



Centennial Coal



Centennial Newstan Pty Ltd

**Newstan Colliery
Water Management Plan**

June 2021

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Abbreviations

AHD	Australian Height Datum
BOM	Bureau of Meteorology
CRD	Cumulative rainfall departure
DES	Queensland Department of Environment and Science
DO	Dissolved oxygen
DPIE	Department of Planning, Industry and Environment
DPIEW	Department of Planning, Industry and Environment – Water
EC	Electrical conductivity
EP&A Act	Environmental Planning and Assessment Act
EPA	Environmental Protection Authority
EPL	Environmental Protection Limit
ESCP	Erosion and Sediment Control Plan
FUS	Fassifern underground storage
GDE	Groundwater dependent ecosystem
GHD	GHD Pty Ltd
LDP	Licensed discharge point
LEA	Lease Extension Area
LMCC	Lake Macquarie City Council
m	metres
ML/year	Megalitres per year
Mtpa	Million tonnes per annum
NCSS	Newstan Colliery Services Site
ROM	Run of mine
SILO	Scientific Information for Land Owners
SREA	Southern Reject Emplacement Area
SSD	State Significant Development
WMP	Water management plan
VWP	Vibrating wire piezometer

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1 Introduction

Newstan Colliery (Newstan) is an existing underground coal mine operation located on the western side of Lake Macquarie. Newstan is located approximately 25 km south-west of Newcastle in NSW and is located in the Lake Macquarie Local Government Area. The colliery is owned and operated by Centennial Newstan Pty Limited (Centennial Newstan), which is a wholly owned subsidiary of Centennial Coal Company Limited (Centennial).

Newstan is currently approved under DA 73-11-98 which was granted in May 1999. The original approval enabled mining to continue within the existing mining areas that had not previously been mined. DA 73-11-98 has been modified eight times, most recently in 2018. Newstan has approval to extract up to 4 million tonnes per annum (Mtpa) of run of mine (ROM) coal.

In 2014, the Northern Coal Logistics Project was approved, which effectively transferred the management of the Newstan Colliery Surface Site (NCSS) to Northern Coal Services. Therefore, Newstan now refers to the underground mine in the upper seams (Great Northern and Fassifern seams) and the lower seams (West Borehole, Borehole, Young Wallsend and Yard seams) within the consolidated consent boundary of DA 73-11-98.

This site-specific Water Management Plan (WMP) has been prepared for the Newstan operations as part of a Regional Water Management Plan (GHD 2016). This plan seeks to replace the previous Newstan Revised Water Management Plan (GHD, 2009) and the Main West Groundwater Monitoring Program (GHD, 2012). The Newstan WMP will be progressively developed as water management requirements change over time.

The Newstan operations have interactions with the Northern Coal Services operations and Awaba pit top and historical underground workings. Operations at the NCSS are covered by the site-specific WMP prepared for Northern Coal Services while operations at the Awaba pit top and historical underground workings are covered by a separate site-specific WMP (GHD 2018).

