintenance work on sections of the Antiene Rail Spur, including rail grinding, condition assessments, inspections and testing will be undertaken during the next reporting period.	2021 Annual Review	Completed. A range of corrective and preventative maintenance activities have been conducted during the reporting period, as described in further detail in Section 7.7.	7.7
Additional infill planting at the MEA tree planting area with tube stock during the optimal planting periods.	2021 Annual Review	Not completed. Favourable weather conditions during the reporting period have improved vegetation growth and coverage. For this reason, infill planting was not undertaken and will be reassessed during the next reporting period.	7.8
A reduction of pest animals prior to tree planting.	2021 Annual Review	Completed. Macropod and feral pig control has been undertaken during the reporting period.	7.14
Annual inspection of the access tracks will commence during the next reporting period in accordance with the Bushfire Management Plan.	2021 Annual Review	Completed. An inspection of the access tracks was conducted during the reporting period.	7.12

Action required	Requested by	Action taken	Section in Annual Review
Management measures planned for offset areas during the next reporting period are: • Drayton Wildlife Refuge - Weed control program targeting Prickly Pear • Southern Offset Area - Weed control program targeted at Galenia and Golden Wreath Wattle • Southern Offset Area - Infill planting where required.	2021 Annual Review	Completed. Weed control within the Drayton Wildlife Refuge, including Prickly Pear and Southern Offset Area, including Galenia and Golden Wreath Wattle, was conducted throughout the reporting period. Further planting at the Southern Offset area was undertaken during the reporting period.	9.2
The access to some surface water monitoring sites poses a safety risk after heavy rain; hence the locations of those sites will be reviewed during the next reporting period.	2021 Annual Review	Completed. The locations of surface water monitoring sites have been reviewed and consideration has been given to alternative locations further upstream and/or closer to sealed roads as required.	8.3
Two tree planting programs with approximately 20,000 tube stock planted on existing mine rehabilitation within the conceptual woodland corridor.	2021 Annual Review	Completed. 18,000 plants were installed during the reporting period, slightly less than planned due to lack of availability from suppliers.	9.2

Action required	Requested by	Action taken	Section in Annual Review
A weed control program focussing on High Threat Exotic weed species.	2021 Annual Review	Completed. Weed control, focussing on High Threat Exotic weed species, was undertaken as planned during each season during the reporting period.	9.2
Installation of nest boxes in appropriately sized canopy trees within remnant vegetation to compare occupation within rehabilitation areas.	2021 Annual Review	Completed. 20 nest boxes were installed during the reporting period.	7.14
Submission of a new MOP and revised RCE to the Resources Regulator.	2021 Annual Review	Completed. A MOP and RCE was submitted to the Resources Regulator during the reporting period. A Forward Program, covering the period 3 February 2023 to 2 February 2025, was also submitted to the NSW Resources Regulator in August 2022.	Page 2
Undertake an IEA under development consents SSD 9526, PA 06_0202 and DA 106-04-00.	2021 Annual Review	Completed. IEA conducted during the reporting period, DPE letter of 14 September 2022 advises the department accepts the IEA report without further amendment.	6 (as stated in this table)

Action required	Requested by	Action taken	Section in Annual Review
Ensure that installation of additional pumping infrastructure on DC2 dam is completed. Verify that upgraded pumping infrastructure will have the capacity to minimise the risk of future discharges	2022 Independent Environmental Audit	Completed. Installation of additional pumping infrastructure on DC2 dam completed.	6 (as stated in this table)
Ensure Maxwell Infrastructure site Sewage Treatment System Maintenance and Compliance Reports contain the date and time of each inspection undertaken.	2022 Independent Environmental Audit	Completed. Maxwell Infrastructure site Sewage Treatment System Maintenance and Compliance Reports contain the date of each inspection undertaken.	6 (as stated in this table)
Ensure all containers containing material that is likely to cause environmental harm are contained in suitably bunded areas. Minimise the number of open containers located within bunds to reduce the generation of oily/contaminated water generated from rain events.	2022 Independent Environmental Audit	Completed. All containers containing material that are likely to cause environmental harm have either been placed in suitably bunded areas or have been disposed of. The number of open containers located within bunds has been minimised to reduce the generation of oily/contaminated water generated from rain events.	6 (as stated in this table)

Action required	Requested by	Action taken	Section in Annual Review
Undertake a review of the reliability of the current E-samplers and if appropriate, request an EPL variation to allow more flexibility in the type of monitoring equipment that can be used.	2022 Independent Environmental Audit	Completed. Review of the reliability of the current E-samplers has been undertaken, an EPL variation has been requested and has been approved to allow for alternative monitoring equipment, which has been purchased and commissioned.	6 (as stated in this table)
Implement a consolidated compliance management system to assign, track and complete compliance requirements by their due date.	2022 Independent Environmental Audit	Completed. A consolidated compliance management system (INX InControl) to assign, track and complete compliance requirements by their due date has been implemented.	6 (as stated in this table)

7 ENVIRONMENTAL PERFORMANCE

The Environmental Management Strategy for the Maxwell UG Mine provides an overview of the site's environmental monitoring. Environmental monitoring is a significant indicator of the site's environmental performance. In April 2022, the Environmental Management Strategy was updated to incorporate MOD1. The Environmental Management Strategy was again updated in December 2022 to incorporate MOD2.

The locations of all environmental monitoring sites are shown in **Appendix 2**.

7.1 Meteorological Monitoring

Management

Meteorological conditions such as wind speed, wind direction, temperature, rainfall, solar radiation and humidity are monitored at two automatic weather stations AWS-1 and AWS-2.

Performance

During the reporting period, temperature trends were similar to previous years with a peak in summer and trough in winter. This is shown in **Figure 3** and **Figure 4**.

The monthly mean maximums at AWS-1 were significantly below the previous five-year monthly mean maximums for all months, ranging from 7.2 degrees Celsius (°C) below the five-year mean maximum in January to 0.1°C below the five-year mean maximum in May. The monthly mean minimums were less consistent, ranging from 4.1°C below the five-year mean minimum in December to 2.4°C above the five-year monthly mean minimum in August.

The monthly mean maximum temperatures for AWS-2 were also cooler than the previous five-year monthly mean maximums, ranging from 8.2°C below the five-year mean maximum in January to 0.6°C above the five-year mean maximum in May. The monthly mean minimums at AWS-2 were less consistent, ranging from 4.2°C below the mean the five-year mean maximum in April to 2.3°C above the five-year mean maximum in May.

Analysis showed that these statistics were consistent with records from across NSW, with 2022 overall exhibiting below average mean maximum temperatures and above average mean minimums (source: Australian Government Bureau of Meteorology (BoM) Annual climate statement 2022). This reflects persistent La Niña and with periods of high rainfall, resulting in smaller diurnal temperature ranges.

A summary of wind monitoring over the reporting period is presented in **Figure 5** and **Figure 6**. Consistent with previous years, and consistent with the geography of the Hunter Valley, the predominant winds were from the south-east/east-south-east and north-west/ west-north-west.

As in previous years, winds from the south-east generally dominated during the warmer months and winds from the north-west generally dominated during the cooler months. In total 88 per cent of wind speeds throughout the reporting period were up to 4 metres per second (m/s). Both AWS-1 and AWS-2 had a higher proportion of wind from the south-east than in previous years.

AWS-2 exhibited a larger proportion of higher wind speeds (only 51 per cent were up to 4 m/s). This reflects its elevated and exposed location on grazing land.

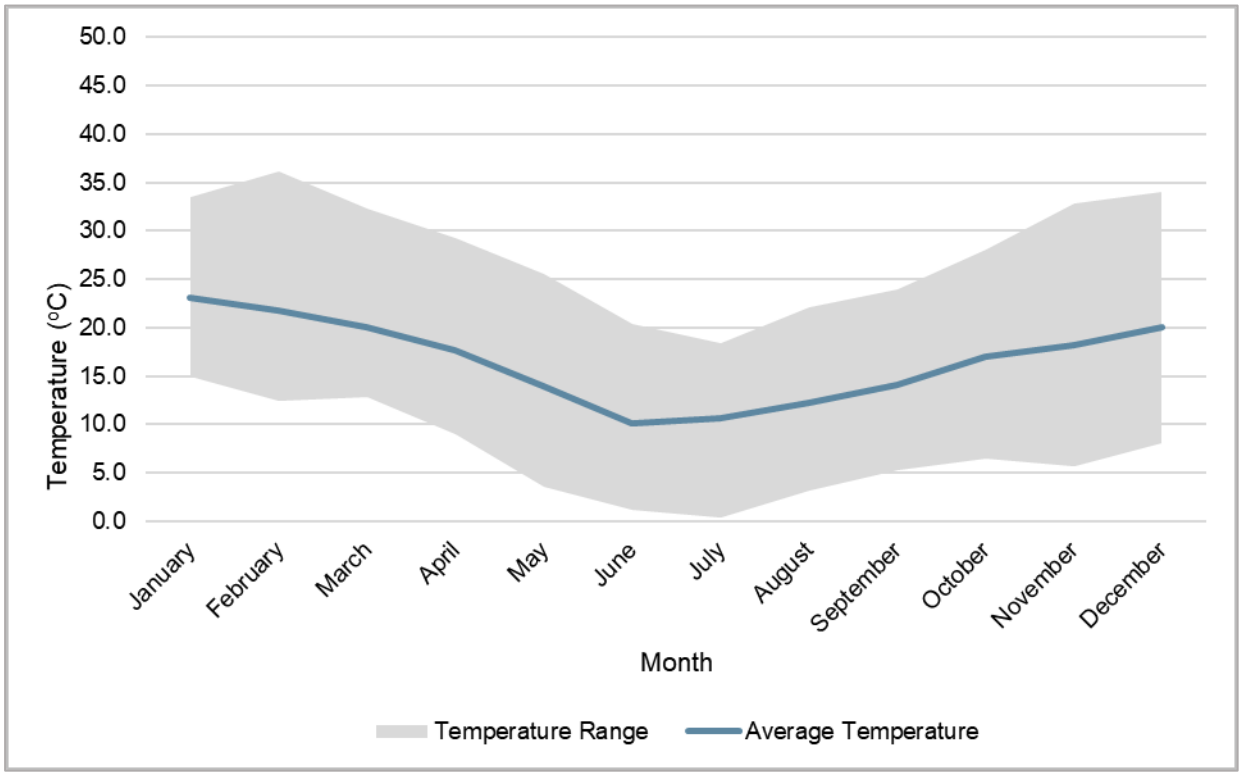


Figure 3. AWS-1 average temperature and temperature range for the reporting period

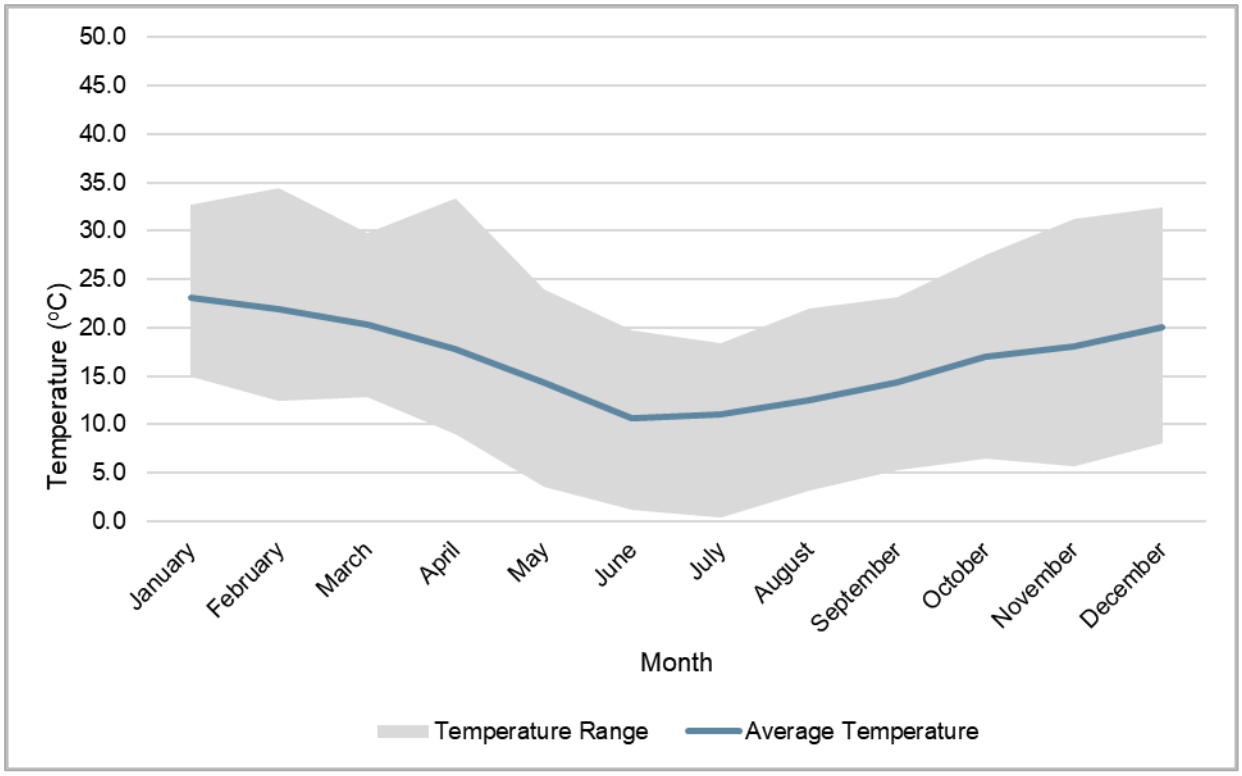


Figure 4. AWS-2 average temperature and temperature range for the reporting period

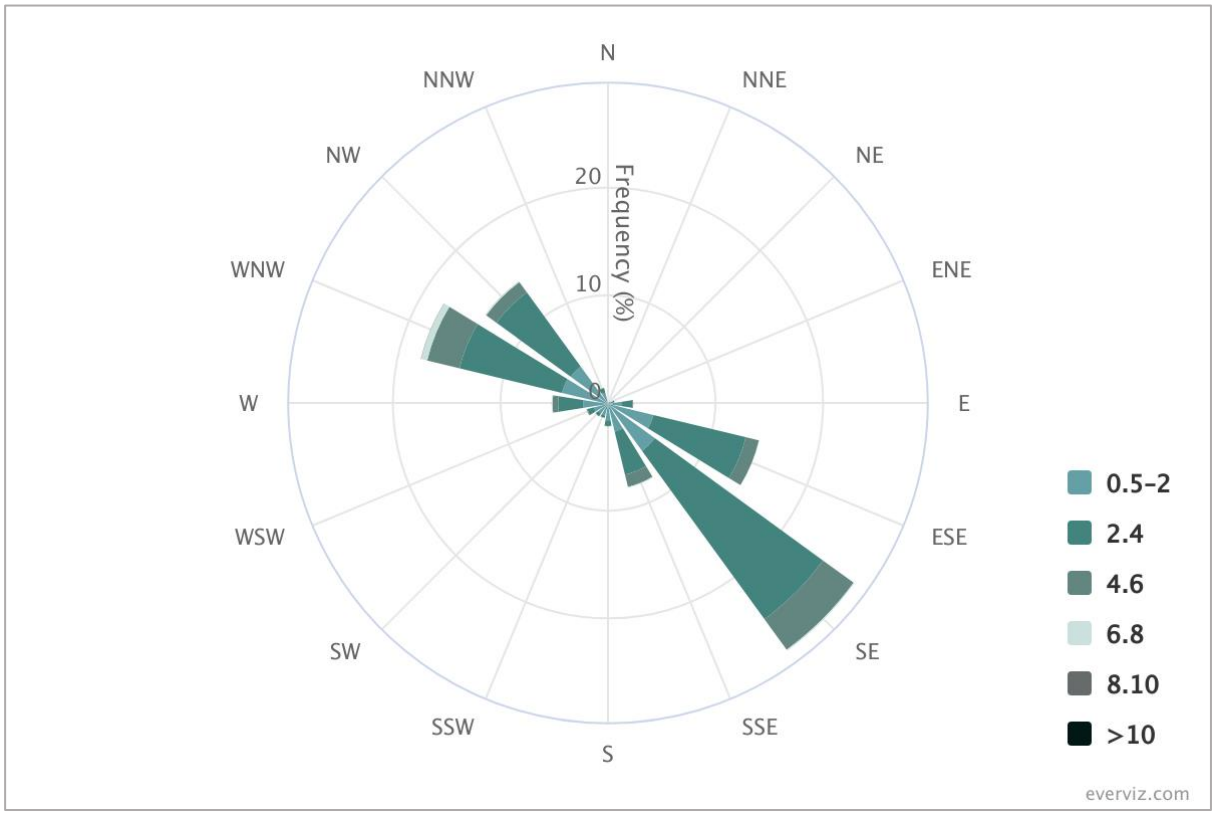


Figure 5. Wind speed and direction for the reporting period at AWS-1

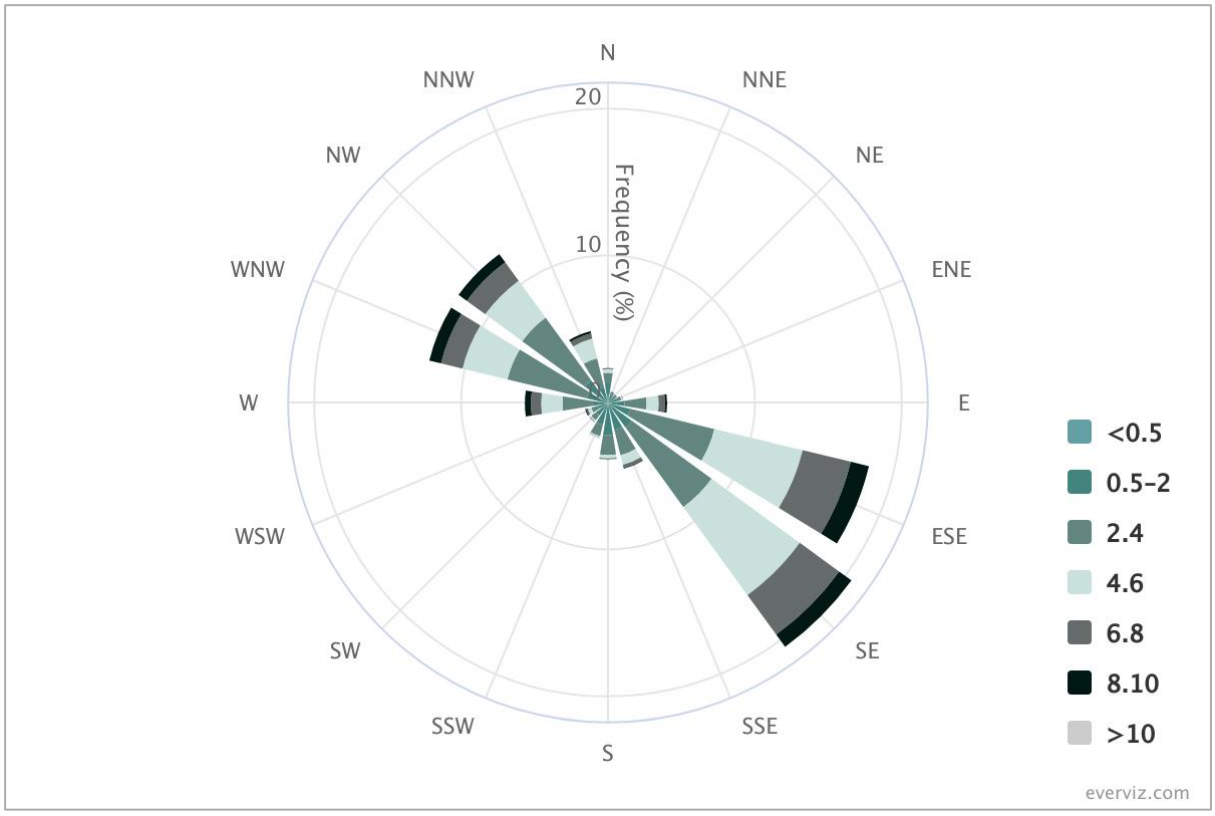


Figure 6. Wind speed and direction for the reporting period at AWS-2

Rainfall recorded during the reporting period was significantly above average. This can be seen in **Figure 7** which shows monthly rainfall during the reporting period compared to the average monthly rainfall for the previous 10 years. The increase in rainfall was consistent with observations made by the Australian Government Bureau of Meteorology in their Annual climate statement 2022, which noted that NSW had the second highest annual rainfall and wettest spring on record.

The extremely wet conditions in March 2022 were due to the influence of La Niña, a generally positive Southern Annular Mode (SAM), and persistent anti-cyclones ('blocking highs') over the Great Australian Bight during summer and early autumn resulting in predominantly easterly winds over much of Australia. July was a very wet month and largely associated with East Coast Lows**.**

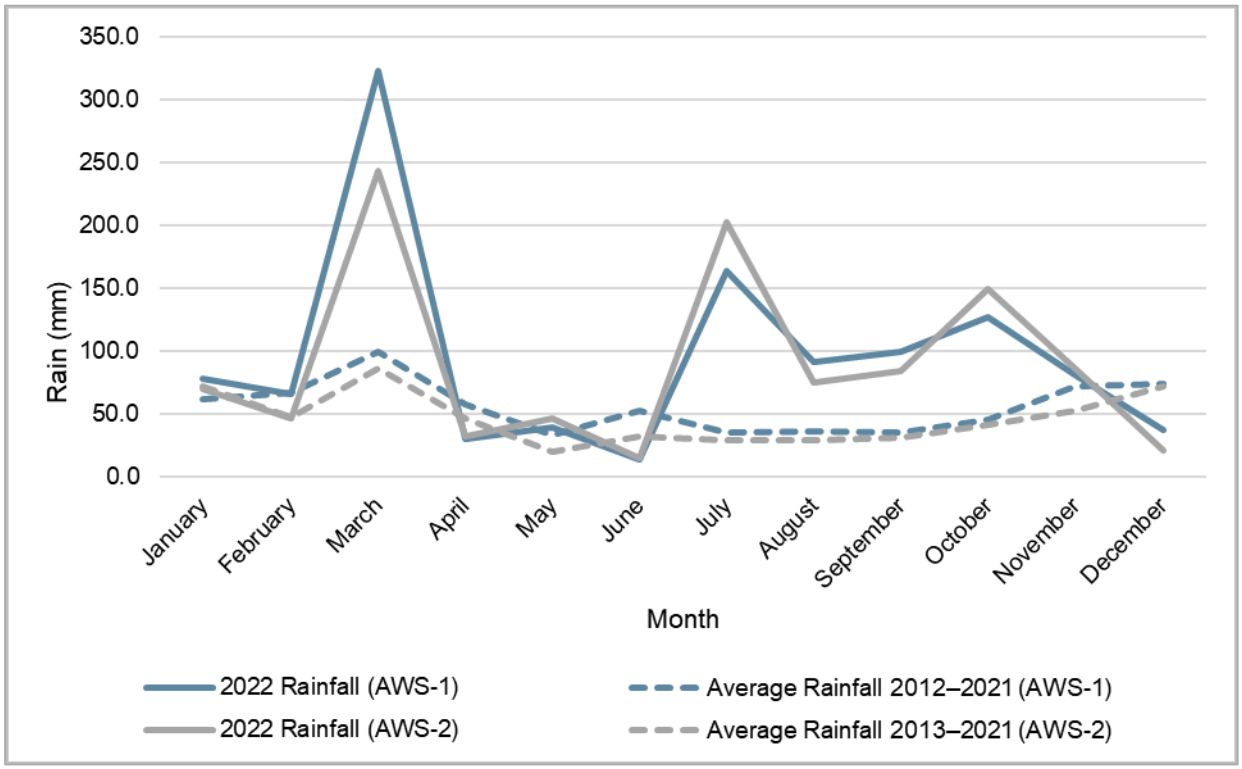


Figure 7. Rain for the reporting period with historic comparison

Proposed Improvements

There are no improvements identified for the next reporting period.

7.2 Noise

Management

Potential noise impacts from the site are managed in accordance with the Noise and Blasting Management Plan (NBMP) for the Maxwell UG Mine. In February 2022, the NBMP was updated to incorporate MOD1. The NBMP was again updated in August 2022 following submission of the 2021 Annual Review. The purpose of the NBMP is to detail statutory requirements and outline the controls to be implemented for the management of noise associated with the site.

The noise monitoring program includes a combination of attended and real-time monitoring at locations representative of residential receivers. Attended monitoring is carried out in accordance with the relevant requirements set out in the Noise Policy for Industry (EPA 2017). Measurement of the noise environment for compliance assessment is conducted by

an acoustic consultant. The compliance assessment for the remaining residential sites is determined by the acoustic consultant using the noise model to extrapolate from the measured values.

Real-time noise monitoring is undertaken for operational purposes only and currently involves the use of a BarnOwl directional noise monitoring system.

Performance

Construction activities were undertaken during day time typically on a five to six days per week basis, with night shift commencing at the MEA during the second half of the reporting period.

Attended noise monitoring and modelling was conducted during the reporting period to assess noise impacts and determine compliance to approval criteria. Monitoring was conducted every month at four locations (NM1 to NM4) in accordance with the NBMP. Noise impacts were assessed each month over three consecutive operating days for a minimum of 1.5 hours during the day, 30 minutes during the evening and 1 hour during the night.

Results for the reporting period are summarised in **Table 22** and **Table 23** in **Appendix 3**.

The approval criteria was not exceeded for any noise monitoring parameter at any location during the reporting period. Noise generated by the site alone was consistently inaudible and or too low to be measured. This is below the EIS predictions but was expected given the location and nature of the construction activity (i.e., primarily at the MEA).

Similarly, cumulative noise impacts were significantly below the approval criteria. Maximum noise levels from the site are compared to maximum noise levels recorded over the previous eight years in **Figure 30** in **Appendix 3**. Results show that there has been an overall reduction in noise levels since open cut mining operations ceased in late 2016.

The noise model used for the noise assessment in the Maxwell UG Mine EIS was validated for the reporting period by an acoustic consultant, as best as possible given the non-operational status of the mine, by comparing actual attended noise monitoring data in the reporting period with the predictions made in the noise model.

Proposed Improvements

Section 4.2.3 of the NBMP outlines a method for field calibration of the real-time Barn Owl data. During the reporting period, the site was inaudible at all monitoring locations and therefore calibration could not be undertaken as no quantifiable noise from the site was present. Once production has commenced and if the site generates sufficient noise, the Barn Owl will be calibrated with the attended noise monitoring data.

During the next reporting period, Maxwell will look to install additional noise mitigation measures at three privately owned receivers in accordance with Schedule 2, Condition D1 of Development Consent SSD 9526. All work will be undertaken in consultation with the landowner and the measures shall be consistent with the measures outlined in the Voluntary Land Acquisition and Mitigation Policy (DPIE 2018).

7.3 Blasting

Management

Potential blast impacts from the site are managed in accordance with the NBMP for the Maxwell UG Mine. As noted above, in February 2022, the NBMP was updated to incorporate MOD1. The NBMP was again updated in August 2022 following submission of the 2021

Annual Review. The purpose of the NBMP is to detail statutory requirements and outline the controls to be implemented for the management of surface blasts associated with the site.

Any private landholder or occupier of any residence, who registers an interest in being notified about blasting activities at the site are notified of upcoming blast events. An early notification is provided approximately two days before a proposed blast and another notification is provided on the day of the proposed blast. Proposed blast times are also uploaded onto the Muswellbrook Shire Council Blasting Announcements webpage to enable interested members of the public to get up-to-date information. A Pre-Blast Checklist is completed prior to each blast and includes a fume risk assessment and review of environmental conditions on the day of the blast.

Temporary blast monitors were installed at six locations in October 2022 prior to surface blasting for the Maxwell UG Mine. Airblast overpressure and ground vibration are recorded in accordance with *AS 2187.2 – 2006 and ANZEC Guidelines*.

Performance

Blasts were conducted on the following dates during the reporting period:

- 29 November 2022 (one blast)
- 6 December 2022 (one blast)

A summary of the monitoring data is shown in **Table 8**. The recorded levels demonstrate that blast vibration and overpressure levels recorded at the time of the blast were negligible and largely indistinguishable from background levels recorded pre and post blasting.

Table 8. Summary of blast monitoring results

Date	Time	Monitoring site name	Maximum vibration (mm/s)	Maximum overpressure (dBL)	Maximum vibration (mm/s) during hour pre- and post-blast	Maximum overpressure (dBL) during hour pre- and post-blast
29 November 2022	16:48	Bowfield	0.029	105.1	0.063	114.3
		Plashett	0.038	104.5	0.062	121.2
		Antiene	0.108	108.7	0.354	115.1
		Coolmore	0.096	106.0	0.114	118.3
		Godolphin	0.040	113.5	0.337	120.5
		ADL1	(1)	(1)	(1)	(1)
6 December 2022	14:31	Bowfield	0.029	94.6	0.094	113.5
		Plashett	0.029	94.6	0.076	108.8
		Antiene	0.034	100.1	0.171	110.8
		Coolmore	0.101	91.8	0.107	104.7

Date	Time	Monitoring site name	Maximum vibration (mm/s)	Maximum overpressure (dBL)	Maximum vibration (mm/s) during hour pre- and post-blast	Maximum overpressure (dBL) during hour pre- and post-blast
		Godolphin	0.114	83.8	0.407	106.5
		ADL1	0.036	100.9	0.049	113.7

(1) *No data for ADL1 - trigger mode was active however zero triggered events occurred at that location on 29/11/22 (i.e. blast not large enough to trigger).*

Proposed Improvements

There are no improvements identified for the next reporting period.

7.4 Air Quality

Management

Potential air quality impacts from the site are managed in accordance with the Air Quality and Greenhouse Gas Management Plan (AQGGMP) for the Maxwell UG Mine. In February 2022, the AQGGMP was updated to incorporate MOD1. The AQGGMP was again updated in August 2022 following submission of the 2021 Annual Review and further updated in November 2022 to incorporate MOD2. The purpose of the AQGGMP is to detail statutory requirements and outline the controls to be implemented for the management of air quality associated with the site.

The air quality management system includes a comprehensive set of both proactive and reactive control measures and monitoring tools to maintain compliance with the air quality criteria for particulate matter less than 10 µm (PM_{10}) and particulate matter less than 2.5 µm ($PM_{2.5}$). These measures and tools are designed to minimise the potential for generation of wind-blown dust from disturbed surfaces and mining activities, and to enable effective control of episodic dust events. In accordance with the AQGGMP, a combination of depositional dust gauges, E-Samplers and tapered element oscillating microbalance (TEOM) monitors were used for the site during the reporting period to:

- monitor air quality surrounding the site;
- assist in air quality management; and
- assess compliance to air quality impact limits specified by approval conditions.

Performance

A summary of air quality monitoring results during the reporting period are presented below including an assessment of compliance to approval criteria, a comparison to predictions made in the Maxwell UG Mine EIS and consideration of long-term trends.

Total Suspended Particulates (TSP)

In accordance with the AQGGMP, TSP levels were calculated during the reporting period based on PM_{10} results recorded at each TEOM monitor. As shown in **Table 9**, the annual TSP level was lower than the impact assessment criterion and the highest maximum EIS prediction for year 1 of operations.

Table 9. Monitoring summary – TSP (µg/m^3)

Monitor	Averaging period	Approval criterion	Highest maximum EIS year 1 prediction	Current reporting period result (2022)
TEOM-1	Annual	90	42.1	27.5
TEOM-2	Annual		36.3	26.3

The long-term trend for the annual TSP level, over a 10-year period, is shown in **Figure 8.** The data shows an identical level to 2021, which in itself was a significant reduction from 2019 which is attributed to the higher-than-average rainfall received during 2020 to 2022 across regional NSW in addition to the cessation of widespread bushfires in 2019–20.

The TSP result recorded in 2018 was particularly high. An investigation at the time into the 2018 result found the elevated levels were being influenced by a lessee feeding cattle in an exposed area immediately adjacent to the monitor and were not attributable to impacts from the site nor indicative of regional conditions.

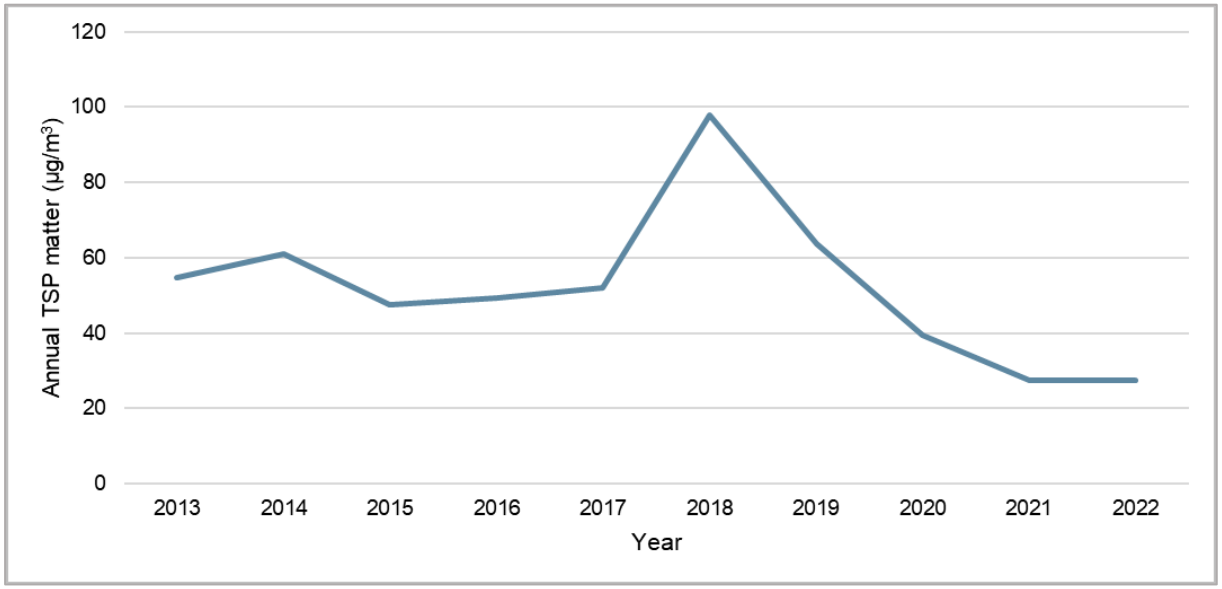


Figure 8. Long-term results for TSP calculated from PM_{10} results at TEOM-1

Notes: Following investigations, it was determined that the elevated 2018 result was not attributable to impacts from the Maxwell Infrastructure site. Data from TEOM-2 is not presented as monitoring commenced in December 2021 and hence no long term trend is apparent.

PM_{10}

As shown in **Table 10**, the annual PM_{10} level remained below the annual impact assessment criterion and the EIS prediction for year 1 of operations.

PM_{10} levels, as shown in **Figure 9**, are currently trending downwards. This reflects the end of the extended drought in NSW following higher than average rainfall during 2020 to 2022 in combination with the end of the catastrophic bushfires of 2019–20. PM_{10} levels monitored by the UHAQMN have shown a similar trend across the region since 2015.

Table 10. Monitoring summary – annual PM_{10} concentrations (µg/m^3)

Monitor	Averaging period	Approval criterion	Highest maximum EIS year 1 prediction	Current reporting period result (2022)
TEOM-1	Annual	25	17.5	11.0
TEOM-2	Annual		13.0	10.5

All 24-hour PM_{10} levels for the reporting period are presented in **Appendix 4**. The 24-hour criterion of 50 micrograms per cubic metre (µg/m^3) was not exceeded on any day during the reporting period.

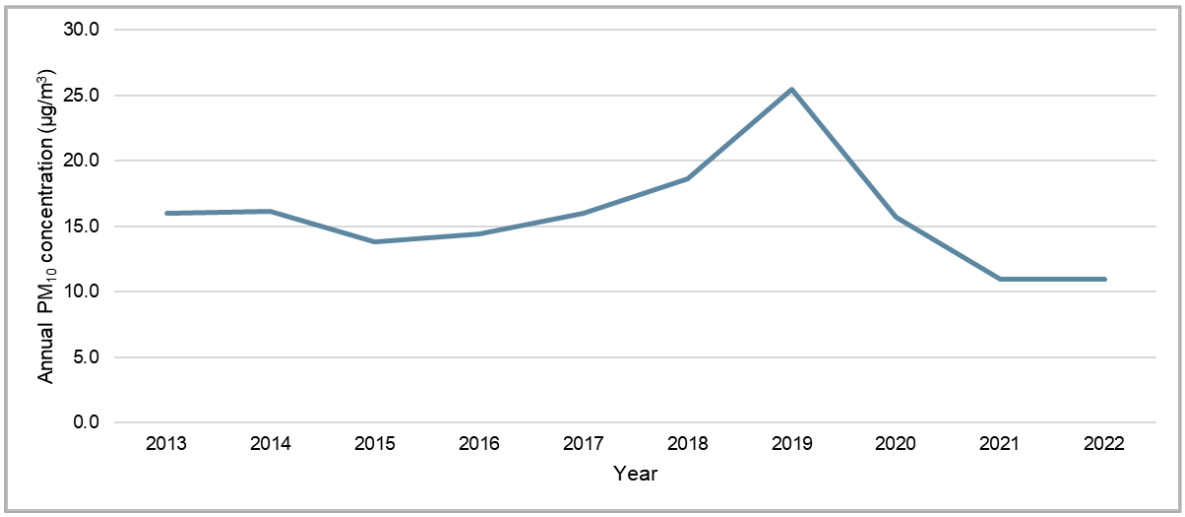


Figure 9. Long-term results for PM_{10} at TEOM-1

Note: (monitoring commenced at TEOM-2 in December 2021 and hence long-term trend information at this location will be presented in subsequent Annual Reviews)

$PM_{2.5}$

As shown in Table 11, the annual $PM_{2.5}$ level remained below the annual impact assessment criterion and the EIS prediction for year 1 of operations.

Monitoring of $PM_{2.5}$ commenced at TEOM-1 on 9 March 2021 and at TEOM-2 on 12 December 2021. Hence there is an insufficient long-term data record to describe trends. However historical concentrations are judged likely to exhibit similar trends to the other airborne particulate fractions and to that recorded by the UHAQMN.

Table 11. Monitoring summary – annual $PM_{2.5}$ concentrations (µg/m^3)

Monitor	Averaging period	Approval criterion	Highest maximum EIS year 1 prediction	Current reporting period result (2022)
TEOM-1	Annual	8	5.3	4.5
TEOM-2	Annual		4.9	7.3*

** Due to a failure of the TEOM-2 instrument between June and August 2022, extraneous $PM_{2.5}$ concentrations were recorded; the instrument was returned to the manufacture and a hire instrument was installed.*

All 24-hour $PM_{2.5}$ levels for the reporting period are presented in **Appendix 4**. The 24-hour criterion of 25 micrograms per cubic metre (µg/m^3) was not exceeded at TEOM-1 however it

was exceeded 13 times by TEOM-2 during the reporting period. This occurred between 7 June and 4 August 2022 and was due to a failure of the TEOM instrument which resulted in it being sent to the manufacturer for investigation and being replaced with a hire instrument.

Deposited Dust

Deposited dust results were significantly less than the impact assessment criteria for both the maximum increase in dust level and maximum total deposited dust. This can be seen in the summary of results presented in **Table 12** and **Table 13**.

Table 12 shows that the annual average deposited dust results were either less than or equal to the EIS predictions during the reporting period for year 1 of operations.

The long-term trend in annual average deposited dust levels is shown in Figure 10. Like other air quality parameters, deposited dust has been trending down since 2018 consistent with the end of drought conditions and not attributable to impacts from the Maxwell UG Mine, as activities have decreased significantly since open cut mining ceased in October 2016.

Results for 2019 to 2021 show a reduction in deposited dust levels. The exception is for site 2230 in 2021, for which the annual mean is heavily influenced by one result in July 2021 (11.8 g/m^2/month). Sampling notes from July 2021 indicate that this was a contaminated sample (contamination can include soil deposited by birds). Without this result, the annual mean would be 1.8 g/m^2/month.

Table 12. Monitoring summary – incremental deposited dust (g/m^2/month)

Monitor	Averaging period	Approval criterion	Previous reporting period result (2021)	Current reporting period result (2022)
2230	Annual	2	0.1	-0.1
2247			0.0	-0.1
2235			0.0	0.0
2175			0.0	0.0

Table 13. Monitoring summary - total deposited dust (g/m^2/month)

Monitor	Averaging period	Approval criterion	EIS year 1 prediction	Current reporting period result (2022)
2230	Annual	4	1.6	1.4
2247			1.7	1.3
2235			1.7	1.7
2175			1.7	1.7

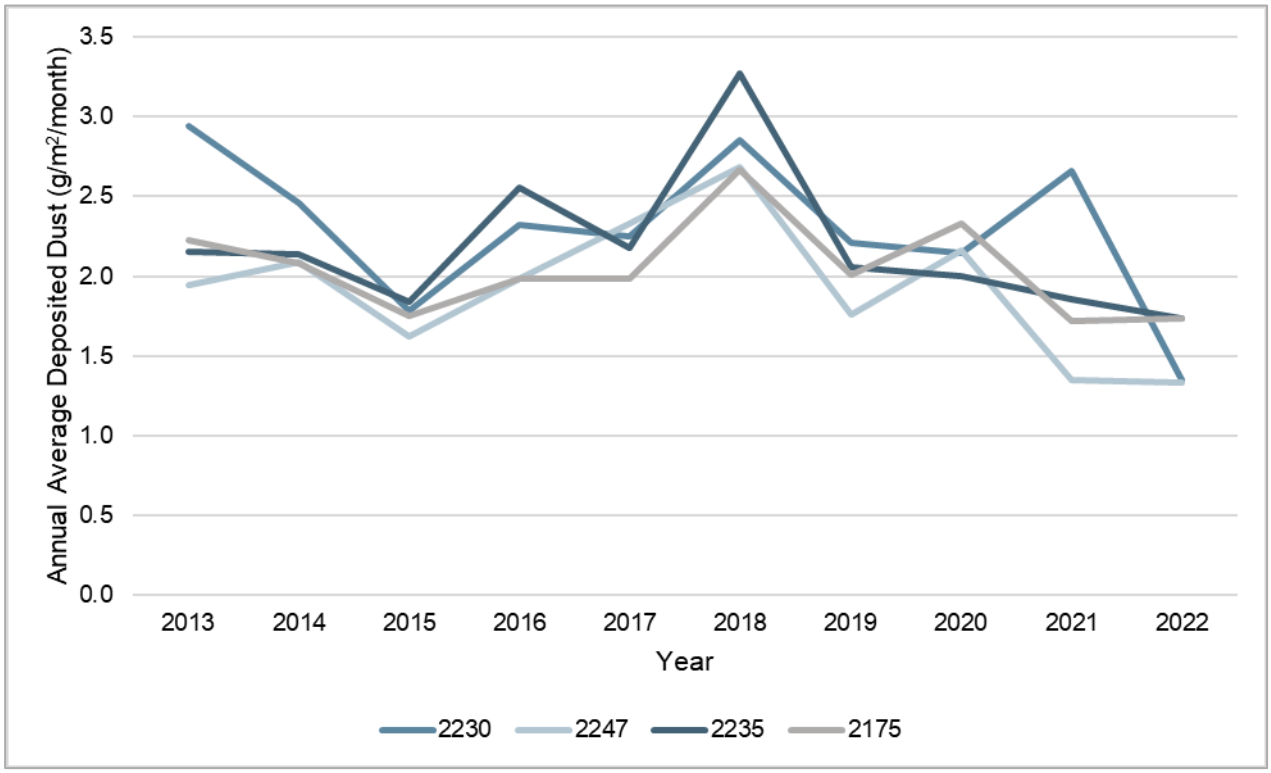


Figure 10. Long-term results for deposited dust

Proposed Improvements

There are no improvements identified for the next reporting period.

7.5 Aboriginal Cultural Heritage

Management

Aboriginal cultural heritage at the Maxwell UG Mine is managed in accordance with the Aboriginal Cultural Heritage Management Plan (ACHMP). In February 2022, the ACHMP was updated to incorporate MOD1. The ACHMP was again updated in August 2022 following submission of the 2021 Annual Review and further updated in November 2022 to incorporate MOD2. The purpose of the ACHMP is to detail the statutory requirements and provide a framework for the management of Aboriginal cultural heritage associated with the site and accompanying offset areas.

Performance

The Aboriginal Cultural Heritage Assessment for the Maxwell UG Mine EIS identified 39 open artefact sites (i.e., isolated artefact or artefact scatters containing Aboriginal objects) that would be wholly or partially impacted within the surface development area.

A surface collection of the 39 open artefact sites was undertaken during 2021 by archaeologists and registered Aboriginal parties. Recorded locations for all 39 previously identified surface artefact 'loci' were visited during the surface collection and definite and potential cultural lithic items were collected. Approximately 500 lithic items were recovered as part of the surface collection. Artefacts were recovered from 27 of the 39 sites, with artefacts unable to be recovered from 12 sites due to thick vegetation cover obscuring the ground surface. Of those unable to be located, five comprised isolated artefact sites and seven were low density artefact scatters. Notwithstanding the above, a significantly larger number of lithics were recovered during the surface collection than were recorded during the original site recordings.

A surface collection was undertaken for the MOD1 areas on 2 March 2022, by an archaeologist and registered Aboriginal parties. Recorded locations for the two previously identified surface artefact 'loci' within the MOD1 areas (37-2-4359 and 37-2-0415) were visited during the surface collection. All exposed ground surfaces at and immediately surrounding these locations were inspected for surface artefacts, with existing GPS data, 'loci' photographs and descriptions used as locational guides where necessary. All definite and potential cultural lithic items identified as a result of these inspections were collected. Seventeen lithic items were recovered as part of the surface collection, all of which were from site 34-2-0415. No artefacts were recovered from site 37-2-4359 with a single artefact originally recorded as part of this site.

Maxwell's site database was updated to reflect the surface collection and Aboriginal Site Impact Recording forms were prepared and submitted to the Aboriginal Heritage Information Management System registrar for all salvaged sites.

Proposed Improvements

Further surface collection will be undertaken within the MOD2 disturbance areas during the next reporting period. The collection will be undertaken in accordance with the ACHMP.

7.6 Non-Aboriginal Heritage

Management

The land that comprises the Maxwell UG Mine and surrounds has primarily been used for pastoral activities since the early period of European settlement. The land within the Maxwell Infrastructure site was part of the historic Edinglassie Estate and originally part of Pringle's Station, owned by Robert Pringle and James White in 1839. The majority of the underground area was originally part of the historic Plashett Estate, with a small part to the east forming part of the historic Bowfield Estate. An Historic Heritage Assessment was undertaken for the Maxwell UG Mine EIS. The assessment noted that no items listed on local, regional, State or national historic registers are located within the site boundary.

Performance

The Maxwell UG Mine will not result in any material adverse impacts on any non-Aboriginal heritage places and as such no specific measures are required to manage or mitigate any impacts.

Proposed Improvements

There are no improvements identified for the next reporting period.

7.7 Transport

Management

Coal transportation activities were not undertaken during the reporting period. First and second workings have not commenced under SSD 9526. The rail loop remains under care and maintenance and relevant conditions of approval remain in place. This includes:

- reporting requirements;
- communications with Mt Arthur Coal on the rail loop and Antiene rail spur; and
- the continuation of the Joint Community Consultative Committee (CCC) with Mt Arthur Coal.

Performance

The Maxwell site rail loop was used for the temporary stowage of empty rolling stock by Aurizon Operations Ltd. The number of train movements and the date and time of each train movement is provided in **Appendix 5**.

A number of activities associated with development consent DA 106-04-00 were undertaken during the reporting period including:

- Site inspections of the rail loop;
- Various corrective and preventative maintenance activities including lifting and repacking of the track, replacement of sleepers and ballast, repairs to drainage infrastructure, track grinding and vegetation and weed removal;
- Testing and condition assessments, and
- Level crossing works on the Antiene Road Level Crossing.

Proposed Improvements

Preventative and corrective maintenance work on sections of the Antiene Rail Spur, including rail grinding, condition assessments, inspections and testing will be undertaken during the next reporting period. The spur and loop will be prepared for coal export from site.

7.8 Visual Impact

Management

Potential visual impacts from the site are managed in accordance with the Visual Impact Management Plan (VIMP) for the Maxwell UG Mine. In February 2022, the VIMP was updated to incorporate MOD1. The VIMP was again updated in August 2022 following submission of the 2021 Annual Review. The purpose of the VIMP is to detail the statutory requirements and controls to be implemented for the management of visual amenity associated with the site. A Landscape and Visual Impact Assessment was undertaken for the Maxwell UG Mine EIS and found that the site will have inherently low visual impacts because the mining operation is underground and the MEA is located in a natural valley.

The MEA tree screen (planted in 2019 along ridge lines and contours to the west of the MEA) is monitored on an annual basis for at least the first five years after installation. The inspection requires monitoring to ensure the planted trees are establishing to become self-sustaining. The inspection includes as a minimum, an assessment of the survival rate, tree height, tree width and to identify any impacts from weeds, feral animals or grazing.

Once the tree screen has been established (i.e. five years after planting), annual monitoring will be undertaken to measure the visual impact and determine the effectiveness of the tree screen from representative viewing locations.

Performance

The 2019 tree planting areas were inspected during the reporting period. The inspection found the tree screens were performing well with an estimated 80 per cent survival rate across the various areas. Overall tree growth was good with the majority of trees being recorded at a height above 2 metres. Further infill planting will increase the effectiveness of the tree screen. A summary of the monitoring results are provided in **Appendix 6**.

Favourable weather conditions during the reporting period have improved vegetation growth and coverage, therefore over time it is expected that this area will improve the visual amenity to complement the natural landscape.

Proposed Improvements

Proposed improvements to the management of visual impacts for the next reporting period include:

- Additional infill planting at the MEA tree planting area with tube stock during the optimal planting periods; and
- A reduction of pest animals within the area prior to planting.

7.9 Greenhouse Gas and Energy Efficiency

Management

Greenhouse gas (GHG) and energy efficiency for the site are managed in accordance with the AQGGMP for the Maxwell UG Mine. In February 2022, the AQGGMP was updated to incorporate MOD1. The AQGGMP was again updated in August 2022 following submission of the 2021 Annual Review and further updated in November 2022 to incorporate MOD2. GHG emissions attributable to the Maxwell UG Mine include emissions from fuel and energy consumption which are regularly quantified. This information is then used to manage GHG emissions and energy consumption to the minimum practicable level.

Performance

Actual greenhouse gas emissions from the Maxwell UG Mine have been calculated for Year 0 (the construction phase of the Mine) using the same methodology used for the EIS. The emissions from Maxwell Infrastructure (from actual diesel and electricity use in 2022) have also been added to the emissions from the Mine (noting the EIS only included emissions from the additional activities associated with the Mine).

With the addition of the emissions from Maxwell Infrastructure, the calculated total site emissions are 0.0022 Mt CO2-e. This represents 13 per cent of the 0.017 Mt CO2-e calculated for the EIS for the Mine for Year 0 (construction-only scenario). Excluding Maxwell Infrastructure, site emissions for Year 0 are calculated as 0.0016 Mt CO2-e, representing 12% of the amount predicted in the EIS. The primary difference from that calculated for the EIS is due to the absence of Scope 1 (fugitive emissions) in Year 0 which were assumed in the EIS to come from some coal extraction from the Whynot and Woodlands Hill seams, which did not occur in 2022.

Relative to the estimated annual average greenhouse emissions for the Mine of 0.41Mt (CO2-e (Scope 1 and 2), the calculated actual emissions during Year 0 (construction phase) for the reporting period (2022) of 0.0022 Mt CO2-e are very small (0.53 per cent).

Emission reduction activities during the reporting period have included:

- Progressive transition of lighting to LED bulbs, including for floodlights within the main warehouse and stores yard and daylight switches
- External and internal LED lighting for the bath house and fitting of daylight switches
- External LED lighting in the refuel shed and daylight switches
- Replacement of the old continuous electric hot water system with a commercial heat pump system
- Variable Speed Drive (VSD) pump controlling for raw and potable water pump systems for power efficiency savings
- Administration buildings converted to utilise room-by-room air conditioning rather than whole of building ducted air conditioning.

Proposed Improvements

Activities during the next reporting period will include:

- Evaluation of the long-term large-scale potential of solar following the execution of formal agreements with EDF Renewables to develop large scale renewable energy projects in the Upper Hunter Valley, helping to support the Hunter's transition to a low carbon economy.
- Continuation of a study commissioned by Malabar to quantify gas emissions from the Maxwell UG Mine and identify potential opportunities for GHG mitigation.

7.10 Waste

Management

Waste is managed at the Maxwell UG Mine in accordance with the Waste Management Plan. Where appropriate, spent resources are reused or recycled in preference to being disposed of as waste. During the reporting period, the focus for waste management was on removing unused resources, particularly around infrastructure areas and recycling materials where possible.

Performance

Waste and recycling streams are monitored on a monthly basis. Quantities of the major waste and recycling streams over the past 10 years are shown in **Figure 12**. This comparison shows that waste significantly reduced with the cessation of open cut mining in late 2016. This is commensurate with the reduction in resource use associated with the reduced operational activity at the site. During this reporting period, there was an increase in general waste disposed compared to the previous reporting period. This was commensurate with the commencement of the construction of in May 2022. The amount of general waste diverted from landfill to recycling increased by a similar proportion. The initiative to realise the value of cans and bottles via the NSW container deposit scheme Return and Earn resulted in continued contributions to a local charity.

No predictions were made in the EIS in relation to waste quantities.

The Maxwell UG Mine has an existing sewage treatment plant (STP) for effluent generated on-site. This is located at the Maxwell Infrastructure site. From the STP, treated effluent is pumped to settlement ponds. Previously, overflow from the ponds was applied to land. However, due to the low number of people on site and low volume of effluent, the treated effluent evaporates from the first pond.

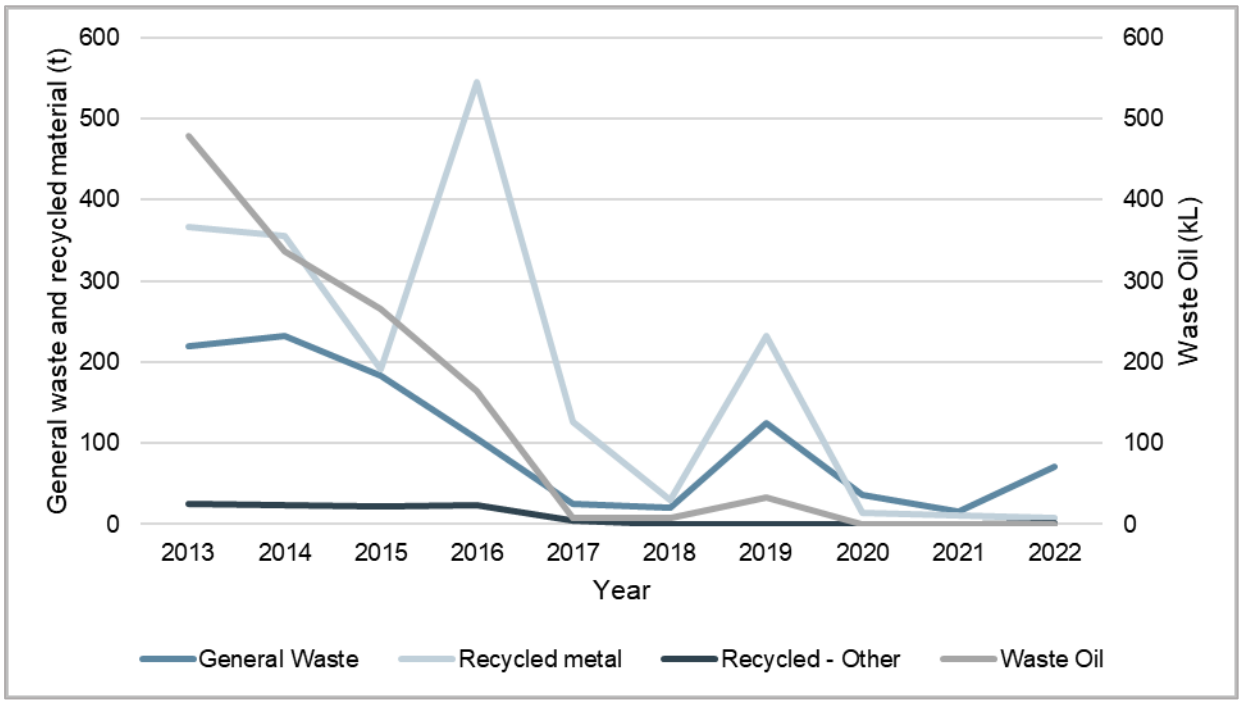


Figure 11. Long-term waste stream quantities

A small amount of Mixed Waste Organic Outputs (MWOO) was previous stockpiled at the Maxwell Infrastructure site. MWOO was previously used for rehabilitation activities until in October 2018, the NSW Environment Protection Authority (EPA) revoked all general and specific resource recovery orders and exemptions for the application of MWOO to land. An amendment was made to the *Protection of the Environment Operations (Waste) Regulation* in October 2020 to allow prescribed premises to dispose of (i.e. bury) MWOO on site subject to conditions of the regulation. Maxwell buried the stockpiled MWOO during the reporting period in accordance with the Regulation.

Proposed Improvements

There are no improvements identified for the next reporting period.

7.11 Contaminated Land

Management

Contaminated land is managed in accordance with the Contaminated Materials Protocol (CMP) for the Maxwell UG Mine. In February 2022, the CMP was updated to incorporate MOD1. The purpose of the CMP is to describe the procedures to be implemented in the event that potentially contaminated material is identified during construction, and to outline the measures to ensure compliance with the requirements of SafeWork NSW and relevant guidelines.

Maxwell Infrastructure also maintains a bioremediation area for the remediation of material contaminated by hydrocarbons. An update to the Bioremediation Management Plan as approved by DPE on 1 August 2022.

Performance

No new areas of contaminated land were identified during the reporting period.

In February 2022, sediment from the workshop drain, wash pad sump, diesel tank sump and fuel truck sump was added to the bioremediation area. In December 2022, contaminated soil from a diesel spill was added for treatment. In February 2022 the site was sprayed for weeds. No material was removed from the bioremediation area during the reporting period.

Proposed Improvements

Malabar will seek to empty one or more of the bioremediation pads during the next reporting period, in accordance with the Bioremediation Management Plan, to ensure sufficient capacity in case of future need.

7.12 Bushfire

Management

Potential bushfire impacts from the site are managed in accordance with the Bushfire Management Plan for the Maxwell UG Mine. This plan was prepared in consultation with the Rural Fire Service. The purpose of the Bushfire Management Plan is to detail statutory requirements and outline the controls to be implemented to manage bushfires on the site.

Where possible a minimum 10 m Asset Protection Zone (APZ) is provided around all key infrastructure and along boundary fences (within approved disturbance areas) to act as a fire break. The vegetation in APZs is limited to grass that is mowed on a regular basis. Non-operational grassed areas are also mowed and/or grazed to reduce fuel loads. Access tracks that can be used as fire trails are monitored annually in August to assess if there are sufficient tracks for fire-fighting access and if tracks require maintenance.

Fire-fighting equipment is available on site and is available for use in the event of a bushfire. The equipment includes a fire trailer, mine site water cart, fire hose reels and pumps, fire extinguishers on a mobile plant and light vehicles.

Performance

There were no bushfires recorded at the Maxwell UG Mine during the reporting period.

Vegetation was maintained during the reporting period to minimise the risk of bushfire occurring. All equipment was serviced and maintained in accordance with the relevant Australian Standards. Inspection and testing was performed by on-site personnel and appropriate service providers according to the electrical and mechanical maintenance management plans. Hand-held fire extinguishers were inspected by on-site trained personnel and maintained by an external fire service provider.

An inspection of key assets, access points and infrastructure was conducted prior to the commencement of the 2022 bushfire season to maintain the ability to reduce fire load and protect assets in the event of a bushfire impacting site. A range of actions including resupplying the CHPP fire depot with extinguishers and engaging a contractor to complete scheduled maintenance on the fire trailer were implemented.

Proposed Improvements

The extremely wet weather during this reporting period has meant that slashing of all property boundaries did not occur. This will be undertaken during the next reporting period.

7.13 Spontaneous Combustion

Management

Potential spontaneous combustion at the site is managed in accordance with the Spontaneous Combustion Management Plan (SCMP) for the Maxwell UG Mine. In February 2022, the SCMP was updated to incorporate MOD1. The SCMP was again updated in August 2022 following submission of the 2021 Annual Review and further updated in December 2022 to incorporate MOD2. The purpose of the SCMP is to detail statutory requirements and outline the controls to be implemented for the management of spontaneous combustion associated with the site. The management of spontaneous combustion is focused on the monitoring of previously capped areas along with the capping of any new outbreaks.

Along with regular inspections conducted as part of the general site activities, formal monthly spontaneous combustion inspections are conducted. A thermal imaging camera is utilised to assist the identification of areas where ground surface temperatures are above background levels. The surface area exhibiting smoke or steam emissions is estimated for each detected outbreak. In addition, an annual aerial survey using a fixed wing aircraft fitted with infrared detection is used to identify the presence of hot spots on a site-wide basis. This survey was conducted on 26 June 2022.

Spontaneous combustion monitoring supports the planning of activities to prevent and remediate spontaneous combustion outbreaks. These management activities include reprofiling, track rolling and the application of inert capping.

Performance

Spontaneous combustion locations are categorised in accordance with the following intensity criteria:

- Minor - visible steam or smoke exists, however, the area affected is 200 m² or less.
- Moderate - exhibiting continuous visible smoke or steam and / or has an area of greater than 200 m².
- Major - exhibiting naked flames, regardless of the area affected.

As shown in **Table 14**, all spontaneous combustion outbreaks identified during the reporting period were inactive or of a minor intensity. All locations continue to be monitored. As shown in **Table 14,** approximately 28 square metres (m^2) was estimated to be affected by spontaneous combustion outbreaks across the site at the end of the reporting period. This is less than previous years and reflects the extensive preventative and remedial works undertaken over the past number of years. The annual aerial infrared survey in June 2022 allowed confirmation of the success of mitigation works to date in addition to informing planning for future activity.

Table 14. Long-term area affected by spontaneous combustion

Year	Area Affected (m²)
2010	1,170
2011	1,070
2012	1,160
2013	1,180
2014	810
2015	870
2016	810
2017	1,150
2018	1,170
2019	320
2020	50
2021	55
2022	28

Proposed Improvements

There are no improvements identified for the next reporting period.

Figure 12. Locations affected by spontaneous combustion at the end of the reporting period

7.14 Biodiversity

Management

Biodiversity at the Maxwell UG Mine is managed in accordance with the Biodiversity Management Plan (BMP) and Rehabilitation Management Plan (RMP). In April 2022, the BMP was updated to incorporate MOD1. The purpose of the BMP is to detail statutory requirements and to outline the short, medium and long-term management measures for vegetation and fauna habitat within:

- the Drayton Wildlife Refuge, Northern Offset Area and Southern Offset Area (jointly referred to as the Maxwell Infrastructure Biodiversity Offset Areas) required under Schedule 2, Conditions B45 and B46 of Development Consent SSD 9526;
- the approved disturbance areas in accordance with Schedule 2, Condition A12 of Development Consent SSD 9526; and
- remnant vegetation and fauna habitat in areas not likely to be impacted by the project.

Routine ecological monitoring is conducted across the Maxwell UG Mine including the Maxwell Infrastructure offset areas and rehabilitated lands. The ecological monitoring program was streamlined in 2018 as some sites were replicates located in discrete locations and non-target vegetation types. The streamlined monitoring program maintains the spatial distribution required to provide representative data.

Monitoring sites, as shown in **Appendix 2, Figure 29**, are located within woodland rehabilitation, pasture rehabilitation and offset areas. Sites located in offset areas are used as a reference site to measure remanent vegetation and fauna habitat in areas not likely to be impacted by mining, these sites are referenced against the woodland rehabilitation, to provide ecological targets for ecosystem integrity and species diversity. Monitoring is undertaken annually, with each site monitored every second year.

Biodiversity Offsets

Existing offsets including the Drayton Wildlife Refuge, Northern Offset Area and Southern Offset Area (jointly referred to as the Maxwell Infrastructure Biodiversity Offset Areas) were already in place prior to Development Consent SSD 9526. These areas have been incorporated into this Biodiversity Management Plan and a conservation and biodiversity bond has been provided to DPE for the continued management of these offsets.

Maxwell has prepared a Biodiversity Stewardship Application (BSA) for a land based offset for the Maxwell UG Mine. The proposed land based offset provides sufficient credits to satisfy the biodiversity credit requirements in Conditions B47, B50A and B50B of Development Consent SSD 9526. Maxwell held a meeting with the NSW Biodiversity Conservation Trust (BCT) on 27 July 2021. At the meeting, BCT advised that the initial review of the draft application would take two weeks and the full assessment of the application would take approximately six months. As such, Maxwell requested a revised timeframe for retiring biodiversity credits to 30 June 2022. This request was approved by DPE on 2 September 2021.

A further extension was granted until 28 February 2023 following consultation with the Credits Supply Taskforce. This extension was granted to allow the Credit Supply Taskforce to continue to process the BSA in its current form in parallel to seeking legal advice.

In December 2022, Maxwell again applied to have the date extended. DPE consulted with the Credits Supply Taskforce regarding the remaining time required to process the application and a further extension was granted until 30 August 2023.

In accordance with Condition B49 of Development Consent SSD 9526, Maxwell commissioned additional flora surveys and an expert report to demonstrate a reduction in credits. The supplementary surveys did not identify any of the target species within the Maxwell UG Mine areas, supporting the survey outcomes described in the Biodiversity Assessment Report (Hunter Eco, 2019). In addition, the expert report also concluded that Diuris tricolor, Prasophyllum petilum and Pterostylis chaetophora are unlikely to be present within the Maxwell UG Mine areas. As such, Maxwell requested that the biodiversity credit requirements for Diuris tricolor, Ozothamnus tesselatus, Prasophyllum petilum, Pterostylis chaetophora and Thesium australe be reduced to zero as these species are not likely to be impacted by the Maxwell UG Mine. DPE reviewed and approved the request to reduce biodiversity credit requirements to the following:

- The offset requirements for stage 1 and stage 2 for Pterostylis chaetophora, Ozothamnus tesselatus and Thesium australe are reduced to zero.
- The offset requirements for stage 1 for Diuris tricolor are changed from 1,474 credits to 5 credits, and for Prasophyllum petilum are changed from 1,114 credits to 6 credits.
- The offset requirements for stage 2 for Diuris tricolor and Prasophyllum petilum are reduced to zero.

Performance

During the reporting period the following measures were implemented to improve biodiversity at the Maxwell UG Mine:

- regular walkover inspections of rehabilitation;
- tubestock infill planting within woodland vegetation communities;
- culling of kangaroos prior to infill planting to reduce grazing pressure on tubestock;
- continuation of the grazing trial on mine pasture rehabilitation;
- implementation of a targeted weed management program; and
- installation of nest boxes to improve fauna habitat in the woodland vegetation communities.

Ecological monitoring was undertaken during October to December 2022. Monitoring consisted of biometric vegetation sampling, Biodiversity Assessment Methodology (BAM) for remnant woodland reference sites and woodland rehabilitation areas, fauna monitoring, assessment of pest animals, topsoil assessment of monitoring sites, and comparison against the Ecosystem and land use establishment phase performance indicators and completion criteria.

The Rehabilitation Management Plan defines rehabilitation into primary and secondary domains, the primary domains are based on land management units with unique operational and functional purposes whereas the secondary domains are defined on land management units with a similar post mining land use objective. The rehabilitation phases within each domain show the progress towards the post mining land use goals. All areas of existing pasture and woodland rehabilitation are currently within the ecosystem and land use establishment phase. All further rehabilitation activities will focus on enhancing the rehabilitation to meet the relevant phase objectives and completion Criteria. The monitoring results in comparison to the ecosystem and land use establishment phase completion criteria are detailed in **Table 25** to **Table 27** in **Appendix 7**.

Biometric Vegetation Sampling

Biometric vegetation sampling was undertaken on eleven reference and woodland rehabilitation sites. Sites were representative of Ironbark-Spotted Gum-Grey Box Woodland, Narrow-leaved Ironbark Woodland, Yellow Box-Grey Gum Woodland and Forest Red Gum Woodland.

Results showed the reference sites were in good condition and naturally self-sustaining with no direct impact from past mining activities or recent site changes. The reference sites show no evidence of die back or disease, with weed management practices during the previous reporting period having a positive impact with generally low weed cover present. General enhancement of these areas will likely continue to occur naturally with the additional application of weed control when required.

The woodland rehabilitation sites showed varying results, as most sites are in early ecosystem establishment phase. These sites recorded lower values in comparison to the reference sites when assessing the number of trees with hollows, total length of fallen logs, regeneration of canopy species and native overstorey, midstory and ground covers. All of these units will increase in time as trees and other native vegetation mature with the application of required management actions such as weed control and enhancement plantings. Percentage foliage cover of mid-storey species was similar to or exceeded the reference sites on rehabilitation sites and is progressing well towards the targets. Improvements are required in the Southern Offset area with weed management of exotic grasses and replanting of canopy species to provide protection and resilience for successional lower stratum species. Of the 139 plant species that were recorded during surveys, 95 were local native species.

Biodiversity Assessment Methodology Sampling

The BAM vegetation sampling was adopted during the 2021 ecological monitoring program to comply with the Biodiversity Management Plan. The BAM provides a direct comparison of sampling results based on attributes such as foliage cover, stem size, tree regeneration, length of logs and litter cover against a Plant Community Type benchmark database providing an Integrity score. The BAM sampling was undertaken at four woodland reference sites and seven woodland rehabilitation sites.

Results indicate that the woodland reference sites had an integrity score from between 69 and 74 indicating that these sites are achieving the benchmark conditions for the target Plant Community Type. The woodland rehabilitation sites scores resulted in two groupings, three sites scoring <12 due to low native cover in all stratum; these results are expected given the woodland rehabilitation areas are at early phase of ecosystem succession. The second grouping scored between 19 and 45 primarily due to development of a moderate canopy cover; these sites are generally progressing well towards the target vegetation type however will need time to further develop an appropriate canopy, shrub and ground cover layer. Improvements to these ecosystems will establish in time, with the addition of weed management programs, an increase in fauna habitats and planting or seeding of native vegetation cover within the canopy, shrub and groundcover layers.

Fauna Monitoring

Fauna monitoring occurred at six sites (four reference sites and two rehabilitation sites) to determine the occurrence of terrestrial vertebrate animals, including bird, mammal, reptile and amphibian species.

There were 53 fauna species recorded during the 2022 monitoring program, including 30 bird species, fourteen mammal species, five reptile species and four amphibian species. A total of three threatened species were recorded, being the speckled warbler (*Chthonicola sagittata*), the squirrel glider (*Petaurus norfolcensis*) and the eastern bentwing-bat (*Miniopterus schreibersii oceanensis*).

Comparison of the average number of fauna species data, recorded at each site from 2013 to 2022, indicates a general increase trend of fauna species at the reference sites from 25 to 36 species.

Pest Animals

The predominate pest species observed at site were kangaroos, they were noted to be over grazing rehabilitation areas and creating nesting beds under established trees and shrubs. During the reporting period a kangaroo cull was undertaken in the southern offset area.

Large numbers of kangaroos have the potential to impact regenerating flora species and establishment of new rehabilitation areas. A reduction in kangaroo numbers will be targeted prior to the Autumn and Spring tree planting campaigns, during the next reporting period.

Feral pigs also have an impact of rehabilitation lands. During the reporting period a total of nineteen pigs were trapped and shot on site. All feral pig sightings and control efforts are recorded in the FeralScan database—a third party pest animal recording and management tool administered by the Centre for Invasive Species Solutions and supported by NSW Local Land Services (amongst others).

Soil Assessment

Topsoil samples at twenty-five monitoring sites were analysed in accordance with the RMP, with results compared to DPI standards for the North Coast of NSW and the Environmental Analysis Laboratory.

The results of topsoil samples from reference sites show that the soils pH, Electrical Conductivity (EC), and plant growth limiting factors are in line with indicative guidelines, other analytes such as exchangeable calcium, magnesium and potassium are lower than guidelines and the carbon-nitrogen ratio and sulphur were generally higher than the guidelines.

The pasture rehabilitation topsoil analysis indicates that results are generally in line with indicative guidelines. The calcium-magnesium ratio is low and the carbon-nitrogen ratio is high however, these results will not restrict the growth of vegetation. The vegetation at these sites is in good condition.

The woodland rehabilitation sites topsoil analyses were in line with indicative guidelines, with no significant issues to be addressed. However, the addition of mulch in areas of bare ground would act to improve the organic matter in those locations.

Closure Criteria

As shown in **Appendix 7** the regeneration of species from all structural layers was recorded at the Southern Offset and two locations within the woodland rehabilitation corridor monitored during the reporting period. The total cover of invasive weeds remained below the closure criteria in the Northern Offset, and Wildlife Refuge area, predominately due to weed control implemented during the reporting period. Invasive weeds remain moderate to high in the Southern Offset Area and the Northern rehabilitation areas, including woodland rehabilitation. An intensive weed control program was established focussing on all offset areas and mine rehabilitation during the reporting period. Work will continue in these areas during the next reporting period.

Woodland rehabilitation sites that were monitored during the reporting period are shown in **Table 27** in **Appendix 7**. Monitoring results indicate that the ground cover including foliage coverage is trending towards the closure criteria. However, development of ground cover for erosion protection and native tree and shrub establishment in one section of the Great North Tip are not meeting completion criteria. The native groundcover, tree and shrub species require further management to assist with establishment.

The diversity of canopy and mid-storey species, particularly at the Southern Offset area and Northern rehabilitation area were not meeting the completion criteria targets mainly due to pest animals impacting on planting campaigns and weed infestations. To remediate this

issue, further development of a canopy and mid-storey cover through infill planting, and appropriate weed control will occur during the next reporting period.

Pasture rehabilitation sites monitored during the reporting period are shown in **Table 26** in **Appendix 7**. The overall groundcover has established well with a suitable mix of perennial grasses, forbs and legume species. Ecological monitoring demonstrated good cover of perennial grass species in the Eastern rehabilitation area. All pasture rehabilitation sites are trending towards meeting the closure criteria for post mining land use for sustainable grazing.

Proposed Improvements

Table 15 identifies the management measures planned for offset areas during the next reporting period. Measures planned for rehabilitation areas are discussed in **Section 9.3**.

Table 15. Measures planned for offset areas in the next reporting period

Location	Management measure
Southern Offset Area	Weed control program targeted at Galenia and Golden Wreath Wattle.
Southern Offset Area	Infill planting where required.

8 WATER MANAGEMENT

8.1 Water Take

During the reporting period, the Maxwell UG Mine did not actively draw water from any ground or surface water sources. Maxwell holds Water Access Licence (WAL) 41559 and WAL41491 for the passive intake of aquifer water associated with the mine excavation at the Maxwell Infrastructure site.

Although open cut mining has ceased, Maxwell UG Mine EIS predicts that groundwater will continue to flow into the mine voids until it stabilises. Predicted values in the EIS have been sourced from the Groundwater Impact Assessment within the Drayton Mine Extension Environmental Assessment.

Table 16 shows the calculated passive water take in accordance with the conditions of WAL41559 and WAL41491. This estimated passive inflow was calculated by consultants specialising in water management and modelling. The inflow of 880 Megalitres (ML) estimated for the reporting period is less than the 985 ML per year (or 2.7 ML/day) that was predicted for year 10 of operations in the previous EA. It is also less than the total entitlement of 1,387 ML held under WAL41559 and WAL41491.

Table 16. Water take July 2021 to June 2022 (WAL reporting period)

Water Licence #	Water sharing plan, source and management zone	Entitlement (ML)	Passive take inflows (ML)	Active pumping (ML)	TOTAL (ML)
WAL 41559	Sharing Plan: North Coast Fractured and Porous Rock Groundwater Sources Water Source: New England Fold Belt Coast Groundwater Source	985	424	0	424
WAL 41491		402			
WAL 41234	Sharing Plan: North Coast Fractured and Porous Rock Groundwater Sources 2016 Water Source: Sydney Basin-North Coast Groundwater Source	806	0	0	0
WAL 43166	Sharing Plan: North Coast Fractured and Porous Rock Groundwater Sources 2016 Water Source: Sydney Basin-North Coast Groundwater Source	28	0	0	0

Water Licence #	Water sharing plan, source and management zone	Entitlement (ML)	Passive take inflows (ML)	Active pumping (ML)	TOTAL (ML)
WAL 39739	Sharing Plan: North Coast Fractured and Porous Rock Groundwater Sources 2016 Water Source: Sydney Basin-North Coast Groundwater Source	23	0	0	0
WAL 43160	Sharing Plan: Hunter Unregulated and Alluvial Water Sources 2009 Water Source: Jerrys Water Source.	50	0	0	0
WAL 39792	Sharing Plan: North Coast Fractured and Porous Rock Groundwater Sources 2016 Water Source: Sydney Basin-North Coast Groundwater Source	55	0	0	0

8.2 Water Consumption

During the reporting period, the site consumed approximately 55 ML of raw water from dams on site. This water was primarily used for dust suppression on unsealed roads, within vehicle washdown bays and at the MEA during construction.

A total of 1.3 ML of potable water from the town supply was also used in administration facilities for toilets, washing and consumption and 0.20 ML of potable water was delivered by truck to crib huts, temporary offices and cattle troughs. A small quantity was also used to assist seedlings post-planting and for weed spraying.

As **Figure 13** shows, water consumption has reduced over the long-term, particularly since open cut mining ceased in 2016. The recent increase in raw water usage is due to the reasons described above. Both raw and potable water usage are expected to increase significantly as construction continues and operational phases are commenced.

Water stored on site increased from approximately 16,727 ML to 19,715 ML during the reporting period, indicating that water consumption was well within the limits required to maintain the site's closed raw water system, with no active intake or output of water. This is also demonstrated by the input-output statement of the water accounting framework in **Appendix 8**. In addition, the extreme rainfall events of 2022 as described in **Section 7** contributed to the increase in water stored on site.

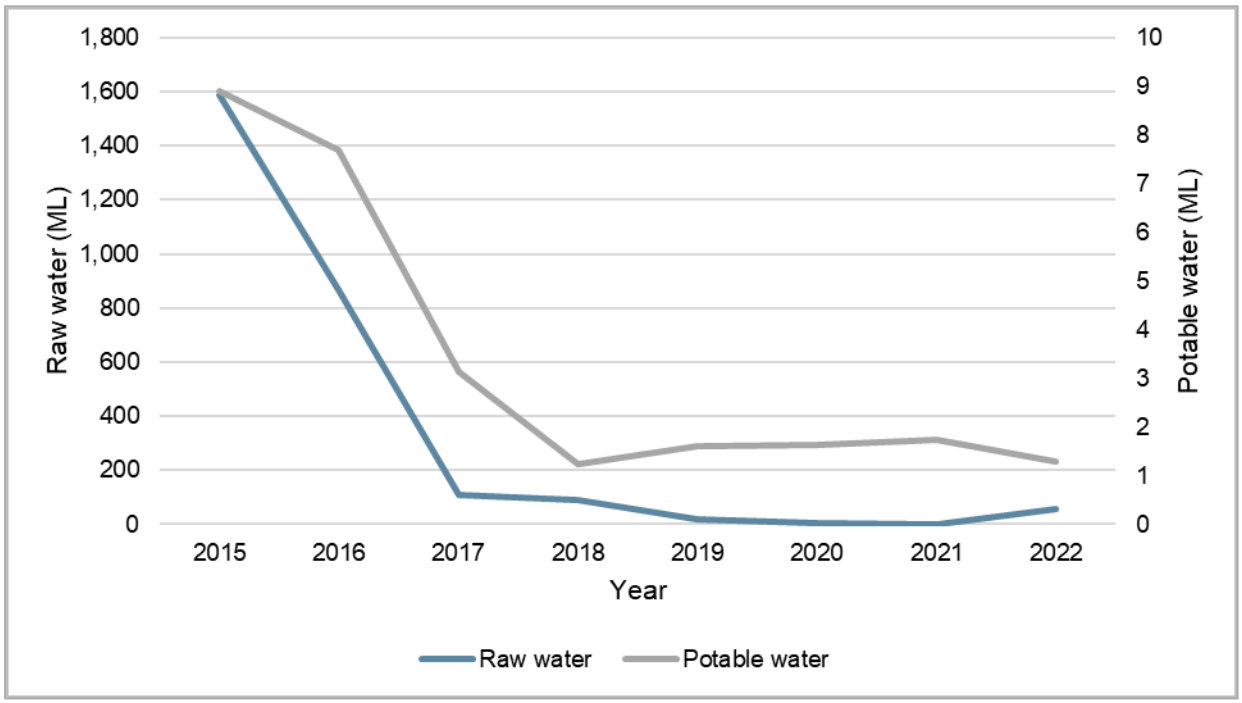


Figure 13. Long-term water consumption

8.3 Surface Water

Management

Surface water at the site is managed in accordance with the Water Management Plan (WMP) for the Maxwell UG Mine. In August 2022, the WMP was updated following submission of the 2021 Annual Review. The purpose of the WMP is to detail statutory requirements and outline the water management controls to be implemented for the site. This WMP includes the following sub-plans that are relevant to the management of surface water:

- Site Water Balance and Salt Balance
- Erosion and Sediment Control Plan
- Surface Water Management Plan (SWMP).

The SWMP includes the requirement for quarterly water quality monitoring and following rainfall events.

Performance

In accordance with the current SWMP, the quality of surface water at Maxwell UG Mine is analysed quarterly and following rainfall events >25mm in a 24-hour period midnight to midnight. Annual average surface water quality results for the reporting period are provided as graphs in **Appendix 9.** Surface Water Quality Results along with a comparison to the average results recorded for the previous five years.

Generally, results from mine water storage monitoring locations for all variables in the reporting period were of a similar to those recorded for 2021, noting that the results in 2021 were lower than prior years. This is deemed likely due to the high rainfall during 2021 and 2022, which diluted water storages and monitored variables. The exceptions to this were relatively large annual average increases at sites 2109 (DC2 Dam) and 2114 (Rail Loop Dam). These increases were due to very high concentrations being recorded during sampling events on 23 June and 20 December 2022 and are deemed likely due to rainfall

occurring prior to each sampling event, which due to the small size of these two water storages, were disproportionately affected by overland flow following the rain. It should be noted that all water onsite is retained on site, in accordance with the Water Management Plan.

Downstream surface water monitoring results (median over three consecutive samples) have been compared to the trigger values in the SWMP, which have been set using preliminary guideline values. Specifically:

- for field measurements of EC at sites W3, Saddlers D/S and SW1 in Q3 2021, of turbidity at MEA D/S in Q3 2021 and of EC at SW1 in Q4 2021; and
- for laboratory measurements of TSS at Saddlers U/S and TDS at W3 and SW1 in Q3 2021, of TSS at Saddlers D/S and SW1 and of TDS at SW1 in Q4 2021.

In accordance with the Surface Water Quality Trigger Action Response Plan within the SWMP monitoring will continue to enable the development of site-specific trigger values.

The access to some surface water monitoring sites is difficult following heavy rain; hence the locations of those sites has been reviewed. Alternative monitoring locations, for example upstream of the same creek, closer to sealed roads or upgraded tracks, have been agreed with the monitoring contractor in such instances.

Proposed Improvements

New mine water storages at the MEA will be commissioned during the next reporting period and monitored on a routine basis.

In accordance with the SWMP, site specific triggers will be calculated from site data based on the ANZG (2018) method for guideline value derivation, during the next reporting period, given that 24 months of baseline observations will be available, following approval of the first version of the WMP in August 2021.

8.4 Stream Health

Management

Stream health impacts at the site are managed in accordance with the current WMP. This includes quarterly stream health monitoring at each of the three locations along Saddlers Creek.

The extent of riparian vegetation, the extent of erosion and sedimentation deposits and Swamp Oak health is used as an indicator of stream health and to provide supplementary information on potential geomorphic impacts to drainage lines. Monitoring is undertaken by taking photographs and recording observations at each site.

Performance

The results of the stream health monitoring are shown in **Appendix 10**.

Changes since the commencement of monitoring in Q3 2020 reflect changes that can be expected following the end of the extended drought in 2020. The significantly higher rainfall has resulted in an increase in water levels, a general improvement in vegetation size and health including of weeds along the broader banks. Apart from an increase in pool depths, no changes have been observed in relation to the physical characteristics at all three monitoring locations.

Proposed Improvements

There are no improvements identified for the next reporting period.

8.5 Groundwater

Management

Groundwater at the site is managed in accordance with the WMP for the Maxwell UG Mine. In August 2022, the WMP was updated following submission of the 2021 Annual Review. The purpose of the WMP is to detail statutory requirements and outline the water management controls to be implemented for the site. This WMP includes the Groundwater Management Plan.

In accordance with the Groundwater Management Plan:

- the observed groundwater levels from the Maxwell Infrastructure groundwater monitoring program have been reviewed against the model predictions; and
- a suitably qualified hydrogeologist[1] has determined when water levels deviate significantly from that predicted by the groundwater assessment for the Project EIS and determined the reason for this deviation.

Malabar committed to installing five additional groundwater monitoring bores prior to the commencement of the second workings. To meet this commitment the following groundwater monitoring bores were installed in December 2022:

- two shallow monitoring bores (MB05 and MB07) within the Saddlers Creek alluvium;
- one shallow monitoring bore (MB04) along an unnamed Creek (within EL5460);
- two monitoring bores (MB06-S and MB06-D) in the Permian Coal Measures (i.e. Jerrys Plains Subgroup) – it is planned that these are to be installed in January 2023.

The installation of MB07 was to address recommendation of Dr Frans Kalf made within his peer review of the HydroSimulations groundwater assessment (July 2019) that formed Appendix E of the Maxwell Project EIS. The recommendation was to install further alluvial monitoring targeting the areas of predicted drawdown shown in Figure 7 of the EIS Groundwater Dependent Ecosystem Assessment. In particular monitoring locations should target areas within the 5m drawdown contour where practical, to supplement existing bores located within the smaller areas of predicted drawdown.

The groundwater monitoring network is presented in **Figure 14**, inclusive of MB06-S and MB06-D.

[1] SLR Consulting Australia Pty Ltd, 202 Submarine School, Sub Base Platypus, North Sydney, NSW, Australia, 2060.

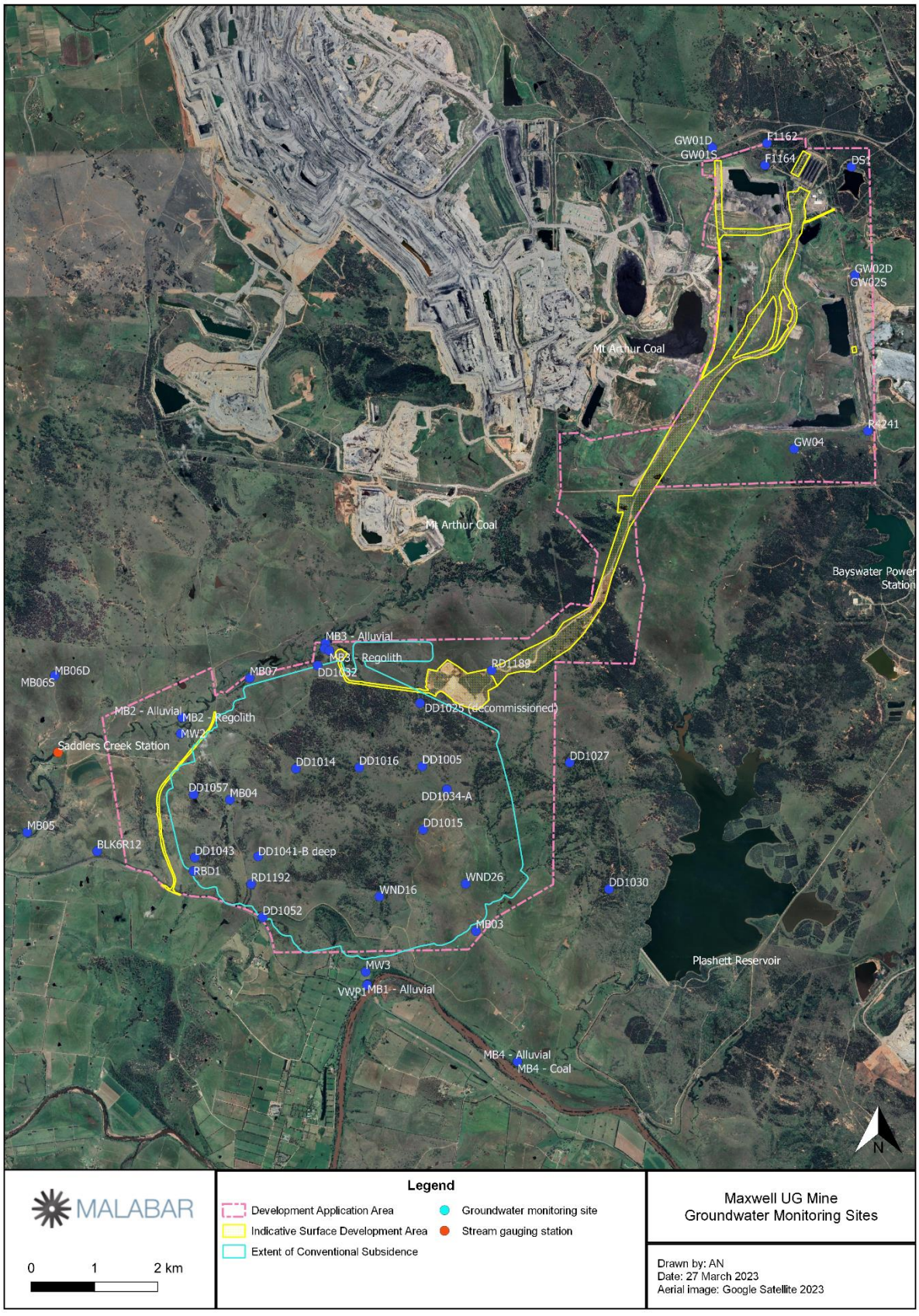


Figure 14 Groundwater Monitoring Network

Performance

Groundwater Levels

Groundwater levels, measured monthly (or twice daily where loggers are installed), have remained stable over the reporting period. Baseline groundwater levels at monitoring locations are displayed in **Figure 15** to **Figure 21**, in combination with the cumulative rainfall departure (CRD). In the legend displayed on each groundwater hydrograph, the depth of the base of the screen and the associated aquifer monitored is also presented.

The CRD trend has been generated from SILO[2] (grid point:32.40; 150.90, latitude and longitude) from 1900 to 2022**.** Positive gradients on this curve confirm wetter conditions than normal, while negative gradients indicate dry conditions. If rainfall recharge is a significant source of groundwater, the temporal variability in recorded groundwater levels can be expected to mimic the pattern of the CRD curve. That is, natural fluctuations in the groundwater table result from temporal changes in rainfall recharge to groundwater systems. Typically, changes in groundwater elevation reflect the deviation between the long-term monthly average rainfall and the actual rainfall, illustrated by the CRD (HydroSimulations, 2019).

Maxwell Underground Mine

Groundwater levels in the Jerrys Plains Subgroup have remained relatively stable during 2022 (**Figure 15**). Groundwater levels in the upper Blakefield overburden aquifer (DD1014 and DD1025) have responded to rainfall recharge in the range of 1m to 1.5m in July–August 2022. Groundwater levels in the mid to lower Blakefield overburden aquifer (DD1016, DD1005 and DD1015) have remained stable showing no significant responses to rainfall recharge.

In the Whynot overburden (DD1052), groundwater levels also responded to rainfall recharge in the range of 2m to 3m and are observed at 118.4 mAHD in late 2022. Groundwater levels in the Woodlands Hill overburden (DD1043) have increased by 1.2m during 2022 and are observed at 129.9 mAHD in December 2022. In the lower aquifer, the groundwater levels in the Arrowfield overburden aquifer remained stable at approximately 124.4 mAHD.

In the deeper geological units, groundwater levels in the Piercefield and Edderton overburdens have remained stable showing a groundwater level difference of approximately 5m between the two units. No significant changes in the vertical hydraulic head gradient between the major aquifers of the Jerrys Plains Subgroup are observed in 2022.

In addition, there is no evidence of observed groundwater depressurisation related to mining (i.e., caused by neighbouring mines) during the review period in the Jerrys Plains Subgroup aquifers.

[2] SILO database of Australian climate data: https://www.longpaddock.qld.gov.au/silo/

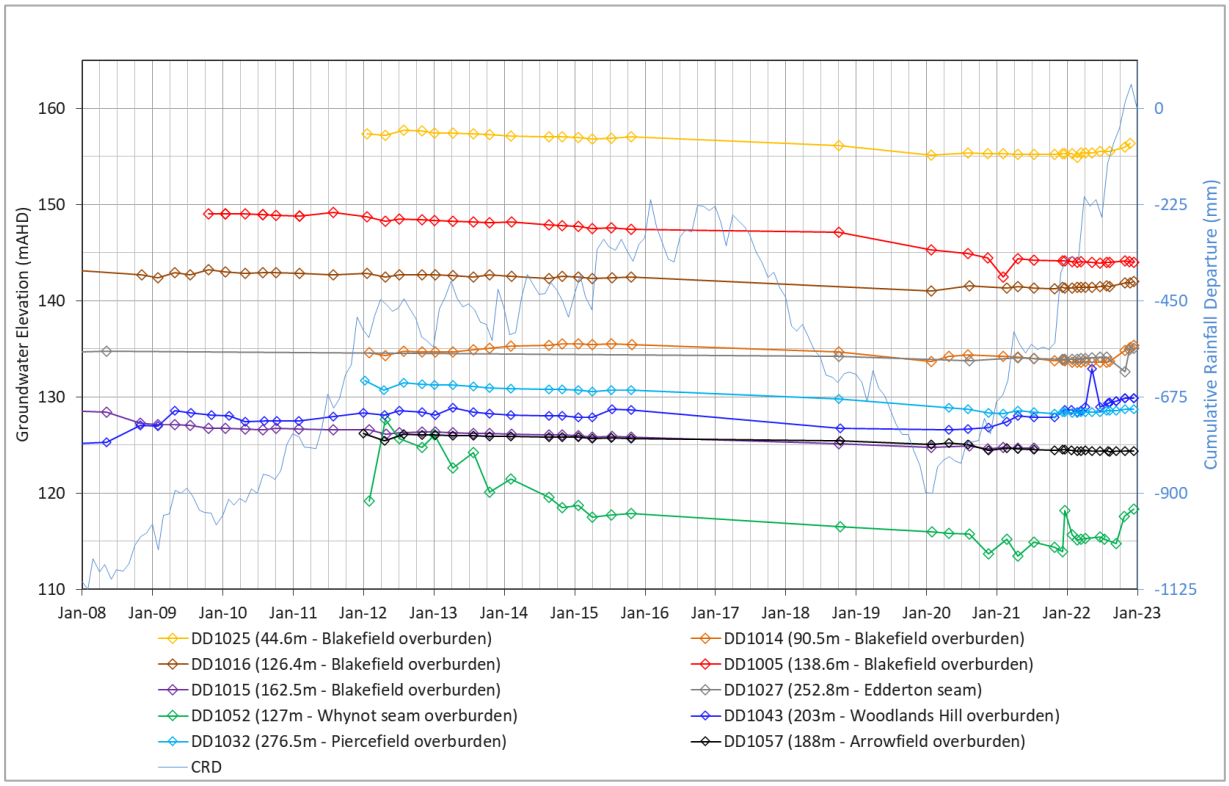


Figure 15 Groundwater Levels – Maxwell Underground Bores (Jerrys Plains Subgroup)

Note: Depth of the base of the screen and the associated aquifer also shown in the legend; CRD = cumulative rainfall departure.

Saddlers Creek Catchment

In 2022, groundwater levels across the Saddlers Creek catchment have been responsive to above average rainfalls conditions (**Figure 16**).

The open standpipes MB3-Alluvial, MB3-Regolith and MW1 located across the upper reach of Saddlers Creek and within the indicative extent of the underground development have responded to rainfall in the range of 0.5m to 1m (**Figure 16**). MB3-Alluvial and MB3-Regolith continue to show the same general groundwater trends and correlate well to rainfall. In addition, a downward vertical gradient between MB3-Alluvial and MB3-Regolith remains during 2022 with a head separation of less than 0.5m which suggests that the shallow bedrock (regolith) is likely recharged by the overlain alluvium formation.

Figure 16 Groundwater Levels – Saddlers Creek (upper reach)

The open-stand pipes MB2-Alluvial, MB2-Regolith and MW2 are located along the mid reach of Saddlers Creek, approximately 2.4km downstream to MB3-Alluvial. The Maxwell gauging station installed along Saddlers Creek is located approximately 2.3km downstream from MB2-Alluvial. In 2022, groundwater levels observed along the mid reach of Saddlers Creek have responded to rainfalls in the range of 0.5m to 1m (**Figure 17**). Groundwater levels in MW2 have increased by approximately 1.4m in 2022 while groundwater levels in MB2-Alluvial and MB2-Regolith have increased by less than 0.5m. The upward vertical head gradient between MB2-Alluvial and MB2-Regolith remains unchanged over the reporting period with a head separation of 1.5m. This suggests that groundwater still flows from the shallow bedrock (regolith) to the alluvium formation and are less responsive to rainfall recharge compared to upstream groundwater sites (i.e. MB3-Alluvium and MB3-Regolith).

Saddlers Creek water levels recorded at the Maxwell gauge station is presented in **Figure 17** alongside the groundwater levels recorded at the nearest groundwater monitoring sites. Over 2022 Saddlers Creek water levels have responded in the range of 0.5m to 2.2m to rainfall events. It is likely that surface water recharged the alluvium formation during high rainfall events (i.e. March 2022, July 2022, November 2022).

There is no evidence of observed groundwater depressurisation related to mining (i.e. caused by neighbouring mines) along Saddlers Creek in 2022.

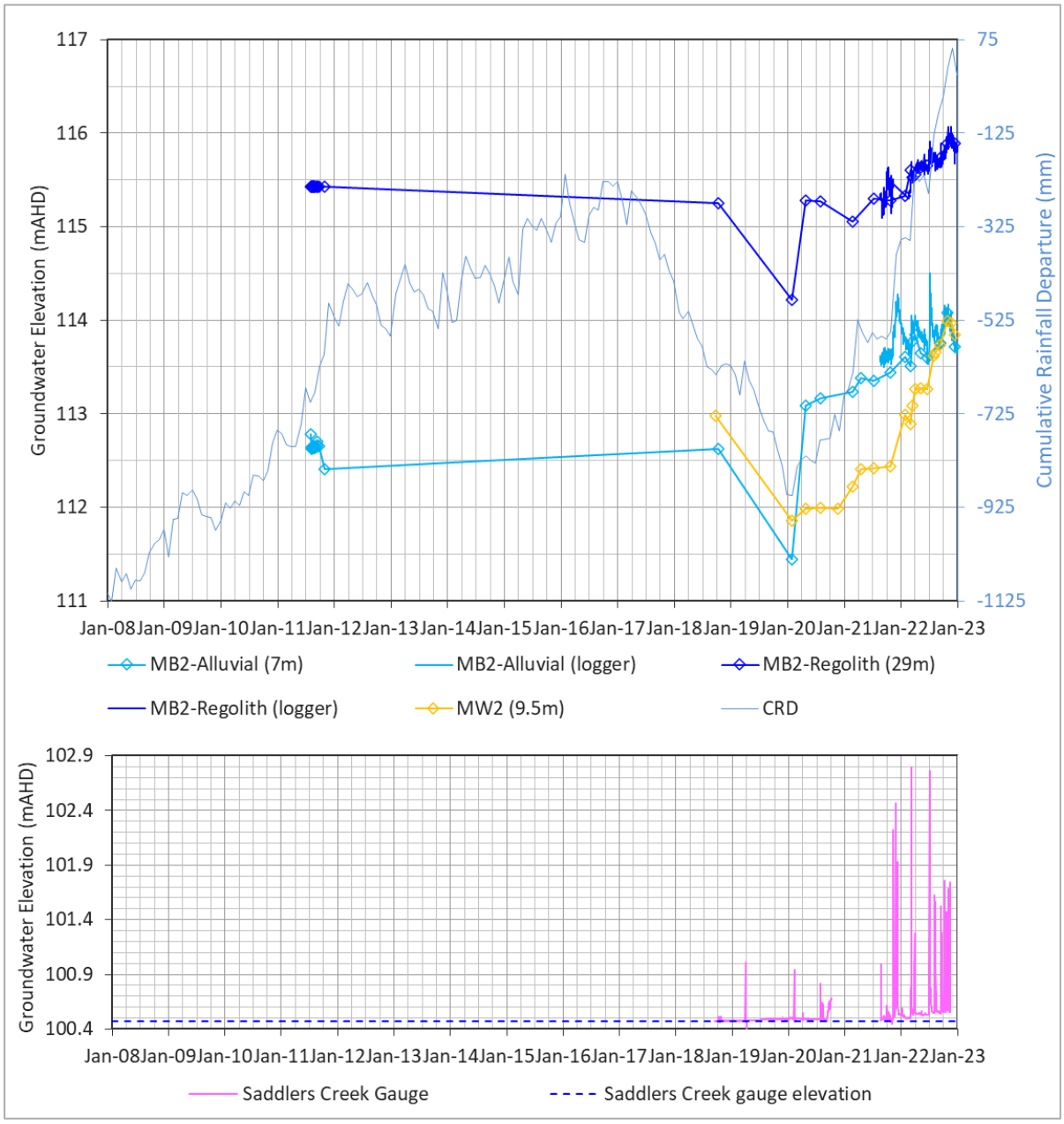


Figure 17 Groundwater levels at bores close to Saddlers Creek (mid-reach) and depth readings at the Saddlers Creek gauging station

Hunter River Catchment

Groundwater levels at groundwater monitoring sites located along the Hunter River also responded to rainfall events during 2022 (**Figure 18**).

Groundwater levels in MB1-Alluvial responded to above average rainfalls in the range of 0.5m to 1m as well as MB1-Whybrow and MB1-Redbank located to the south of Maxwell Project. The nested open standpipes at sites MB1 indicated an upward vertical head gradient with a head separation of approximately 1.4m between the alluvium and the Whybrow overburden and 0.8m with the Redbank overburden. This suggests that in 2022 groundwater continued to flow from the Permian to the Hunter River alluvium with the latter being recharged during rainfall events. MW3 was reported dry during the reporting period.

Approximately 2.6km downstream, MB4-Alluvial and MB4-Coal also show responses to rainfall events. The minor groundwater head separation between these two sites indicates

that the Permian (MB4-Coal) is likely recharged by groundwater in the alluvium formation during rainfall events as observed in 2022.

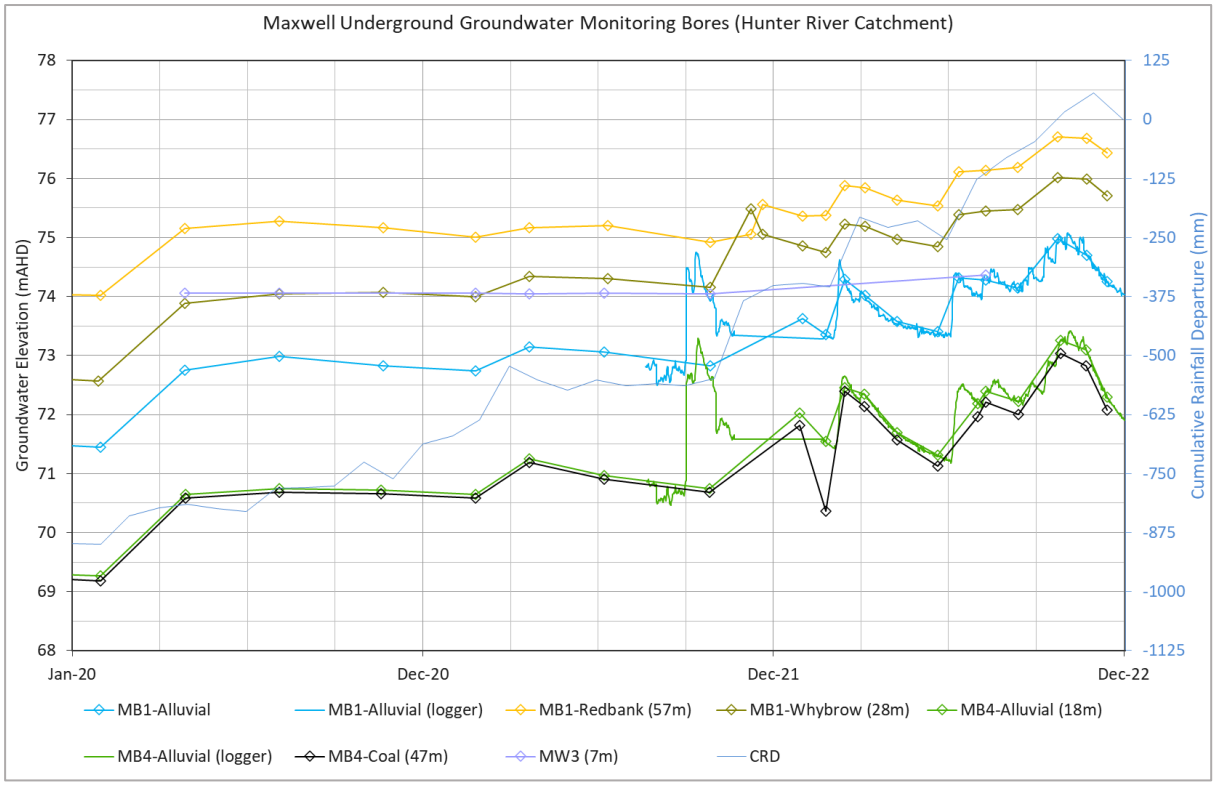


Figure 18 Groundwater Levels – Hunter River Catchment

Hydrometric analysis of groundwater-surface water interaction was undertaken using groundwater levels in bore GW080077 (which is screened in the Hunter River alluvium close to Denman) and Hunter River stage elevations at the Denman gauge (#210055) located approximately 18.5 km upstream from the Hunter River and Saddlers Creek confluence (source of data: Water NSW[3]). The analysis is presented in **Figure 19**. In 2022, river water levels are consistently 2m or more above adjacent groundwater levels, indicating a losing river surface water source with flow into the Hunter River alluvium at these locations, however spatial and temporal changes in surface water and groundwater interactions along the Hunter River can be influenced by water abstraction from private users (i.e. irrigation). No change in surface and groundwater interactions is observed along the Hunter River and upstream to the Maxwell Project during the review period.

Also, there is no evidence of observed groundwater depressurisation related to mining (i.e. neighbouring mines) along the Hunter River in the vicinity of the Maxwell Project in 2022.

[3] WaterNSW Real Time Data website: https://realtimedata.waternsw.com.au/

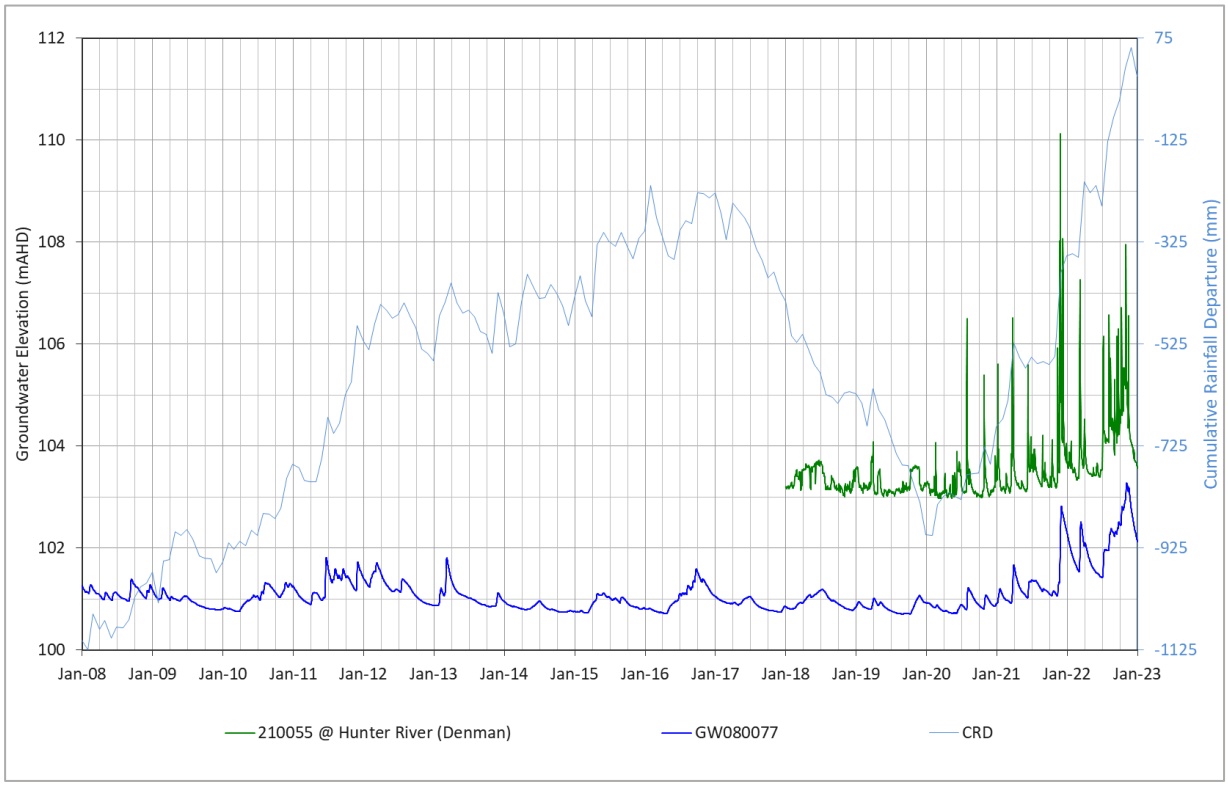


Figure 19 Groundwater Levels at GW080077 and Surface Water Level at 210055 (Hunter River)

Maxwell Infrastructure

Figure 20 presents the SE15 Void (known as the South Void) and ES27 Void (known as the East Void) water levels plotted alongside the groundwater levels recorded at the nearby groundwater monitoring sites GW04 and R4241 located south of the Maxwell Infrastructure and GW02S and GW02D located to the north of the ES27 Void.

In 2022, SE15 Void and ES27 Void water levels increased by 4.5m. The two voids are known to be hydraulically connected, as is demonstrated by the same surface water level elevations during the reporting period.

R4241 is located approximately 1.2km to the south of ES27 and 200m to the south-east of SE15 Void. R4241 monitors groundwater levels in the Jurassic Volcanics, mapped to the south of the Maxwell Infrastructure. The low hydraulic conductivities of the Jurassic Volcanics (in the vicinity of R4241) suggests that there are very limited interactions between the ES27 and SE15 voids and groundwater present in the Jurassic Volcanics. Groundwater in the Jurassic Volcanics is considered as perched groundwater, likely disconnected from the Greta Coal Measures. Groundwater levels in R4241 remained approximately 40m higher than the void water levels in 2022.

Groundwater levels in GW04 are observed approximately 8m above the void water levels. This suggests that in the southern edge of the Maxwell Infrastructure area, the two voids (ES27 and SE15) remained a groundwater sink in 2022.

Groundwater monitoring sites GW02S and GW02D are considered appropriate groundwater monitoring sites to assess the interactions between groundwater and surface water in the ES27 Void.

In early 2022, groundwater levels in GW02D were approximately 2m above the ES27 void water levels. Limited groundwater responses to rainfall in GW02D is observed in 2022. Surface water levels in ES27 Void increased approximately 2.4m above the GW02D

groundwater levels at the end of 2022. However, groundwater levels in the shallow regolith at GW02S remained stable over the review period and are observed 53m above the ES27 Void water level which suggests that ES27 Void remained a groundwater sink with groundwater likely flowing into the voids during 2022.

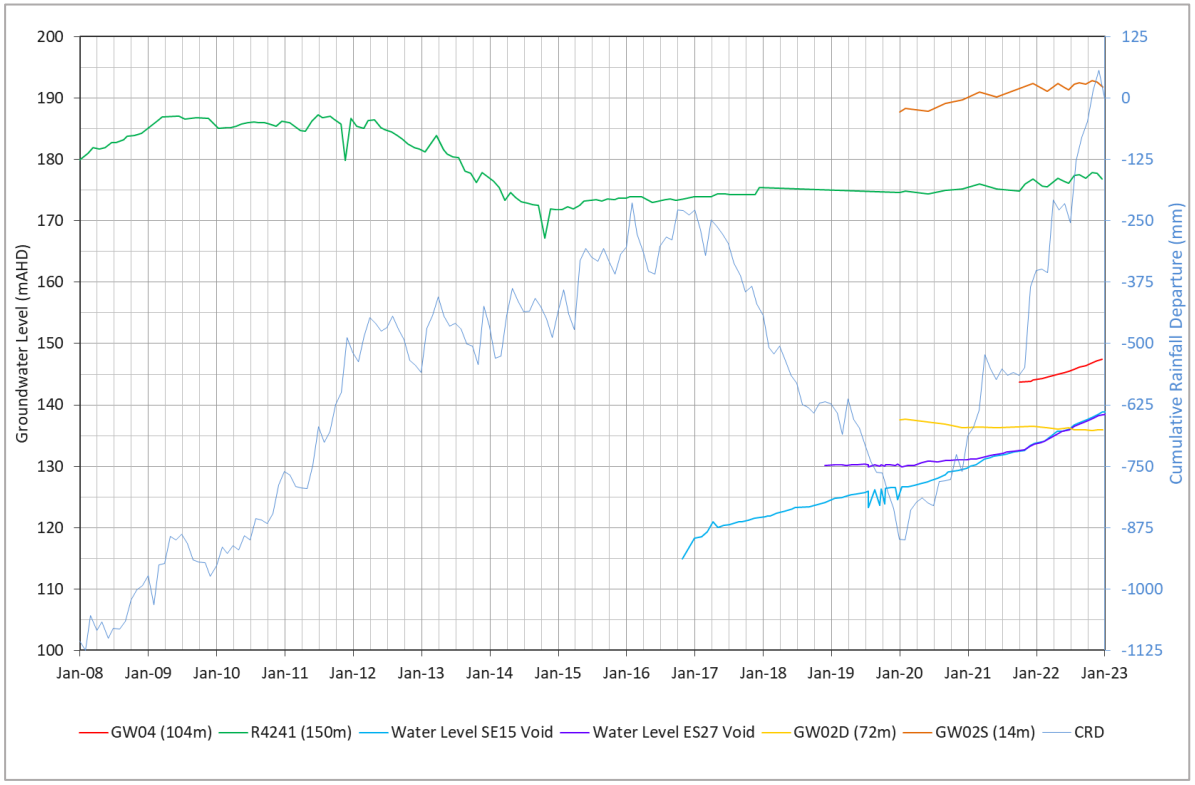


Figure 20 Groundwater Levels – Maxwell Infrastructure (in the vicinity of ES27 and SE15 Voids)

Figure 21 presents the NN Void (known as the North Void) surface water levels plotted alongside the groundwater levels recorded at the nearby groundwater monitoring sites F1162, F1164, GW01S and GW01D.

F1162 and F1164 are the closest groundwater monitoring sites to the NN Void and monitor the unmined Greta Coal Measures. In 2022, groundwater levels at these two locations followed the same trend as the surface water level in the NN Void being +/- 1m of the surface water level elevation of the NN Void. Further to the north-west, GW01S and GW01D are located approximately 830m from the NN Void. GW01S and GW01D monitor groundwater in the upper and lower regolith. The groundwater levels at these two sites show the same trend with a minor upward vertical head gradient between GW01S and GW01D. Groundwater levels in GW01S and GW02 remained approximately 59m above the NN Void surface water levels. Hence in 2022, the NN Void continued to act as a groundwater sink with limited likelihood of groundwater discharge from the NN Void to Ramrod Creek.

The elevation of groundwater levels has remained above the elevation of the water surface in the voids, indicating that there is likely to be an inflow of aquifer water into the voids as predicted in the EA and supported by the site water balance model discussed in **Section 8.1**.

Figure 21 Groundwater Levels – Maxwell Infrastructure (in the vicinity of NN Void)

Groundwater Quality

The quality of groundwater at the site is analysed regularly in accordance with the current Groundwater Management Plan. Average groundwater quality results for the reporting period along with a comparison to average results recorded for the previous five years, where available, are provided in **Appendix 11.** Groundwater Results in the reporting period were generally consistent with those recorded previously.

Electrical Conductivity and pH

Figure 22 presents electrical conductivity (EC) and pH recorded at the groundwater monitoring sites located along Saddlers Creek (**Figure 22a** and **Figure 22b**) and along the Hunter River (**Figure 22c** and **Figure 22d**).

pH in the Saddlers Creek alluvium and shallow regolith has remained relatively stable during 2022 fluctuating by less than a pH unit (**Figure 22a**). In 2022, EC recorded along Saddlers Creek ranges from 4,000 µS/cm to 11,000 µS/cm with the alluvium bores having a higher salinity than bores screened within the shallow regolith (**Figure 22b**). EC in the Saddlers Creek alluvium has generally slightly increased over 2022 (MB2-Alluvial and MB3-Alluvial while groundwater at MW2 has freshened compared to historic data (**Figure 22b**).

In 2022, pH in the Hunter River alluvium and shallow regolith has also remained relatively stable and fluctuated between 7 and 8 pH units (**Figure 22c**). Following the above average rainfall conditions in 2022, groundwater in the Hunter River alluvium has continued to freshen to approximately 1,000 to 2,000 µS/cm (i.e. MB1-Alluvial and MB4-Alluvial) (**Figure 22d**). In the deeper geological units EC has remained stable at approximately ~6,000 µS/cm (MB1-Redbank and MB1-Whybrow) (**Figure 22d**).

Figure 23 presents EC and pH recorded at the groundwater monitoring sites located across Maxwell Underground (**Figure 23a** and **Figure 23b**) and Maxwell Infrastructure (**Figure 23c** and **Figure 23d**).

pH in the Jerrys Plain Subgroup remained stable over 2022 ranging from 7 to 8.5 for DD1043, DD1052 and DD1057 (**Figure 23a**). An increase in pH in the range of 1 pH unit is recorded in DD1025, DD1027, DD1032 and DD1005.

In 2022, EC recorded in the Jerrys Plain Subgroup ranged from 1,000 µS/cm to 14,000 µS/cm, and shows no significant changes compared to previous years (**Figure 23b**). The largest EC variation recorded in 2022 is in DD1025 (Blakefield overburden) increasing from 11,200 µS/cm to 13,700 µS/cm which could be associated with the increasing groundwater levels at this location (i.e. being recharged by a more saline groundwater).

pH across the Maxwell Infrastructure groundwater monitoring sites has remained stable in 2022 with December 2022 being the lowest in DS1 (pH of 6.2) and highest GW02S (pH of 7.2) (**Figure 23c**).

In 2022, groundwater EC across the Maxwell Infrastructure sites ranged from 265 µS/cm to 13,000 µS/cm and remained relatively stable (**Figure 23d**). The exceptions are:

- at GW01S, decreasing from 7,080 µS/cm in June 2022 to 265 µS/cm in December 2022. This freshening of groundwater could be influenced by rainfall recharge however additional monitoring is required to confirm EC trends.
- At GW02S, an increase from 6,440 to 13,000 µS/cm from September to December 2022
- at GW02D, falling from 11,700 in September 2022 to 6,870 µS/cm in December 2022. Prior to this, levels were elevated, from December 2021 (11,500 µS/cm), June 2022 (12,000 µS/cm) and September 2022 (11,700 µS/cm). In December 2022, EC at ES27 Void was recorded at 5,810 µS/cm which suggest that there are limited interactions between groundwater in GW02D and ES27 Void.

The raw groundwater quality results for the Maxwell Underground and Maxwell Infrastructure groundwater monitoring sites are presented in the quarterly Environmental Monitoring Data reports; these are available on the Malabar Resources website[4], and hence are not repeated in this Annual Review. The quarterly reports include the 2022 average for each parameter at each groundwater monitoring site presented alongside the long-term average for comparison.

In 2022, groundwater quality including dissolved metal concentrations remained within baseline levels.

[4] Malabar Resources website: https://malabarresources.com.au/

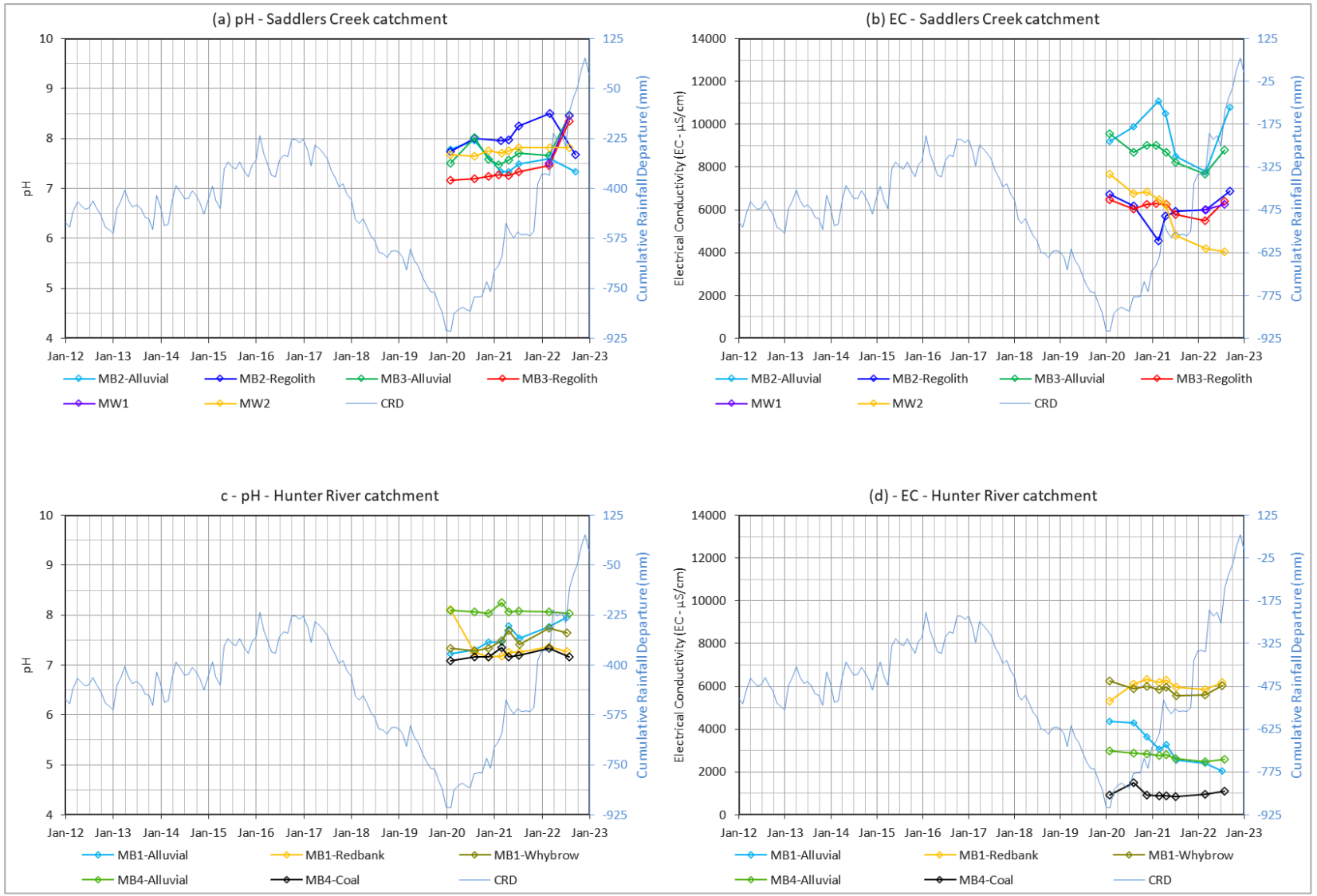


Figure 22 Groundwater pH and Electrical Conductivity (EC) along Saddlers Creek and the Hunter River

Figure 23 Groundwater pH and Electrical Conductivity (EC) across Maxwell Underground Mine and Maxwell Infrastructure

TARP Assessment

The following section assesses the groundwater data (i.e. groundwater levels and quality) against the Trigger Action Response Plan (TARP) trigger levels presented in the Groundwater Management Plan.

There was no mining activity conducted for the Maxwell UG Mine during the review period. Construction of the mine commenced in May 2022 and first workings is scheduled to commence on or after 28 February 2023.

Groundwater Levels

Table 17 identifies any groundwater level trigger exceedances during the review period.

Groundwater levels at the Maxwell Infrastructure groundwater monitoring sites R4241, GW01D, GW01S, GW02D, GW02S (**Appendix 11**) and at the Maxwell UG Mine sites MB3-Alluvial and MB3-Regolith (**Appendix 11**) have not exceeded the trigger levels and hence are deemed at Normal status.

At DD1025 and DD1032 groundwater levels declined below the trigger level of 157.3 mAHD and 130.6 mAHD respectively. This is deemed due to over conservative trigger levels rather than being mining-related, given mining has not yet commenced.

It is noted that DD1025 was decommissioned in December 2022 for safety reasons (to prevent inrush to the upcoming underground mining operations). Hence this site will be excluded in the next groundwater review.

No mining activities have been conducted at Maxwell UG Mine during the reporting period or since the exceedance of the groundwater level triggers observed at DD1025 and DD1032. Other mining operations could have exacerbated the decline in groundwater levels during the drought period (2017–2019) or buffered any subsequent groundwater recovery (i.e.in early 2020).

The over-conservative trigger levels at DD1025 and DD1032 have hence been revised in this Annual Review. The 5th percentile of the groundwater dataset for the period March 2020 to date (i.e. period following the NSW 2017–19 drought) has been used to calculate the revised trigger levels and is presented in **Appendix 11**. The revised trigger levels at DD1025 and DD1032 are 155.1 mAHD and 128.3 mAHD respectively.

Following the revision of the groundwater trigger levels, groundwater levels at DD1025 and DD1032 are observed above the trigger levels in 2022 and within the Normal Level of the TARP criteria (**Table 17** and **Appendix 11**).

Table 17 Groundwater Level Exceedances – shallow and deep open standpipes

Bore	Trigger Level Exceedances											
	Jan 22	Feb 22	Mar 22	Apr 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22
Maxwell Infrastructure	**Groundwater Management Plan (Aug 2022)**											
R4241	N	N	-	N	N	N	N	N	N	N	N	N
GW01D	N	N	-	N	N	N	N	N	N	N	N	N
GW01S	N	N	-	N	N	N	N	N	N	N	N	N
GW02D	N	N	-	N	N	N	N	N	N	N	N	N
GW02S	N	N	-	N	N	N	N	N	N	N	N	N
Maxwell Underground Mine												
DD1025*	N	N	N	N	N	N	N	N	N	N	N	N
DD1032*	N	N	N	N	N	N	N	N	N	N	N	N
MB3-Alluvial	N	N	N	N	N	N	N	N	N	N	N	N
MB3-Regolith	N	N	N	N	N	N	N	N	N	N	N	N
Private Bores												
GW029660	-	-	-	-	-	-	-	-	-	-	-	-
GW029647	-	-	-	-	-	-	-	-	-	-	-	-
GW029648	-	-	-	-	-	-	-	-	-	-	-	-

LX: maximum trigger level exceedances recorded N: Normal Level L1: TARP Level 1 L2: TARP Level 2

"-" no data available for this period – no access due to extreme weather events in Q1 2022 for the Maxwell Infrastructure sites and due to Landowner permission not being obtained for the Private Bores

"" Groundwater trigger level revised.*

Groundwater Quality

An assessment of groundwater quality (EC and pH) at each of the monitored bore locations against the TARP trigger levels has been undertaken. EC and pH plots for groundwater monitoring locations with the approved groundwater quality trigger levels are presented in **Appendix 11.** A summary is presented in **Table 18.**

No groundwater quality results were available for the private bores for the reporting period.

In 2022, EC and pH are all within Normal levels. The exceptions are the exceedance of the EC trigger level at GW02S in December 2022 and the three consecutive exceedances of the EC trigger level at GW02D from December 2021 to September 2022.

EC levels at GW02D ranged from 11,500 µS/cm in December 2021 to 12,000 µS/cm in June 2022 and 11,700 in September 2022 (there was no measurement taken in March 2022 due to the extreme rainfall events that restricted site access). These values represent an exceedance of the trigger level (10,500 µS/cm) for three consecutive measurements. Levels fell to 6,870 µS/cm in December 2022.

GW02D is located north of the ES27 Void. The latest EC measurement of the ES27 Void is 5,810 µS/cm which indicates that the increase in EC at GW02D is not due to seepage of surface water from the ES27 Void to GW02D.

The increase in EC could be influenced by a build-up of sediment at the bottom of standpipe GW02D and limited rainfall recharge as field sampling noted that the logger was suspended in mud in December 2021.

It is therefore judged likely that the increase in EC above the trigger level at GW02D is not caused by site activities and does not result in an exceedance of a Water Management Performance Measure in Table 4 of Development Consent SSD 9526. Further monitoring at GW02D is required to confirm the EC trend.

Table 18 Trigger Exceedances for pH and EC in 2022

Bore	Period	Trigger Level Exceedance		
		EC (µS/cm)	pH lower	pH upper
R4241	Q1-2022	-	-	-
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
GW01S	Q1-2022	-	-	-
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
GW01D	Q1-2022	-	-	-
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
GW02S	Q1-2022	-	-	-
	Q2-2022	N	N	N
	Q3-2022	N	N	N

Bore	Period	Trigger Level Exceedance		
		EC (µS/cm)	pH lower	pH upper
	Q4-2022	Y	N	N
GW02D	Q1-2022	-	-	-
	Q2-2022	Y	N	N
	Q3-2022	Y	N	N
	Q4-2022	N	N	N
DD1025	Q1-2022	N	N	N
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
DD1032	Q1-2022	N	N	N
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
MB3-Alluvial	Q1-2022	N	N	N
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
MB3-Regolith	Q1-2022	N	N	N
	Q2-2022	N	N	N
	Q3-2022	N	N	N
	Q4-2022	N	N	N
Private Bores	No data available	-	-	-

"-" no data available for this period – no access due to extreme weather events in Q1 2022 for the Maxwell Infrastructure sites and due to Landowner permission not being obtained for the Private Bores.

Groundwater Actions for Next Review Period

Following the decommissioning of DD1025 in December 2022, it is planned to incorporate in the next review period, an existing groundwater monitoring bore into the TARP assessment as a replacement to DD1025.

Proposed Improvements

There are seven bores equipped with VWPs across the Maxwell UG Mine which includes RD1189, RD1192, VWP1, BKL6R12, WND16, WND26, RBD1. The following VWPs sensors are suggested to be removed from the Groundwater Management Plan:

- RD1189-VWP2, RD1189 VWP7, RD1189-VWP9 (unstable);
- RD1192-VWP1 (disabled, no data past August 2011);
- WND16-VWP3, WND16-VWP4 (unstable and disabled respectively);
- MB1VWP1 (VWP5 only) (unstable).

It is also proposed to remove the following open-stand pipes from the Groundwater Management Plan:

- DD1015 due to a blockage of the bore, suspected to have collapsed;

- DD1027 as it monitors the Edderton Seam (i.e. not targeted by the Maxwell UG Mine). Groundwater data at this monitoring sites bring no significant value for future assessment in groundwater level and quality analysis for the Maxwell Project;
- MW3 as it is reported dry since early 2020;
- DD1025 as it was decommissioned in December 2022 due to the requirement to mitigate risks to the underground mine workings.

In accordance with the Groundwater Management Plan, the observed groundwater levels will be reviewed against the model predictions; this will occur in the next Annual Review, following commencement of first workings.

9 REHABILITATION

9.1 Management

Rehabilitation at the Maxwell UG Mine was previously managed in accordance with the Mining Operations Plan (MOP). An amendment to the MOP was approved by the Resources Regulator in February 2022 and included:

- Reference to the recently approved ML1820 (for ancillary mining activities) and ML1822 (for underground coal mining);
- Reference to development consent SSD 9526 that was modified on 19 November (MOD1) and associated activities;
- Revised topsoil and overburden numbers;
- The installation of a second water pipeline from the mine entry area to the Eastern Void; and
- Decommissioning of the Orica Plant located on CL229.

Rehabilitation at the Maxwell UG Mine is now managed in accordance with the Rehabilitation Management Plan and the Forward Program. The Rehabilitation Management Plan and Forward program were prepared in August 2022 following an amendment to the *Mining Regulation 2016* under the *Mining Act 1992*. The amendment provided new standard rehabilitation conditions for mining leases which replaces existing mining lease conditions. The Rehabilitation Management Plan details how rehabilitation will be undertaken on site and includes final land use options and describes the implementation, monitoring and measurement of rehabilitation. The Forward Program includes a schedule of mining activities and a summary of the spatial progression of rehabilitation for the next 3 years.

The post mining land use goal is to deliver a safe, stable, non-polluting and sustainable post-mining landform that is consistent with the surrounding natural topography and fit for sustaining the intended post-mining land use. As an underground mine, the project would result in minimal changes to existing landforms. Consistent with previous approvals, the vision is to create a landscape with areas capable of productive land use, alongside woodland corridors to support biodiversity.

In accordance with the Maxwell UG Mine EIS the design and post-mining land use objectives for the site are as follows:

- Provide a landscape that is safe, stable and non-polluting.
- Minimise potential environmental impacts and liability arising from mine closure.
- Remove any waste or potentially hazardous materials from site.
- Minimise the potential impacts of decommissioning.
- Develop landforms that return land affected by mining to a condition that is suitable for a range of sustainable land uses.
- Create a stable post-mining landform that is compatible with the surrounding landscape, and that is capable of productive land use that achieves the nominated land capability.
- Establish vegetation that is self-sustaining, is perpetual and provides a sustainable habitat for local fauna and successive flora species.
- Create a post-mining landform that enhances the local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (DMR, 1999).
- Develop land uses that benefit the future use of the site for the local community.
- Develop a landscape that reduces the requirement for long-term monitoring and management.

Rehabilitation Cost Estimate

On 13 December 2021 a Rehabilitation Cost Estimate (RCE) was submitted to the Resources Regulator following the grant of ML1820 and ML1822 and approval of MOD1. This RCE was approved in April 2022 and the security deposit was varied.

A revised RCE was submitted to the Resources Regulator in August 2022 following submission of the Forward Program. Feedback and approval are expected during the next reporting period.

Targeted Assessment Program - Landform Establishment and Section 240 Notice

On 2 March 2021, the Resources Regulator performed a planned inspection of landform establishment activities at Maxwell Infrastructure site. This targeted assessment was undertaken to identify risks and assess performance of associated controls associated with landform establishment activities, as well as assess compliance with statutory obligations. Based on the observations during the inspection, the Resources Regulator formed the view that there is a potential risk of adverse impact to the environment due to the uncertainty of the long-term erosional stability of the final landform.

Subsequently, on the 28 June 2021, Maxwell was issued with a notice under Section 240 of the *Mining Act 1992* (Section 240 Notice) to undertake an assessment of the long-term erosional stability of the final landforms that have been constructed as part of the rehabilitation of the mine and listed as Pasture and Woodland rehabilitation in Figure 14 of the Annual Environmental Management Report 2020. The notice also required Maxwell to undertake an assessment of the surface water management structures located in the rehabilitated landform. The assessment report was submitted to the Resources Regulator in January 2022.

In March 2022, Maxwell received a commencement of investigation letter from the Resources Regulator. Maxwell provided a response in April 2022. In November 2022, the Resources Regulator determined that no breach had occurred.

In December 2022, Maxwell was issued with a notice under Section 240 of the *Mining Act 1992* (Section 240 Notice) to engage a suitably qualified expert to undertake an assessment that sets out the design of modifications to the rehabilitated landform and surface water management structures on the rehabilitated landform to address the instability and erosion risks. The notice also includes further directions to conduct a risk assessment, prepare a rehabilitation management plan, forward program and rehabilitation report. This notice will be addressed in the next reporting period.

Soil Amelioration

Due to historic site practices, good quality topsoil for use during rehabilitation is minimal. Previously on site, soil ameliorants have been used to increase soil organic matter, improve soil nutrient levels and promote vegetation growth.

Biosolids, which are a by-product of the wastewater treatment process, have been used on site as a soil ameliorant in pasture areas. Compost made up of garden organics and biosolids has also been used as a soil ameliorant in some woodland areas. Where required gypsum is also applied at a rate of five tonnes per hectare.

Topsoil stripped during the construction of the Maxwell UG Mine (i.e., from the transport corridor and mine entry area) will be recovered using dozers, excavators or scrapers. It will then be placed into dedicated stockpiles. Where possible, stockpiles will be no greater than three metres in height and will be located away from drainage lines, operational areas and proposed disturbance areas. Surface drainage in the vicinity of stockpiles will be diverted to minimise run-on and managed to minimise sediment laden run-off. All stockpiles will be ripped and sown with a cover crop/pasture mix once their construction is completed.

A combination of topsoil, subsoil and ameliorants will be used for future rehabilitation. A soil balance is provided in **Table 19**. These numbers do not include topsoil and subsoil currently in-situ. Maxwell considers that there is sufficient material for the rehabilitation of the Maxwell UG Mine.

Table 19. Soil balance (stockpiled)

Type	Estimated Amount (m^3)
Topsoil	178,490
Subsoil	1,0252,276

9.2 Performance

Approximately 850 hectares of previously open cut mined land associated with the Maxwell Infrastructure site has been rehabilitated. No new areas of rehabilitation were completed during the reporting period. No buildings or infrastructure were decommissioned or demolished during the reporting period. Rehabilitation activities focussed on enhancing existing areas of rehabilitation. These activities included:

- infill planting in the woodland rehabilitation corridor to increase species diversity;
- targeted weed management across the site for High Threat Exotic weed species;
- management of pest animal species in consultation with the Local Land Services and near neighbours; and
- continued cattle grazing on pastured rehabilitated paddocks.

The location of rehabilitation activities is shown in **Figure 24**.

All areas of rehabilitation are within the ecosystem and land use establishment phase. This phase incorporates revegetated lands and habitat augmentation, focusing on species selection, presence and growth, together with weed and pest animal management. Whilst the rehabilitation is progressing, no areas of rehabilitation have been formally signed off as meeting the land use objectives and completion criteria.

Approximately 6.8 ha of mine rehabilitation will be disturbed during the next reporting period as part of the construction for the civil works for the conveyor trace and the permanent access road.

During the next reporting period, construction works will be focussed on the civil works for the conveyor trace, the permanent access road, portals and the drift to the Woodlands Hill seam. First workings are expected to commence in the Whynot seam bord and pillar operation.

A summary of the rehabilitation status is provided in **Table 20.**

Table 20. Rehabilitation status

Mine Area Type	Previous reporting period (actual) Year 2021 (ha)	This reporting period (actual) Year 2022 (ha)	Next reporting period (forecast) Year 2023 (ha)
A. Total mine footprint[1]	1,238	4,179	4,179
B. Total active disturbance[2]	385	419	443
C. Land being prepared for rehabilitation[3]	0	0	0
D. Land under active rehabilitation[4]	853	853	846
E. Completed rehabilitation[5]	0	0	0

[1] Total mine footprint includes all areas within the mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities.

[2] Total active disturbance includes all areas ultimately requiring rehabilitation.

[3] Land being prepared for rehabilitation includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development.

[4] Land under active rehabilitation includes areas under rehabilitation and being managed to achieve relinquishment.

[5] Completed rehabilitation requires formal sign-off by the Resource Regulator that the area has successfully met the rehabilitation land use objectives and completion criteria.

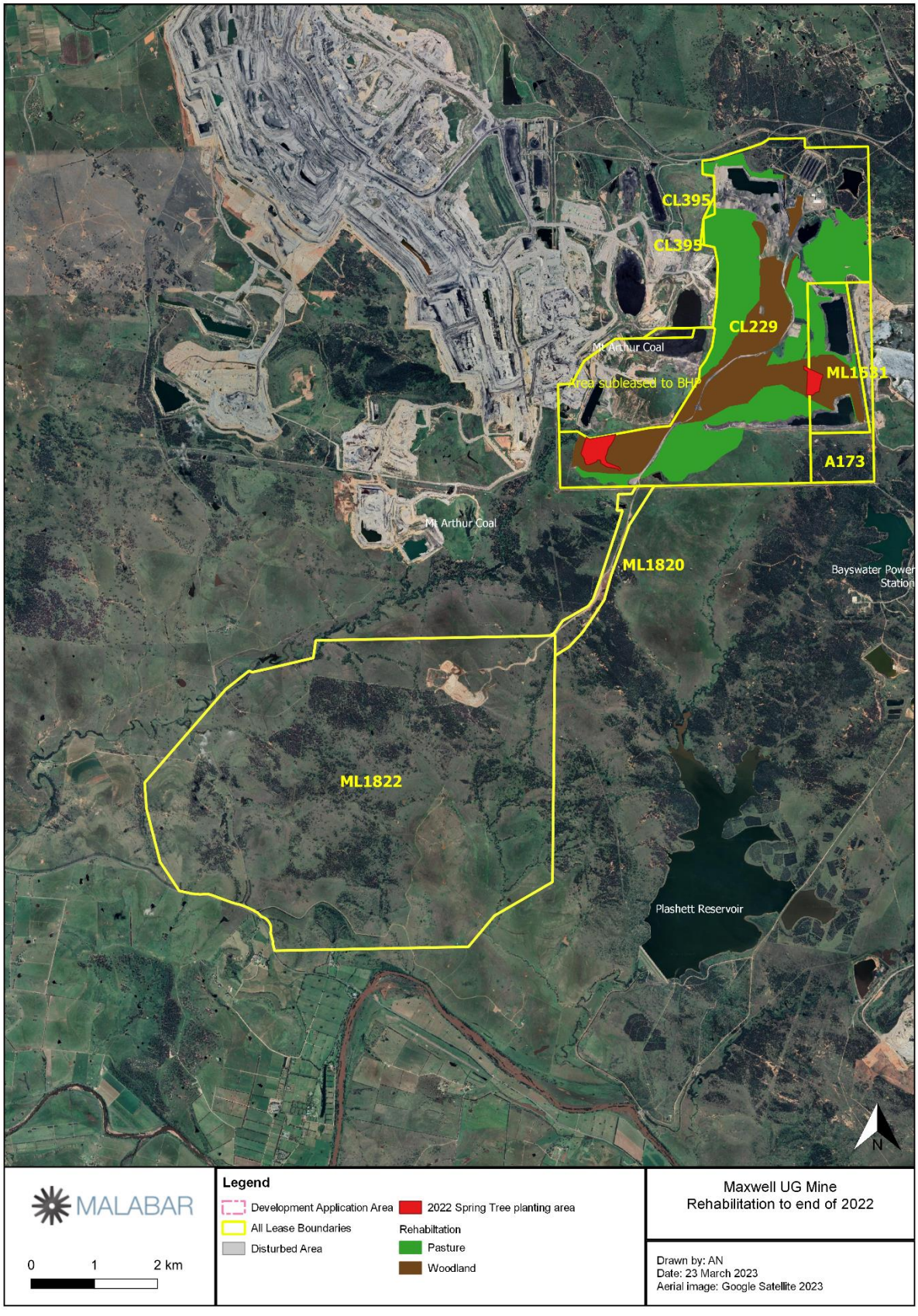


Figure 24. Location of rehabilitation activities

Other Rehabilitation Activities

Tree Planting

Two tree planting programs were undertaken during the reporting period. The programs targeted a total of 22 hectares of existing mine rehabilitation within the conceptual woodland corridor. Ground preparation works for optimal tree propagation were undertaken and included:

- slashing of grass to safely define the work area as well as improve the success of spraying activities to prevent competition to tree growth;
- single deep rip lines (minimum 500 mm deep) to break up the surface to allow tube stock to be planted and establish. The rip lines also help capture water, reduce erosion and improve soil moisture levels; and
- spraying of rip lines with glyphosate to reduce competition for growth from grass species.

Tree and shrub species consistent with the Spotted Gum Ironbark Woodland, Red Gum Woodland and Yellow Box Woodland vegetation communities were planted. A total of 18,000 plants were installed using a growth promoting compound and a browsing deterrent applied directly to the plants to reduce impact of herbivores on plant success. Following planting each plant was watered in with a minimum of one litre per plant. Follow up watering on two occasions was undertaken using a watercart, due to the dry conditions in December.

Kangaroo Cull

A culling of kangaroos was undertaken during the reporting period to reduce grazing pressure and minimise the impact to native groundcover species from the digging of day beds under trees and shrubs in rehabilitation areas. Programs were targeted prior to planting activities on rehabilitated land.

Weed Management

Weed management activities were undertaken during the reporting period in summer, autumn, winter and spring as shown in **Figure 25**. Weed type, density, distribution and access were taken into account when planning weed management activities. Primary areas of focus were:

- offsets and conservation areas;
- areas adjacent to private land;
- areas of rehabilitation
- tree planting areas;
- areas of high infestations of weeds of national significance; and
- areas identified for weed control in the annual Ecological Monitoring Reports.

Nest Boxes

Twenty nest boxes had previously been installed during 2021 in woodland rehabilitation areas. Monitoring of nest boxes occurred as part of the ecological monitoring program in Spring 2022. The monitoring results indicate that there has been no usage of the nest boxes, likely due to the boxes being installed less than 12 months earlier. The nest boxes were observed to be installed correctly and located in an appropriate habitat.

A further 20 nest boxes (for parrots, gliders and treecreepers) were installed in woodland rehabilitation in August 2022. These boxes will continue to be monitored for use and at some stage may be included in the ecological monitoring program.

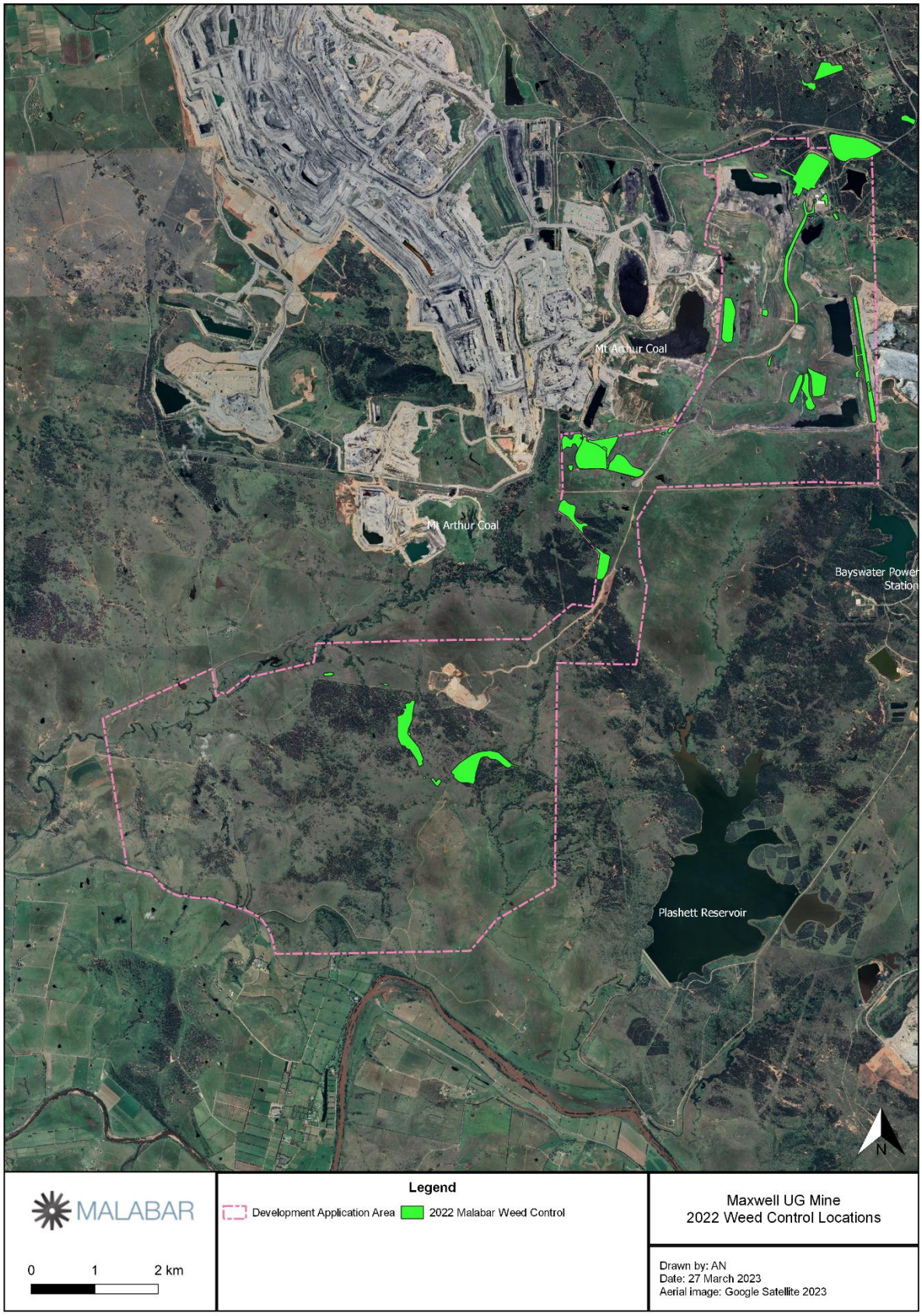


Figure 25. Weed control 2022

Trials

Cattle Grazing Trial

A grazing trial commenced on rehabilitation at the Southern Tip in 2018. The trial continued throughout the reporting period. Cattle were strategically rotated between three paddocks of which two were located on mine rehabilitation. The cattle will be sold to market during the next reporting period and the paddocks will be rested and monitored for new vegetation growth and diversity. Results so far are demonstrating that Maxwell can create a post mining landscape that is compatible with the surrounding landscape and capable of sustaining productive land use.

Native Grass Trial

A native grassland establishment trial was undertaken at Maxwell Infrastructure during 2013. The trial involved seeding a small area in the north with locally collected grassland species from Dartbrook. The seed mix was dominated by Red Grass (*Bothriochloa macra*) and Queensland Blue Grass (*Dichanthium sericeum*). The trial was monitored in 2013 and determined to be unsuccessful due to poor germination. A follow-up inspection during 2018 showed the area to be dominated by native grasses, particularly Lobed Bluegrass (*Bothriochla biloba*) and Queensland Bluegrass. Queensland Blue Grass was then included into the pasture mix as a trial on a 24-hectare parcel of land that was rehabilitated during 2018. Due to the dry conditions at the time, only a small number of Queensland Blue Grass was identified in the area.

The area was inspected by an ecologist in July 2022 and results showed evidence of native grass species such as Lobed Bluegrass (*Bothriochla biloba*), Queensland Bluegrass (*Dichanthium sericeum*) and Purple Wiregrass (*Aristida ramosa*). Further inspections of the area will be undertaken during the next reporting period.

9.3 Actions for the Next Reporting Period

The following activities will occur during the next reporting period:

- two tree planting programs consisting of approximately 21,000 tube stock to be planted on existing mine rehabilitation within the conceptual woodland corridor;
- a weed control program focussing on High Threat Exotic weed species;
- a kangaroo cull on rehabilitation areas to reduce the impact on grazing on vegetation;
- continued wild dog and fox controls in association with the Local Land Services;
- baiting of rabbits near the Great North Tip and along the main access road; and
- where practicable, fallen timber and hollow resources should be reintroduced into woodland rehabilitation areas where there is a low abundance of habitat features.

10 COMMUNITY

10.1 Complaints

The Maxwell UG Mine maintains a 24-hour community hotline (1800 653 960) for any issues or enquiries. The community hotline number is advertised in the local newspapers and on the Malabar Resources website (https://malabarresources.com.au). In addition to the community hotline, the Maxwell site can also be contacted by email (info@malabarresources.com.au). Complaints received are recorded on the Community Complaints register found on the Malabar Resources website, the register is updated on a monthly basis.

During the reporting period, there were no complaints received. The number of complaints received has continued to decrease since 2014 (as shown in **Figure 26**) in line with a decrease in activities since open cut mining ceased in October 2016.

10.2 Engagement

Community Consultative Committees (CCCs) provide a forum for discussion between Maxwell and representatives of the local community, key stakeholder groups and the local council on issues relating directly to the Maxwell UG Mine. Although the CCC is not a decision-making or regulatory body, it performs an important advisory and consultative role.

On 2 August 2021, The DPE approved for the Maxwell Infrastructure CCC to be combined with the Maxwell CCC and had no objections to amalgamate the Spur Hill CCC into the Maxwell CCC. An approved Independent Chairperson has been appointed to Chair the Maxwell CCC.

The Maxwell CCC held meetings on four occasions during the reporting period including the 16 March 2022, 16 June 2022, 14 September 2022 and 7 December 2022. During the meetings the CCC reviewed the site's environmental performance and discussed community issues. In addition, two extraordinary CCC meetings were held on 17 February 2022 to discuss MOD1 and MOD2 and on the 9 August 2022 to provide a further update on MOD2.

Two meetings were also held for the Antiene Rail Spur, Joint CCC during the reporting period. The meetings were held on the 15 June 2022 and 7 December 2022. These meetings were attended by CCC representatives from Maxwell and Mt Arthur Coal. During the meetings the CCC reviewed the environmental performance of the Antiene Rail Spur which is a shared asset between the two sites.

All meeting minutes are available on the Malabar Resources website.

Information on environmental management and performance, as well as relevant approvals, can be accessed by the community through the Malabar Resources website.

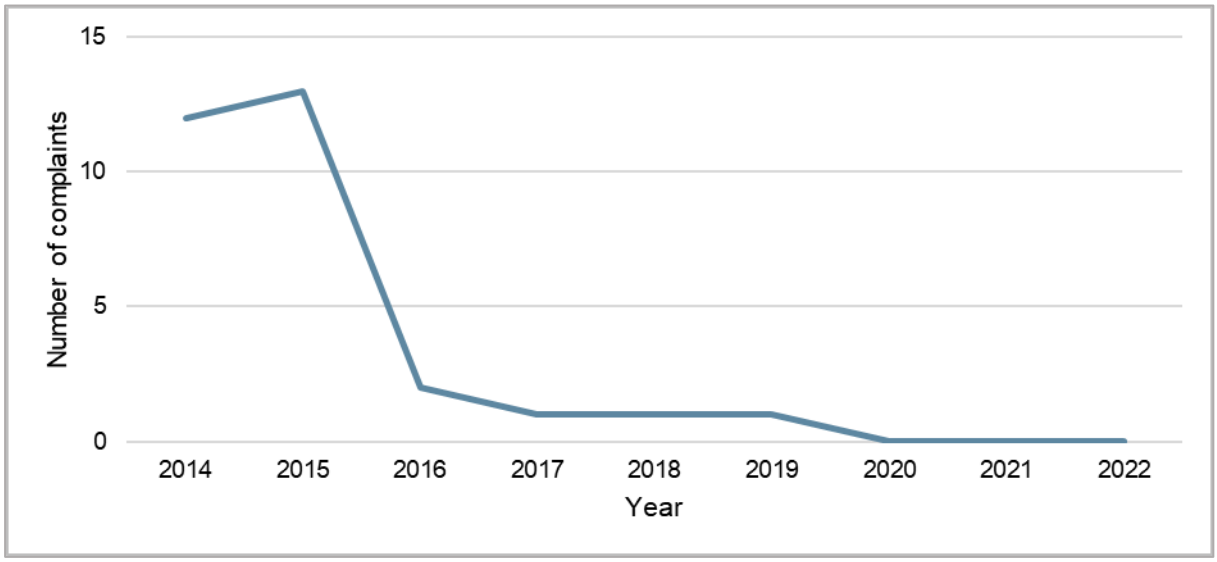


Figure 26. Long-term number of complaints

10.3 Contributions

Malabar donated to local community groups, charities, aged care, schools, scholarships and sporting teams within Muswellbrook, Denman, Scone, Singleton and the surrounding areas. During the reporting period, over $20,500 was donated to the local community. Categories of the contributions are detailed below in **Figure 27**.

Total contributions by Malabar to the end of 2022 are over $554,000.

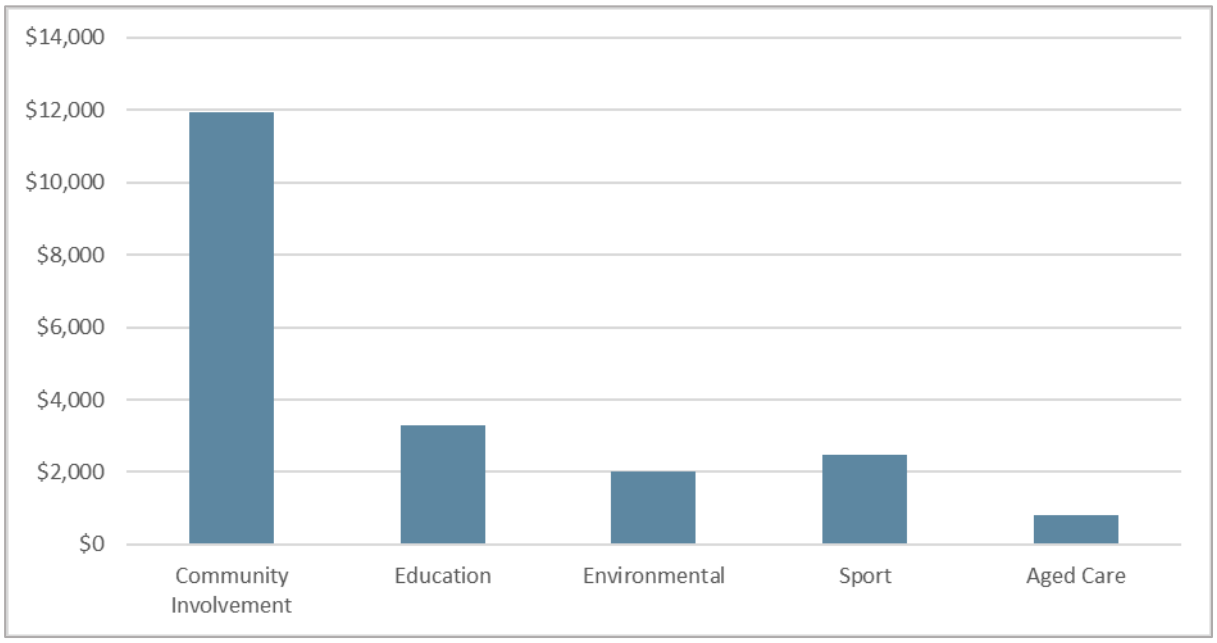


Figure 27. Community contributions in the reporting period

11 INCIDENTS AND NON-COMPLIANCES

11.1 Incidents

Data capture

As identified in **Table 2**, Maxwell received an advisory letter from the EPA in July 2021 following submission of the 2020 Annual Return that showed EPA Identification Point No.11 (ES-04) had a data capture rate of 84 per cent. This occurred due to monitoring equipment failure from 30 June to 27 August 2020 which required the unit to be sent to the equipment manufacturer in the US for repairs. At the time, Maxwell was unable to source a replacement monitor. The monitor has since been repaired and is operational.

Water discharges on 8 March 2022

In accordance with Schedule 2, Condition E9 of State Significant Development Consent 9526 and Section 148 of the Protection of the Environment Operations Act 1997, Maxwell provided verbal and written notification to the NSW Department of Planning and Environment (DPE) of two potential pollution incidents that occurred on site on Tuesday 8 March 2022 (DPE reference numbers SSD-9526-PA-54 and SSD-9526-PA-55).

At approximately 6.36 am and 8.35 am respectively on Tuesday 8 March 2022, Maxwell was notified that the DC2 Dam and the Rail Loop Dam started to overflow via their designated spillways, discharging water from the premises following excessive rainfall on the day of and in the days preceding the incident. Both dams ceased discharging water at approximately 10pm on Tuesday 8 March 2022.

DPE letter of 4 May 2022 advised that that the department had reviewed the incident report and additional information provided by Malabar and considered that the discharge from the Rail Loop Dam breached Schedule 2 Condition B36 of SSD 9526 as modified (the consent).

The DPE letter further advised that the department had assessed the breach in accordance with the department's Compliance Policy and had determined, in this instance, to record the breach with no further action proposed. In reaching this decision, the department had considered the following matters:

- Heavy rainfall was recorded at the site between 6 and 9 March 2022 inclusive, with 90.8mm of rainfall recorded on the day of the incident.
- The Rail Loop Dam was maintained at low level prior to the rainfall event.
- At the time of the incident, mine-affected water was transferred from the Rail Loop Dam and DC2 Dam to other water storages on site by pumping.
- Analyses of water quality samples collected from the Rail Loop Dam and Spillway indicate that the water discharged to Ramrod Creek was greater than 400 µS/cm, which meets the definition of saline water in the Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002 (NSW).
- The physio-chemical parameters of the discharged water were within the available ANZECC Guideline trigger values for aquatic ecosystem, livestock, irrigation and drinking water supply.
- Maxwell Underground notified downstream users of the incident, in accordance with the Trigger Action Response Plan for the mine water storages in the approved Water Management Plan and no complaints were received at the time of reporting.
- Malabar Resources has commenced installing additional pumping infrastructure at the DC2 Dam.

The department advised in the letter that they did not require any further information.

11.2 Exceedances

No monitoring results exceeded approval criteria during the reporting period.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The measures listed in **Table 21** will be implemented during the next reporting period to continue to improve the environmental and community performance at the Maxwell Infrastructure site.

Table 21. Improvement measures planned for next reporting period

Reference Number	Measure	Planned Timing
1	Real-time noise monitoring data will be calibrated with the attended noise monitoring data.	December 2023
2	Additional infill planting at the MEA tree planting area with tube stock during the optimal planting periods.	October 2023
3	Maxwell will look to install additional noise mitigation measures at three privately owned receivers in accordance with Schedule 2, Condition D1 of Development Consent SSD 9526.	December 2023
4	An archaeological salvage will be undertaken within the MOD2 disturbance areas during the next reporting period.	December 2023
5	Preventative and corrective maintenance work on sections of the Antiene Rail Spur, including rail grinding, condition assessments, inspections and testing will be undertaken during the next reporting period to prepare for coal export from site.	December 2023
6	Evaluation of the long-term large-scale potential of solar following the execution of formal agreements with EDF Renewables to develop large scale renewable energy projects in the Upper Hunter Valley, helping to support the Hunter's transition to a low carbon economy.	December 2023
7	Malabar will seek to empty one or more of the bioremediation pads during the next reporting period to ensure sufficient capacity in case of future need.	October 2023
8	The slashing of all property boundaries will be undertaken during the next reporting period.	August 2023
9	Weed controls programs at the Southern Offset Area will target Galenia and Golden Wreath Wattle	December 2023
11	Infill planting will be undertaken at the Southern Offset Area.	October 2023
12	New mine water storages at the MEA will be commissioned during the next reporting period and monitored on a routine basis.	December 2023

Reference Number	Measure	Planned Timing
13	In accordance with the SWMP, site specific triggers will be calculated from site data based on the ANZG (2018) method for guideline value derivation where 24 months of baseline observations are available.	December 2023
14	In accordance with the Groundwater Management Plan, the observed groundwater levels will be reviewed against the model predictions	December 2023
15	Two tree planting programs consisting of approximately 21,000 tube stock to be planted on existing mine rehabilitation within the conceptual woodland corridor.	October 2023
16	Implement a weed control program focussing on High Threat Exotic weed species.	December 2023
17	Undertaken a kangaroo cull on rehabilitation areas to reduce the impact on grazing on vegetation.	October 2023
18	Undertake baiting of rabbits near the Great North Tip and along the main access road (where appropriate).	December 2023
19	Where practicable, fallen timber and hollow resources will be reintroduced into woodland rehabilitation areas where there is a low abundance of habitat features.	December 2023

APPENDIX 1. APPROVAL CONDITIONS RELEVANT TO THE ANNUAL REVIEW

Condition	Description	Report Section
SSD 9526		
Schedule 2 **Condition B28**	The applicant must report on water captured, intercepted or extracted from the site each year (direct and indirect) in the Annual Review, including water taken under each water licence.	8.1 and **Appendix 8**
Schedule 2 **Condition B64 (e)**	The applicant must: (e) monitor and report on the effectiveness of the waste minimisation and management measures in the Annual Review referred to in condition E11.	7.10
Schedule 2 **Condition B83**	The Applicant must: keep accurate records of the: Amount of coal transported from the site (on a daily basis); and Date and time of each train movement generated by the development; and publish these results in the Annual Review.	7.7 and **Appendix 5**
Schedule 2 **Condition E7**	Within three months of: (b) the submission of an Annual Review under condition E11; The suitability of existing strategies, plans and programs required under this consent must be reviewed by the Applicant	**To be conducted within three months of the submission of this Annual Review**

Condition	Description	Report Section
Schedule 2 Condition E11	By the end of March in each year after the commencement of the development, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department reviewing the environmental performance of the development, to the satisfaction of the Planning Secretary. This review must:	**2021 Annual Review to be submitted by 31 March 2022**
	(a) describe the development (including any rehabilitation) that was carried out in the previous calendar year,	5, 9
	and the development that is proposed to be carried out over the current calendar year;	
	(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:	7, 8, 10 **Appendix 3** **Appendix 4** **Appendix 5** **Appendix 6** **Appendix 7** **Appendix 9** **Appendix 10** **Appendix 11**
	(i) relevant statutory requirements, limits or performance measures/criteria;	
	(ii) requirements of any plan or program required under this consent;	
	(iii) monitoring results of previous years; and	
	(iv) relevant predictions in the document/s listed in condition A2(c).	
	(c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;	11
	(d) evaluate and report on:	7
	(i) the effectiveness of the noise and air quality management systems; and	
	(ii) compliance with the performance measures, criteria and operating conditions of this consent;	1, 7, 8, 9
	(e) identify any trends in the monitoring data over the life of the development;	7, 8, 9
	(f) identify any discrepancies between the predicted and actual impacts of the development, and analyse the	7, 8, 9
	potential cause of any significant discrepancies; and	7, 8, 9, 12
	(g) describe what measures will be implemented over the next calendar year to improve the environmental	
	performance of the development.	

Condition	Description	Report Section
E12	Copies of the Annual Review must be submitted to Council and made available to the CCC and any interested person upon request.	**Copies of the Annual Review will be submitted to Council and made available to the CCC and any interested persons upon request.**
E17(a)(xi)	Before commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must: Make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website: (xi) the Annual Reviews of the development.	**The Annual Review will be made publicly available on the Malabar Resources website.**
PA 06_0202		
Schedule 3 Condition 7	The Proponent shall: (a) implement all reasonable and feasible noise mitigation measures; (b) investigate ways to reduce the noise generated by the project, including maximum noise levels which may result in sleep disturbance; and (c) report on these investigations and the implementation and effectiveness of these measures in the Annual Review.	7.2
Schedule 3 Condition 44	The Proponent shall: (a) keep records of the: amount of coal transported from the site each year; and number of coal haulage train movements generated by the project (on a daily basis); date and time of each train movement generated by the project; and (b) include these records in the Annual Review.	7.7 and **Appendix 5**
Schedule 3 Condition 47	The Proponent shall: … (e) report on waste management and minimisation in the Annual Review,	7.10
Schedule 5 Condition 5	Within 12 months of this approval, and annually thereafter, the Proponent shall submit an Annual Review to the Director-General and relevant agencies. This report must:	

Condition	Description	Report Section
	(a) identify the standards and performance measures that apply to the project;	7**,** 8 **and** 9
	(b) describe the works carried out in the last 12 months;	5.1 and 5.2
	(c) describe the works that will be carried out in the next 12 months;	5.3
	(d) include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;	10.1
	(e) include a summary of the monitoring results for the project during the past year;	7**,** 8 and 9
	(f) include an analysis of these monitoring results against the relevant: · limits/criteria in this approval; · monitoring results from previous years; and · predictions in the EA;	7**,** 8 and 9
	(g) identify any trends in the monitoring results over the life of the project;	7**,** 8 and 9
	(h) identify and discuss any non-compliance during the previous year; and	1 and 11
	(i) describe what actions were, or are being, taken to ensure compliance.	11 and 12
Appendix 3 **Statement of Commitments** **Ref 21**	[Maxwell Infrastructure] will prepare and submit to relevant regulatory departments an Annual Review which will discuss monitoring results and include a discussion on predictions and commitments made within this EA.	7**,** 8 and 9
DA 106-04-00		
Schedule 2 Condition 5.1b	The Applicant shall: … (iii) provide all results and analysis of air quality monitoring in the Annual Review including a determination of the annual dust deposition rate in gm/m2/month, which shall be plotted in the Annual Review.	7.4 and **Appendix 4**
Schedule 2 Condition 5.3.2c	The Applicant shall also: … (ii) include a summary of noise monitoring results in the Annual Review.	7.2 **and** Appendix 3

Condition	Description	Report Section
Schedule 2 Condition 8.1a	The Applicant shall, throughout the life of the rail loading facility and rail loop and for a period of at least three years after the completion of operations in the DA area, prepare and submit an Annual Environmental Management Report, which may be incorporated into the existing Drayton Annual Review to the satisfaction of the Director- General. The Annual Review shall include a review of the performance of coal transportation against the Environmental Management Strategy, the conditions of this consent, and other licences and approvals relating to the coal transport operations. To enable ready comparison with the predictions of the EIS, diagrams and tables, the report shall include, but not be limited to, the following matters:	
	(i) an annual compliance review of the performance of the project against conditions of this consent and statutory approvals;	1 and 11
	(ii) a review of the effectiveness of the environmental management of the coal transport operations in terms of EPA, DMR, and MSC requirements;	7.7
	(iii) results of all environmental monitoring required under this consent or other approvals, including interpretations and discussion by a suitably qualified person;	7**,** 8 and 9
	(iv) identify trends in monitoring results over the life of coal transport operations;	7**,** 8 and 9
	(v) a listing of any variations obtained to approvals applicable to the subject area during the previous year; and	4
	(vi) environmental management targets and strategies for the next year, taking into account identified trends in monitoring results.	12
Schedule 2 Condition 8.1b	In preparing the Annual Review, the Applicant shall:	
	(i) respond to any request made by the Director-General for any additional requirements; and	**0**
	(ii) comply with any requirements of the Director-General or other relevant government agencies.	**0**
Schedule 2 Condition 9.2a	The environmental coordinator employed by [Maxwell Infrastructure] (refer condition 2.1) shall be responsible: (ii) for providing a report of complaints received with respect to the Drayton coal transportation operations every six months throughout the life of the project to the Director-General, MSC, EPA, DMR, and CCC, or as otherwise agreed by the Director-General. A summary of this report shall be included in the Annual Review (condition 8.1(a)).	10.1
CL 229, CL 395 and ML 1531		

Condition	Description	Report Section
Condition 3	(1) Within 12 months of the commencement of mining operations and thereafter annually or, at such other times as may be allowed by the Director-General, the lease holder must lodge an Annual Environmental Management report with the Director-General.	**All**
	(2) The Annual Review must be prepared in accordance with the Director-General's guidelines current at the time of reporting and contain a review and forecast of performance for the preceding and ensuing twelve months in terms of:	
	the accepted Mining Operations Plan;	9
	development consent requirements and conditions;	7**,** 8 and 9
	Environment Protection Authority and Department of Land and Water Conservation (or Department of Environment and Conservation and Department of Planning) licences and approvals;	7**,** 8 and 9
	Any other statutory environmental requirements;	7**,** 8 and 9
	Details of any variations to environmental approvals applicable to the lease area; and	4
	Where relevant, progress towards final rehabilitation objectives.	9

APPENDIX 2. ENVIRONMENTAL MONITORING LOCATIONS

Figure 28. Air quality, noise and meteorological monitoring locations

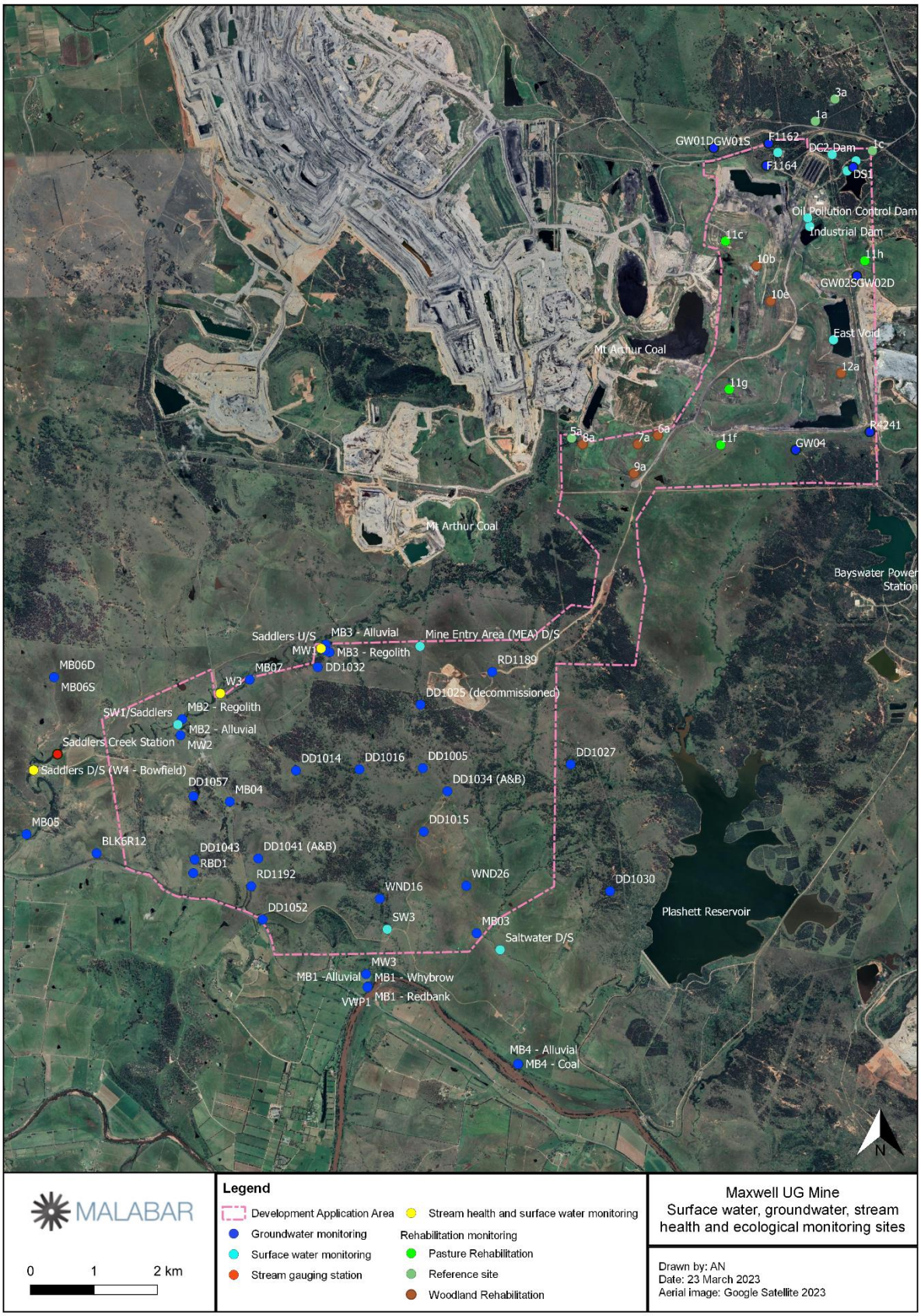


Figure 29. Surface water, groundwater, stream health and ecological monitoring locations

APPENDIX 3. NOISE MONITORING RESULTS

Table 22. Monitored noise generated by the project alone (results under the Maxwell Underground Mine Noise and Blasting Management Plan)

Location	Maxwell UG Mine Operational noise criteria (dB(A))				Rail loop and Antiene Rail Spur development consent operational noise criteria (db(A)			2022 maximum result (dB(A))		
	Day ($L_{Aeq\ (15\ min)}$) Years 1 to 3)	Evening ($L_{Aeq\ (15\ min)}$)	Night ($L_{Aeq\ (15\ min)}$)	Night (L_{max})	Day $L_{Aeq\ (15\ min)}$)	Evening $L_{Aeq\ (15\ min)}$)	Night $L_{Aeq\ (15\ min)}$)	Day ($L_{Aeq\ (11\ hr)}$)	Evening ($L_{Aeq\ (4\ hr)}$)	Night ($L_{Aeq\ (9\ hr)}$)
390, 398, 402	44	39	39	52	38	38	38	<20	<20	<20
425, 427	40	37	37	52				<20	<20	<20
399	42	37	37	52				<20	<20	<20
400	41	36	36	52				<20	<20	<20
403	44	40	40	52				<20	<20	<20
411	45	41	41	52				<20	<20	<20
418	44	39	39	52				<20	<20	<20
419, 420, 539	42	38	38	52				<20	<20	<20
421, 424	41	38	38	52				<20	<20	<20
423	42	39	39	52				<20	<20	<20
538	42	38	38	52				<20	<20	<20
All other privately-owned properties	40	35	35	52				<20	<20	<20

Table 23. Monitoring summary - cumulative noise (results under the Maxwell Underground Mine Noise and Blasting Management Plan)

Location	Rail loop and Antiene Rail Spur development consent cumulative noise criteria (db(A)			2022 maximum result (dB(A))		
	Day ($L_{Aeg\ (11\ hour)}$)	Evening ($L_{Aeg\ (4\ hour)}$)	Night ($L_{Aeg\ (9\ hour)}$)	Day ($L_{Aeg\ (11\ hour)}$)	Evening ($L_{Aeg\ (4\ hour)}$)	Night ($L_{Aeg\ (9\ hour)}$)
NM1[1]	40	40	40	54	47	46
NM2				<20	27	29
NM3				<20	<20	<20
NM4				<20	20	<20

1. The monitoring location for NM1 is representative of noise conditions at the residence for mine noise, but due to its close proximity to the rail loop, it is not considered representative of train noise conditions at the residence. Considering additional distance & atmospheric absorption the predicted train noise level at the residence is 15 dB(A) below the measured values in the above table.

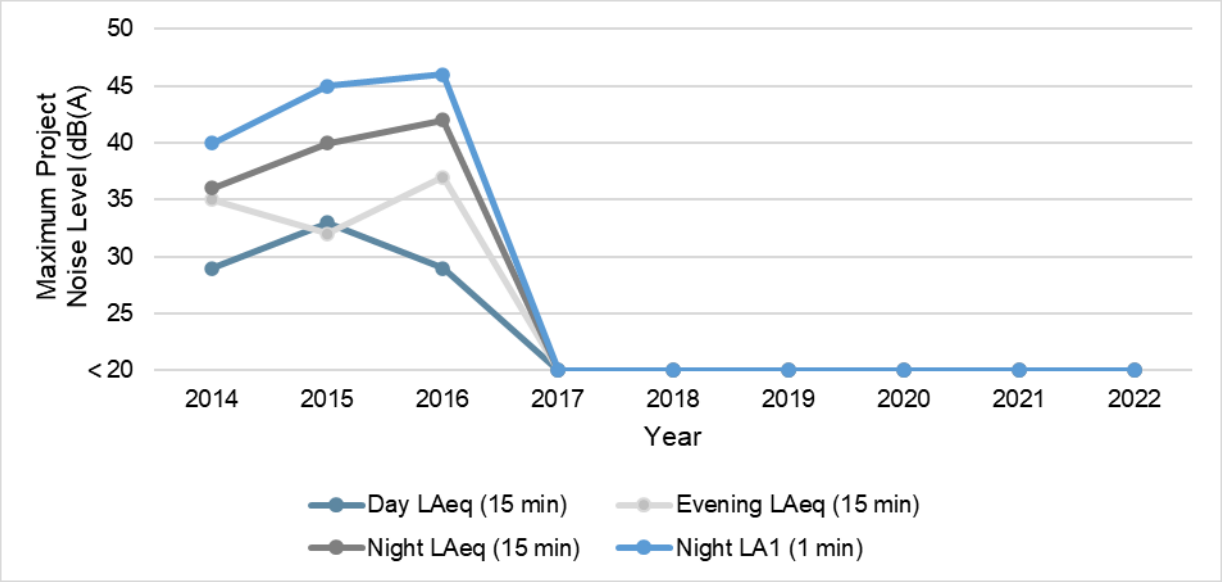


Figure 30. Long-term maximum project noise levels

APPENDIX 4. AIR QUALITY MONITORING RESULTS

Table 24. PM_{10} and $PM_{2.5}$ 24-hour average concentrations in µg/m^3 for the reporting period.
See Notes below table.

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
1/01/2022	19.27	8.41	21.18	11.76
2/01/2022	15.80	5.76	15.94	6.47
3/01/2022	14.78	2.55	26.07	13.77
4/01/2022	18.33	5.70	8.67	0.28
5/01/2022	9.29	2.09	5.02	0.70
6/01/2022	10.38	2.35	5.96	-1.15
7/01/2022	10.45	2.32	1.72	-4.30
8/01/2022	7.56	1.80	26.06	19.34
9/01/2022	14.91	7.57	8.90	5.15
10/01/2022	16.51	5.48	23.19	14.17
11/01/2022	17.30	5.57	15.08	7.67
12/01/2022	16.34	5.42	15.24	4.83
13/01/2022	10.56	2.59	15.68	7.14
14/01/2022	17.60	7.55	14.23	6.74
15/01/2022	13.80	3.38	15.61	7.07
16/01/2022	19.17	7.81	18.26	9.81
17/01/2022	29.84	13.96	26.26	14.64
18/01/2022	18.13	7.62	15.35	8.13
19/01/2022	9.31	2.39	9.69	4.23
20/01/2022	17.04	4.29	19.29	7.84
21/01/2022	15.64	2.87	19.03	7.60
22/01/2022	12.96	3.45	8.79	2.75
23/01/2022	12.03	2.50	12.65	5.58
24/01/2022	10.89	3.50	14.47	5.82
25/01/2022	17.64	4.87	14.06	4.93
26/01/2022	14.32	2.44	18.15	6.94
27/01/2022	15.60	3.83	9.98	1.32

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
28/01/2022	18.43	4.28	18.26	8.30
29/01/2022	21.94	6.55	11.28	-0.08
30/01/2022	16.63	3.40	16.53	6.30
31/01/2022	19.67	4.65	16.79	6.42
1/02/2022	16.06	5.36	13.63	6.11
2/02/2022	8.93	2.03	8.33	4.42
3/02/2022	11.69	2.67	9.51	3.56
4/02/2022	10.42	1.69	13.53	5.84
5/02/2022	7.57	0.37	8.96	1.05
6/02/2022	8.53	1.06	14.49	7.42
7/02/2022	9.53	0.60	5.30	-1.26
8/02/2022	11.16	3.12	5.75	-0.05
9/02/2022	16.99	6.45	9.58	2.37
10/02/2022	20.19	7.36	18.10	5.08
11/02/2022	13.89	7.34	13.86	8.39
12/02/2022	14.02	3.78	15.70	5.97
13/02/2022	15.45	3.05	11.01	0.83
14/02/2022	19.23	4.09	13.03	1.81
15/02/2022	21.76	5.60	13.43	2.09
16/02/2022	21.71	5.87	14.15	2.33
17/02/2022	18.92	5.89	11.33	2.12
18/02/2022	16.73	7.16	13.12	4.92
19/02/2022	15.21	3.84	12.95	3.22
20/02/2022	14.20	5.42	13.86	3.10
21/02/2022	12.80	4.61	9.33	1.68
22/02/2022	11.54	4.29	10.41	3.84
23/02/2022	7.73	1.48	12.47	6.68

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
24/02/2022	5.43	0.59	14.42	9.11
25/02/2022	11.41	2.36	15.66	7.28
26/02/2022	9.99	3.21	13.25	6.39
27/02/2022	10.00	2.32	13.07	7.44
28/02/2022	9.48	1.85	12.16	6.65
1/03/2022	4.21	-0.89	9.03	5.66
2/03/2022	6.03	0.29	9.28	5.21
3/03/2022	2.94	-1.59	8.20	5.10
4/03/2022	5.10	0.05	6.95	2.92
5/03/2022	10.71	2.36	12.78	5.62
6/03/2022	4.90	-0.63	7.39	3.89
7/03/2022	4.88	-0.23	7.58	3.75
8/03/2022	4.29	0.59	5.52	3.87
9/03/2022	5.76	1.57	5.99	3.24
10/03/2022	13.03	3.65	13.63	6.72
11/03/2022	16.75	4.60	17.09	7.88
12/03/2022	11.39	2.78	13.97	7.23
13/03/2022	12.98	4.57	11.75	6.27
14/03/2022	11.13	2.97	11.63	4.92
15/03/2022	13.24	3.54	12.71	4.88
16/03/2022	12.78	2.12	15.35	7.19
17/03/2022	16.86	5.29	13.58	5.95
18/03/2022	14.21	2.24	15.51	5.82
19/03/2022	14.54	3.48	16.04	7.72
20/03/2022	17.81	4.76	16.61	6.52
21/03/2022	20.32	5.30	16.36	7.64
22/03/2022	16.10	6.60	15.59	8.50

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
23/03/2022	20.35	8.33	19.31	10.21
24/03/2022	5.42	-0.12	5.04	1.64
25/03/2022	10.29	1.94	10.46	3.39
26/03/2022	7.56	2.55	6.25	2.32
27/03/2022	8.75	2.63	7.51	3.03
28/03/2022	8.95	3.32	6.73	2.58
29/03/2022	7.34	1.75	14.09	8.45
30/03/2022	10.42	1.50	16.25	8.40
31/03/2022	8.75	1.49	7.96	3.30
1/04/2022	6.80	1.32	9.07	6.24
2/04/2022	7.18	0.63	12.28	8.65
3/04/2022	8.09	2.30	11.60	7.87
4/04/2022	13.69	4.49	9.46	5.84
5/04/2022	16.84	6.54	14.92	9.25
6/04/2022	16.55	6.96	19.44	12.20
7/04/2022	10.72	4.50	9.54	6.14
8/04/2022	7.94	0.79	10.62	5.45
9/04/2022	9.58	1.89	10.73	4.97
10/04/2022	15.53	3.91	15.75	8.77
11/04/2022	11.25	3.10	11.26	7.06
12/04/2022	17.08	4.37	12.02	5.30
13/04/2022	10.74	2.44	12.19	7.08
14/04/2022	10.58	3.37	13.00	6.59
15/04/2022	9.54	3.23	14.28	8.07
16/04/2022	12.44	5.27	11.81	6.85
17/04/2022	13.32	3.48	16.69	9.73
18/04/2022	10.41	2.56	13.63	10.00

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19/04/2022	9.33	2.21	18.88	6.69
20/04/2022	5.18	0.81	9.11	5.93
21/04/2022	8.21	2.03	11.17	8.07
22/04/2022	6.59	0.30	11.56	6.92
23/04/2022	7.98	1.49	12.06	7.32
24/04/2022	8.71	2.59	10.65	6.74
25/04/2022	11.42	4.59	12.05	7.27
26/04/2022	10.46	3.88	12.60	7.05
27/04/2022	10.44	4.15	13.18	8.56
28/04/2022	13.72	6.65	11.46	7.85
29/04/2022	9.11	3.18	8.94	5.78
30/04/2022	7.99	2.18	11.75	7.35
1/05/2022	9.83	2.99	11.72	7.72
2/05/2022	14.58	6.68	13.82	9.14
3/05/2022	9.28	3.17	11.20	8.60
4/05/2022	9.92	3.46	12.50	8.68
5/05/2022	8.48	3.27	11.21	6.45
6/05/2022	6.17	-0.08	10.05	8.79
7/05/2022	4.97	1.00	10.99	9.32
8/05/2022	8.70	3.02	9.69	9.43
9/05/2022	12.76	5.31	15.32	11.20
10/05/2022	11.30	2.83	13.11	8.00
11/05/2022	-	-	13.26	6.93
12/05/2022	-	-	10.79	6.73
13/05/2022	-	-	9.78	6.67
14/05/2022	-	-	10.37	6.58

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
15/05/2022	-	-	8.87	6.18
16/05/2022	-	-	9.13	5.85
17/05/2022	-	-	15.87	10.36
18/05/2022	-	-	14.63	10.38
19/05/2022	-	-	12.89	10.08
20/05/2022	-	-	17.74	11.03
21/05/2022	10.56	4.91	13.06	9.79
22/05/2022	6.64	2.34	13.78	8.93
23/05/2022	6.97	3.66	9.85	6.71
24/05/2022	7.65	2.81	8.75	6.86
25/05/2022	8.23	4.79	11.14	7.19
26/05/2022	12.25	6.60	3.05	-1.61
27/05/2022	12.40	6.71	9.41	5.89
28/05/2022	6.76	3.52	5.34	2.23
29/05/2022	4.38	2.44	1.65	-0.10
30/05/2022	3.91	1.71	4.72	0.13
31/05/2022	-	-	7.50	2.55
1/06/2022	3.07	-0.39	13.38	9.96
2/06/2022	1.91	-0.59	-	-
3/06/2022	6.73	4.70	-	-
4/06/2022	1.69	0.70	21.47	21.92
5/06/2022	2.10	0.90	22.51	23.67
6/06/2022	1.58	-0.69	22.38	22.41
7/06/2022	4.96	1.99	26.89	26.87

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
8/06/2022	4.25	2.30	21.99	22.67
9/06/2022	3.59	1.05	21.34	21.43
10/06/2022	6.39	2.45	22.41	23.04
11/06/2022	4.18	1.14	25.94	26.88
12/06/2022	8.21	3.01	26.11	25.36
13/06/2022	4.69	2.31	27.56	26.43
14/06/2022	13.43	8.68	25.65	26.30
15/06/2022	10.95	5.02	27.80	28.83
16/06/2022	9.71	4.22	29.74	30.41
17/06/2022	7.17	4.27	28.72	30.11
18/06/2022	10.25	4.78	29.65	31.06
19/06/2022	11.12	4.46	37.17	38.67
20/06/2022	12.02	3.97	20.59	18.94
21/06/2022	8.39	4.56	24.00	23.75
22/06/2022	6.90	2.95	14.77	14.19
23/06/2022	4.40	1.25	17.94	17.17
24/06/2022	5.49	2.48	20.83	20.34
25/06/2022	7.06	3.32	13.68	13.28
26/06/2022	7.70	4.01	15.27	16.75
27/06/2022	9.46	4.55	7.74	10.83
28/06/2022	9.31	1.72	10.83	12.80
29/06/2022	-	-	11.17	12.01
30/06/2022	12.49	3.71	16.86	18.39
1/07/2022	16.55	4.38	15.81	18.59

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
2/07/2022	6.98	4.52	14.33	19.67
3/07/2022	2.91	2.50	13.68	20.86
4/07/2022	3.96	3.65	13.27	19.50
5/07/2022	3.25	2.50	23.34	31.66
6/07/2022	2.48	1.94	17.53	25.39
7/07/2022	1.55	0.22	15.84	22.17
8/07/2022	3.73	1.62	0.71	3.87
9/07/2022	3.85	1.98	4.30	9.56
10/07/2022	4.60	3.17	7.54	13.54
11/07/2022	6.80	3.55	1.89	10.94
12/07/2022	4.54	3.47	3.43	15.49
13/07/2022	4.15	2.90	3.25	12.83
14/07/2022	3.40	1.12	2.50	11.43
15/07/2022	4.67	2.52	3.55	12.09
16/07/2022	5.22	3.07	4.31	12.98
17/07/2022	5.04	1.33	2.56	12.51
18/07/2022	7.68	1.79	6.73	14.58
19/07/2022	9.63	5.43	1.72	10.60
20/07/2022	7.61	3.49	3.98	14.14
21/07/2022	7.17	1.78	0.47	10.76
22/07/2022	9.86	2.93	-0.46	10.36
23/07/2022	8.93	2.40	1.57	13.63
24/07/2022	9.67	4.86	0.52	12.42
25/07/2022	11.39	6.07	2.58	14.42

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
26/07/2022	5.13	1.49	5.54	16.53
27/07/2022	6.38	2.60	5.02	12.06
28/07/2022	2.59	0.57	1.81	11.17
29/07/2022	6.02	3.00	7.84	15.32
30/07/2022	10.29	3.92	3.23	13.46
31/07/2022	12.62	7.11	2.88	16.28
1/08/2022	4.99	2.37	1.61	18.76
2/08/2022	3.84	1.40	3.61	16.28
3/08/2022	6.39	3.63	1.13	17.07
4/08/2022	9.92	6.46	0.17	29.63
5/08/2022	3.31	0.72	-8.18	18.90
6/08/2022	3.96	1.07	-	6.10
7/08/2022	2.69	1.18	-6.01	9.38
8/08/2022	4.48	1.90	-0.94	15.12
9/08/2022	3.47	0.76	-0.70	15.17
10/08/2022	8.36	3.11	-	-
11/08/2022	13.76	6.58	11.09	3.33
12/08/2022	10.19	8.01	6.10	3.91
13/08/2022	2.23	0.93	3.28	2.17
14/08/2022	2.36	1.65	0.42	-0.67
15/08/2022	2.22	0.51	1.62	-0.47
16/08/2022	4.20	2.59	-0.03	-0.76
17/08/2022	4.54	1.71	4.03	1.22
18/08/2022	3.06	1.37		

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
19/08/2022	4.31	1.31	-	-
20/08/2022	4.97	1.27	-	-
21/08/2022	10.36	4.05	-	
22/08/2022	-	-	-	-
23/08/2022	-	-	7.50	4.30
24/08/2022	0.91	0.89	0.99	-0.37
25/08/2022	7.31	7.62	2.74	-0.51
26/08/2022	6.45	6.67	4.47	1.04
27/08/2022	11.75	12.24	7.85	3.97
28/08/2022	15.50	16.00	8.74	4.32
29/08/2022	14.09	14.39	6.27	3.32
30/08/2022	8.70	8.58	7.31	3.86
31/08/2022	8.85	8.99	6.52	2.55
1/09/2022	10.34	10.52	7.04	2.92
2/09/2022	4.41	4.50	7.16	3.33
3/09/2022	3.44	3.51	3.91	-0.42
4/09/2022	2.57	1.76	3.55	0.06
5/09/2022	1.85	1.39	3.82	0.67
6/09/2022	-0.73	-1.94	7.30	1.40
7/09/2022	4.94	0.22	6.24	1.20
8/09/2022	14.36	6.43	6.38	1.38
9/09/2022	12.27	4.65	5.92	2.65
10/09/2022	4.39	2.01	3.92	1.76
11/09/2022	7.36	2.18	3.92	0.62

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
12/09/2022	8.42	2.62	4.80	2.60
13/09/2022	9.14	3.56	5.01	0.86
14/09/2022	14.61	6.46	7.13	1.17
15/09/2022	14.47	9.53	6.70	2.81
16/09/2022	6.18	2.89	3.90	2.57
17/09/2022	7.74	1.79	5.89	2.64
18/09/2022	9.43	3.65	6.06	2.06
19/09/2022	-	-	6.01	3.73
20/09/2022	-	-	7.27	0.50
21/09/2022	-	-	10.25	2.07
22/09/2022	6.13	4.61	4.99	3.08
23/09/2022	8.61	5.59	5.02	2.18
24/09/2022	8.96	5.81	6.92	3.27
25/09/2022	9.53	6.14	3.62	1.32
26/09/2022	12.41	6.36	4.43	0.91
27/09/2022	17.31	10.98	8.69	3.16
28/09/2022	16.56	12.04	6.00	2.94
29/09/2022	9.20	7.81	2.02	0.98
30/09/2022	13.35	8.29	4.40	0.73
1/10/2022	17.96	10.94	8.09	1.88
2/10/2022	17.13	11.88	5.61	1.90
3/10/2022	14.83	10.67	4.73	1.11
4/10/2022	16.38	11.74	10.03	3.48
5/10/2022	16.28	12.60	6.95	1.53

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
6/10/2022	17.14	14.22	4.61	1.71
7/10/2022	19.96	17.86	5.05	1.80
8/10/2022	13.49	12.38	3.04	0.05
9/10/2022	11.29	10.34	1.96	0.60
10/10/2022	20.44	13.81	8.94	2.37
11/10/2022	18.69	12.12	8.95	2.79
12/10/2022	19.39	14.00	7.00	0.96
13/10/2022	21.29	12.46	8.42	1.43
14/10/2022	17.36	11.37	5.13	1.96
15/10/2022	20.36	15.05	6.90	2.87
16/10/2022	21.37	14.83	8.26	3.89
17/10/2022	20.07	13.66	7.65	2.43
18/10/2022	21.01	13.67	10.27	3.84
19/10/2022	-	-	9.96	6.41
20/10/2022	-	-	6.59	4.97
21/10/2022	-	-	5.47	2.59
22/10/2022	-	-	5.39	1.70
23/10/2022	-	-	4.78	0.13
24/10/2022	-	-	6.37	3.27
25/10/2022	-	-	8.12	5.34
26/10/2022	-	-	4.23	1.11
27/10/2022	-	-	4.15	0.92
28/10/2022	-	-	5.60	1.15
29/10/2022	-	-	4.20	1.37

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
30/10/2022	-	-	6.64	1.68
31/10/2022	-	-	9.08	0.95
1/11/2022	12.98	10.51	4.51	1.89
2/11/2022	14.43	12.11	1.92	0.36
3/11/2022	15.74	12.27	5.01	1.09
4/11/2022	17.85	11.36	7.30	3.72
5/11/2022	21.52	14.48	8.26	2.22
6/11/2022	23.31	17.22	7.53	4.55
7/11/2022	20.94	15.10	7.13	2.48
8/11/2022	19.70	14.96	8.53	3.06
9/11/2022	14.90	7.76	8.19	2.59
10/11/2022	7.80	-0.07	9.34	2.94
11/11/2022	10.32	2.14	8.99	3.78
12/11/2022	9.17	4.00	12.90	7.13
13/11/2022	10.43	4.86	10.90	8.35
14/11/2022	7.61	1.38	6.39	1.57
15/11/2022	5.39	0.74	4.00	1.72
16/11/2022	8.28	0.97	2.93	1.35
17/11/2022	8.45	1.35	7.81	5.82
18/11/2022	12.74	2.40	26.71	21.51
19/11/2022	8.44	1.32	25.28	19.51
20/11/2022	9.12	1.20	17.29	13.12
21/11/2022	8.60	0.30	19.21	17.57
22/11/2022	7.52	0.18	19.62	20.95

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
23/11/2022	7.02	-0.76	18.23	17.56
24/11/2022	10.89	2.75	13.34	15.27
25/11/2022	16.76	7.14	7.18	3.35
26/11/2022	19.55	10.18	13.00	6.41
27/11/2022	18.51	6.74	17.27	5.79
28/11/2022	17.34	8.70	12.03	7.44
29/11/2022	18.85	7.29	14.87	5.60
30/11/2022	16.36	3.96	20.30	6.30
1/12/2022	16.49	4.58	15.89	5.15
2/12/2022	14.22	5.49	11.49	4.51
3/12/2022	12.67	5.59	10.39	4.00
4/12/2022	12.81	3.92	14.37	4.41
5/12/2022	19.08	6.34	11.47	3.76
6/12/2022	21.41	10.15	14.14	5.72
7/12/2022	16.12	4.05	7.58	2.30
8/12/2022	10.07	2.23	6.69	2.66
9/12/2022	21.83	5.17	18.09	5.15
10/12/2022	14.70	3.37	14.22	6.20
11/12/2022	16.67	7.10	13.01	3.74
12/12/2022	11.79	3.93	11.96	3.23
13/12/2022	10.52	0.51	-	-
14/12/2022	11.33	0.69	-	-
15/12/2022	11.67	2.46	1.59	1.68
16/12/2022	11.56	1.69	4.88	1.79

Date	TEOM-1		TEOM-2	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
17/12/2022	12.33	2.13	5.31	2.21
18/12/2022	6.21	1.10	0.01	1.39
19/12/2022	14.35	3.18	6.93	2.21
20/12/2022	15.63	2.84	9.14	3.52
21/12/2022	15.31	3.67	12.39	4.34
22/12/2022	14.86	4.07	10.14	4.99
23/12/2022	14.64	6.52	3.11	4.42
24/12/2022	11.66	6.23	8.07	6.28
25/12/2022	12.45	8.23	8.75	6.44
26/12/2022	11.09	5.74	8.72	4.11
27/12/2022	16.16	5.68	11.38	2.57
28/12/2022	20.88	8.49	15.04	6.58
29/12/2022	29.10	9.32	16.63	6.15
30/12/2022	19.67	6.88	14.50	5.62
31/12/2022	13.85	3.70	14.31	5.92

Notes:

TEOM-1

TEOM-1 exhibited zero and then negative concentrations from 11/05/22 to 19/05/22 following the scheduled quarterly calibration on 11/5/22. The issue was resolved by the monitoring contractor on 19/05/22. The next day for which a sufficient 1-hour data record to calculate a 24-hour average in accordance with the Validation Process was 20/5/22.

On 31/5/22 there were storms in the area resulting in widespread power outages; the 24-hour average recorded by TEOM-1 on this day was zero. There was less than a 75% 1-hour dataset available for the day and hence no 24-hour average could be calculated in accordance with the Validation Process.

On 29/6/22 TEOM-1 recorded a zero 24-hour concentration for the day. There was less than a 75% 1-hour average dataset to calculate the 24-hour average in accordance with the Validation Process and hence no 24-hour average is recorded for that day.

On 22/8/22 and 23/8/22, the scheduled annual calibration of TEOM-1 resulted in a zero 24-hour average being recorded for those days. There was less than a 75% 1-hour average dataset remaining to calculate the 24-hour average in accordance with the Validation Process and hence no 24-hour value is recorded for those days.

From 19/9/22 to 21/9/22, TEOM-1 'locked up' and required a restart. For those days TEOM-1 recorded a zero 24-hour concentration for the day. There was less than a 75% 1-hour average dataset to calculate the 24-hour average in accordance with the Validation Process and hence no 24-hour average is recorded for those days.

From 19/10/22 to 31/10/22 TEOM-1 displayed an 'unrecoverable error' on its operating screen. Following detection of the issue, the instrument was restarted. For those days TEOM-1 recorded a zero 24-hour concentration for the day. There was less than a 75% 1-hour average dataset to calculate the 24-hour average in accordance with the Validation Process and hence no 24-hour average is recorded for those days.

TEOM-2

On 2/6/22 and 3/6/22 the scheduled annual calibration of TEOM-2 was performed. This resulted in a zero 24-hour average being recorded on 2/6/22 and a large negative being recorded on 3/6/22. There was a less than 75% valid 1-hour average dataset remaining to calculate the 24-hour averages in accordance with the Validation Process and hence no 24-hour averages are recorded for those days.

Following the scheduled annual calibration on 2&3/6/22, issues were experienced with the $PM_{2.5}$ data. Specifically $PM_{2.5}$ concentrations were greater than PM_{10}. Advice from the monitoring contractor is that the TEOM was not controlling its internal operating temperatures correctly due to an electrical fault/circuit board. It also developed a leak in some internal seals that caused the negative results. The instrument was sent to the equipment manufacture in the US (Lear Siegler) to diagnose. A replacement instrument was installed. The original equipment was returned on 17/11, however the equipment continued to perform poorly – as seen by the elevated $PM_{2.5}$ concentrations towards the end of the month; the equipment was again swopped out (on 24/11) and further diagnosis was sought from the manufacturer. The hire instrument remains in place until a resolution is determined.

On the 13&14/12/22 a suspected power cut occurred at TEOM-2. This resulted in a zero 24-hour average being recorded on those days. There was a less than 75% valid 1-hour average dataset remaining to calculate the 24-hour averages in accordance with the Validation Process and hence no 24-hour averages were recorded for those days.

Some minor negative 24-hour $PM_{2.5}$ results were recorded at both TEOMs during 2022, however this is considered a normal function of the TEOM equipment and should not be discounted.

APPENDIX 5. TRAIN MOVEMENTS

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
01-Jan-22	0	-	0
02-Jan-22	1	08:00	0
03-Jan-22	0	-	0
04-Jan-22	0	-	0
05-Jan-22	0	-	0
06-Jan-22	0	-	0
07-Jan-22	0	-	0
08-Jan-22	0	-	0
09-Jan-22	0	-	0
10-Jan-22	0	-	0
11-Jan-22	2	11:00 13:00	0
12-Jan-22	0	-	0
13-Jan-22	0	-	0
14-Jan-22	0	-	0
15-Jan-22	0	-	0
16-Jan-22	0	-	0
17-Jan-22	0	-	0
18-Jan-22	0	-	0
19-Jan-22	0	-	0
20-Jan-22	0	-	0
21-Jan-22	0	-	0
22-Jan-22	0	-	0
23-Jan-22	0	-	0
24-Jan-22	0	-	0
25-Jan-22	0	-	0
26-Jan-22	0	-	0
27-Jan-22	0	-	0
28-Jan-22	0	-	0
29-Jan-22	0	-	0
30-Jan-22	0	-	0
31-Jan-22	0	-	0
01-Feb 22	0	-	0
02-Feb-22	0	-	0
03-Feb-22	0	-	0
04-Febr-22	0	-	0
05-Feb-22	1	Not reported by Aurizon	0
06-Feb-22	0	-	0
07-Feb-22	0	-	0
08-Feb-22	0	-	0
09-Feb-22	0	-	0
10-Feb-22	0	-	0
11-Feb-22	0	-	0
12-Feb-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
13-Feb-22	0	-	0
14-Feb-22	0	-	0
15-Feb-22	0	-	0
16-Feb-22	0	-	0
17-Feb-22	0	-	0
18-Feb-22	0	-	0
19-Feb-22	0	-	0
20-Feb-22	0	-	0
21-Feb-22	0	-	0
22-Feb-22	0	-	0
23-Feb-22	0	-	0
24-Feb-22	0	-	0
25-Feb-22	0	-	0
26-Feb-22	0	-	0
27-Feb-22	0	-	0
28-Feb-22	0	-	0
01-Mar-22	0	-	0
02-Mar-22	0	-	0
03-Mar-22	0	-	0
04-Mar-22	0	-	0
05-Mar-22	0	-	0
06-Mar-22	0	-	0
07-Mar-22	0	-	0
08-Mar-22	0	-	0
09-Mar-22	0	-	0
10-Mar-22	0	-	0
11-Mar-22	0	-	0
12-Mar-22	0	-	0
13-Mar-22	0	-	0
14-Mar-22	0	-	0
15-Mar-22	0	-	0
16-Mar-22	0	-	0
17-Mar-22	0	-	0
18-Mar-22	0	-	0
19-Mar-22	0	-	0
20-Mar-22	0	-	0
21-Mar-22	0	-	0
22-Mar-22	0	-	0
23-Mar-22	0	-	0
24-Mar-22	0	-	0
25-Mar-22	1	Not reported by Aurizon	0
26-Mar-22	1	Not reported by Aurizon	0
27-Mar-22	0	-	0
28-Mar-22	0	-	0
29-Mar-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
30-Mar-2	0	0	0
31-Mar-22	0	-	0
01-Apr-22	0	-	0
02-Apr-22	0	-	0
03-Apr-22	0	-	0
04-Apr-22	0	-	0
05-Apr-22	0	-	0
06-Apr-22	0	-	0
07-Apr-22	0	-	0
08-Apr-22	0	-	0
09-Apr-22	0	-	0
10-Apr-22	0	-	0
11-Apr-22	0	-	0
12-Apr-22	0	-	0
13-Apr-22	0	-	0
14-Apr-22	0	-	0
15-Apr-22	0	-	0
16-Apr-22	0	-	0
17-Apr-22	0	-	0
18-Apr-22	0	-	0
19-Apr-22	0	-	0
20-Apr-22	0	-	0
21-Apr-22	0	-	0
22-Apr-22	0	-	0
23-Apr-22	0	-	0
24-Apr-22	0	-	0
25-Apr-22	0	-	0
26-Apr-22	0	-	0
27-Apr-22	0	-	0
28-Apr-22	0	-	0
29-Apr-22	0	-	0
30-Apr-22	0	-	0
01-May-22	0	-	0
02-May-22	1	22:00	0
03-May-22	0	-	0
04-May-22	0	-	0
05-May-22	0	-	0
06-May-22	0	-	0
07-May-22	0	-	0
08-May-22	0	-	0
09-May-22	0	-	0
10-May-22	0	-	0
11-May-22	0	-	0
12-May-22	0	-	0
13-May-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
14-May-22	0	-	0
15-May-22	0	-	0
16-May-22	0	-	0
17-May-22	0	-	0
18-May-22	0	-	0
19-May-22	0	-	0
20-May-22	0	-	0
21-May-22	0	-	0
22-May-22	0	-	0
23-May-22	0	-	0
24-May-22	0	-	0
25-May-22	0	-	0
26-May-22	0	-	0
27-May-22	0	-	0
28-May-22	0	-	0
29-May-22	0	-	0
30-May-22	0	-	0
31-May-22	0	-	0
01-Jun-22	0	-	0
02-Jun-22	0	-	0
03-Jun-22	0	-	0
04-Jun-22	0	-	0
05-Jun-22	1	Not reported by Aurizon	0
06-Jun-22	1	Not reported by Aurizon	0
07-Jun-22	0	-	0
08-Jun-22	0	-	0
09-Jun-22	0	-	0
10-Jun-22	0	-	0
11-Jun-22	0	-	0
12-Jun-22	0	-	0
13-Jun-22	0	-	0
14-Jun-22	0	-	0
15-Jun-22	0	-	0
16-Jun-22	0	-	0
17-Jun-22	0	-	0
18-Jun-22	0	-	0
19-Jun-22	0	-	0
20-Jun-22	0	-	0
21-Jun-22	0	-	0
22-Jun-22	0	-	0
23-Jun-22	0	-	0
24-Jun-22	0	-	0
25-Jun-22	0	-	0
26-Jun-22	0	-	0
27-Jun-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
28-Jun-22	0	-	0
29-Jun-22	0	-	0
30-Jun-22	0	-	0
01-Jul-22	0	-	0
02-Jul-22	0	-	0
03-Jul-22	0	-	0
04-Jul-22	0	-	0
05-Jul-22	0	-	0
06-Jul-22	0	-	0
07-Jul-22	0	-	0
08-Jul-22	0	-	0
09-Jul-22	0	-	0
10-Jul-22	0	-	0
11-Jul-22	0	-	0
12-Jul-22	0	-	0
13-Jul-22	0	-	0
14-Jul-22	0	-	0
15-Jul-22	0	-	0
16-Jul-22	0	-	0
17-Jul-22	0	-	0
18-Jul-22	0	-	0
19-Jul-22	0	-	0
20-Jul-22	1	12:00	0
21-Jul-22	0	-	0
22-Jul-22	0	-	0
23-Jul-22	0	-	0
24-Jul-22	0	-	0
25-Jul-22	0	-	0
26-Jul-22	0	-	0
27-Jul-22	0	-	0
28-Jul-22	0	-	0
29-Jul-22	0	-	0
30-Jul-22	0	-	0
31-Jul-22	0	-	0
01-Aug-22	0	-	0
02-Aug-22	0	-	0
03-Aug-22	1	14:11	0
04-Aug-22	0	-	0
05-Aug-22	0	-	0
06-Aug-22	0	-	0
07-Aug-22	0	-	0
08-Aug-22	0	-	0
09-Aug-22	0	-	0
10-Aug-22	0	-	0
11-Aug-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
12-Aug-22	1	13:00	0
13-Aug-22	0	-	0
14-Aug-22	0	-	0
15-Aug-22	0	-	0
16-Aug-22	0	-	0
17-Aug-22	0	-	0
18-Aug-22	0	-	0
19-Aug-22	0	-	0
20-Aug-22	0	-	0
21-Aug-22	0	-	0
22-Aug-22	0	-	0
23-Aug-22	0	-	0
24-Aug-22			0
25-Aug-22	0	-	0
26-Aug-22	0	-	0
27-Aug-22	1	14:00	0
28-Aug-22	1	12:00	0
29-Aug-22	0	-	0
30-Aug-22	0	-	0
31-Aug-22	0	-	0
01-Sep-22	0	-	0
02-Sep-22	0	-	0
03-Sep-22	0	-	0
04-Sep-22	0	-	0
05-Sep-22	0	-	0
06-Sep-22	0	-	0
07-Sep-22	1	06:41	0
08-Sep-22	1	14:46	0
09-Sep-22	0	-	0
10-Sep-22	0	-	0
11-Sep-22	0	-	0
12-Sep-22	0	-	0
13-Sep-22	0	-	0
14-Sep-22	0	-	0
15-Sep-22	0	-	0
16-Sep-22	0	-	0
17-Sep-22	0	-	0
18-Sep-22	0	-	0
19-Sep-22	0	-	0
20-Sep-22	0	-	0
21-Sep-22	0	-	0
22-Sep-22	0	-	0
23-Sep-22	0	-	0
24-Sep-22	0	-	0
25-Sep-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
26-Sep-22	0	-	0
27-Sep-22	0	-	0
28-Sep-22	0	-	0
29-Sep-22	0	-	0
30-Sep-22	0	-	0
01-Oct-22	1	07:00	0
02-Oct-22	0	-	0
03-Oct-22	0	-	0
04-Oct-22	0	-	0
05-Oct-22	0	-	0
06-Oct-22	0	-	0
07-Oct-22	0	-	0
08-Oct-22	0	-	0
09-Oct-22	0	-	0
10-Oct-22	0	-	0
11-Oct-22	0	-	0
12-Oct-22	0	-	0
13-Oct-22	0	-	0
14-Oct-22	0	-	0
15-Oct-22	0	-	0
16-Oct-22	0	-	0
17-Oct-22	0	-	0
18-Oct-22	1	08:30	0
19-Oct-22	0	-	0
20-Oct-22	0	-	0
21-Oct-22	0	-	0
22-Oct-22	0	-	0
23-Oct-22	0	-	0
24-Oct-22	0	-	0
25-Oct-22	0	-	0
26-Oct-22	1	08:00	0
27-Oct-22	0	-	0
28-Oct-22	0	-	0
29-Oct-22	0	-	0
30-Oct-22	0	-	0
31-Oct-22	0	-	0
01-Nov-22	0	-	0
02-Nov-22	0	-	0
03-Nov-22	0	-	0
04-Nov-22	0	-	0
05-Nov-22	0	-	0
06-Nov-22	0	-	0
07-Nov-22	0	-	0
08-Nov-22	0	-	0
09-Nov-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
10-Nov-22	0	-	0
11-Nov-22	1	08:00	0
12-Nov-22	0	-	0
13-Nov-22	0	-	0
14-Nov-22	0	-	0
15-Nov-22	0	-	0
16-Nov-22	0	-	0
17-Nov-22	0	-	0
18-Nov-22	0	-	0
19-Nov-22	1	08:00	0
20-Nov-22	0	-	0
21-Nov-22	0	-	0
22-Nov-22	0	-	0
23-Nov-22	0	-	0
24-Nov-22	0	-	0
25-Nov-22	0	-	0
26-Nov-22	0	-	0
27-Nov-22	0	-	0
28-Nov-22	1	06:47	0
29-Nov-22	0	-	0
30-Nov-22	1	09:00	0
01-Dec-22	1	17:00	0
02-Dec-22	0	-	0
03-Dec-22	0	-	0
04-Dec-22	0	-	0
05-Dec-22	0	-	0
06-Dec-22	0	-	0
07-Dec-22	0	-	0
08-Dec-22	0	-	0
09-Dec-22	0	-	0
10-Dec-22	0	-	0
11-Dec-22	0	-	0
12-Dec-22	0	-	0
13-Dec-22	1	11:30	0
14-Dec-22	0	-	0
15-Dec-22	0	-	0
16-Dec-22	0	-	0
17-Dec-22	0	-	0
18-Dec-22	1	09:00	0
19-Dec-22	0	-	0
20-Dec-22	0	-	0
21-Dec-22	0	-	0
22-Dec-22	0	-	0
23-Dec-22	0	-	0
24-Dec-22	0	-	0

Date	Total train movements per day	Time of train movements (24 hour)	Total tonnage per day
25-Dec-22	0	-	0
26-Dec-22	0	-	0
27-Dec-22	1	13:12	0
28-Dec-22	0	-	0
29-Dec-22	1	12:00	0
30-Dec-22	0	-	0
31-Dec-22	0	-	0

APPENDIX 6. VISUAL IMPACT RESULTS

Plant ID No.	Year Planted	Plant Height (m) (2021)	Plant Height (m) (2022)	Plant Width (m) (2021)	Plant Width (m) (2022)
1	2019	2.0	2.2	0.80	1.0
2	2019	1.8	2.0	1.0	1.2
3	2019	2.1	2.3	1.7	1.9
4	2019	1.4	1.6	1.1	1.3
5	2019	1.5	1.7	0.90	1.0
6	2019	2.4	2.6	1.3	1.5
7	2019	0.80	1.0	0.50	0.7
8	2019	1.5	1.7	1.3	1.5
9	2019	1.6	1.8	0.90	1.0
10	2019	0.90	1.1	0.40	0.50
11	2019	2.2	2.4	1.5	1.7
12	2019	2.4	2.6	1.8	2.0
13	2019	1.6	1.8	1.1	1.2
14	2019	1.2	1.4	0.90	1.1
15	2019	1.6	1.8	1.0	1.2
16	2019	0.90	1.1	0.60	0.70
17	2019	1.5	1.7	0.80	0.90
18	2019	1.5	1.8	1.1	1.3
19	2021	0.40	1.6	0.10	0.20
20	2019	1.3	1.4	1.3	1.4
21	2019	1.8	2.0	1.2	1.3
22	2019	1.6	1.8	0.90	1.1
23	2019	1.6	1.8	1.3	1.5
24	2019	1.9	2.1	1.0	1.5
25	2019	2.3	2.5	1.4	1.5
26	2019	1.6	1.8	1.0	1.2
27	2019	1.0	1.1	0.50	0.80
28	2021	0.50	0.6	0.10	0.30
29	2019	1.3	1.5	0.40	0.60
30	2019	1.5	1.7	0.70	0.90
31	2019	0.80	1.0	0.30	0.50

All data presented to two significant figures.

APPENDIX 7. BIODIVERSITY MONITORING RESULTS

Table 25. Performance of Biodiversity Offset sites 2022

Objective	Performance indicator	Completion Criteria	Reference				Rehabilitation			
			Site 1a	Site 1c	Site 3a	Site 5a	Site 6a	Site 7a	Site 8a	Site 9a
Where active regeneration is required for offset areas, targeted vegetation communities are established	Species composition for active vegetation regeneration	Tree, shrub and ground cover species selected from published species composition lists for targeted vegetation communities.	N/A	N/A	N/A	N/A	Y	Y	Y	Y
		Hunter Lowland Redgum Forest is part of the vegetation community within the Wildlife Refuge.	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A
		Spotted Gum - Grey Box woodland is part of the vegetation community within the Northern Offset area.	N/A	N/A	Y	N/A	N/A	N/A	N/A	N/A
		Native woodland communities established within the Southern Offset area included: • Narrow-leaved Ironbark Woodland; • Spotted Gum - Grey Box Woodland; and • Red Gum Forest	N/A	N/A	N/A	N/A	Y	Y	Y	Y
Actively regenerated vegetation (if required) successfully established	Canopy and understorey (tree and shrub) establishment	Seed and or planting establishment results in > 200 stems/ha of understorey and > 400 stems/ha of canopy species at the end of 12 months.	N/A	N/A	N/A	N/A	N	N	N	N
Threats to vegetation establishment are actively monitored and managed	Unauthorised access	Unauthorised access (firewood collection, shooting) prevented through adequate fencing, signage and inspections.	Y	Y	Y	Y	Y	Y	Y	Y
	Weeds management	Weeds species < 20% of species diversity and < 20% groundcover	Y	Y	Y	Y	N	N	N	N
	Spontaneous combustion	No visible spontaneous combustion or vegetation impacts.	Y	Y	Y	Y	Y	Y	Y	Y
	Feral animal management	Regular feral animal management implemented to protect rehabilitation.	Y	Y	Y	Y	Y	Y	Y	Y

Key

	Met performance criteria
	Did not meet performance criteria

Table 26. Performance of pasture rehabilitation sites 2022

Objective	Performance Indicator	Completion Criteria	Site 11c	Site 11f	Site 11g	Site 11h
Groundcover vegetation established to support low intensity grazing	Groundcover establishment	Groundcover vegetation established consisting of suitable mix of perennial grasses, forbs and legume species.	Y	Y	Y	Y
		Pasture vegetation is > 70% cover after 12 months.	Y	Y	Y	Y
	Species diversity	No single species represents more than 40% of cover.	N	Y	N	N
		At least 3 perennial pasture species present (> 3 months after grazing or slashing).	Y	Y	Y	Y
Risks to vegetation establishment monitored and managed	Weed management	Weeds of concern represent < 20% of species diversity and < 20% groundcover.	Y	Y	Y	Y
	Spontaneous combustion	No visible spontaneous combustion or vegetation impacts.	Y	Y	Y	Y
	Feral animal management	Rehabilitation establishment is not being impeded by feral animals.	Y	Y	Y	Y

Key

	Met performance criteria
	Did not meet performance criteria

Table 27. Performance of woodland rehabilitation sites 2022

Objective	Performance indicator	Completion Criteria	Site 10b	Site 10e	Site 12a
Successful initial establishment of vegetation cover	Vegetation cover establishment	Combined groundcover and foliar cover > 50% after 12 months.	Y	Y	Y
	Groundcover as erosion protection	No bare patches in groundcover vegetation > 100 square metres or active erosion rills > 30cm depth.	N	Y	Y
Tree and shrub establishment to facilitate development of native woodland vegetation	Native tree and shrub establishment	Tree and shrub species consistent with key species of: • Narrow Leaved Ironbark Woodland0d • Spotted Gum – Grey Box Woodland; and • Red Gum Woodland.	N	Y	Y
		Seed and or planting establishment results in > 200 stems/ha of understorey and > 400 stems/ha of canopy species at the end of 12 months.	N/A	Y	Y
Risks to vegetation establishment monitored and managed	Weed management	Weeds of concern represent < 20% of species diversity and < 20% groundcover.	Y	Y	Y
	Spontaneous combustion	No visible spontaneous combustion or vegetation impacts.	Y	Y	Y
	Feral animal management	Rehabilitation establishment is not being impeded by feral animals.	Y	Y	Y
	Unauthorised access	Unauthorised access (firewood collection, shooting) prevented through adequate fencing, signage and inspections.	Y	Y	Y
	Bushfire management	Firebreaks and access trails maintained.	Y	Y	Y

Key

	Met performance criteria
	Did not meet performance criteria

APPENDIX 8. WATER ACCOUNTING FRAMEWORK INPUT – OUTPUT STATEMENT

Reporting Period	Date	Storage (ML)
Start	01/01/2022	16,727
Finish	31/12/2022	19,715

INPUTS-OUTPUTS

Input-Output	Element (Source / Destination)	Sub-element (Inputs/Outputs)	Water Quality			Sub-element Total (ML)	Measured, Estimated, Simulated	Accuracy
			Category 1 (ML)	Category 2 (ML)	Category 3 (ML)			
Inputs	Surface Water	*Precipitation and Runoff*		2,618.6		**2,618.6**	Simulated	Medium
		Rivers and Creeks						
		External Surface Water Storage						
	Groundwater	*Aquifer Interception*			880.0	**880.0**	Estimated	Medium
		Bore Fields						
		Entrainment						
	Seawater	*Estuary*						
		Sea/Ocean						
	Third Party Water	*Contract*						
		Wastewater						
		Other	1.7				Measured	High
	TOTAL INPUTS		**1.7**	**2,618.6**	**880.0**	**3,500.3**		
Outputs	Surface Water	*Discharge*						
		Environmental Flows						
	Groundwater	*Seepage*						
		Reinjection						
	Seawater	*Discharge to Estuary*						
		Discharge to Sea/Ocean						
	Supply to Third Party							
	Other	*Evaporation*	558.4			**558.4**	Simulated	Medium
		Entrainment						
		Other (potable, misc)						
	TOTAL OUTPUTS		**558.4**			**558.4**		

APPENDIX 9. SURFACE WATER QUALITY RESULTS

Mine water storage monitoring locations

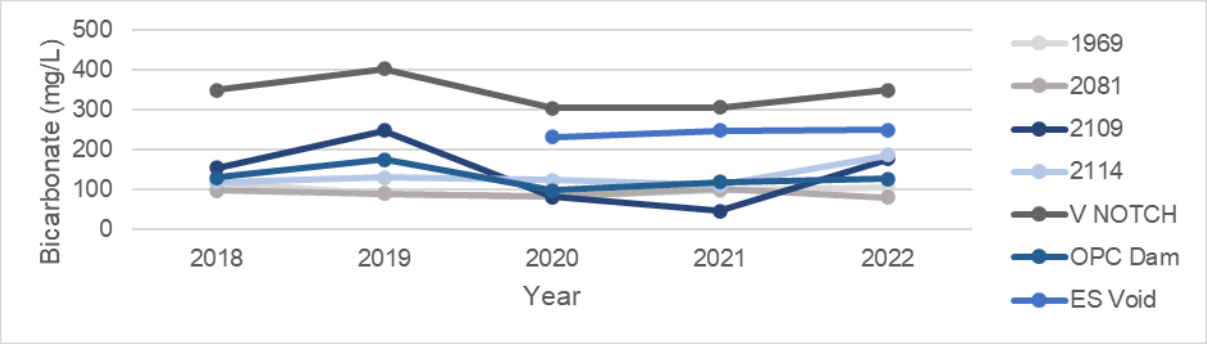


Figure 31. Long-term surface water bicarbonate

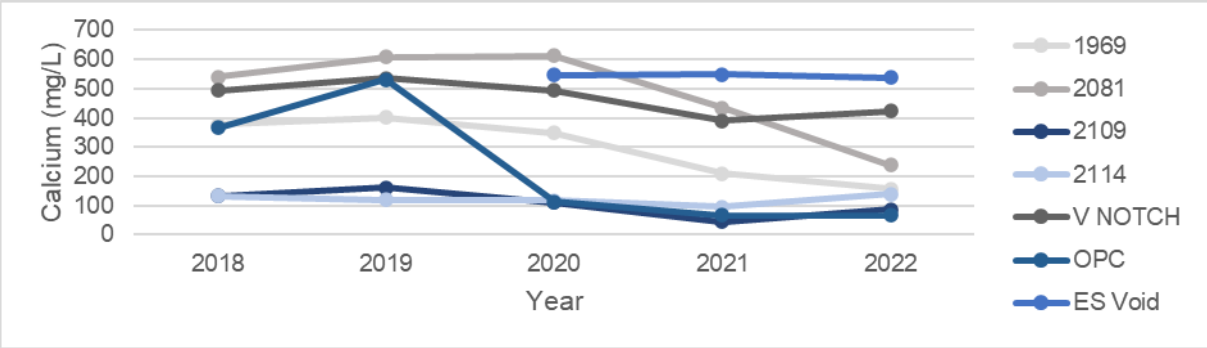


Figure 32. Long-term surface water calcium

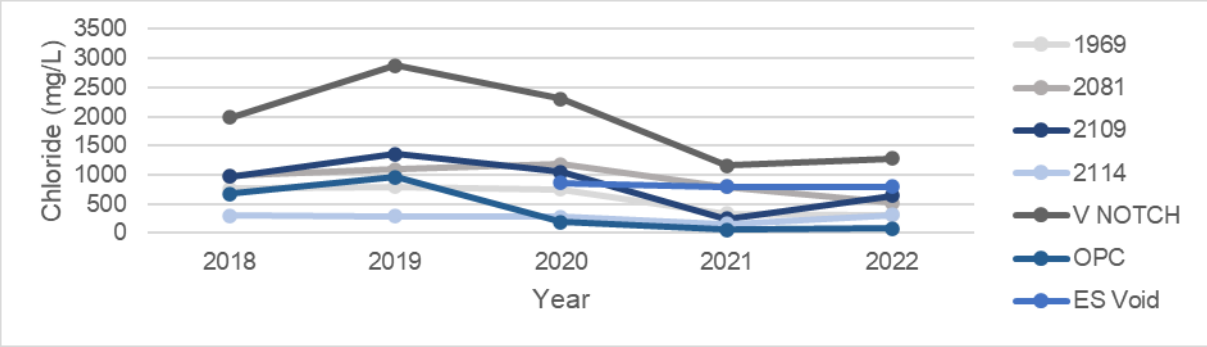


Figure 33. Long-term surface water chloride

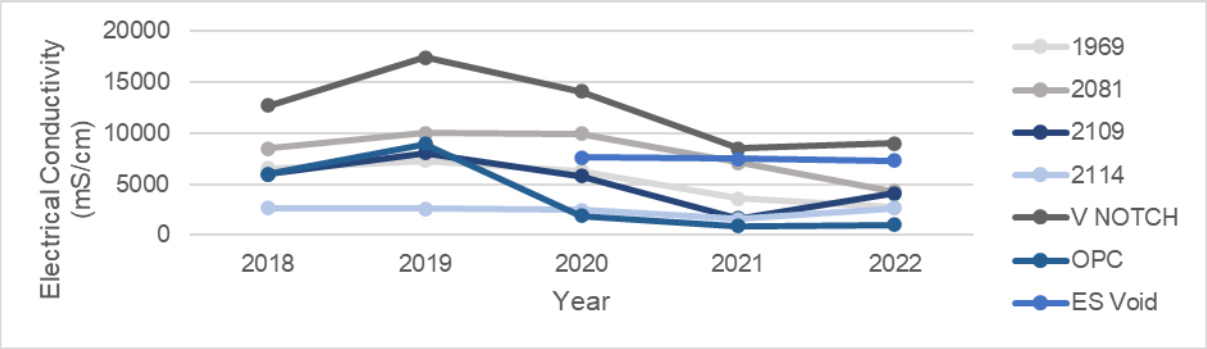


Figure 34. Long-term surface water electrical conductivity

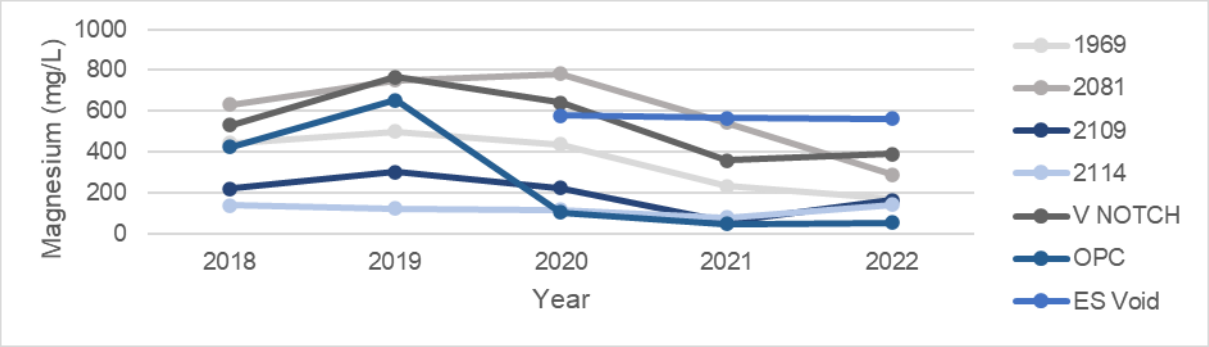


Figure 35. Long-term surface water magnesium

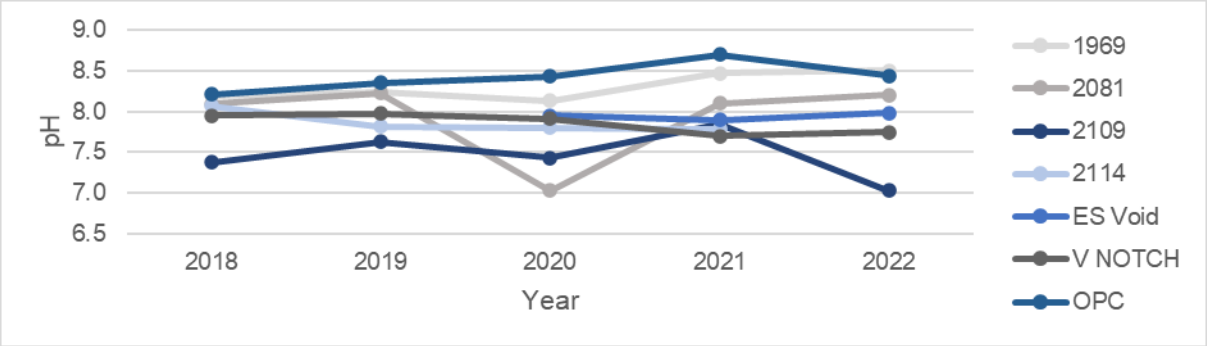


Figure 36. Long-term surface water pH

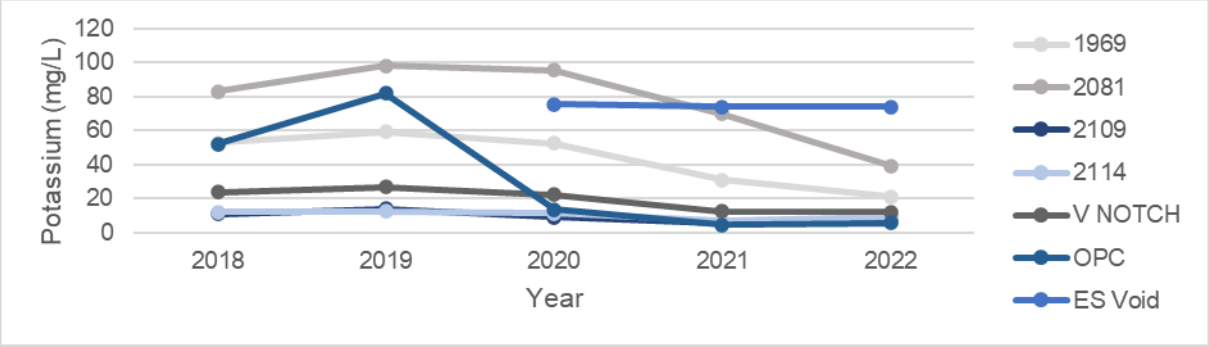


Figure 37. Long-term surface water potassium

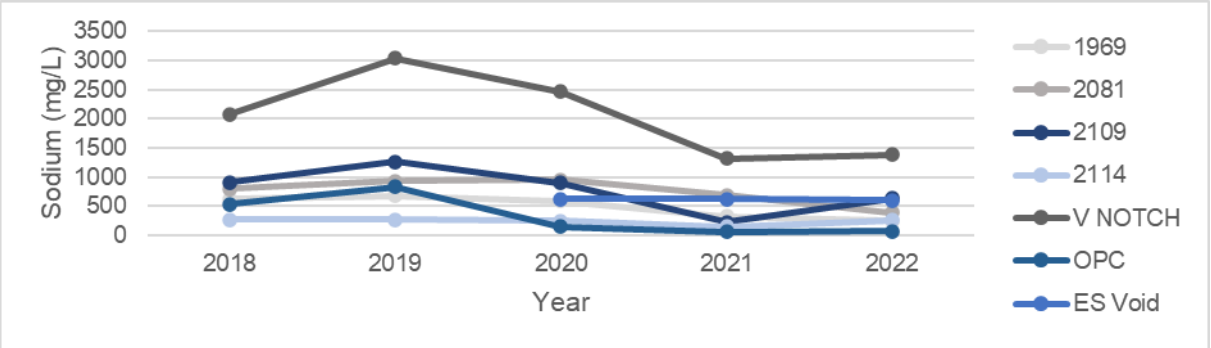


Figure 38. Long-term surface water sodium

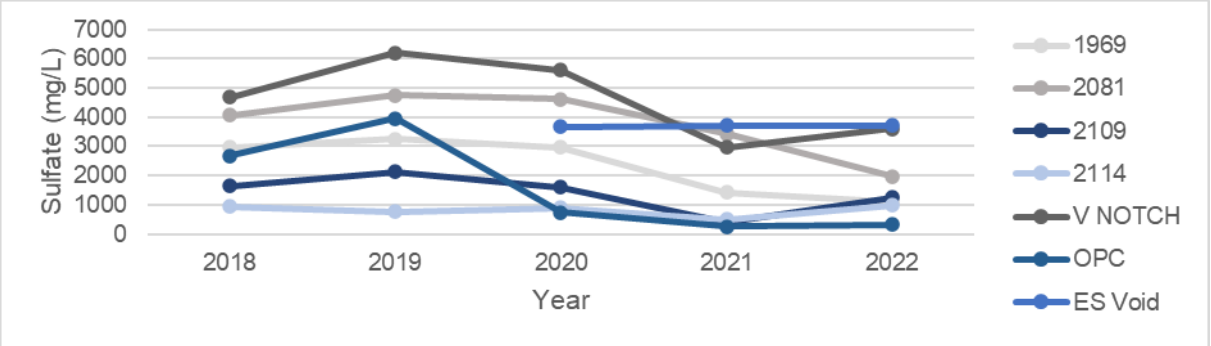


Figure 39. Long-term surface water sulfate

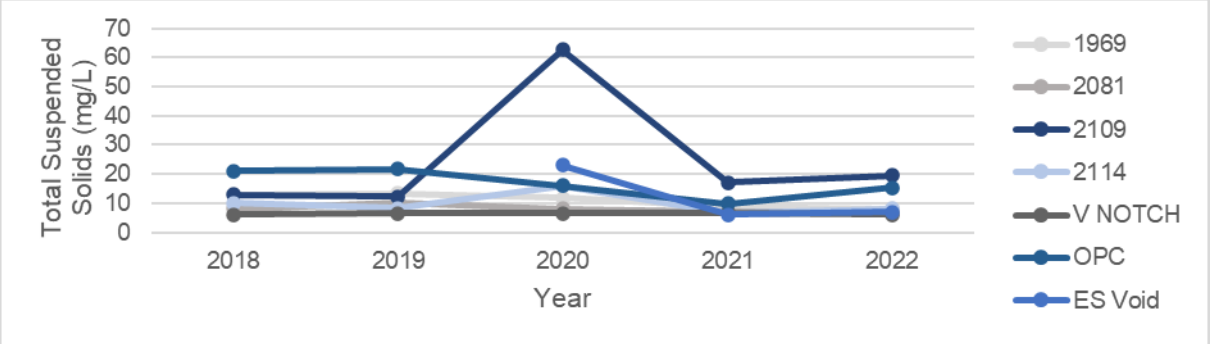


Figure 40. Long-term surface water total suspended solids

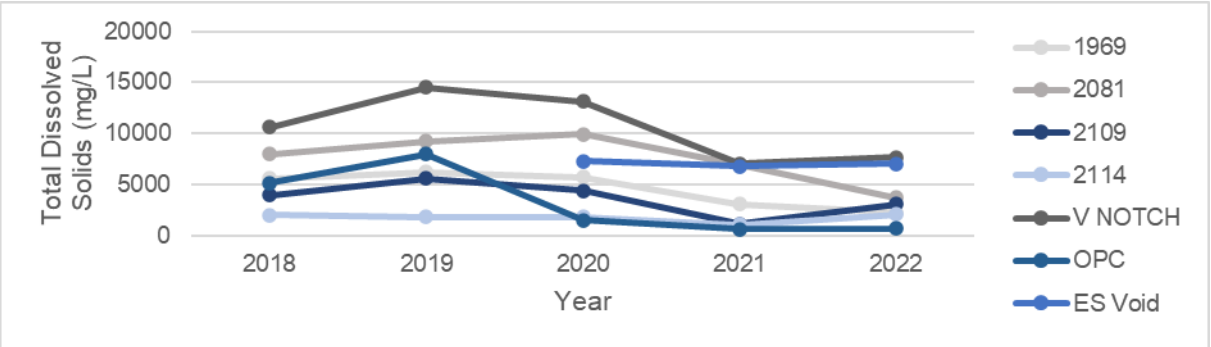


Figure 41. Long-term surface water total dissolved solids

Downstream Surface Water Monitoring Locations

Notes
Laboratory results only included. Field measurements are not included as these are deemed for use for investigatory purposes only and there are no trigger levels set.
Results include all sampling events including post-rainfall.

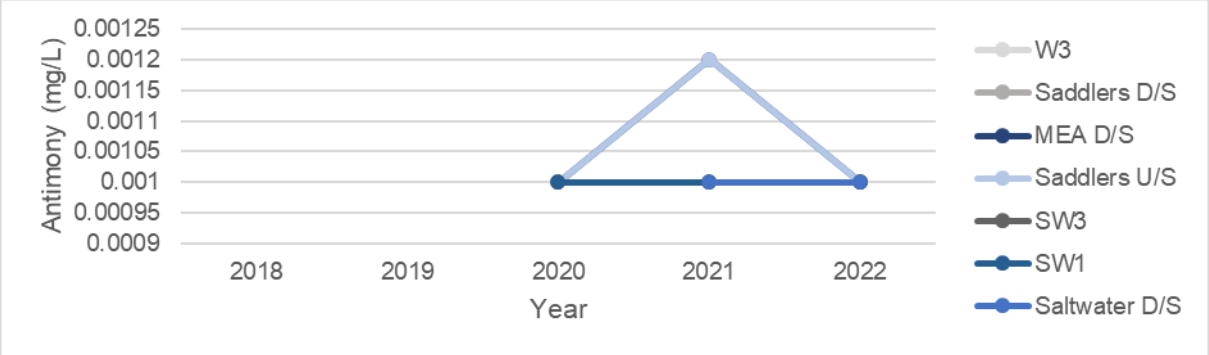


Figure 42. Antimony

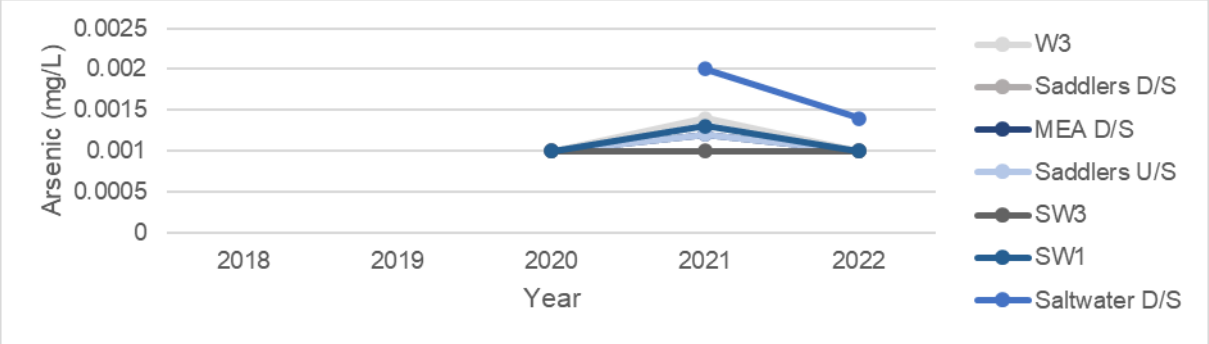


Figure 43. Arsenic

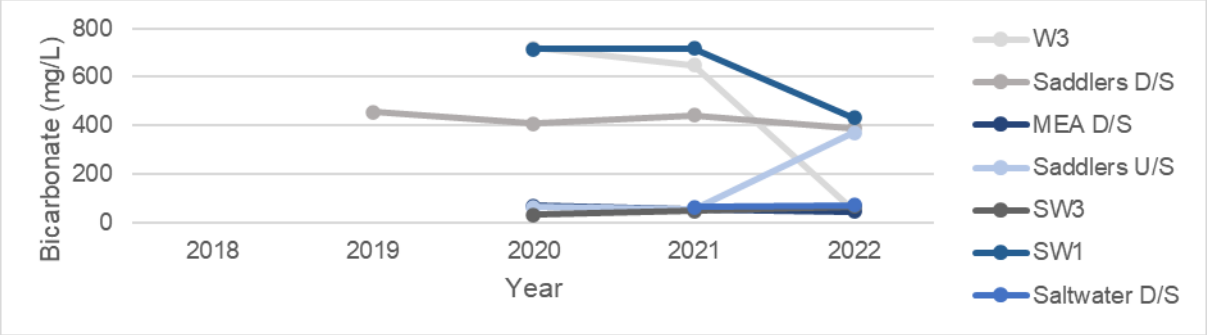


Figure 44. Bicarbonate

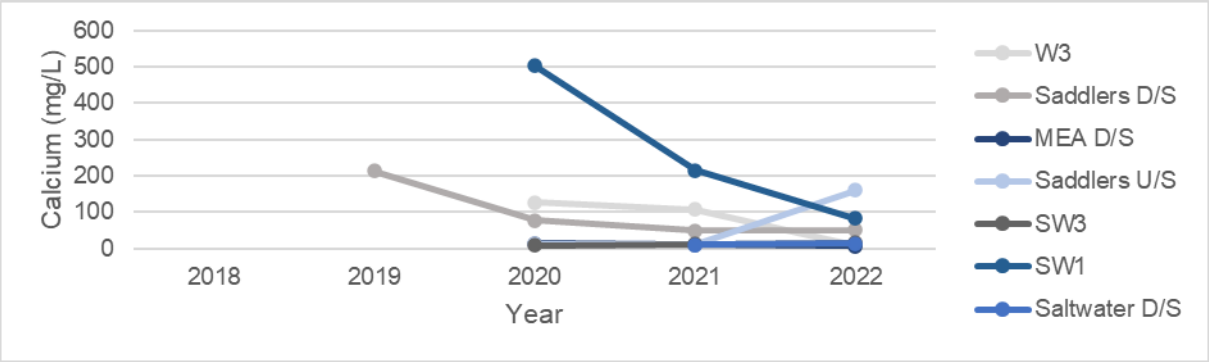


Figure 45. Calcium

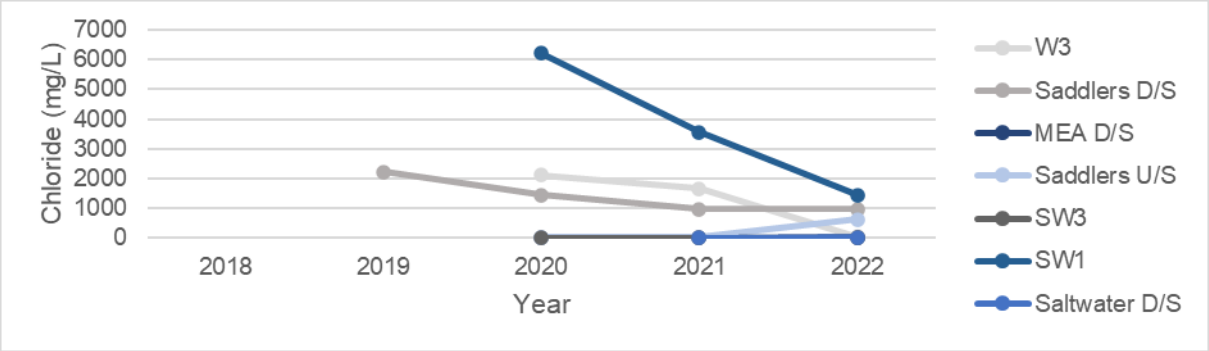


Figure 46. Chloride

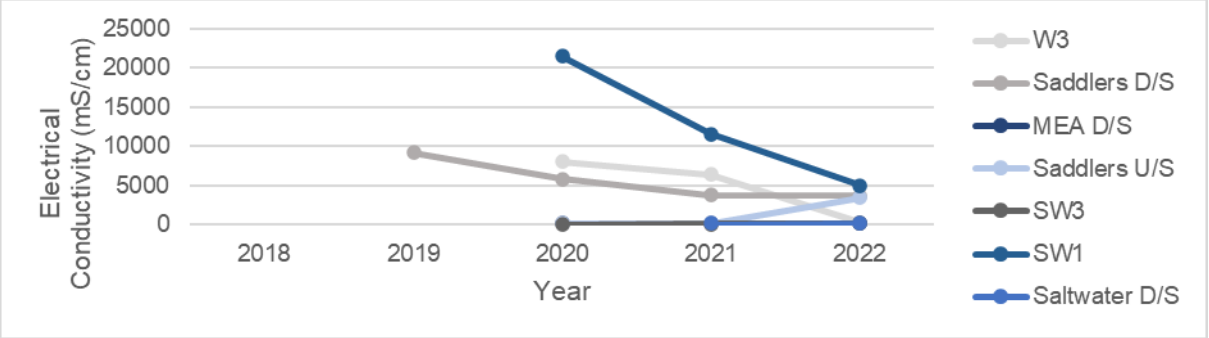


Figure 47. Electrical conductivity

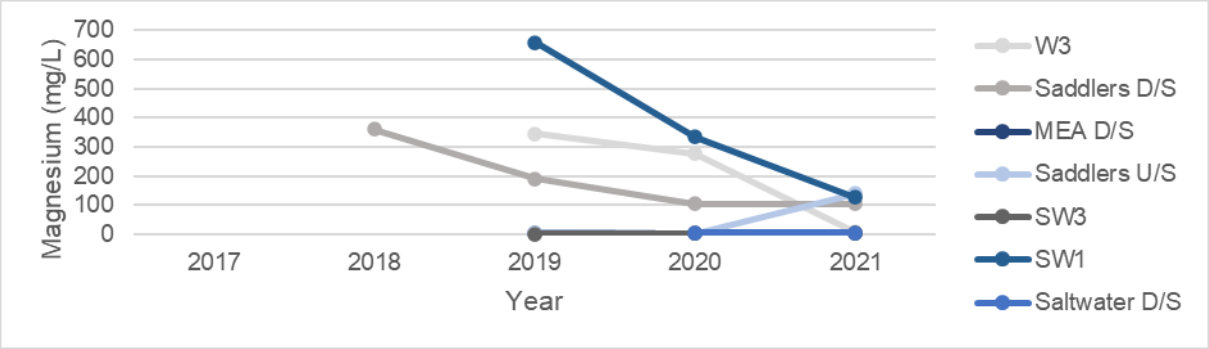


Figure 48. Magnesium

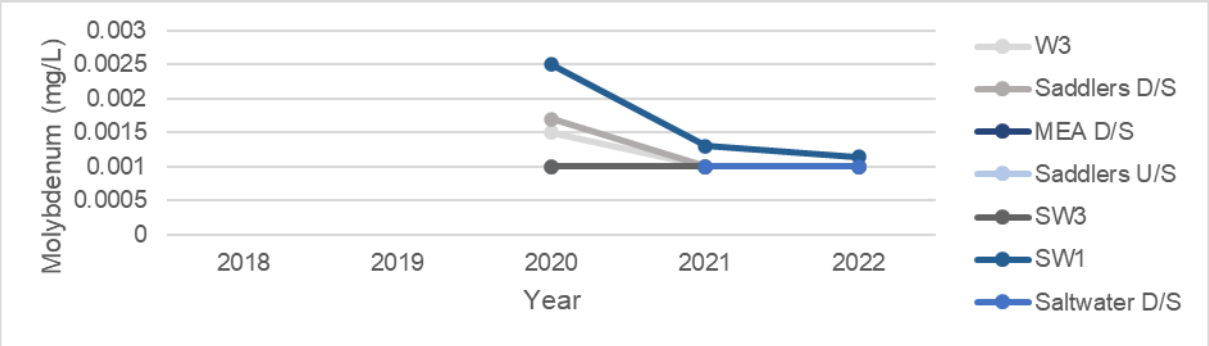


Figure 49. Molybdenum

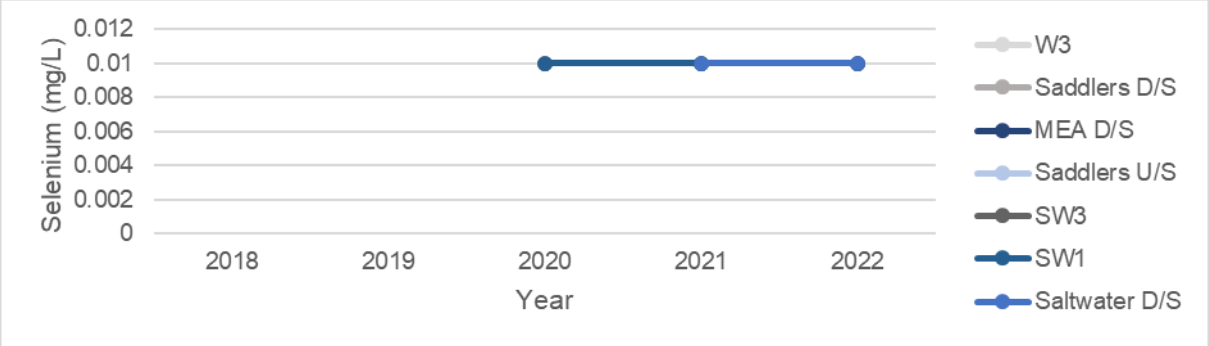


Figure 50. Selenium

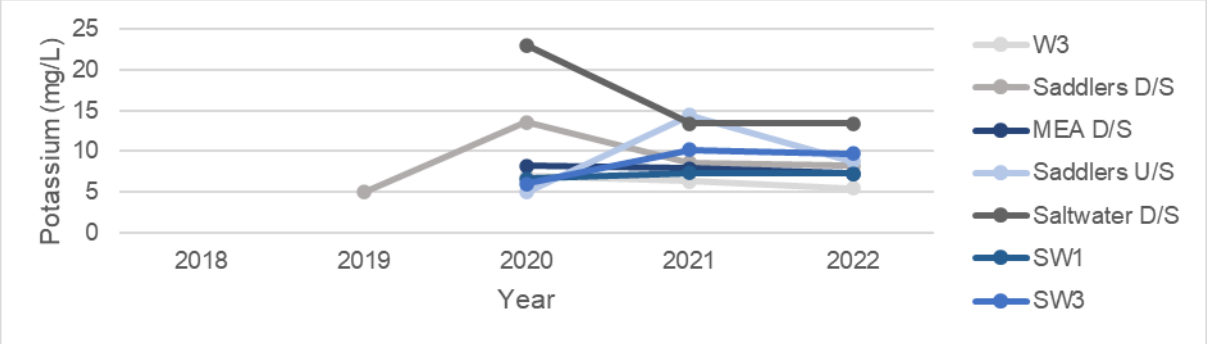


Figure 51. Potassium

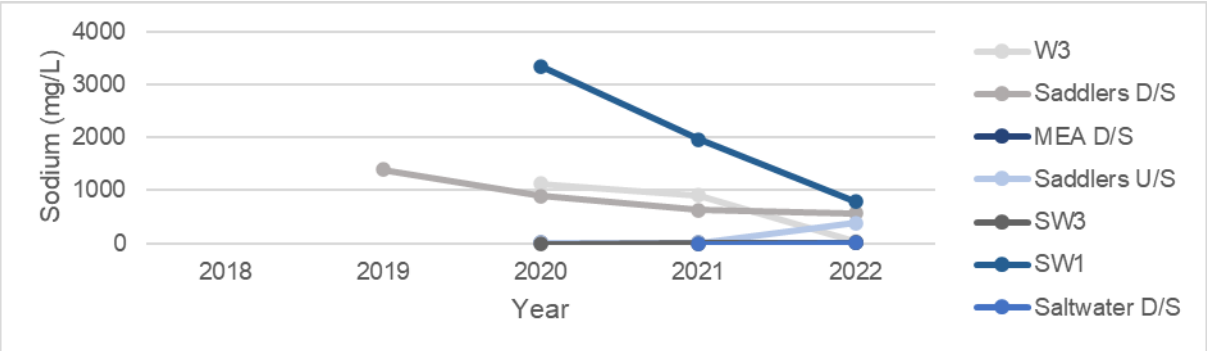


Figure 52. Sodium

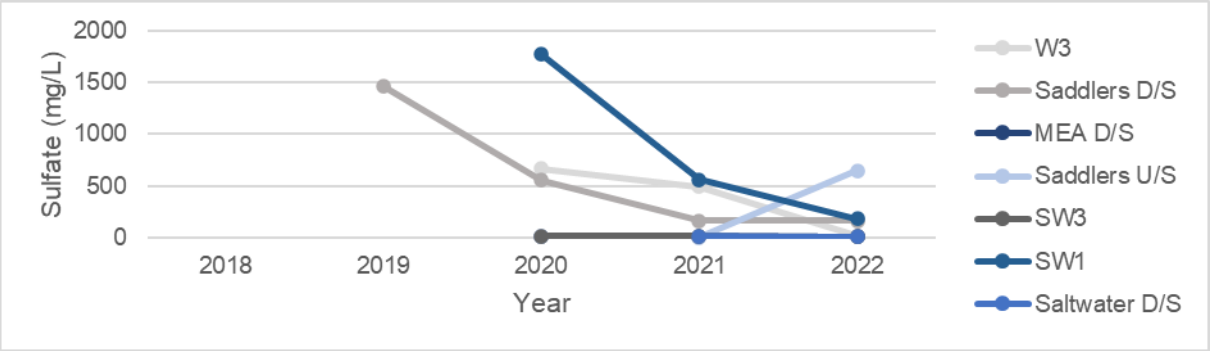


Figure 53. Sulfate

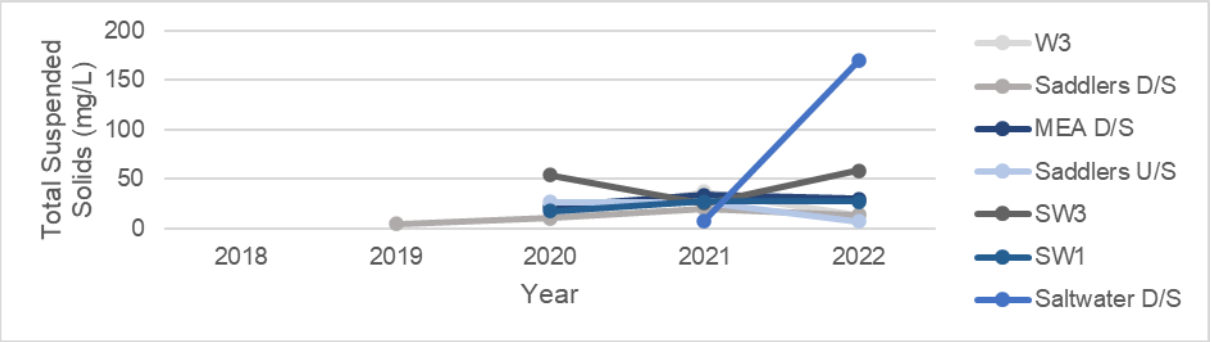


Figure 54. Total suspecded solids

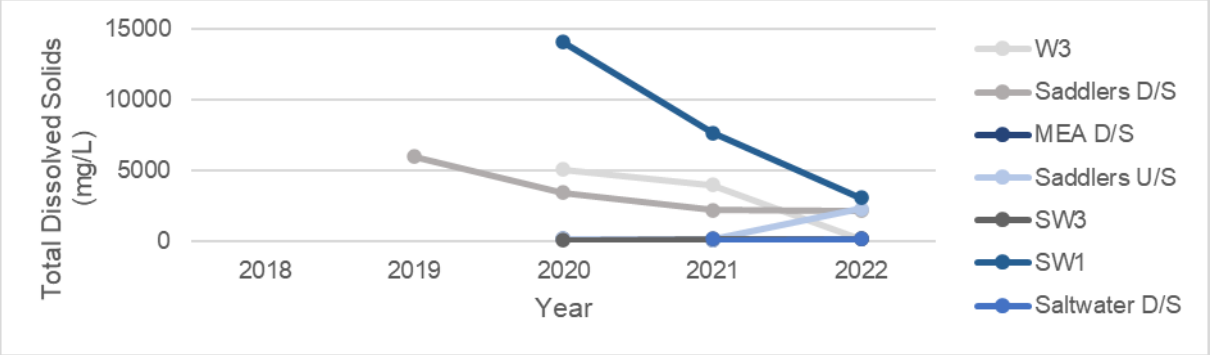


Figure 55. Total dissolved solids

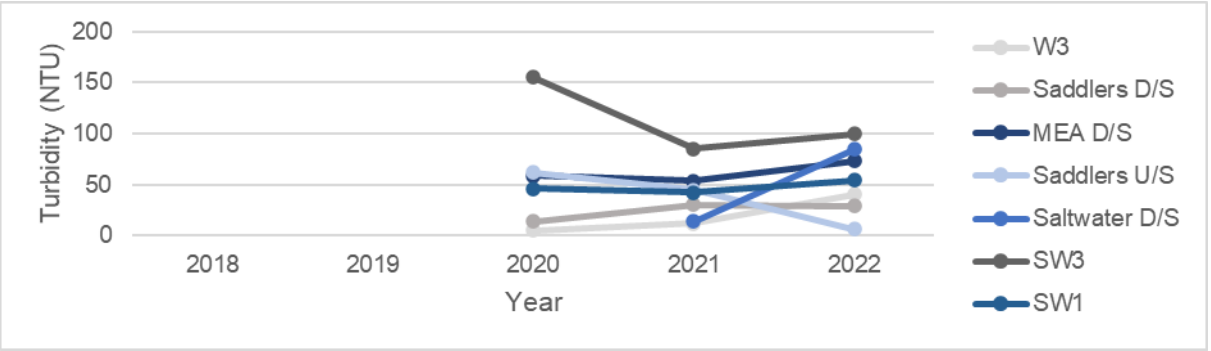


Figure 56. Turbidity

Table 28. Surface water scheduled field measurements at sites along Saddlers Creek for Q1 to Q4 2022 and comparison against trigger levels.
If an exceedance of the trigger level occurs for three consecutive readings, this is highlighted in red.

Site		Field result											
		pH				EC				Turbidity			
	Units	pH				µS/cm				NTU			
	Trigger	6.5–8.5				7,600				64			
		Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2022	Q2 2022	Q3 2022	Q4 2022
W3		Dry	TLTS	TLTS	TLTS	Dry	TLTS	TLTS	TLTS	Dry	TLTS	TLTS	TLTS
Saddlers D/S (W4 – Bowfield)		8.1	8.3	8.2	7.9	7,910	2,025	4,370	1,184	2.4	15	6.5	24
MEA D/S		6.5	7.9	8.2	8.5	156	118	119	258	6.7	62	135	100
Saddlers U/S		7.8	8.0	8.0	7.8	2,451	1,706	6,009	2,950	2.4	6.1	3.0	13
Saltwater D/S		6.5	7.9	7.3	6.9	160	231	206	158	220	39	50	82
SW1/ Saddlers		7.6	8.0	7.8	7.8	1,350	5,160	6,001	1,013	7.9	19	6.4	68
SW2	Not yet operational	-	-	-	-	-	-	-	-	-	-	-	-
SW3		Dry	TLTS	8.1	6.9	Dry	TLTS	355	355	Dry	TLTS	88	59

Notes

- Any exceedances of trigger values will only be investigated if they occur after construction commences. TLTS = too low to sample.

Table 29. Surface water laboratory results at sites along Saddlers Creek (scheduled and post-rainfall sampling) during Q1 to Q4 2022 and comparison against trigger levels.

If an exceedance of the trigger level occurs for three consecutive readings, this is highlighted in red.

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[(c)]	13[(c)]	24 [(b) (c)]	[(a)]	[(a)]	[(a)]	[(a)]	34[(c)]	[(a)]	11[(c)]	[(a)]	[(a)]	50	4900
W3	8/1/22	Rainfall	Too low to sample													
	27/1/22	Scheduled	Dry													
	6/3/22	Rainfall	Too low to sample													
	8/3/22	Rainfall	0.0010	0.0010	0.0010	40	5.0	26	5.0	0.0010	6.0	0.010	18	1.0	20	157
	28/3/22	Rainfall	Too low to sample													
	5/4/22	Scheduled	Too low to sample													
	4/7/22	Rainfall	0.0010	0.0010	0.0010	41	5.0	32	6.0	0.0010	6.0	0.010	22	8.0	16	143
	6/7/22	Rainfall	0.0010	0.0010	0.0010	67	10	71	12	0.0010	5.0	0.010	47	26	5.0	319
	13/7/22	Scheduled	Too low to sample													
	10/10/22	Rainfall	Too low to sample													
	27/10/22	Scheduled	Too low to sample													

Site	Sample date	Sampling type	Laboratory result												
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[c]	13[c]	24 [b] [c]	[a]	[a]	[a]	[a]	34[c]	[a]	11[c]	[a]	[a]	50	4900
	14/11/22	Rainfall	0.0010	0.0010	0.0010	50	6.0	42	9.0	0.0010	5.0	0.010	32	9.0	15	195
Saddlers D/S (W4 – Bowfield)	8/1/22	Rainfall	0.0010	0.0010	0.0010	627	67	1580	150	0.0010	9.0	0.010	944	208	10	3560
	27/1/22	Scheduled	0.0010	0.0010	0.0010	753	85	2040	210	0.0010	9.0	0.010	1100	263	5.0	4350
	6/3/22	Rainfall	0.0010	0.0010	0.0010	511	77	1820	186	0.0010	12	0.010	1000	222	29	3620
	8/3/22	Rainfall	No access, too wet													
	28/3/22	Rainfall	0.0010	0.0010	0.0010	122	17	244	28	0.0010	9.0	0.010	134	51	16	579
	5/4/22	Scheduled	0.0010	0.0010	0.0010	344	42	591	68	0.0010	8.0	0.010	368	138	5.0	1440
	4/7/22	Rainfall	No access, too wet													
	6/7/22	Rainfall	No access, too wet													
	25/7/22	Scheduled	0.0010	0.0010	0.0010	500	75	1170	146	0.0010	8.0	0.010	755	254	5.0	2590
	10/10/22	Rainfall	0.0010	0.0010	0.0010	72	14	79	15	0.0010	5.0	0.010	60	53	28	474
	28/10/22	Scheduled	0.0010	0.0010	0.0010	189	28	301	38	0.0010	6.0	0.010	181	89	12	806
	14/11/22	Rainfall	No access, too wet													
MEA D/S	8/1/22	Rainfall	No access, too wet													

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[c]	13[c]	24 [b] [c]	[a]	[a]	[a]	[a]	34[c]	[a]	11[c]	[a]	[a]	50	4900
	28/1/22	Scheduled	0.0010	0.0010	0.0010	82	8.0	9.0	5.0	0.0010	9.0	0.010	10	1.0	7.0	125
	6/3/22	Rainfall	No access, too wet													
	8/3/22	Rainfall	No access, too wet													
	28/3/22	Rainfall	No access, too wet													
	5/4/22	Scheduled	0.0010	0.0010	0.0010	41	6.0	11	3.0	0.0010	8.0	0.010	10	10	66	172
	4/7/22	Rainfall	No access, too wet													
	6/7/22	Rainfall	No access, too wet													
	27/7/22	Scheduled	0.0010	0.0010	0.0010	34	6.0	10	3.0	0.0010	7.0	0.010	10	10	12	204
	10/10/22	Rainfall	No access, too wet													
	27/10/22	Scheduled	0.0010	0.0010	0.0010	28	5.0	14	3.0	0.0010	5.0	0.010	11	1.0	34	185
	14/11/22	Rainfall	No access, too wet													
Saddlers U/S	8/1/22	Rainfall	No access, too wet													
	27/1/22	Scheduled	0.0010	0.0040	0.0040	408	119	395	100	0.0010	11	0.010	171	223	5.0	1420
	6/3/22	Rainfall	No access, too wet													

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[c]	13[c]	24 [b] [c]	[a]	[a]	[a]	[a]	34[c]	[a]	11[c]	[a]	[a]	50	4900
	8/3/22	Rainfall	No access, too wet													
	28/3/22	Rainfall	No access, too wet													
	5/4/22	Scheduled	0.0010	0.0010	0.0010	233	100	336	76	0.0010	9.0	0.010	203	389	5.0	1470
	4/7/22	Rainfall	No access, too wet													
	6/7/22	Rainfall	No access, too wet													
	27/7/22	Scheduled	0.0010	0.0010	0.0010	490	289	1090	262	0.0010	9.0	0.010	752	1360	5.0	4160
	10/10/22	Rainfall	No access, too wet													
	27/10/22	Scheduled	0.0010	0.0010	0.0010	355	131	679	126	0.0010	6.0	0.010	396	622	14	2200
	14/11/22	Rainfall	No access, too wet													
Saltwater D/S	8/1/22	Rainfall	No access, too wet													
	28/1/22	Scheduled	0.0010	0.0020	0.0020	106	12	3.0	4.0	0.0010	14	0.010	10	1.0	564	119
	6/3/22	Rainfall	No access, too wet													
	8/3/22	Rainfall	0.0010	0.0010	0.0010	35	6.0	19	4.0	0.0010	3.0	0.010	17	10	30	207
	28/3/22	Rainfall	No access, too wet													

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[(c)]	13[(c)]	24 [(b) (c)]	[(a)]	[(a)]	[(a)]	[(a)]	34[(c)]	[(a)]	11[(c)]	[(a)]	[(a)]	50	4900
	5/4/22	Scheduled	0.0010	0.0010	0.0010	83	18	19	6.0	0.0010	22	0.010	10	10	22	213
	4/7/22	Rainfall	No access, too wet													
	6/7/22	Rainfall	No access, too wet													
	1/8/22	Scheduled	0.0010	0.0010	0.0010	60	13	25	6.0	0.0010	19	0.010	10	10	58	189
	10/10/22	Rainfall	No access, too wet													
	27/10/22	Scheduled	0.0010	0.0020	0.0010	70	13	7.0	5.0	0.0010	9.0	0.010	7.0	10	174	215
	14/11/22	Rainfall	No access, too wet													
SW1/ Saddlers	8/1/22	Rainfall	0.0010	0.0010	0.0010	597	136	2570	201	0.0010	9.0	0.010	1300	345	10	5520
	27/1/22	Scheduled	0.0010	0.0010	0.0010	896	188	3690	327	0.0020	6.0	0.010	1870	423	6.0	7800
	6/3/22	Rainfall	0.0010	0.0010	0.0010	68	14	171	14	0.0010	8.0	0.010	103	22	119	452
	8/3/22	Rainfall	No access, too wet													
	28/3/22	Rainfall	0.0010	0.0010	0.0010	90	14	125	13	0.0010	8.0	0.010	77	16	26	402
	5/4/22	Scheduled	0.0010	0.0010	0.0010	582	106	1670	158	0.0010	7.0	0.010	976	203	12	3590
	4/7/22	Rainfall	No access, too wet													

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			9[c]	13[c]	24 [b] [c]	[a]	[a]	[a]	[a]	34[c]	[a]	11[c]	[a]	[a]	50	4900
	6/7/22	Rainfall	No access, too wet													
	1/8/22	Scheduled	0.0010	0.0010	0.0010	606	98	1600	145	0.0010	7.0	0.010	1030	203	11	3340
	10/10/22	Rainfall	No access, too wet													
	28/10/22	Scheduled	0.0010	0.0010	0.0010	174	23	270	23	0.0010	6.0	0.010	162	22	8.0	708
	14/11/22	Rainfall	No access, too wet													
SW2	-	-	Location to be established – see notes													
SW3	8/1/22	Rainfall	0.0010	0.0010	0.0010	54	8.0	6.0	2.0	0.0010	10	0.010	4.0	10	20	124
	27/1/22	Scheduled	Dry													
	6/3/22	Rainfall	0.0010	0.0010	0.0010	32	7.0	5.0	2.0	0.0010	10	0.010	3.0	4.0	96	153
	8/3/22	Rainfall	0.0010	0.0010	0.0010	29	6.0	6.0	2.0	0.0010	9.0	0.010	3.0	1.0	221	161
	28/3/22	Rainfall	0.0010	0.0010	0.0010	79	20	10	7.0	0.0010	13	0.010	6.0	10	18	202
	5/4/22	Scheduled	Too low to sample													
	4/7/22	Rainfall	No access, too wet													
	6/7/22	Rainfall	No access, too wet													

Site	Sample date	Sampling type	Laboratory result													
			Sb	As (V)	As (III)	$CaCO_3$	Ca	Cl	Mg	Mb	K	Se	Na	SO_4	TSS	TDS
Units			mg/L	mg/L mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L
Trigger			**9**[c]	**13**[c]	**24** [b] [c]	[a]	[a]	[a]	[a]	**34**[c]	[a]	**11**[c]	[a]	[a]	**50**	**4900**
	13/7/22	Scheduled	0.0010	0.0010	0.0010	115	32	24	11	0.0010	10	0.010	11	1.0	9.0	258
	10/10/22	Rainfall	No access, too wet													
	27/10/22	Scheduled	0.0010	0.0010	0.0010	103	26	43	11	0.0010	8.0	0.010	25	10	11	260
	14/11/22	Rainfall	0.0010	0.0010	0.0010	53	12	17	5.0	0.0010	8.0	0.010	12	10	34	155

(a) No trigger; for interpretation purposes only

(b) Result is a combination of As (V) and As (III)

(c) Trigger set as a preliminary guideline value

APPENDIX 10. STREAM HEALTH MONITORING RESULTS

Table 30. Stream Health Monitoring Records – Site: W3

Measured variable	Baseline condition (Q3 2020)	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Flow conditions	No flow.	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel setting	Flow (when present) will be heavily constrained by weeds; singular channel, contained within shallow valley.	NC	NC	NC	-	NC	NC	NC	NC	NC
Valley shape	Steep unconsolidated walls, no cliffs.	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel shape variability	Regular	NC	NC	NC	-	NC	NC	NC	NC	NC
Bed material	Mud (silt and clay)	NC	NC	NC	-	NC	NC	NC	NC	NC
Large wood and log jams	None	NC	NC	NC	-	NC	NC	NC	NC	NC
Pool dimensions	No pools visible	NC	NC	NC	-	NC	NC	NC	NC	NC
Pool hydraulic control	No pools visible	NC	NC	NC	-	NC	NC	NC	NC	NC
Exposed bedrock feature	None	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel dimensions	~12m	NC	NC	NC	-	NC	NC	NC	NC	NC
Knickpoint type and dimensions	None	NC	NC	NC	-	NC	NC	NC	NC	NC
In-channel vegetation	Heavily and continuously infested with Juncus acutus (90%)	Increase in weed variety: phragmities australis and	NC	Increased in height and thickness	-	NC	Increased height thickness	Increased height & thickness of juncus acutus also	Increased thickness and height of juncus	Higher Rainfall Increased thickness

Measured variable	Baseline condition (Q3 2020)	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
		thistle (~10% combined)						native phragmities australis present in approx. 30% of area monitored	acutus Due to higher rainfall during 3mths	
Width of riparian vegetation	~30m	~30m	NC	NC	-	NC	<50cm wider	<30cm wider	<20cm wider	NC
Composition and cover of riparian vegetation	Grass exotics on lower banks; upper banks have Acacia saligna or similar.	Thistles have appeared (~10% cover)	NC	Thicker growth	-	NC	Thicker	Thicker	Thicker	Slightly Thicker
Swamp Oak health	Baseline assessment commenced Q2 2021.	-	-	None present in locality	-	NC	NC	NC	NC	NC
Other observations	Some slippage of mid-bank due to cattle and of upper bank due to steepness.	Stake with blue marker added	NC	Small trees on bank have increased in height	-	NC	Cattle present	Small trees grown Wetter summer	Wetter winter. Small trees grown in height	Higher rainfall Surfaces wetter / boggier

NC = No change. Q3 2021 Survey was not undertaken due to COVID-19 restrictions

Table 31. Stream Health Monitoring Records – Site: Saddlers Downstream

Measured variable	Baseline condition (Q3 2020).	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Flow conditions	No flow.	NC	NC	NC	-	NC	NC	Low flow	Low flow	Medium flow
Channel setting	One confined channel consisting of large stagnant pools.	NC	NC	NC	-	NC	NC	Low flow in channel	Low flow into channel	Medium flow through channel
Valley shape	Moderate to steep/rocky banks: gorge on one side, low slope on other	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel shape variability	Irregular: V and U shape; meandering	NC	NC	NC	-	NC	NC	NC	NC	NC
Bed material	Sandy gravel to silt and clay, exposed bedrock	NC	NC	NC	-	NC	NC	NC	NC	NC
Large wood & log jams	None	NC	NC	NC	-	NC	NC	NC	Some small / medium branches. Due to recent flooding in area.	Vegetation flatter due to large rainfall even recently
Pool dimensions	Not measured	6.37m width w x ongoing x 0.5m deep	Rain pool ~ 70cm deep	60mm rain within past week; water level increased by 20+cm	-	Deeper water. Risen by ~20cm.	Deeper water	Deeper water approx. 1m	Deeper flowing water. Could not measure but >1m	Deeper faster flowing water, due to large rainfall event. Unable to measure. Approx. 1.8 – 2mt deep &

Measured variable	Baseline condition (Q3 2020).	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
										approx. 6mt wide
Pool hydraulic control	Rock bar to one side	NC	NC	NC	-	NC	NC	NC	NC	NC
Exposed bedrock feature	Bedrock visible on one bank	NC	NC	NC	-	NC	More veg.	NC	NC	NC
Channel dimensions	~5m	6.73m	NC	NC	-	NC	NC	NC	NC	NC
Knickpoint type and dimensions	None	NC	NC	NC	-	NC	NC	NC	NC	NC
In-channel vegetation	Juncus, exotic grasses, thistle, she oak.	Thistle increase (annual species)	NC	Thicker and taller	-	Thicker and taller	Thicker /taller	Taller vegetation, also present phragmities australis. Approx. 50% of area monitored	Thicker/Taller	Vegetation flatter due to large rain event
Width of riparian vegetation	~30m	~30m	NC	35+m	-	NC	Wider.	Vegetation spreading in width	Vegetation spread in width	Spread in width
Composition and cover of riparian vegetation	She oak: range of heights to >10m, exotic grasses	Bamboo and thistle newly present	More shrubs / grasses grown	More growth in shrubs & grasses	-	NC	Taller /thicker due to flooding in Nov 21	NC	Thicker/Taller due to flooding in June/July	
Swamp Oak health	Baseline assessment commenced Q2	-	-	She oaks have grown, no damage, looking	-	NC	Good growth, approx. 1m higher & <50cm wider.	More growth, looking healthy grown taller	More growth. Very healthy	More growth - healthy

Measured variable	Baseline condition (Q3 2020).	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
	2021.			healthy			Healthy.	and wider, more saplings present		
Other observations		Site relocated (due to high water). Blue markers added.	NC	Increased water level	-	Increased water level from recent rains	Blue marker missing due to flooding.	NC	Post with blue marker replaced. Flooding went through approx. 1m to 1.5m up bank then receded, leaving debris	Overgrown &increased water level

Table 32. Stream Heath Monitoring Records – Site: Saddlers Upstream

Measured variable	Baseline condition (Q3 2020)	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Flow conditions	No flow – dry.	NC	NC	NC	-	NC	NC	Pools of water present now	Pools of water larger	Slow flow to a trickle due to large rain event
Channel setting	Part of a wider braided (3) creek network; channels confined, moderate depth.	NC	NC	NC	-	NC	NC	NC	NC	NC
Valley shape	Moderate to steep V-shape banks.	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel shape variability	Meandering, no cliffs, varying depths	NC	NC	NC	-	NC	NC	NC	NC	NC
Bed material	Mud (silt and clay)	NC	NC	NC	-	NC	NC	NC	NC	NC
Large wood and log jams	Some small logs/branches	NC	NC	NC	-	NC	More branches /logs due to Nov 21 flooding	NC	Logs & Branches moved due to larger flooding in June / July 2022	NC
Pool dimensions	3.5 x 1.8 x 0.5m depth (dry)	NC	NC	Pools have 30cm water due to recent rains	-	More water in pools	No pools	Pools have more water in them. Approx. 20 – 40cm	Pools now ~ 40cm - > 1m.	NC
Pool hydraulic control	Cohesive material	NC	NC	NC	-	NC	NC	NC	NC	NC

Measured variable	Baseline condition (Q3 2020)	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022
Exposed bedrock feature	None	NC	NC	NC	-	NC	NC	NC	NC	NC
Channel dimensions	2.5 + wide x 3.5m depth	NC	NC	NC	-	NC	NC	NC	NC	NC
Knickpoint type and dimensions	None.	NC	NC	NC	-	NC	NC	NC	NC	NC
In-channel vegetation	Mainly exotic grasses, some small she oak, some weeds (Juncus, thistle).	NC	NC	Grass has died off in channel	-	Grasses thicker, trees taller	More grass, trees higher, thicker	Longer grasses she oaks taller wider	Grasses thicker & longer. Good coverage	Grass thicker
Width of riparian vegetation	~80m.	NC	NC	NC	-	NC	NC	NC	NC	NC
Composition and cover of riparian vegetation	Exotic grasses, she oak of varying heights: <3 to >3m.	Thistle newly present	NC	NC	-	NC	NC	NC	Much denser	Denser
Swamp Oak health	Baseline condition commenced Q2 2021: Good general health likely due to high rainfall in Q1 2021, no apparent stress. Multiple smaller specimens are seen around the bank line, ranging in height from 20cm to approximately 1m. No evidence of disease or livestock damage.	-	-	See baseline	-	She oak health good, taller, no damage, smaller saplings starting to grow	Taller, thicker, healthy	Taller wider, health very good, newer saplings emerging	Healthy growth.	Healthy growth, more saplings present
Other observations		Stake with blue marker required	Stake with blue marker added	General area looks healthy and good native grasses.	-	NC	NC	NC	NC	Vegetation thicker surrounding area & tracks. Much wetter on tracks

Photos of Quarterly Stream Health Monitoring at commencement of monitoring in Q3 2020, to the end of the reporting period (Q4 2022).

Site: W3

Quarter	Date	Upstream photo	Downstream photo
Q3 2020	21/07/20		

Quarter	Date	Upstream photo	Downstream photo
Q4 2020	15/12/20		
Q1 2021	17/03/2021		

Quarter	Date	Upstream photo	Downstream photo
Q2 2021	15/06/2021		
Q3 2021	-	Survey not undertaken due to COVID-19 restrictions	Survey not undertaken due to COVID-19 restrictions

Quarter	Date	Upstream photo	Downstream photo
Q4 2021	26/10/21		
Q1 2022	31/1/22		

Quarter	Date	Upstream photo	Downstream photo
Q2 2022	27/4/22		

Quarter	Date	Upstream photo	Downstream photo
Q3 2022	25/7/22		

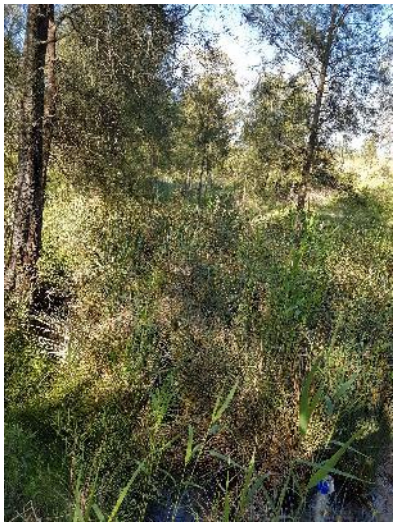
Quarter	Date	Upstream photo	Downstream photo
Q4 2022	27/10/22		

Site: Saddlers Downstream

Quarter	Date	Upstream photo	Downstream photo
Q3 2020	21/07/20		

Quarter	Date	Upstream photo	Downstream photo
Q4 2020	15/12/20 (sites relocated for Q4 2020)		
Q1 2021	17/03/21		

Quarter	Date	Upstream photo	Downstream photo
Q2 2021	15/06/2021		
Q3 2021	-	Survey not undertaken due to COVID-19 restrictions	Survey not undertaken due to COVID-19 restrictions

Quarter	Date	Upstream photo	Downstream photo
Q4 2021	26/10/21		

Quarter	Date	Upstream photo	Downstream photo
Q1 2022	31/1/22		

Quarter	Date	Upstream photo	Downstream photo
Q2 2022	27/4/22		

Quarter	Date	Upstream photo	Downstream photo
Q3 2022	25/7/22		
Q4 2022	27/10/22		

Site: Saddlers Upstream

Quarter	Date	Upstream photo	Downstream baseline photo
Q3 2020	21/07/20		
Q4 2020	15/12/20		

Quarter	Date	Upstream photo	Downstream baseline photo
Q1 2021	17/03/21		
Q2 2021	15/06/21		
Q3 2021	-	Survey not undertaken due to COVID-19 restrictions	Survey not undertaken due to COVID-19 restrictions

Quarter	Date	Upstream photo	Downstream baseline photo
Q4 2021	26/10/21		

Quarter	Date	Upstream photo	Downstream baseline photo
Q1 2022	31/1/22		
Q2 2022	27/4/22		

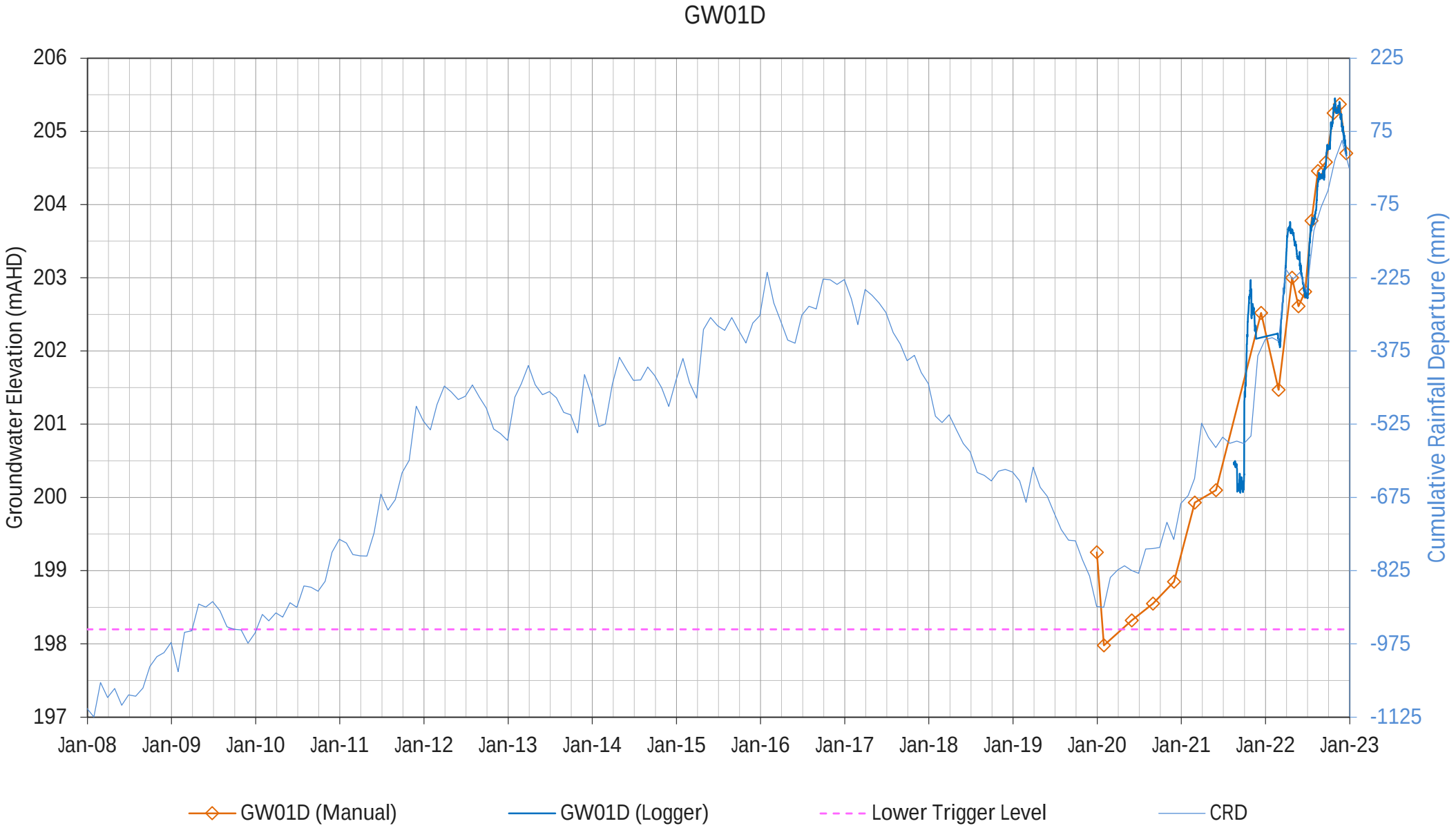
Quarter	Date	Upstream photo	Downstream baseline photo
Q3 2022	25/07/22		

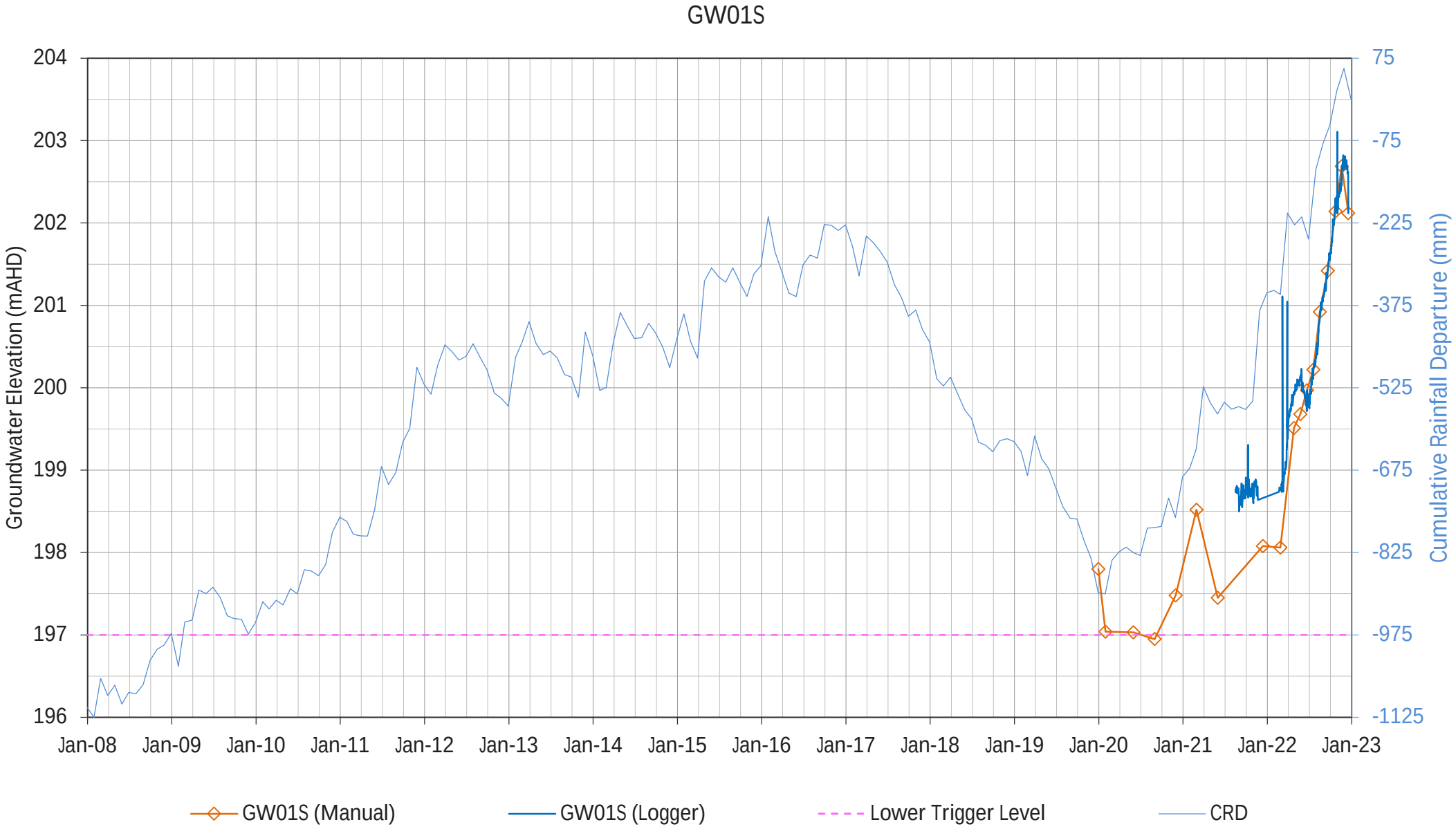
Quarter	Date	Upstream photo	Downstream baseline photo
Q4 2022	27/10/22		

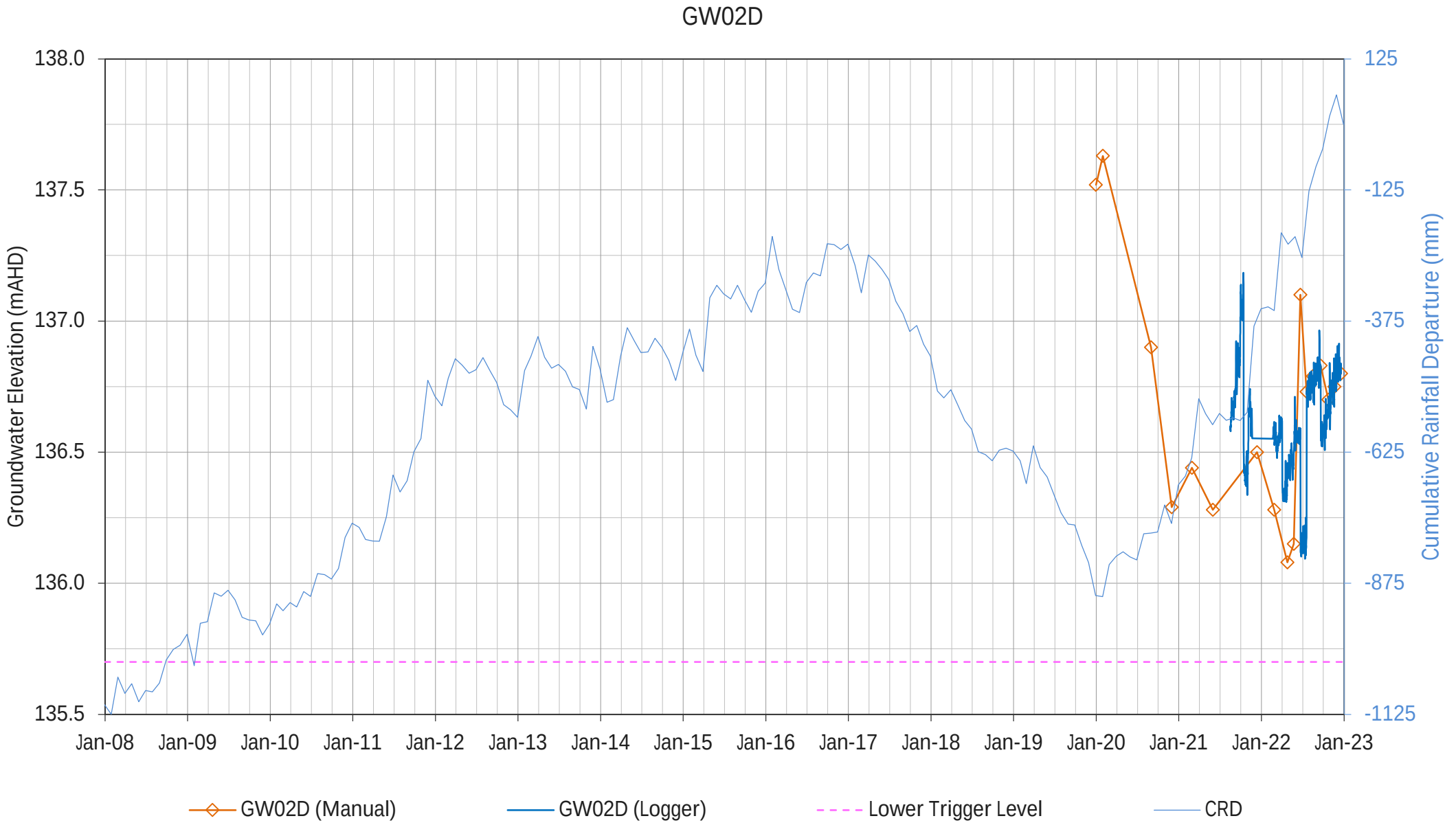
APPENDIX 11. GROUNDWATER RESULTS

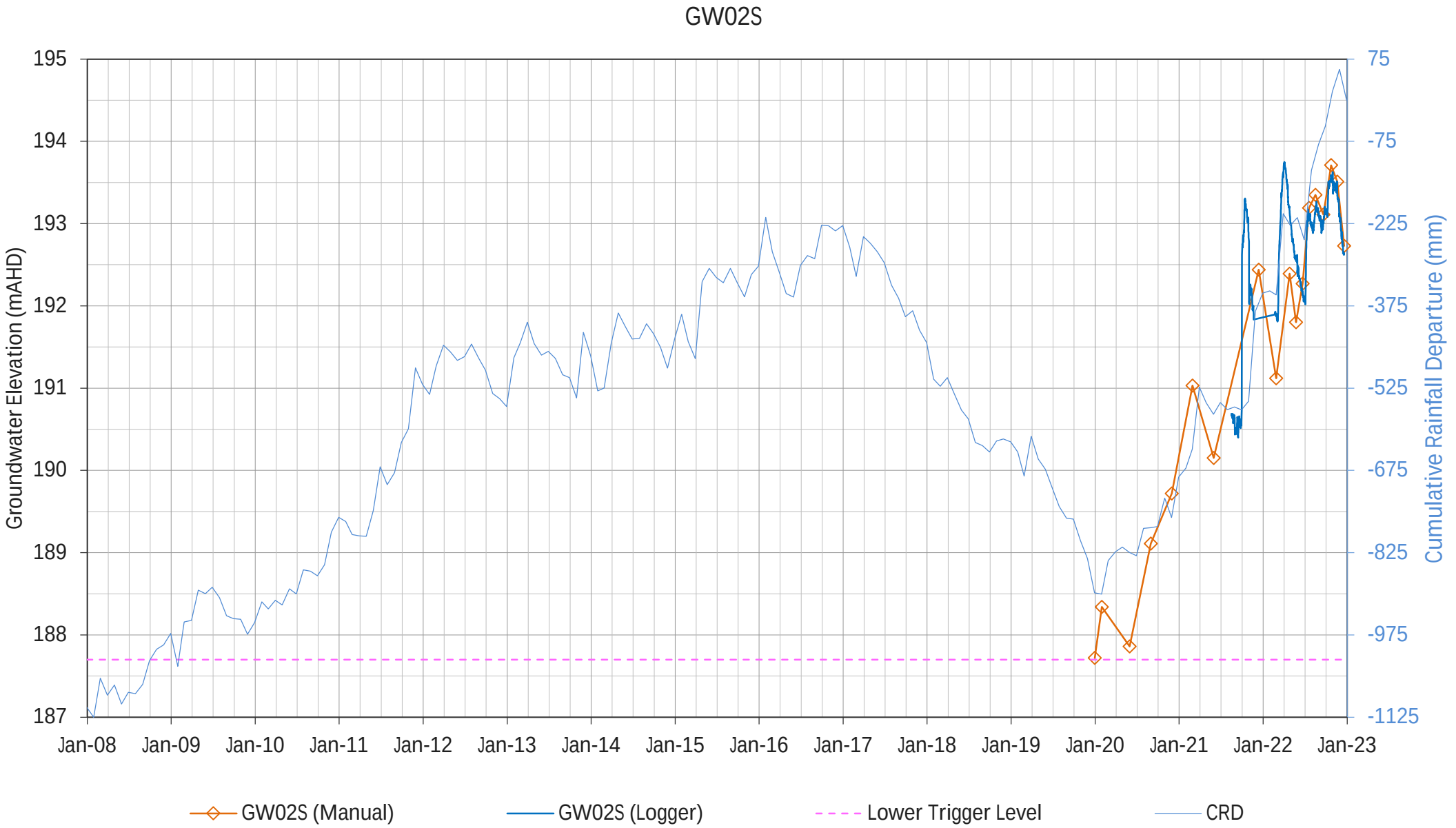
Appendix 11 is structured as follows:

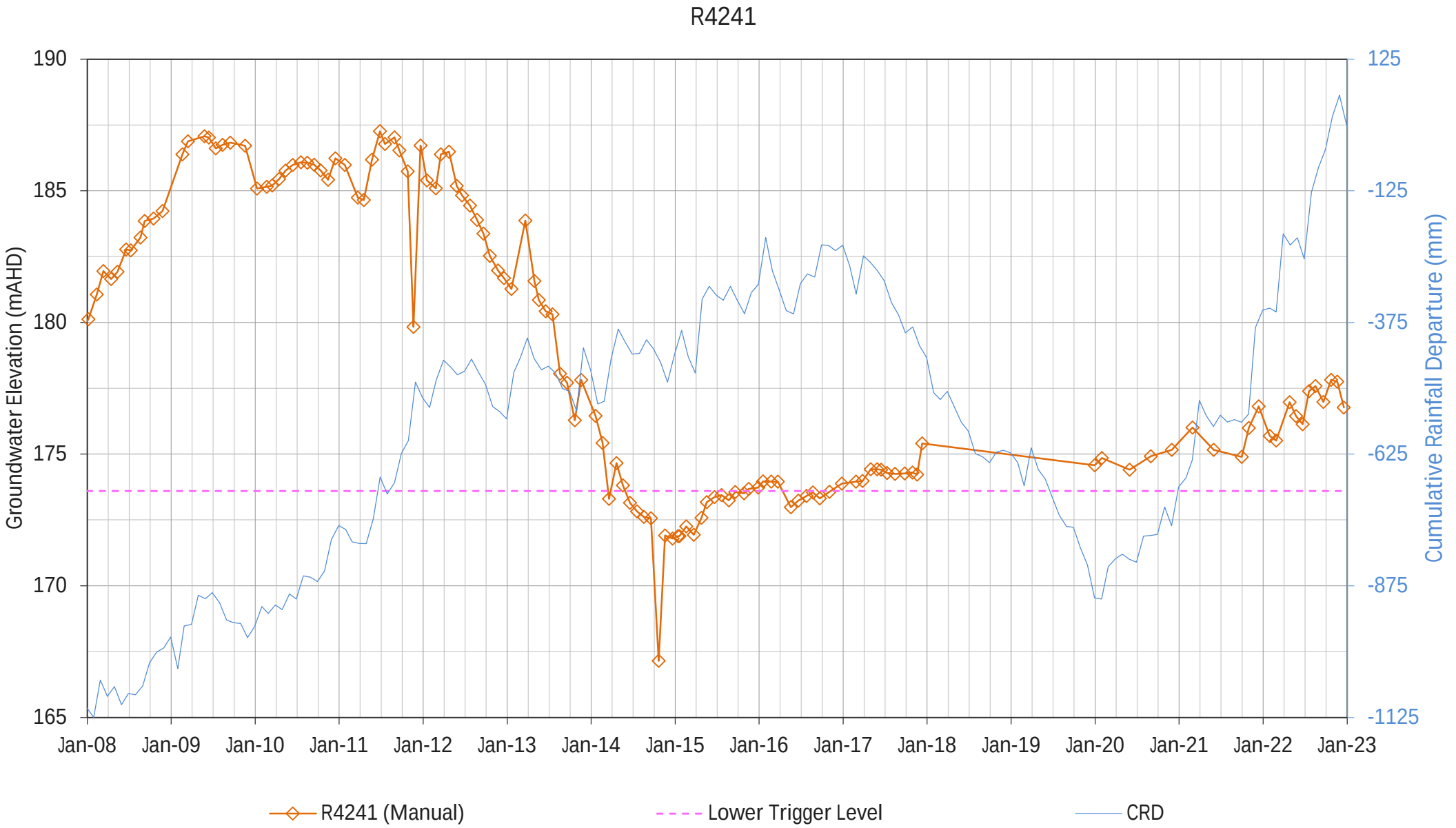
- Hydrographs from Maxwell Infrastructure bores with Trigger Levels (5 bores)
- Hydrographs from Maxwell Underground Mine bores with Trigger Levels (4 bores)
- Hydrographs from Maxwell Underground Mine vibrating wire piezometers (VWPs) (7 bores)
- Water quality graphs for MI bores with Trigger Levels (5 bores)
- Water quality graphs for Maxwell Underground Mine bores with Trigger Levels (4 bores)

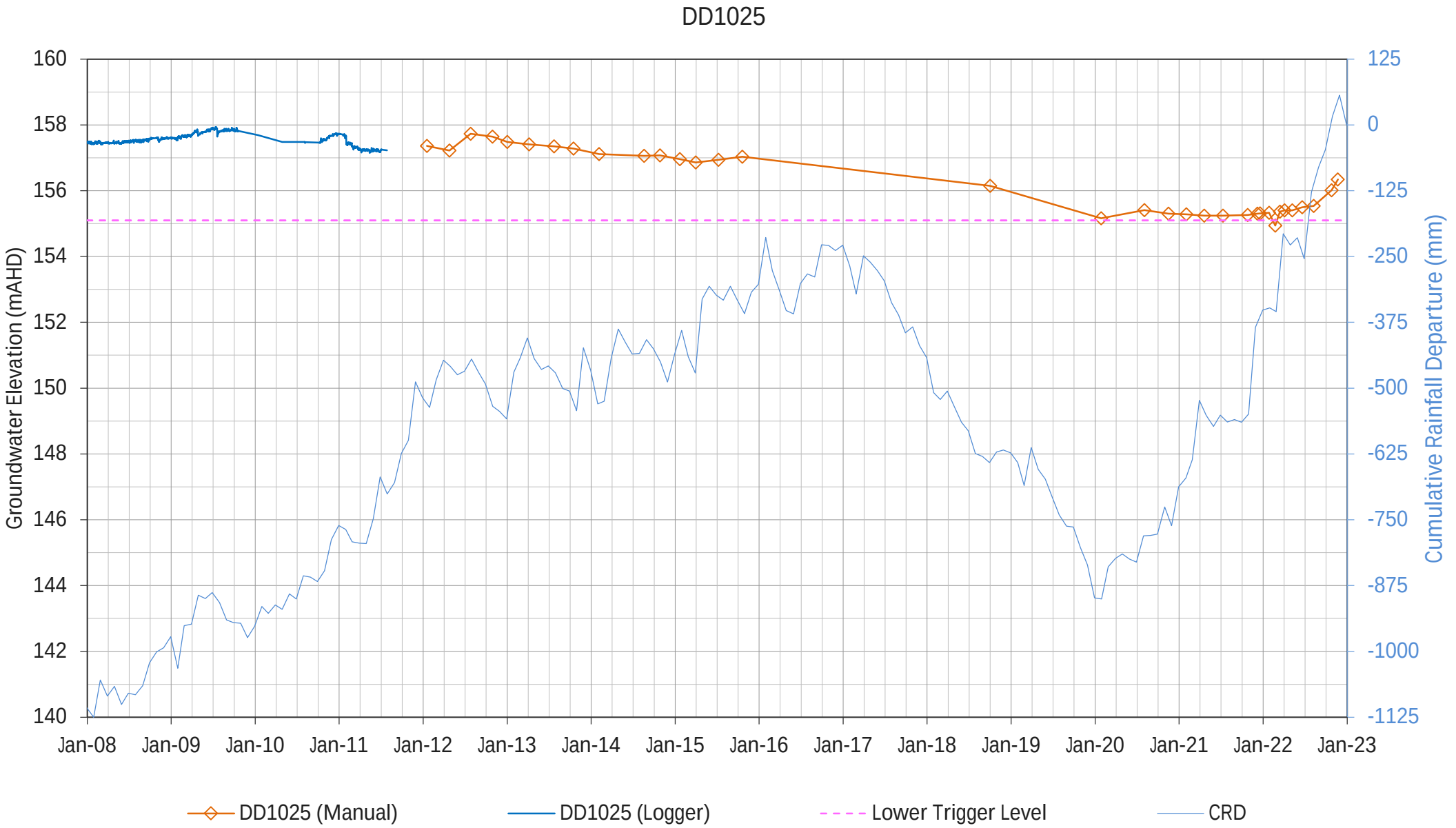

GW01D
Groundwater Elevation (mAHD)
206
205
204
203
202
201
200
199
198
197
Cumulative Rainfall Departure (mm)
225
75
-75
-225
-375
-525
-675
-825
-975
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
GW01D (Manual)
GW01D (Logger)
Lower Trigger Level
CRD

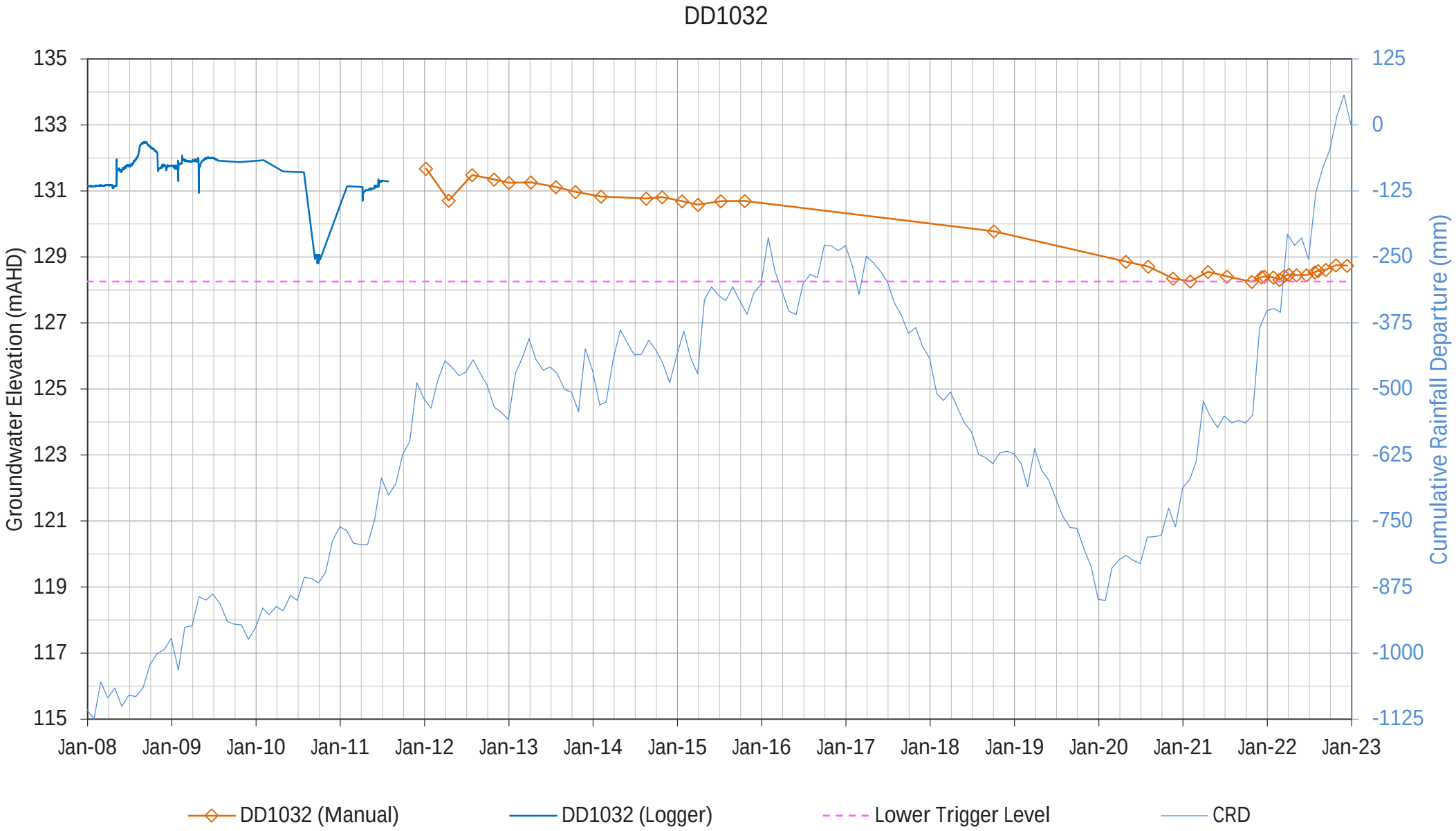

GW01S
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
204
203
202
201
200
199
198
197
196
75
-75
-225
-375
-525
-675
-825
-975
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
GW01S (Manual)
GW01S (Logger)
Lower Trigger Level
CRD

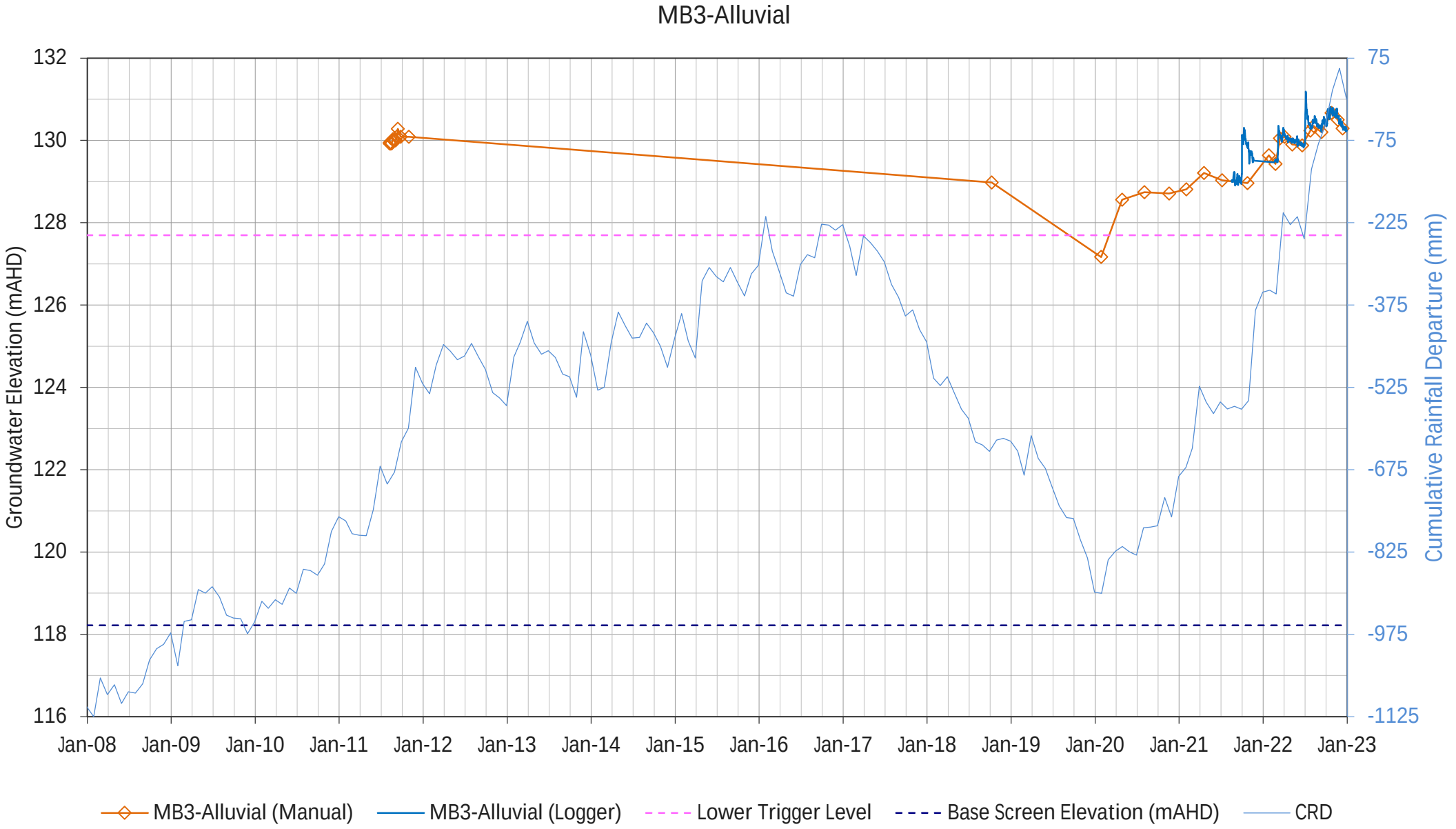

GW02D
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
138.0
137.5
137.0
136.5
136.0
135.5
125
-125
-375
-625
-875
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
GW02D (Manual)
GW02D (Logger)
Lower Trigger Level
CRD

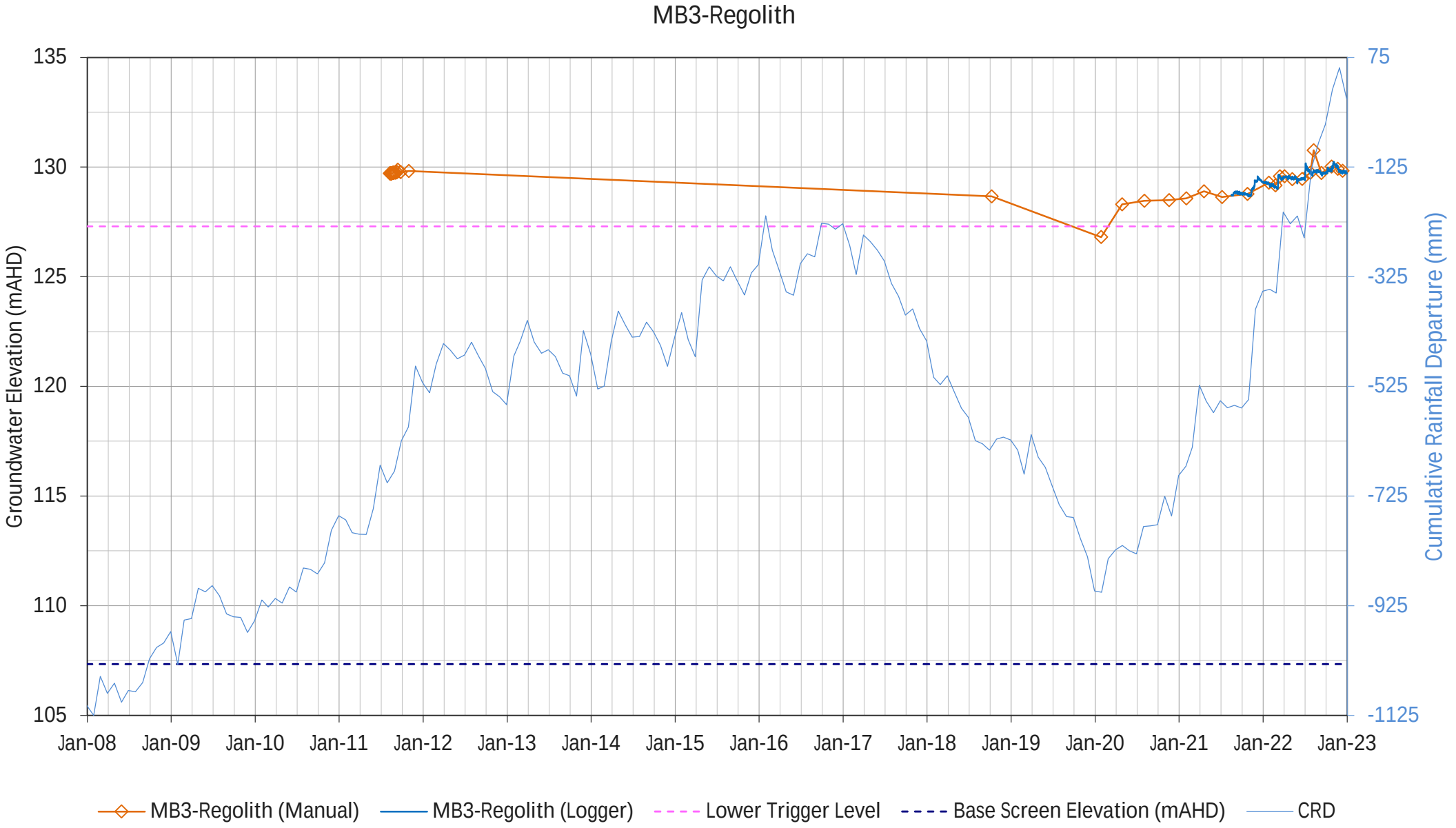

GW02S
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
195
194
193
192
191
190
189
188
187
75
-75
-225
-375
-525
-675
-825
-975
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
GW02S (Manual)
GW02S (Logger)
Lower Trigger Level
CRD

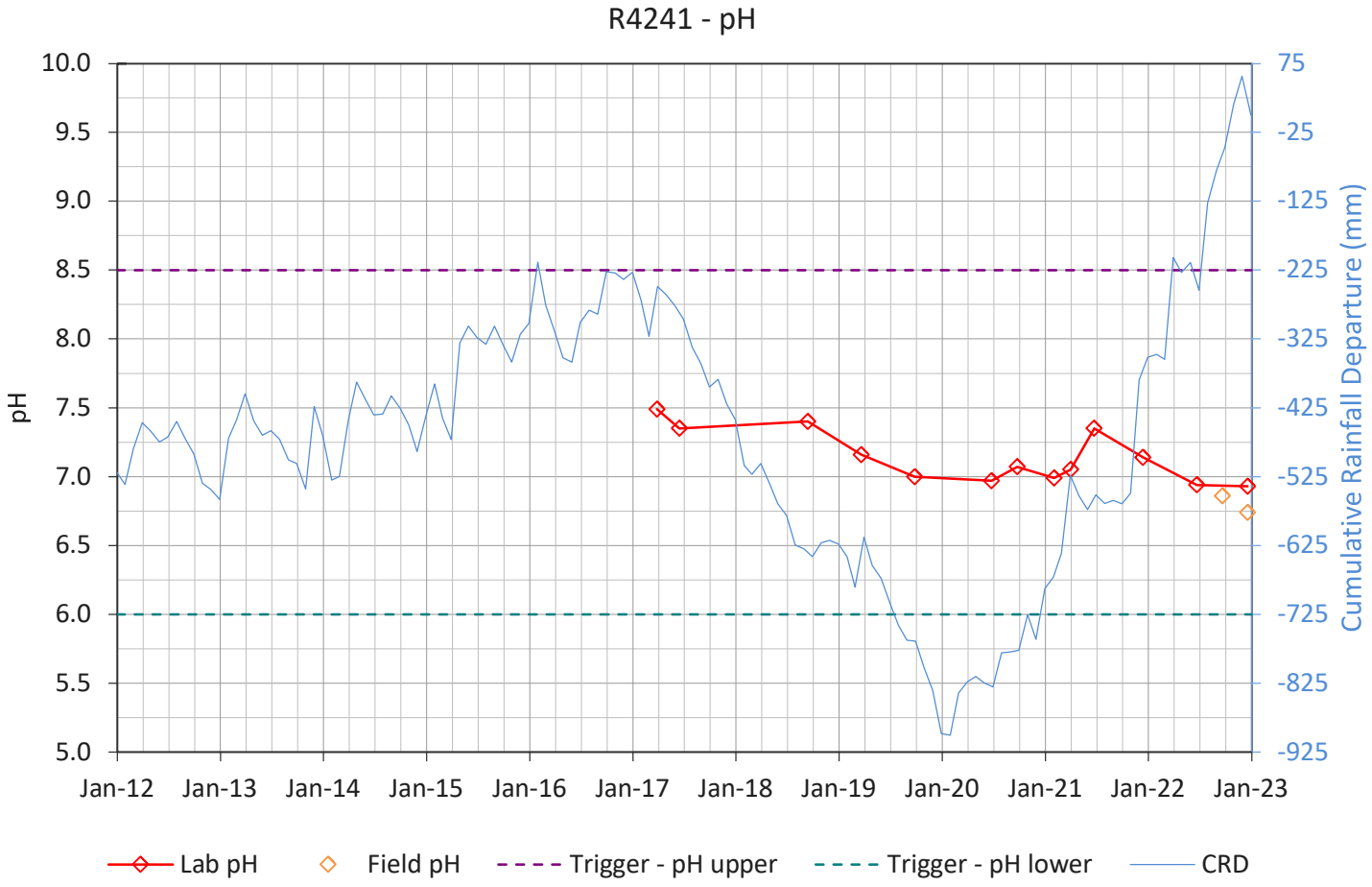

R4241
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
190
185
180
175
170
165
125
-125
-375
-625
-875
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
R4241 (Manual)
Lower Trigger Level
CRD

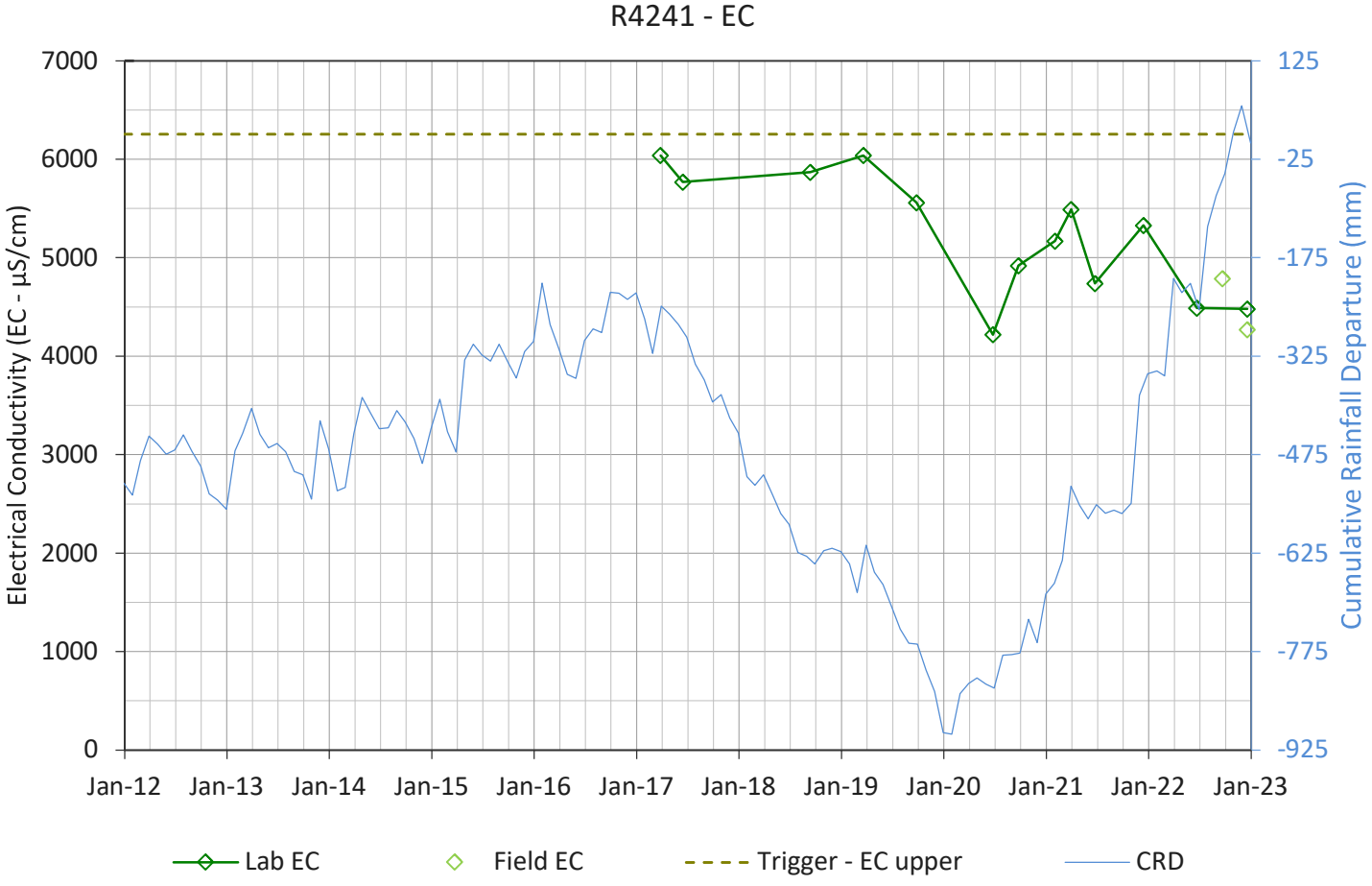

DD1025
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
160
158
156
154
152
150
148
146
144
142
140
125
0
-125
-250
-375
-500
-625
-750
-875
-1000
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
DD1025 (Manual)
DD1025 (Logger)
Lower Trigger Level
CRD

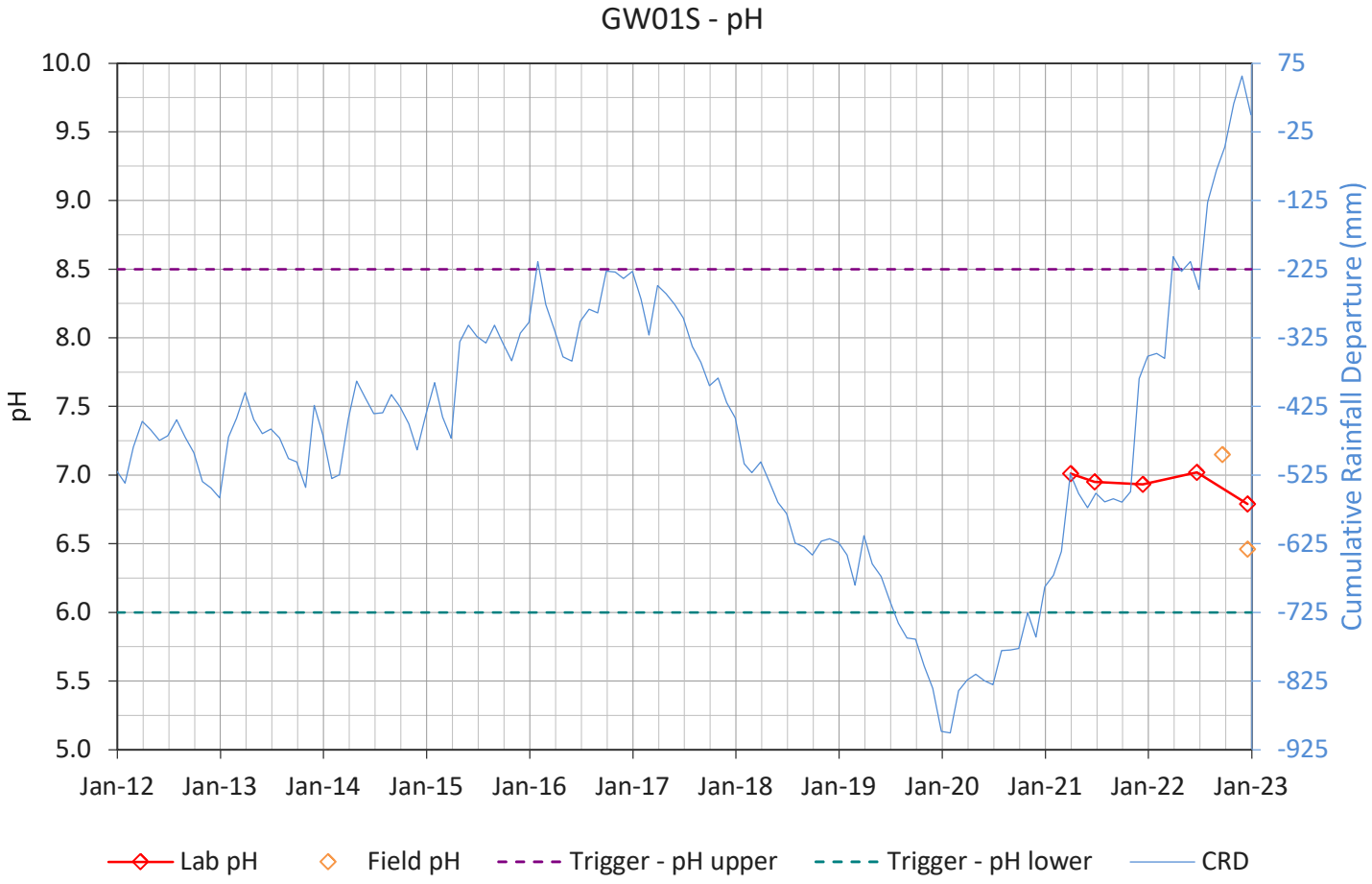

DD1032
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
135
133
131
129
127
125
123
121
119
117
115
125
0
-125
-250
-375
-500
-625
-750
-875
-1000
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
DD1032 (Manual)
DD1032 (Logger)
Lower Trigger Level
CRD

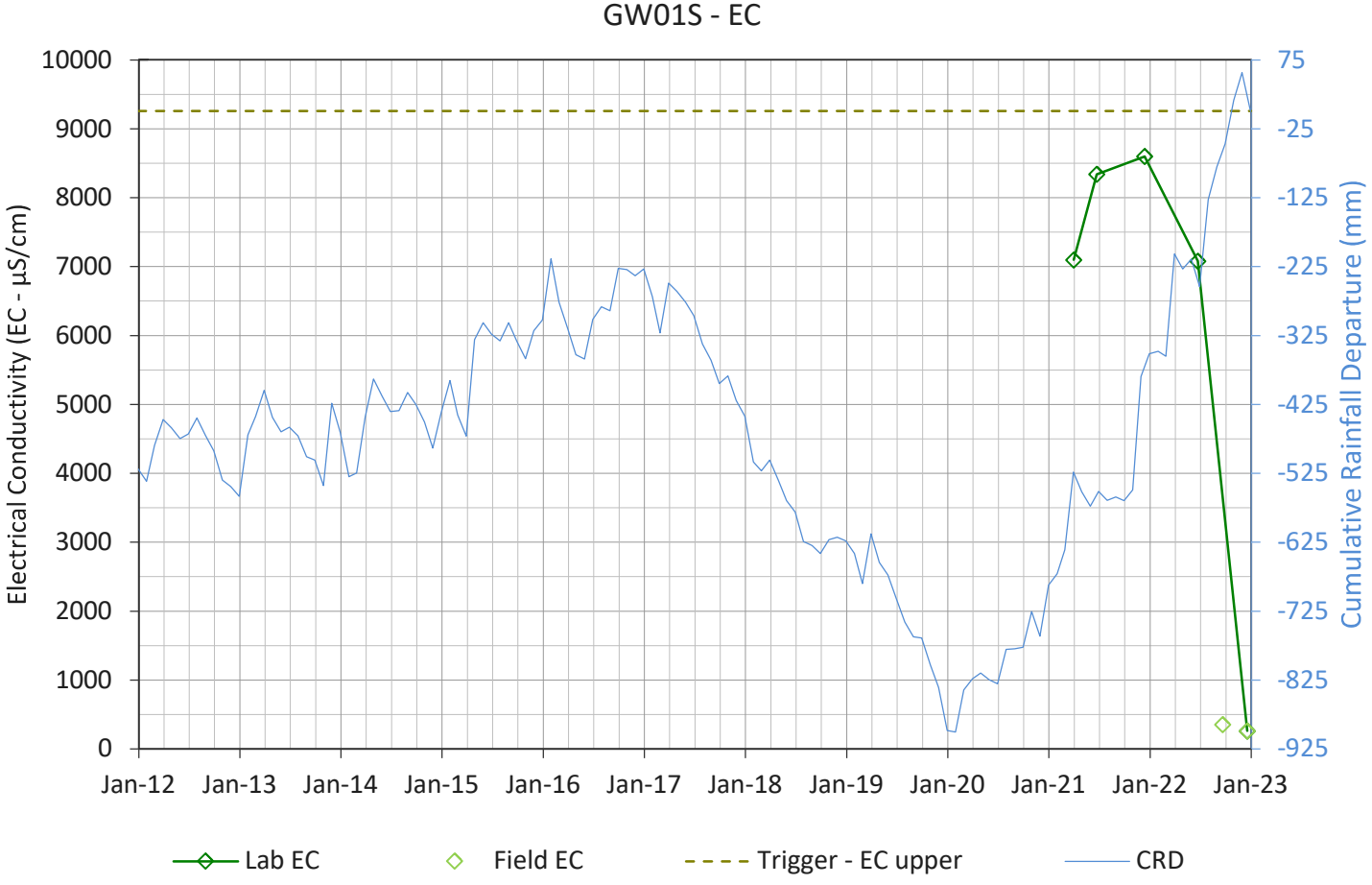

MB3-Alluvial
Groundwater Elevation (mAHD)
132
130
128
126
124
122
120
118
116
Cumulative Rainfall Departure (mm)
75
-75
-225
-375
-525
-675
-825
-975
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
MB3-Alluvial (Manual)
MB3-Alluvial (Logger)
Lower Trigger Level
Base Screen Elevation (mAHD)
CRD

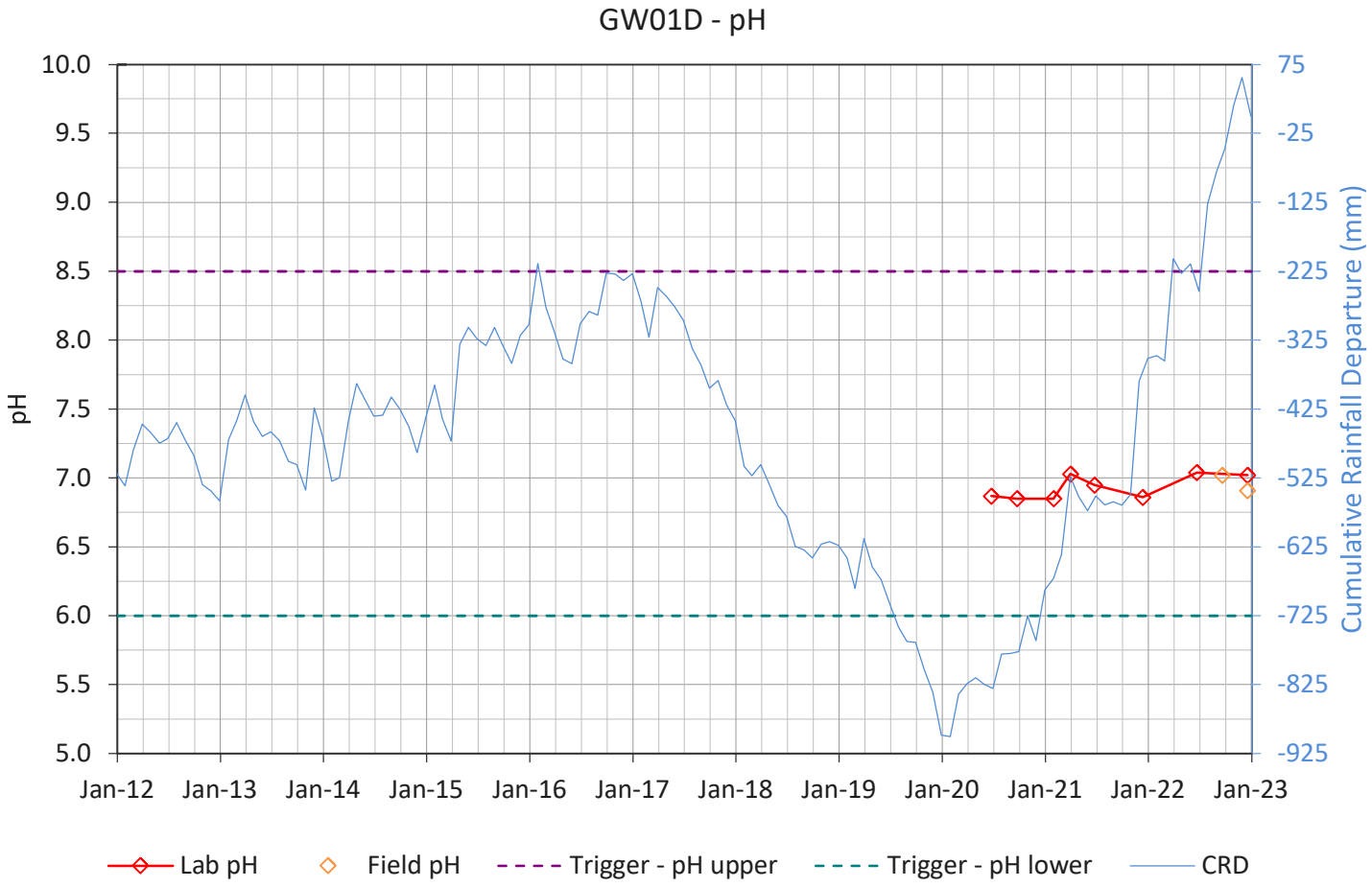

MB3-Regolith
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
135
130
125
120
115
110
105
75
-125
-325
-525
-725
-925
-1125
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
MB3-Regolith (Manual)
MB3-Regolith (Logger)
Lower Trigger Level
Base Screen Elevation (mAHD)
CRD

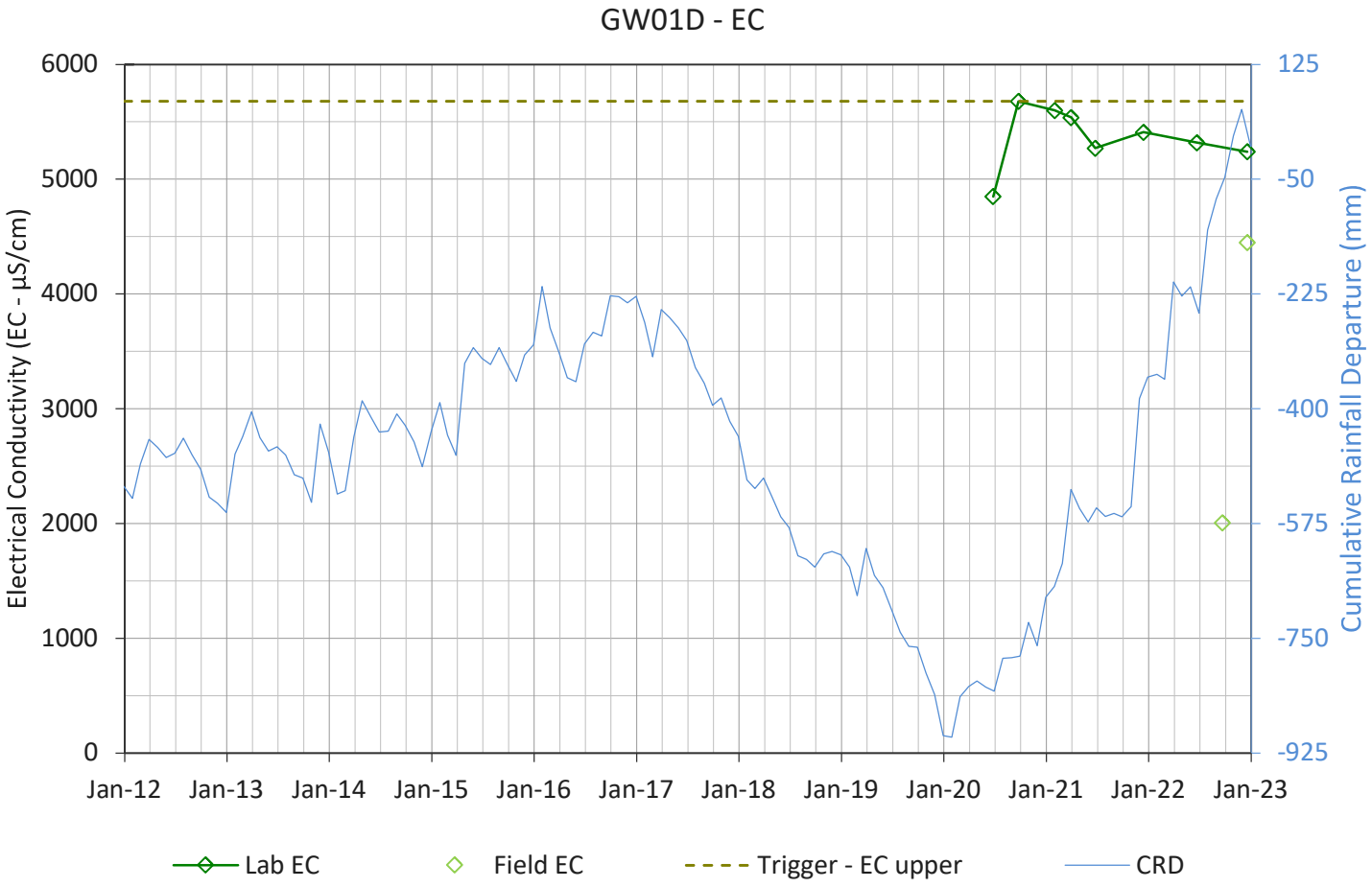

R4241 - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

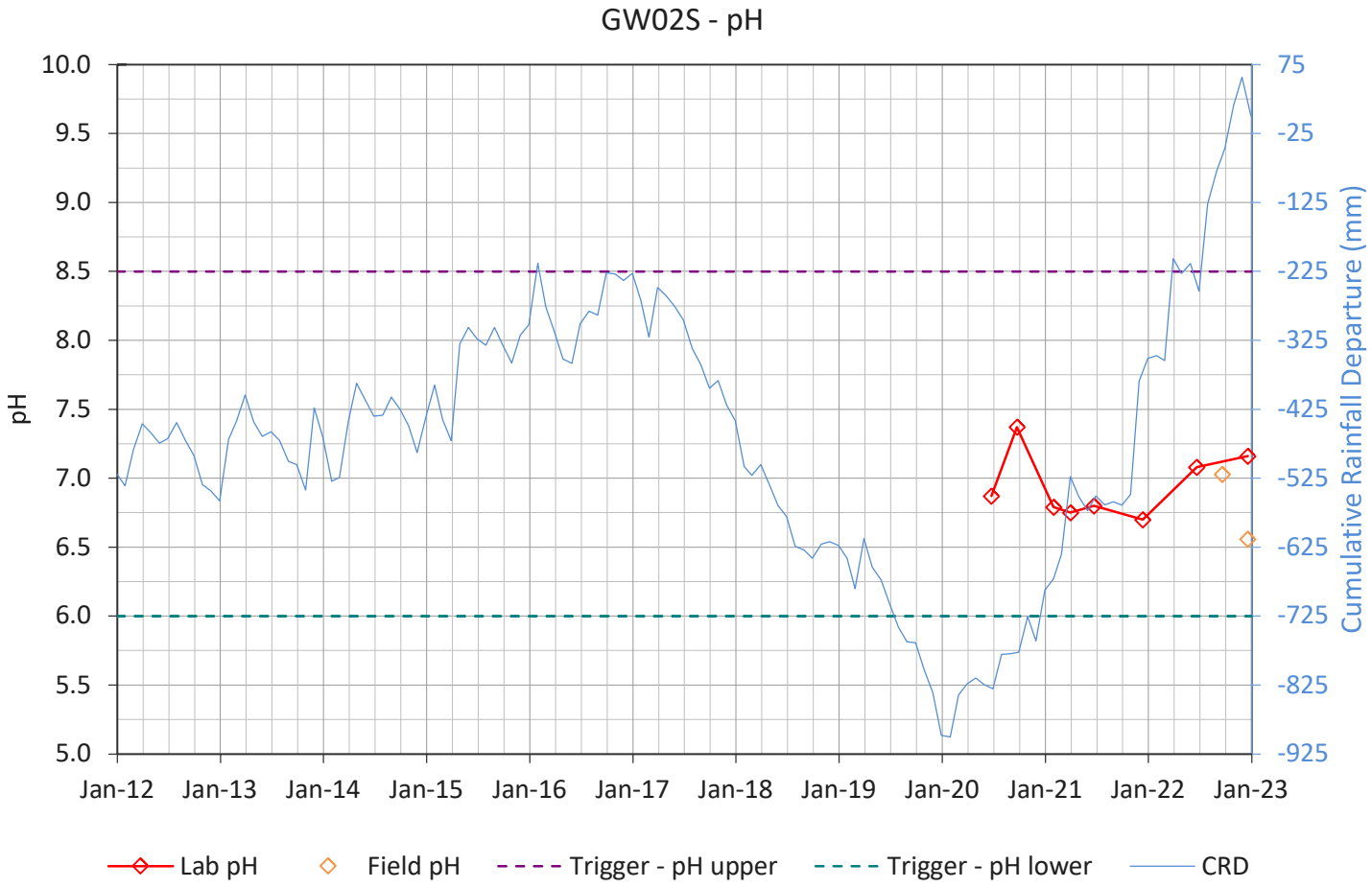

R4241 - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
7000
6000
5000
4000
3000
2000
1000
0
125
-25
-175
-325
-475
-625
-775
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

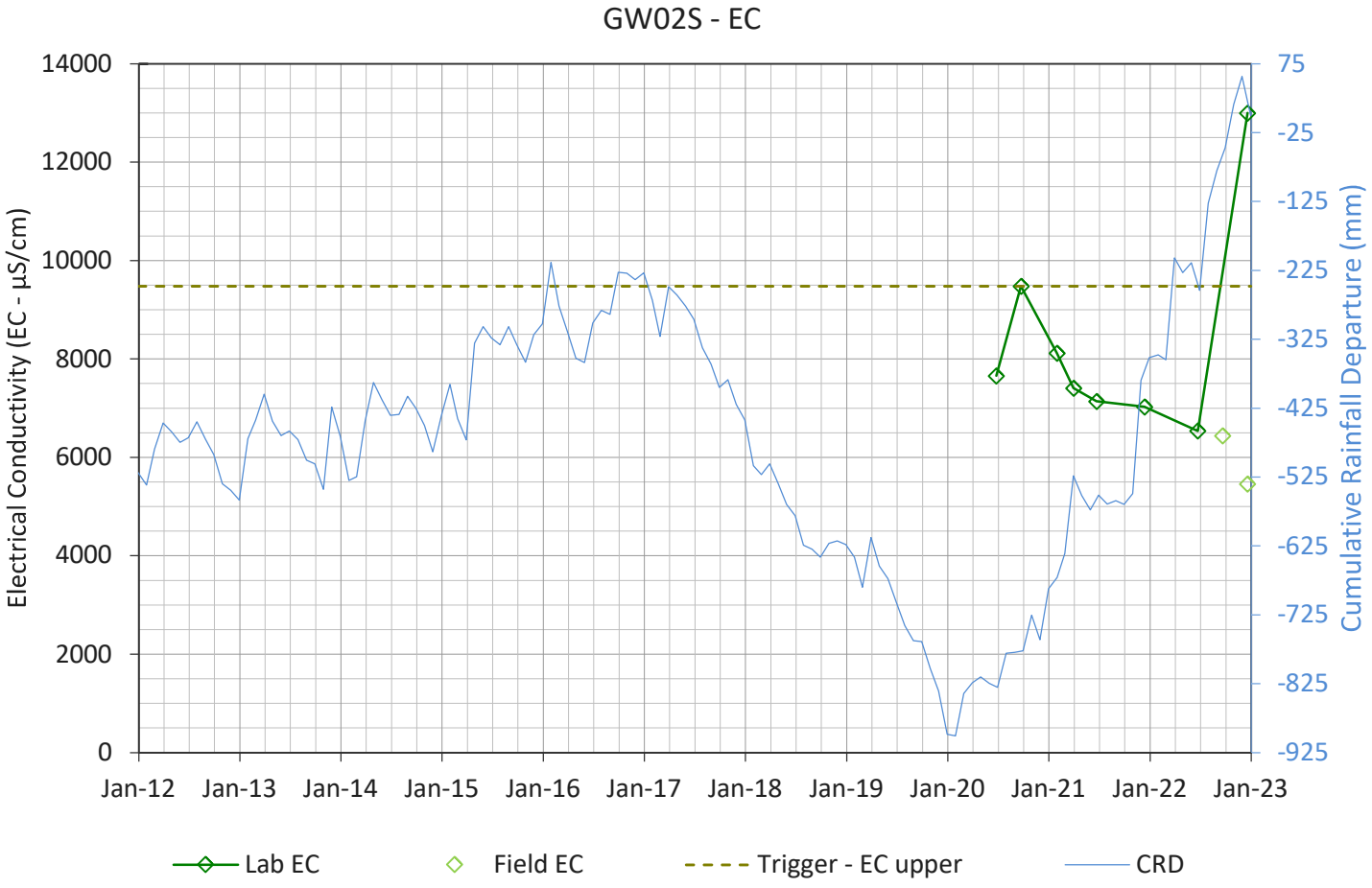

GW01S - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

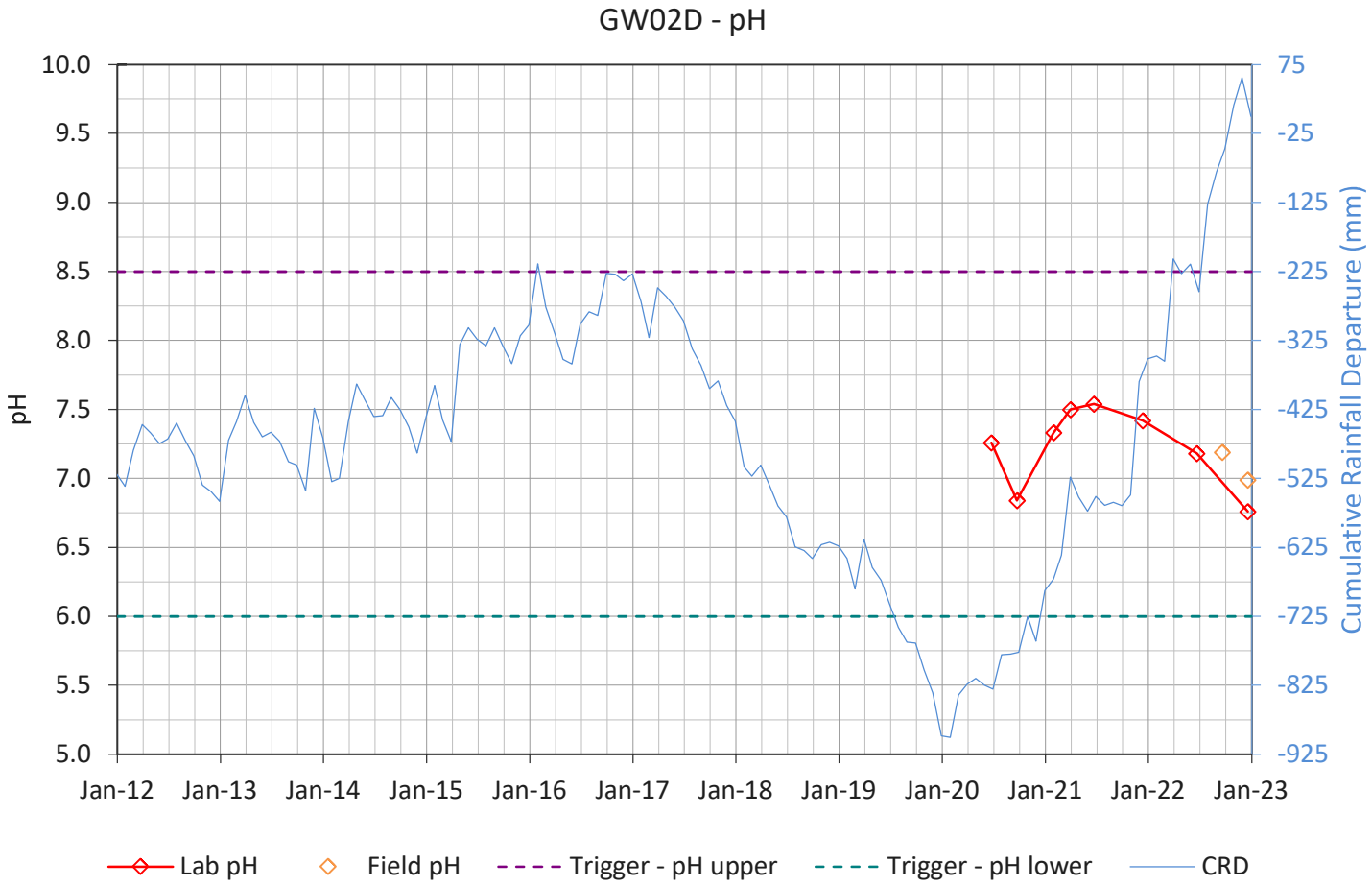

GW01S - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

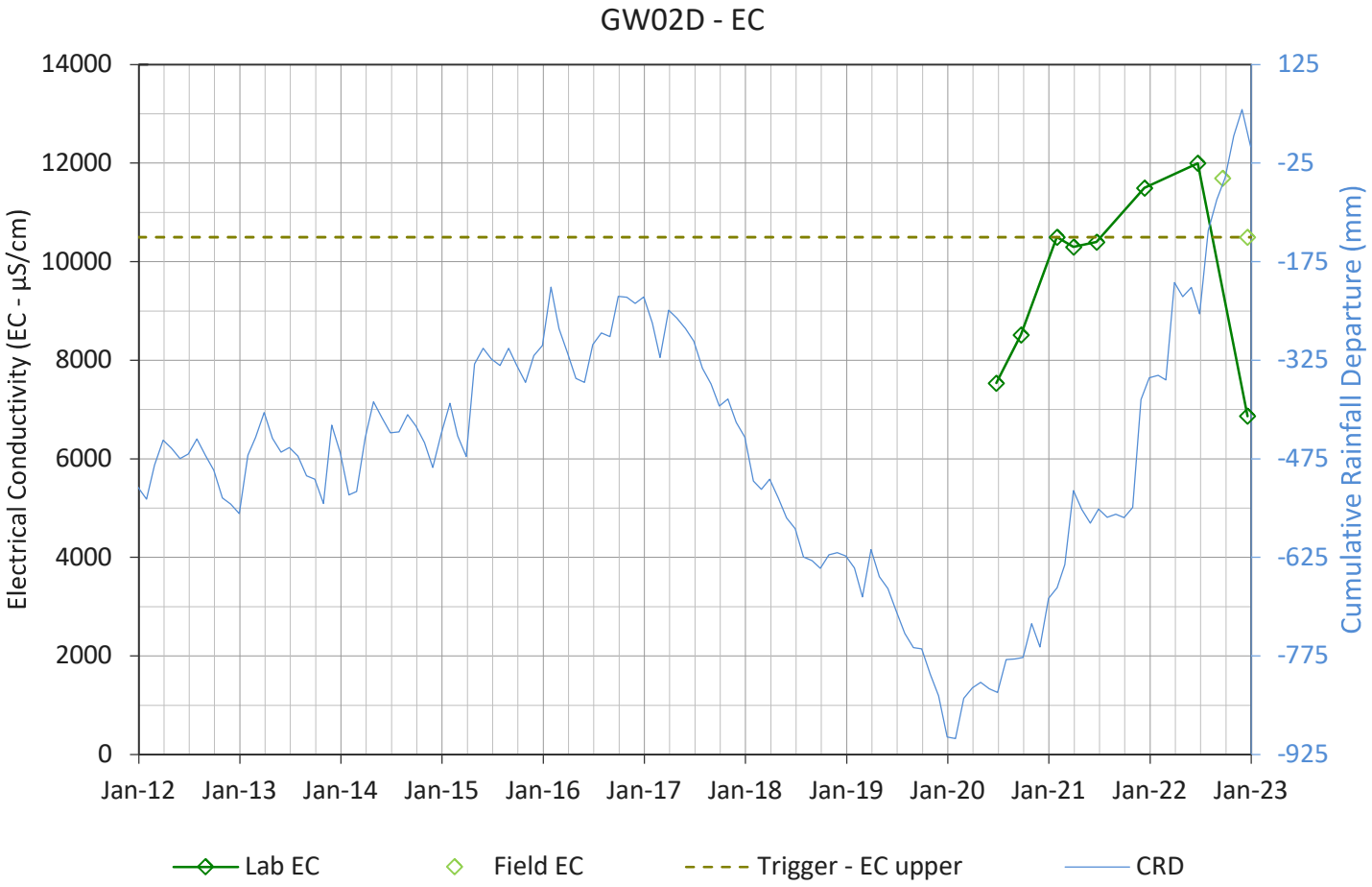

GW01D - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

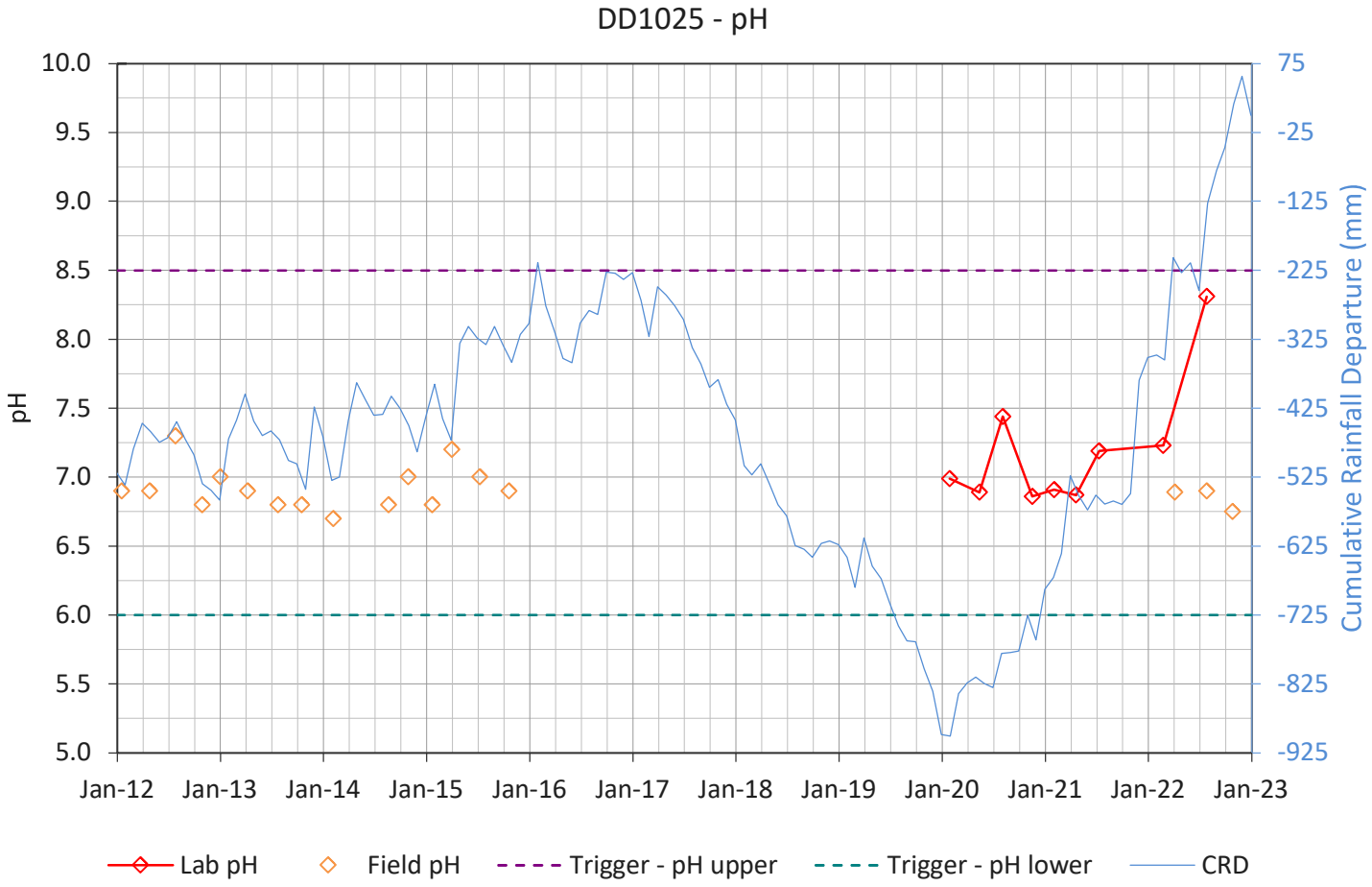

GW01D - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
6000
5000
4000
3000
2000
1000
0
125
-50
-225
-400
-575
-750
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

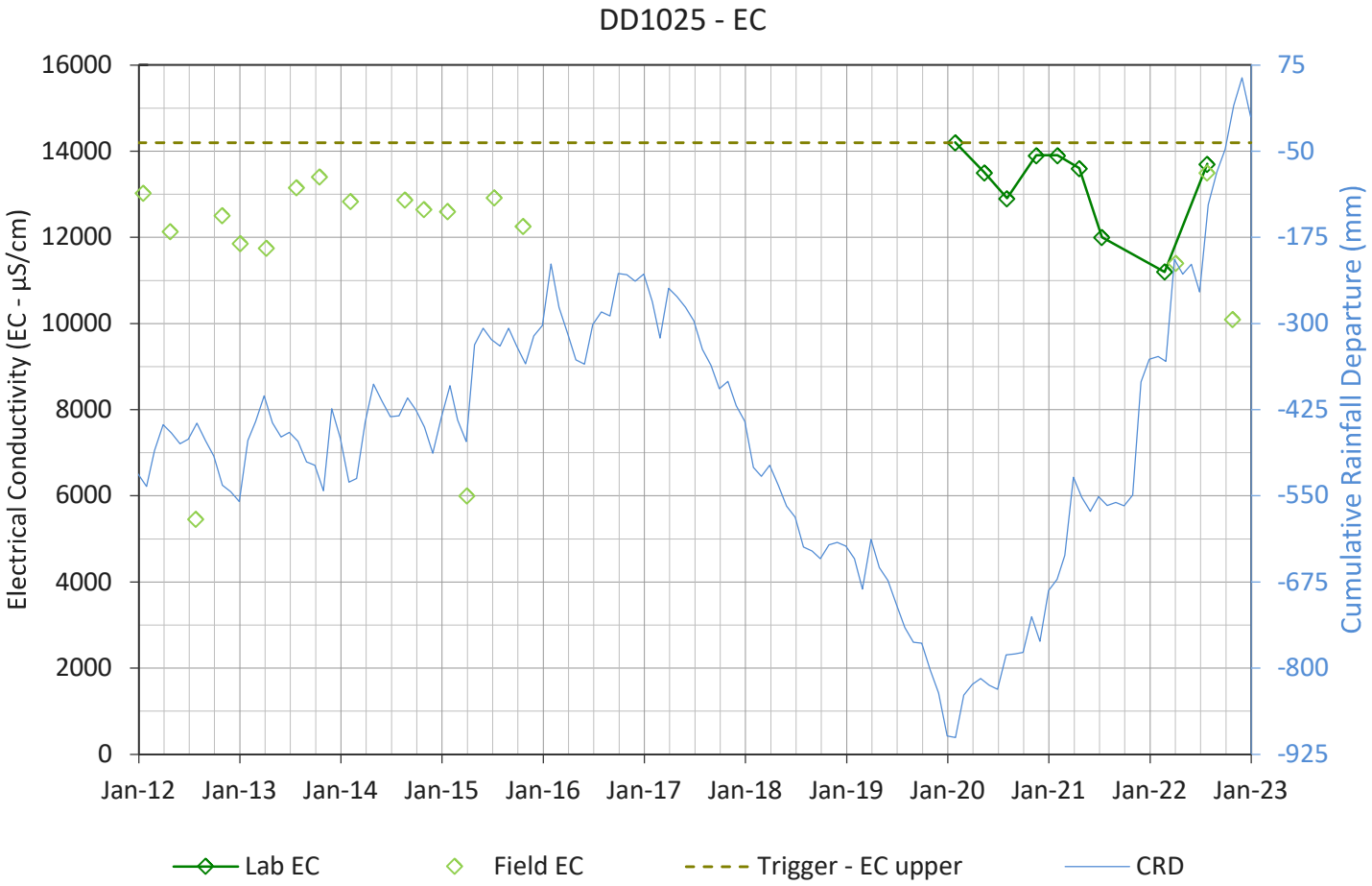

GW02S - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

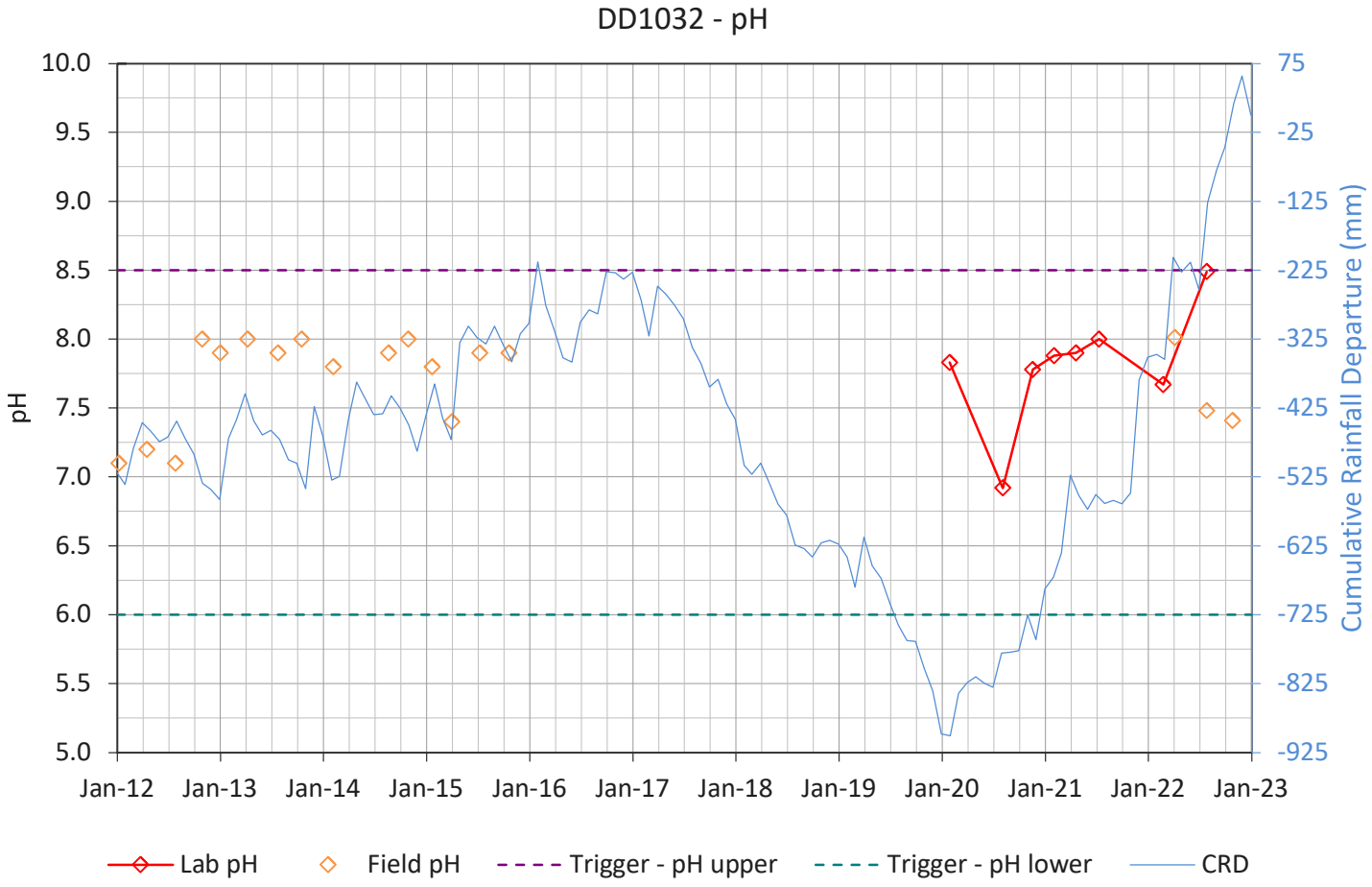

GW02S - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
14000
12000
10000
8000
6000
4000
2000
0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

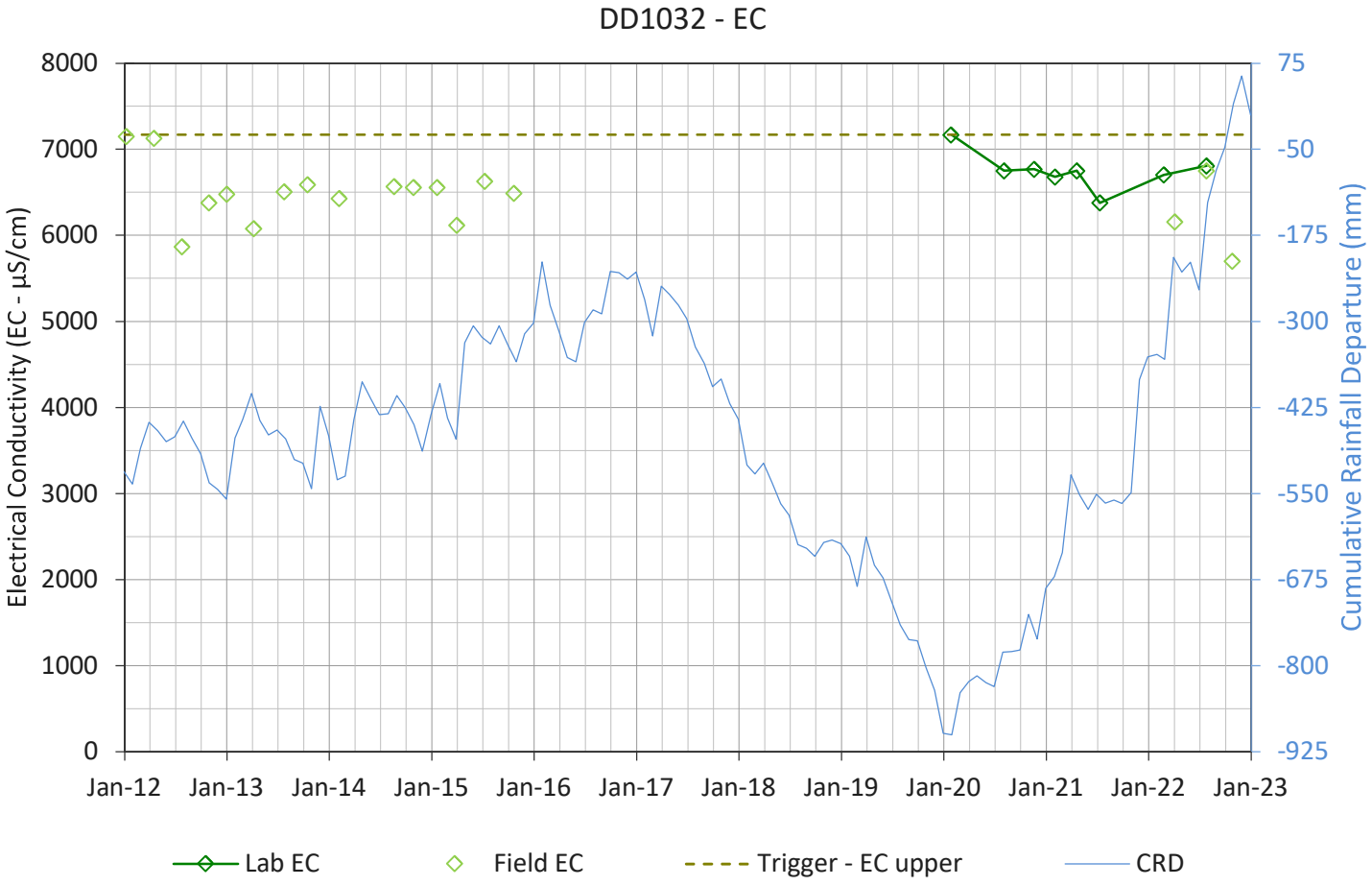

GW02D - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

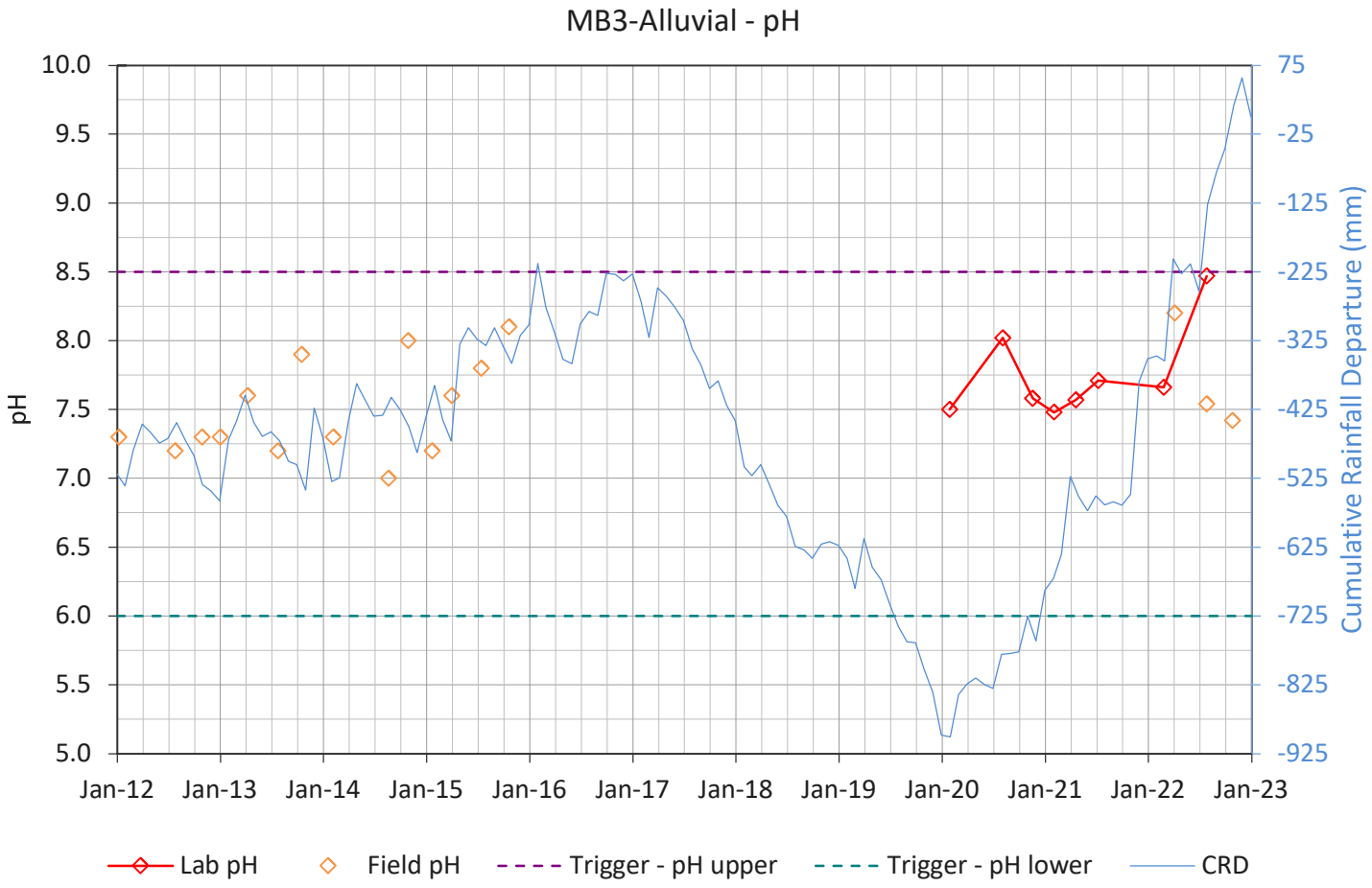

GW02D - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
14000
12000
10000
8000
6000
4000
2000
0
125
-25
-175
-325
-475
-625
-775
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

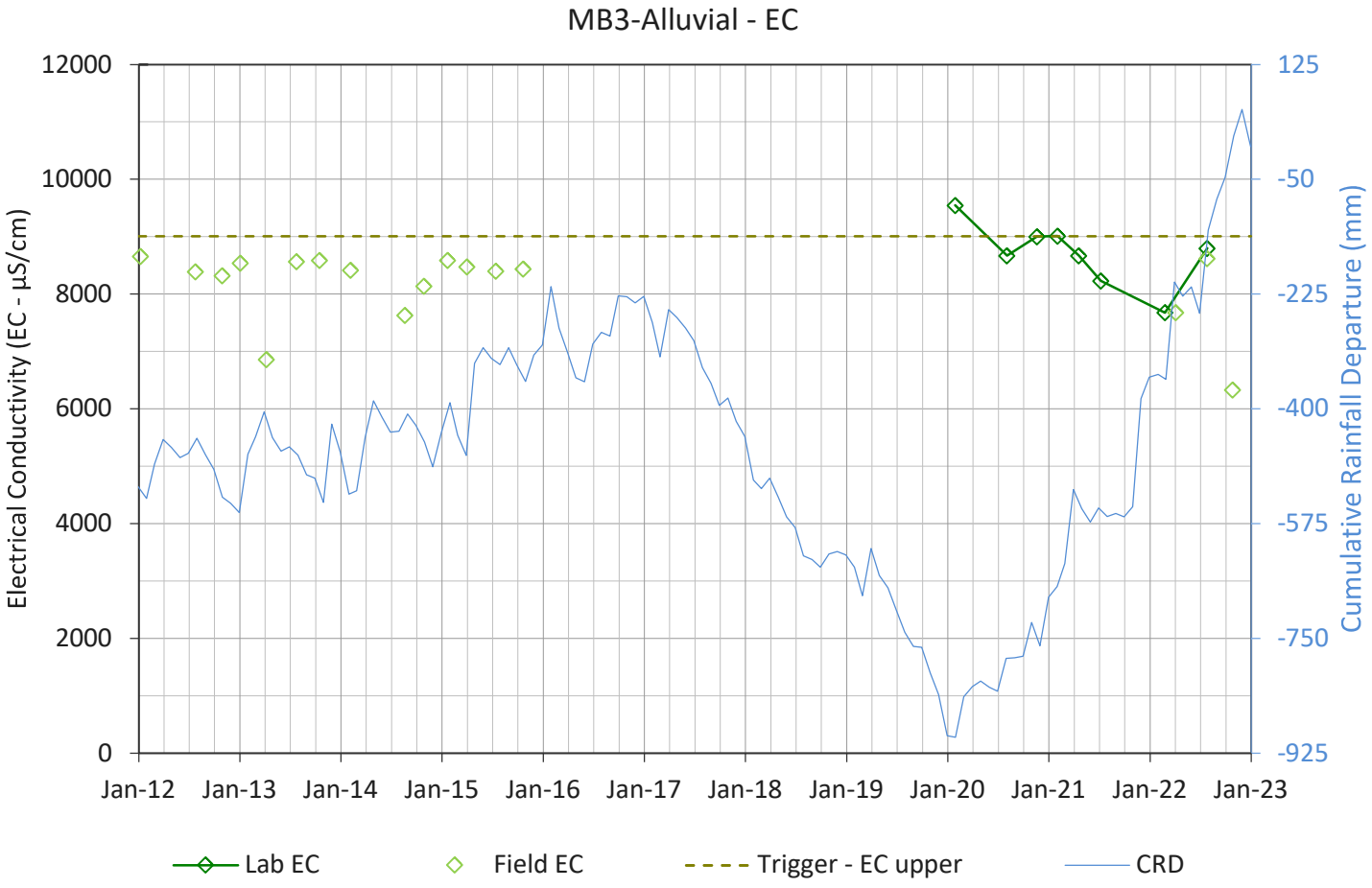

DD1025 - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

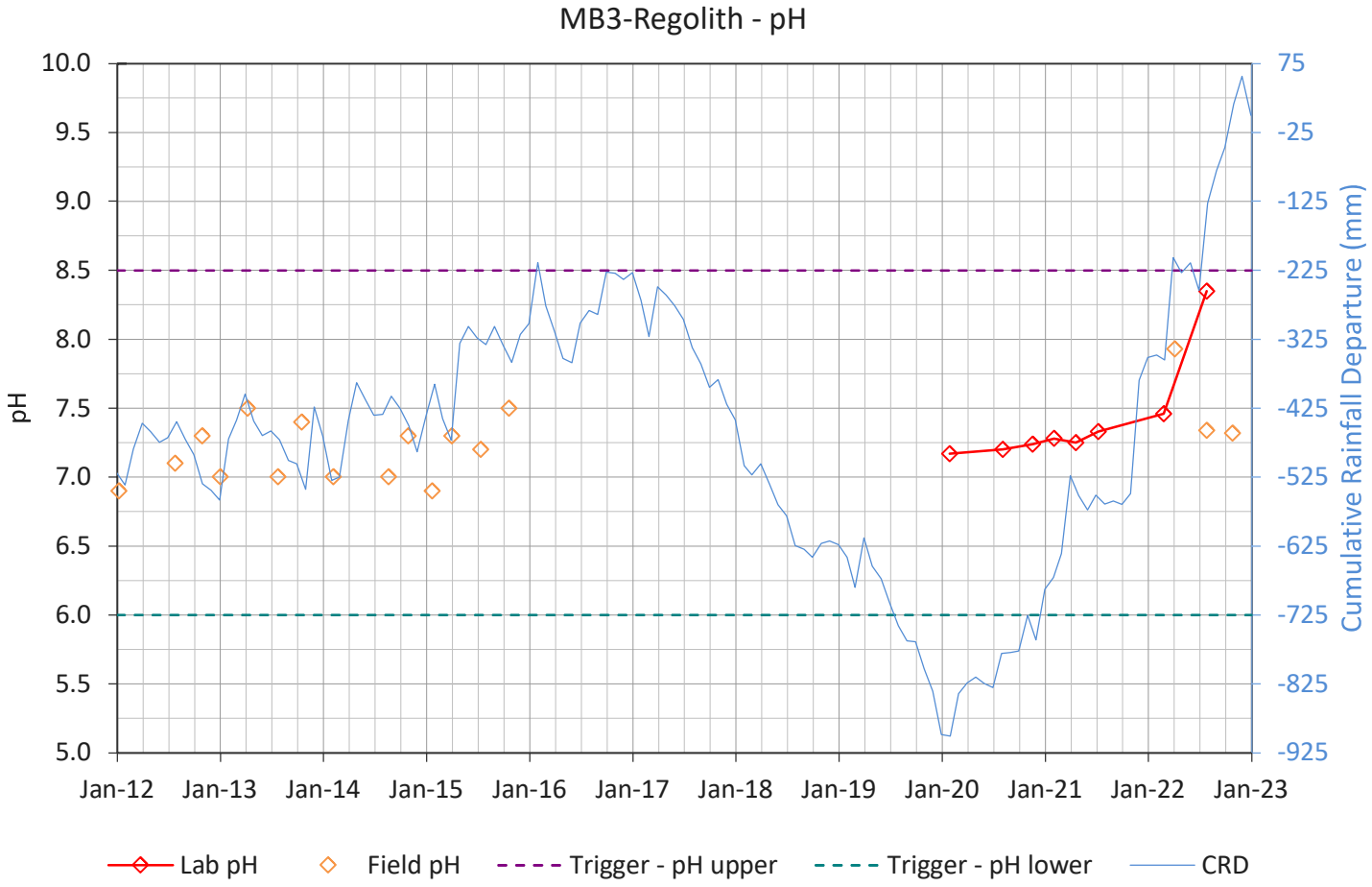

DD1025 - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
16000
14000
12000
10000
8000
6000
4000
2000
0
75
-50
-175
-300
-425
-550
-675
-800
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

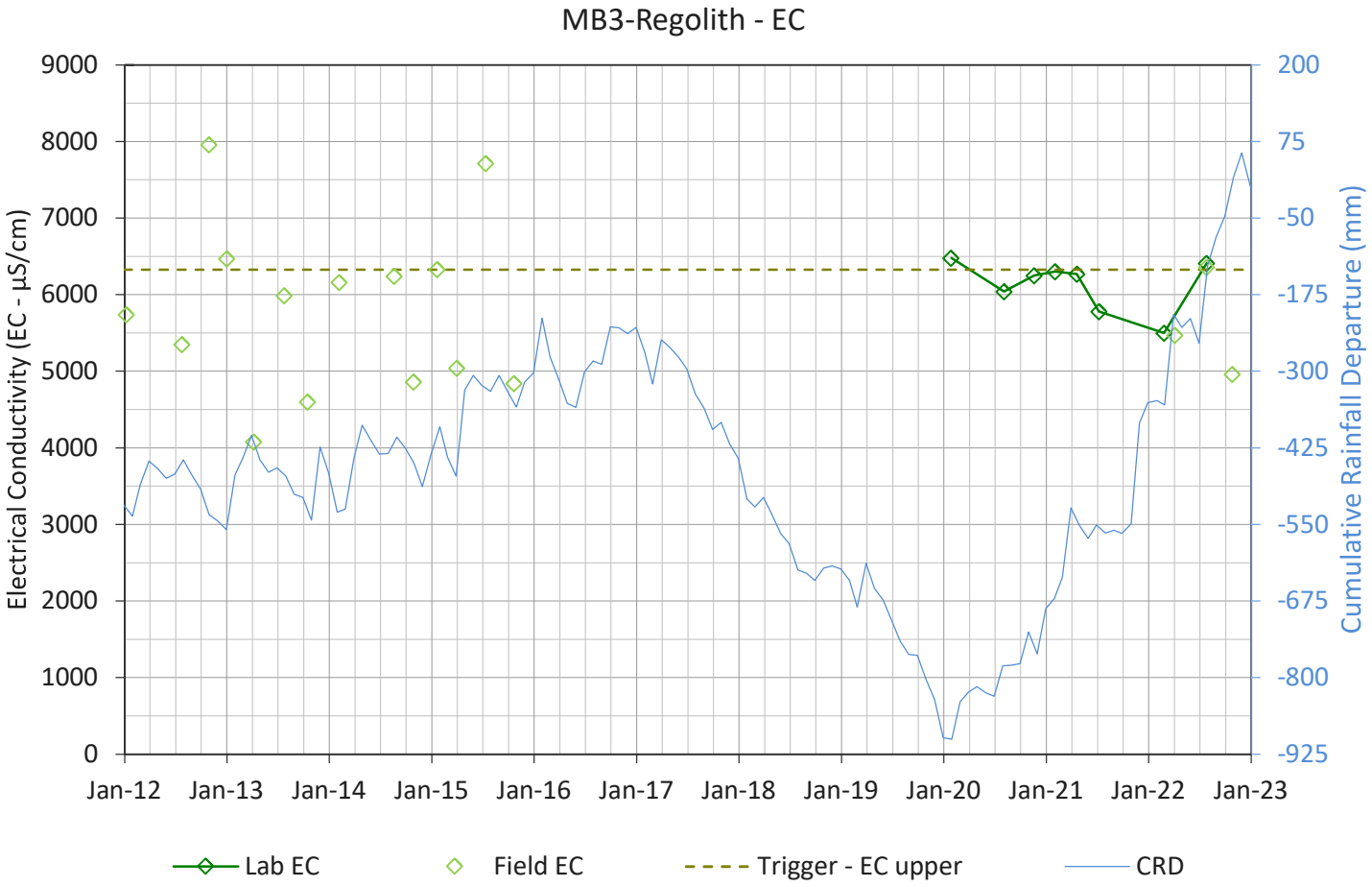

DD1032 - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

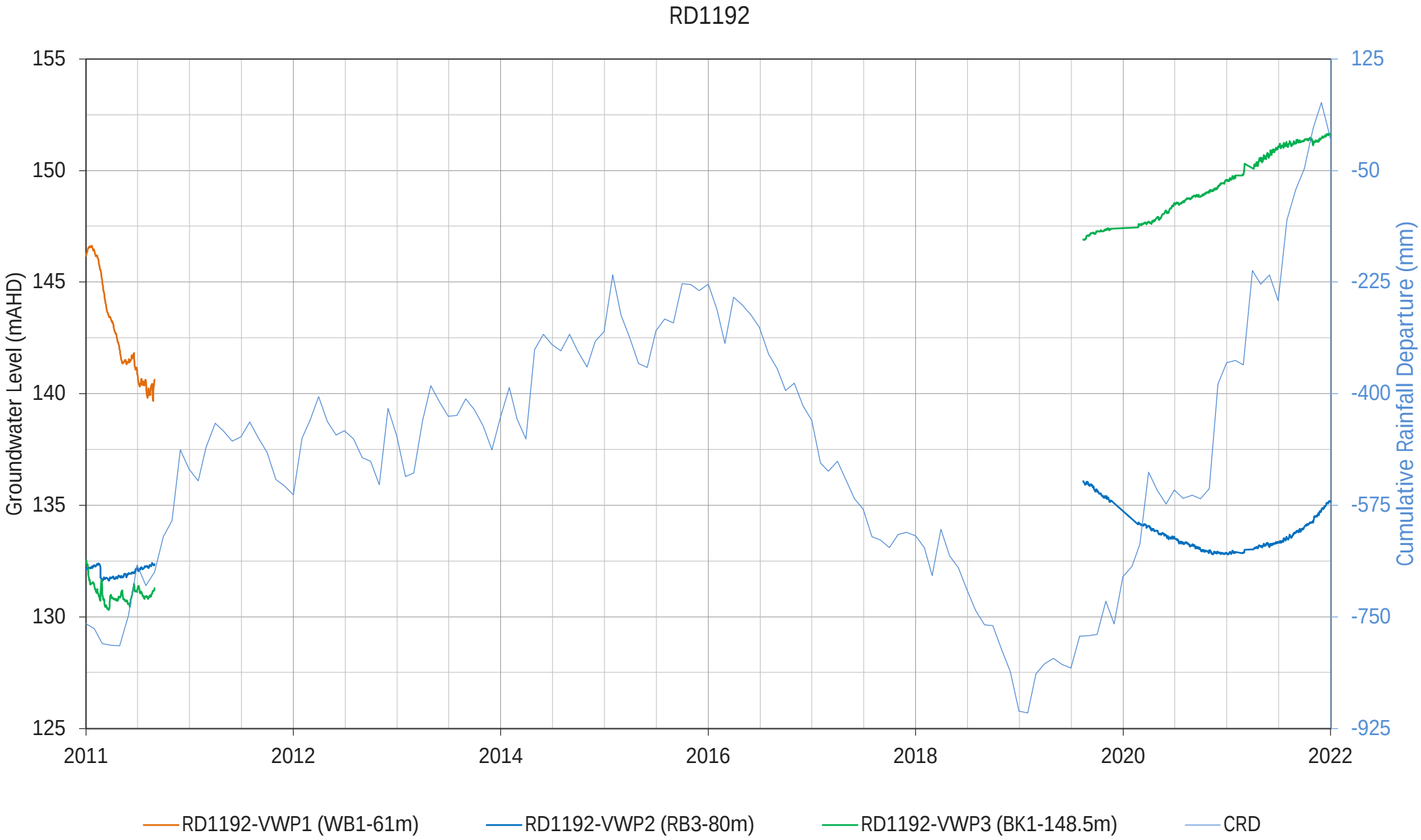

DD1032 - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
8000
7000
6000
5000
4000
3000
2000
1000
0
75
-50
-175
-300
-425
-550
-675
-800
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

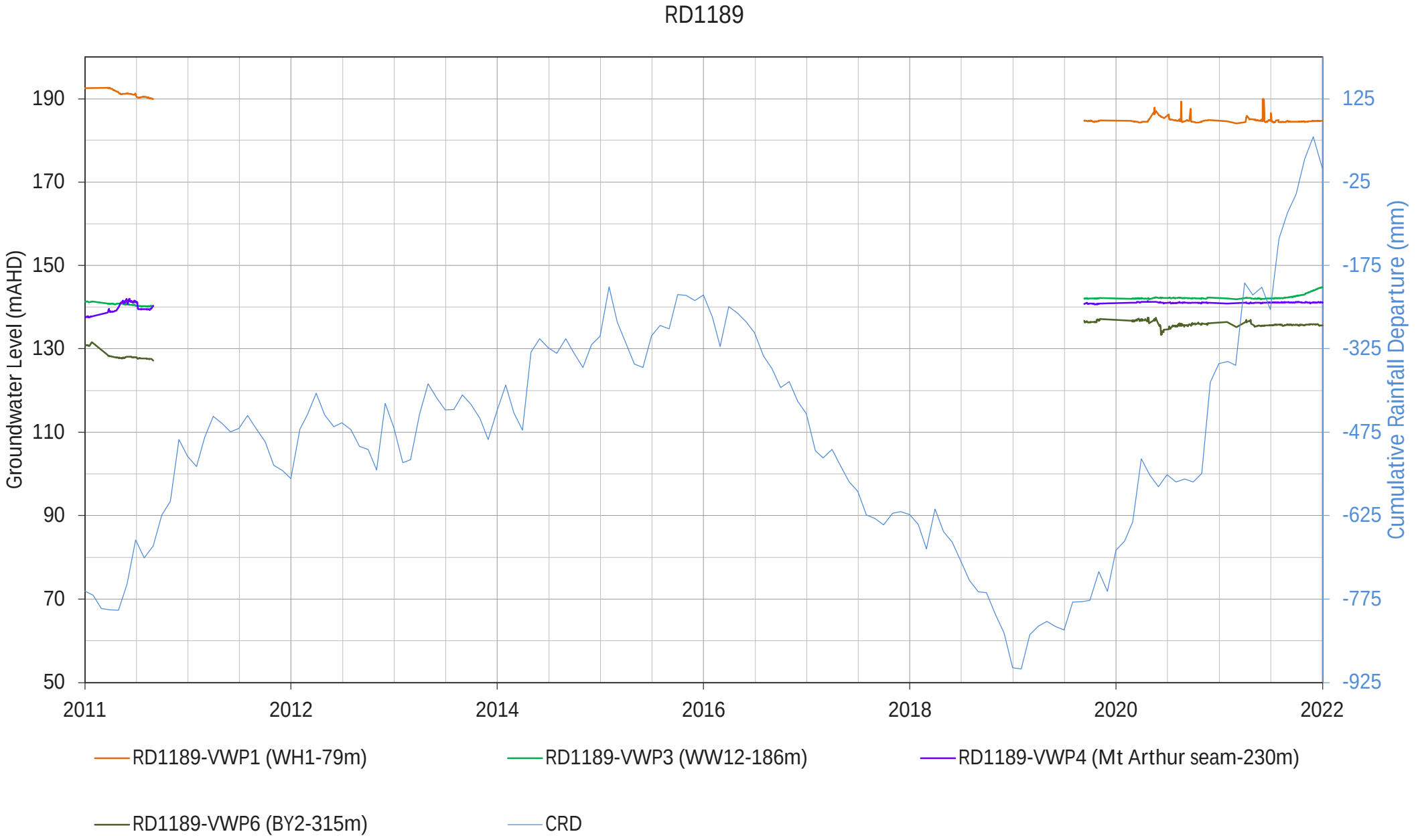

MB3-Alluvial - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

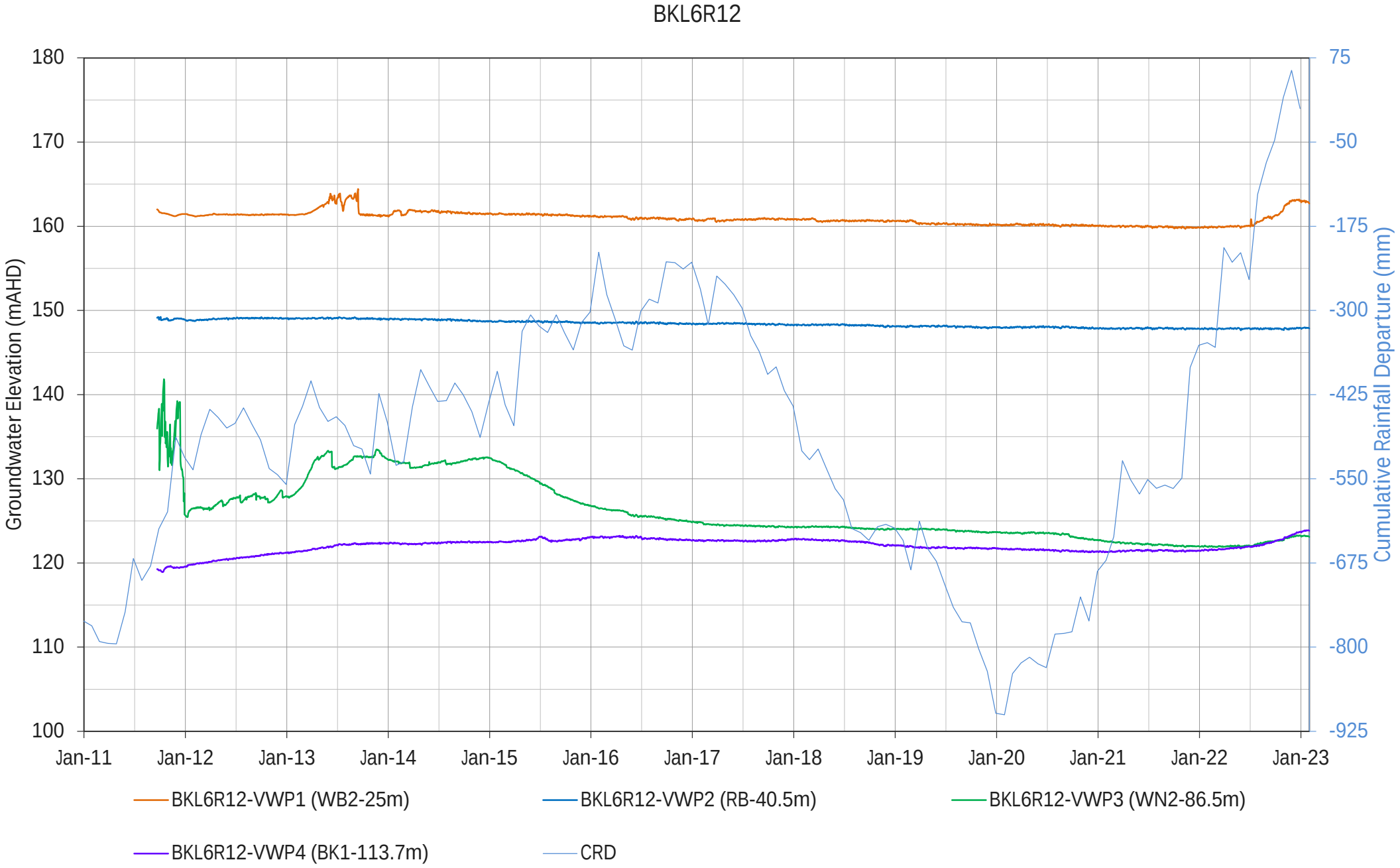

MB3-Alluvial - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
12000
10000
8000
6000
4000
2000
0
125
-50
-225
-400
-575
-750
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

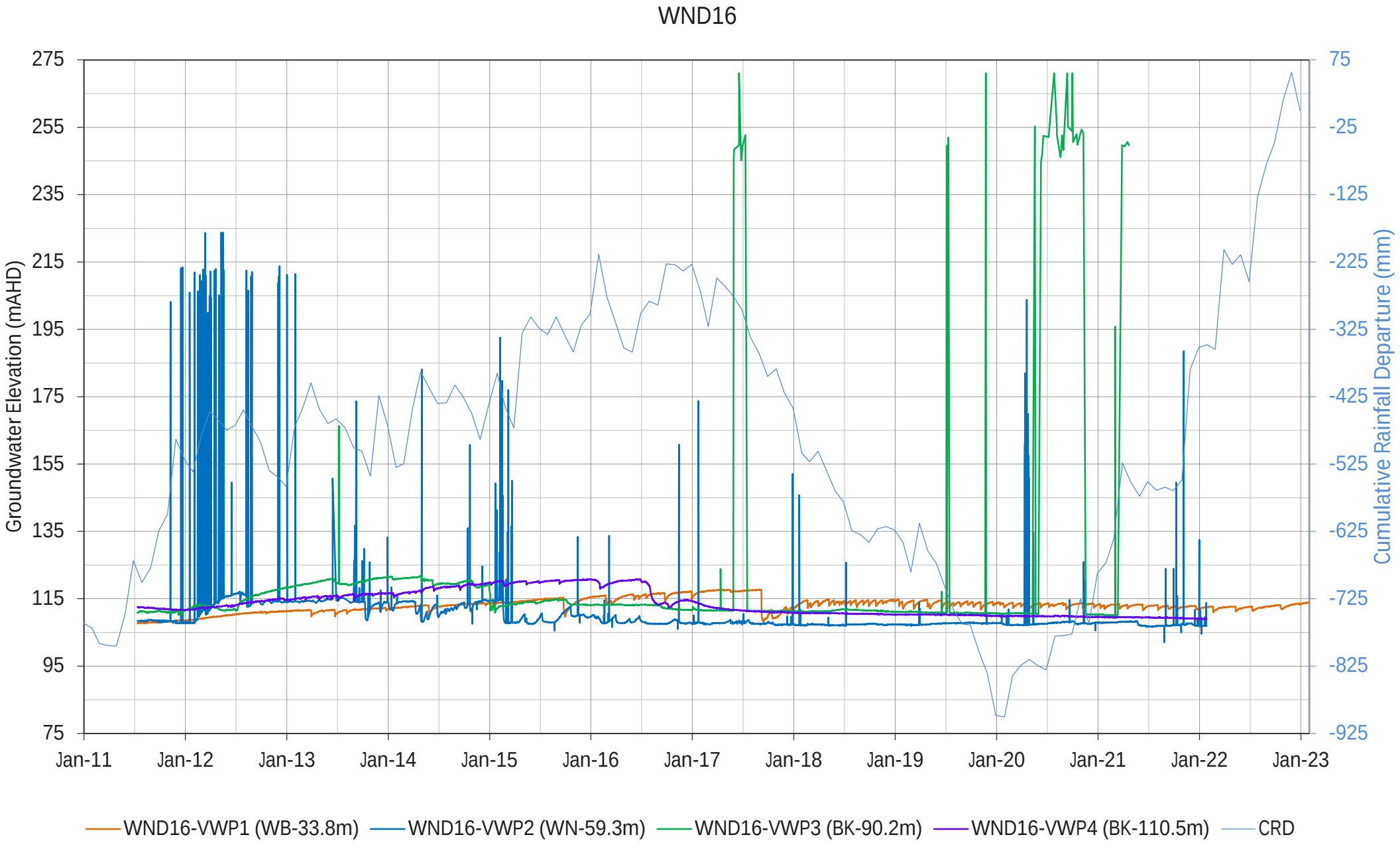

MB3-Regolith - pH
pH
Cumulative Rainfall Departure (mm)
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab pH
Field pH
Trigger - pH upper
Trigger - pH lower
CRD

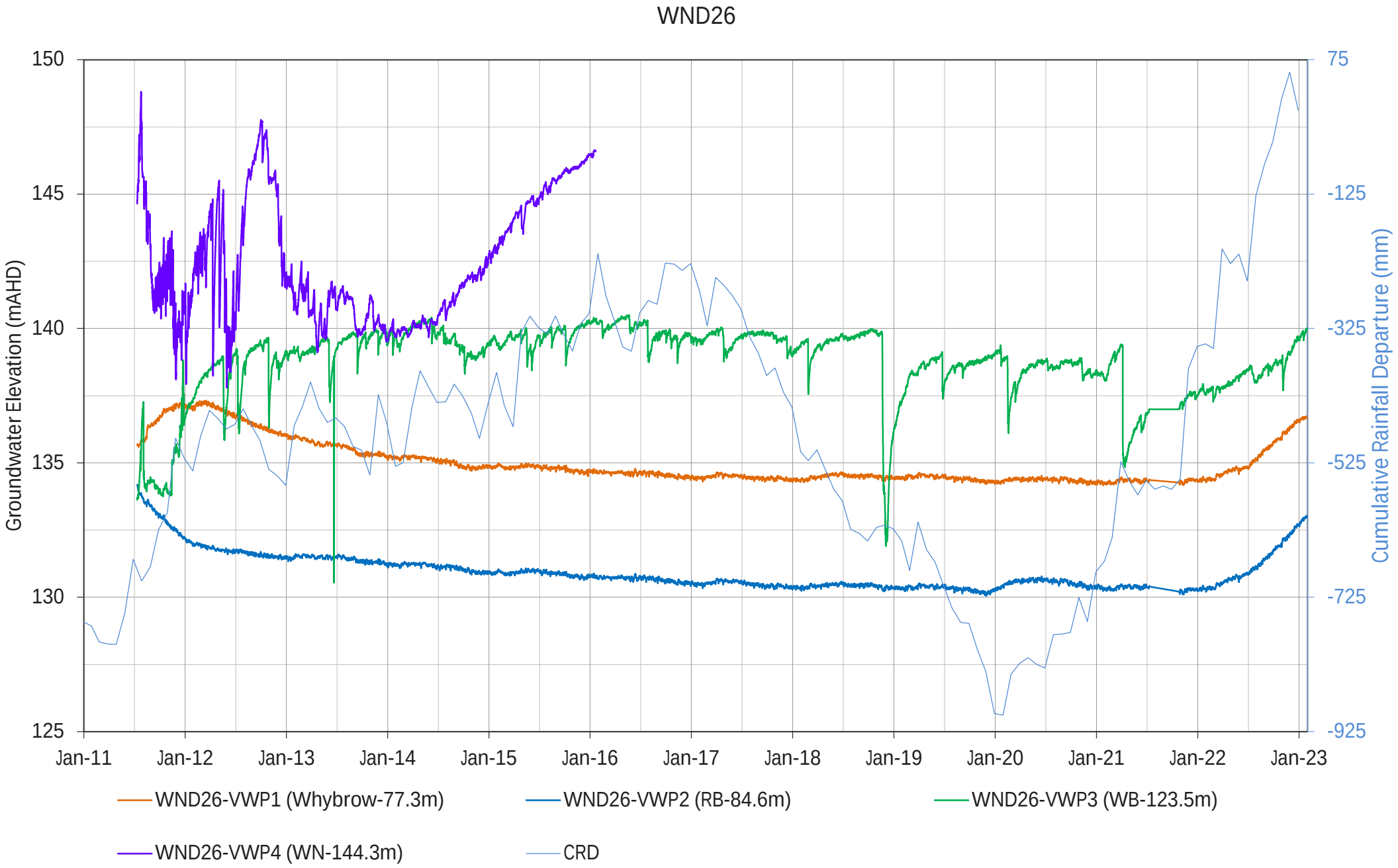

MB3-Regolith - EC
Electrical Conductivity (EC - µS/cm)
Cumulative Rainfall Departure (mm)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
200
75
-50
-175
-300
-425
-550
-675
-800
-925
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
Lab EC
Field EC
Trigger - EC upper
CRD

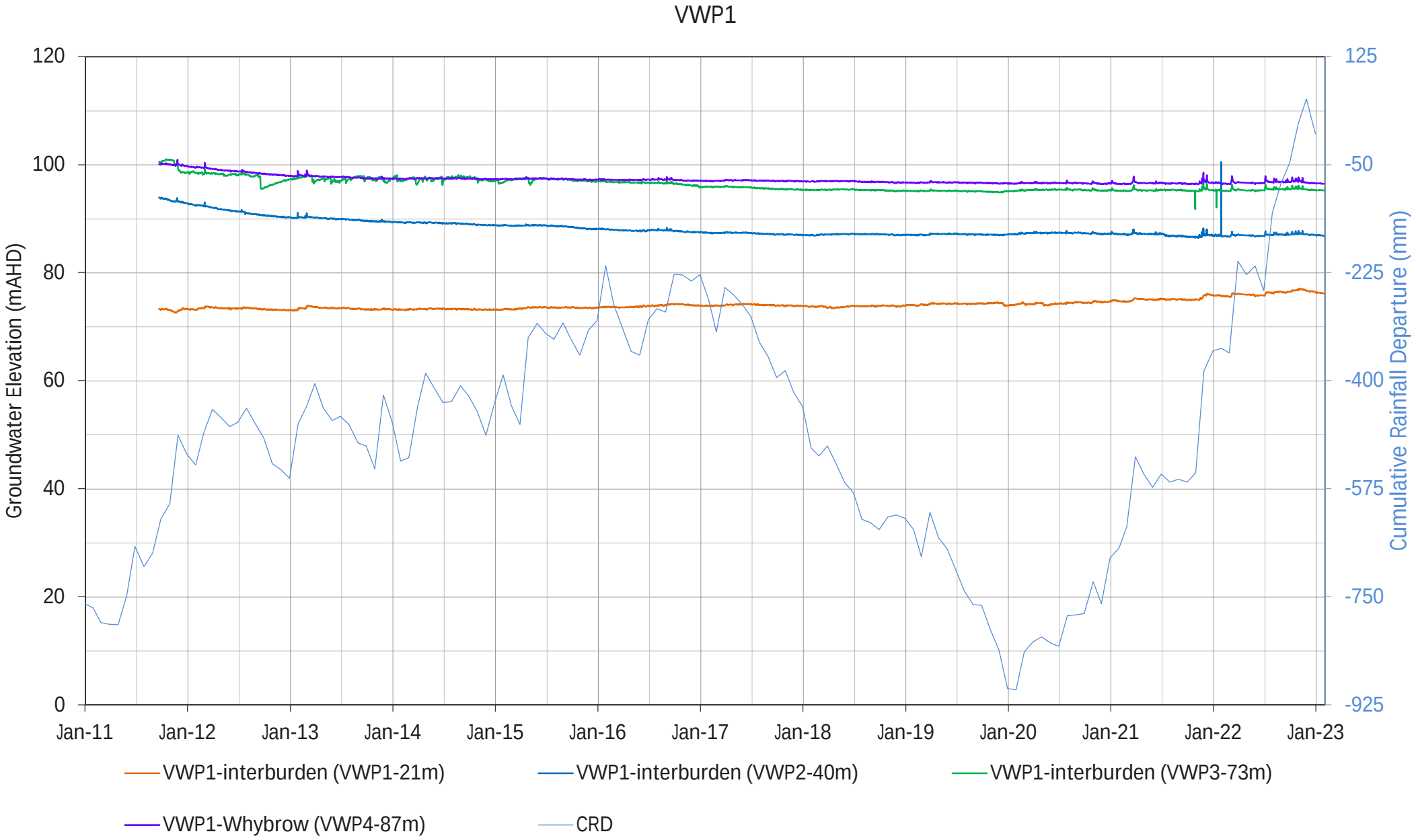

RD1192
Groundwater Level (mAHD)
155
150
145
140
135
130
125
Cumulative Rainfall Departure (mm)
125
-50
-225
-400
-575
-750
-925
2011
2012
2014
2016
2018
2020
2022
RD1192-VWP1 (WB1-61m)
RD1192-VWP2 (RB3-80m)
RD1192-VWP3 (BK1-148.5m)
CRD

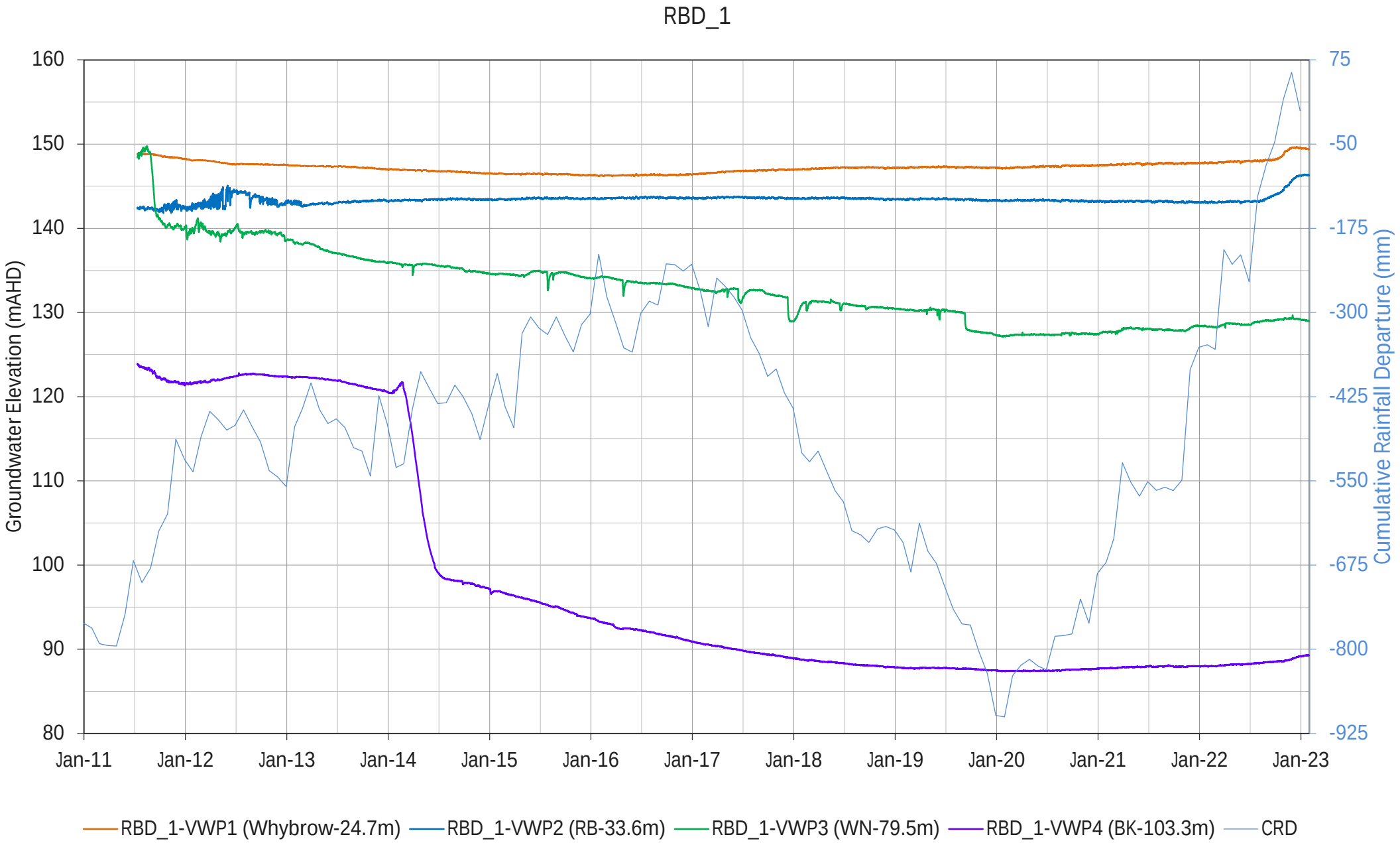

RD1189
Groundwater Level (mAHD)
190
170
150
130
110
90
70
50
Cumulative Rainfall Departure (mm)
125
-25
-175
-325
-475
-625
-775
-925
2011
2012
2014
2016
2018
2020
2022
RD1189-VWP1 (WH1-79m)
RD1189-VWP3 (WW12-186m)
RD1189-VWP4 (Mt Arthur seam-230m)
RD1189-VWP6 (BY2-315m)
CRD


BKL6R12
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
180
170
160
150
140
130
120
110
100
75
-50
-175
-300
-425
-550
-675
-800
-925
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
BKL6R12-VWP1 (WB2-25m)
BKL6R12-VWP2 (RB-40.5m)
BKL6R12-VWP3 (WN2-86.5m)
BKL6R12-VWP4 (BK1-113.7m)
CRD


WND16
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
275
255
235
215
195
175
155
135
115
95
75
75
-25
-125
-225
-325
-425
-525
-625
-725
-825
-925
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
WND16-VWP1 (WB-33.8m)
WND16-VWP2 (WN-59.3m)
WND16-VWP3 (BK-90.2m)
WND16-VWP4 (BK-110.5m)
CRD


WND26
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
150
145
140
135
130
125
75
-125
-325
-525
-725
-925
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
WND26-VWP1 (Whybrow-77.3m)
WND26-VWP2 (RB-84.6m)
WND26-VWP3 (WB-123.5m)
WND26-VWP4 (WN-144.3m)
CRD


VWP1
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
120
100
80
60
40
20
0
125
-50
-225
-400
-575
-750
-925
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
VWP1-interburden (VWP1-21m)
VWP1-interburden (VWP2-40m)
VWP1-interburden (VWP3-73m)
VWP1-Whybrow (VWP4-87m)
CRD


RBD_1
Groundwater Elevation (mAHD)
Cumulative Rainfall Departure (mm)
160
150
140
130
120
110
100
90
80
75
-50
-175
-300
-425
-550
-675
-800
-925
Jan-11
Jan-12
Jan-13
Jan-14
Jan-15
Jan-16
Jan-17
Jan-18
Jan-19
Jan-20
Jan-21
Jan-22
Jan-23
RBD_1-VWP1 (Whybrow-24.7m)
RBD_1-VWP2 (RB-33.6m)
RBD_1-VWP3 (WN-79.5m)
RBD_1-VWP4 (BK-103.3m)
CRD