1.1 Overview of site operations

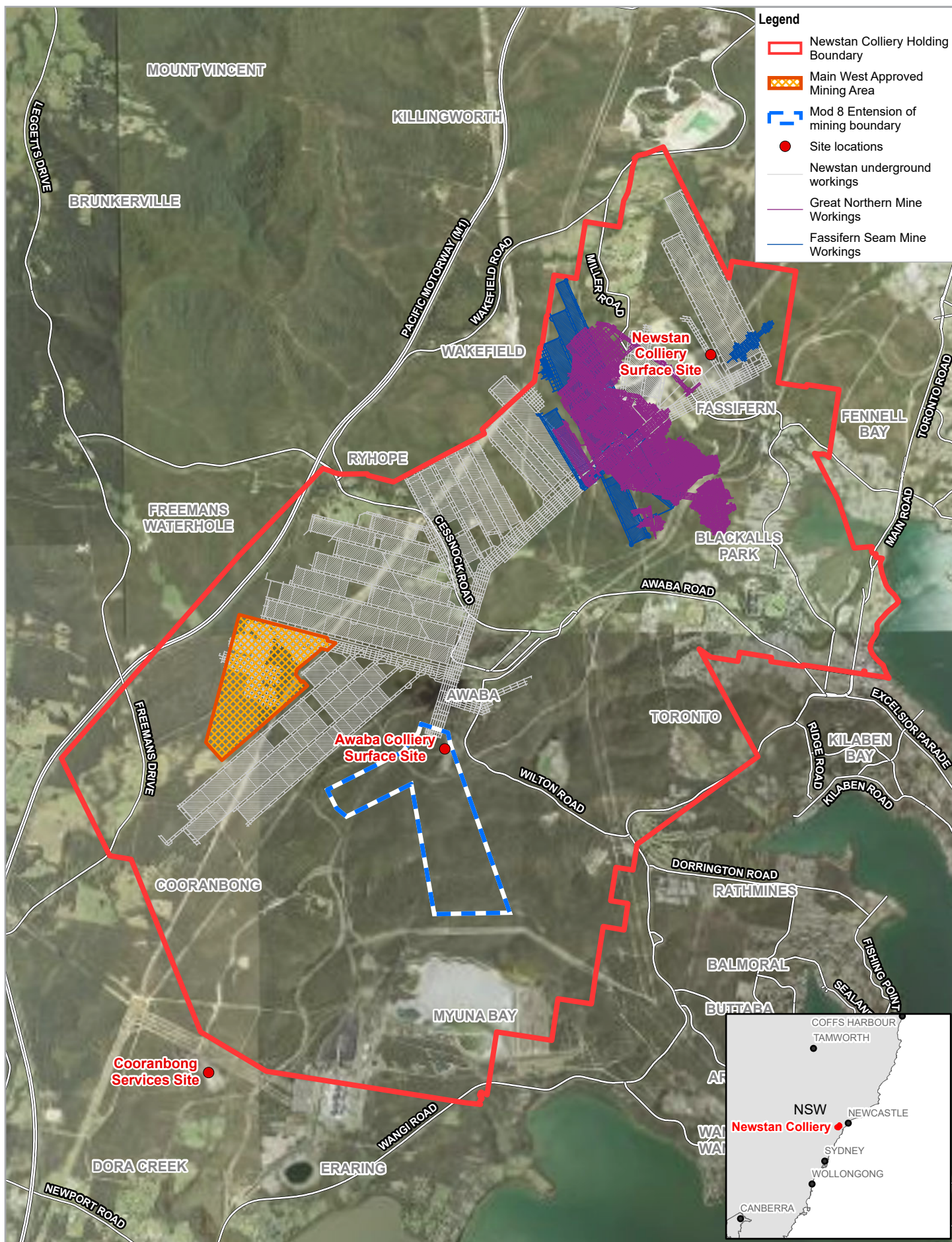
1.1.1 Site features

Underground mining operations commenced at Newstan in 1887, with longwall mining commencing in 1984. Various seams have been mined, including the upper seams (Great Northern and Fassifern seams) and lower seams (West Borehole, Borehole, Young Wallsend and Yard seams) of the Newcastle Coal Measures. Existing mine workings are shown in Figure 1-1.

A State Significant Development (SSD) application was made for the Newstan Mine Extension Project (SSD 5142) in March 2012. Assessment of this project, which involves the continuation of mining operations and the extension of the mining area, is currently ongoing.

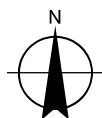
1.1.2 Coal production

Newstan Colliery currently has approval to extract up to 4 Mtpa of ROM coal, however the mine was placed into care and maintenance in August 2014 due to poor market conditions. Modification 4 to DA 73-11-98 permits the development of first workings within the West Borehole seam in the southern portion of the Newstan Colliery mining lease area in an area known as Main West (Figure 1-1). Modification 8 permits the development of first workings within the West Borehole seam into a new area in the southern portion of the Newstan Colliery mining lease area known as the Mod 8 extension of mining area (Figure 1-1).



Paper Size ISO A4
0 500 1,000 1,500 2,000
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Centennial Coal
Newstan
Underground Water Management Plan

Project No. 22-19721
Revision No. 0
Date 09/12/2019

Locality

Figure 1-1

1.1.3 History

Underground mining operations commenced at Newstan in approximately 1887, however the recent history began with longwall mining commencing in 1984, as summarised in Table 1-1.

Table 1-1 History of Newstan Colliery

Date	History
1887	Underground mine established by Northumberland Coal and Land Company.
1984	Longwall mining production commences in the Fassifern Seam.
1990	Longwall mining production commences in the West Borehole and Young Wallsend seams.
14 May 1999	Minister for Urban Affairs and Planning granted development consent to Newstan Colliery under Part 4 of the EP&A Act for the Newstan Colliery Life Extension Area pursuant to Development Application 73-11-98 (DA 73-11-98).
2002	Mine owned and operated by Centennial Newstan.
23 September 2007	Modification 1 approved for mining of longwall 24 and relocation of ventilation shaft.
27 November 2009	Modification 2 approved for delivery of coal from Mandalong Mine by truck for handling and processing.
26 November 2010	Modification 3 approved for delivery of coal from Awaba Colliery by truck for handling and processing.
16 March 2012	Modification 4 approved first workings development in the Main West Mining Area.
19 November 2012	Modification 5 approved delivery of coal from the Cooranbong Entry Site and excavated coal and stone material from Awaba Colliery.
6 January 2014	Modification 6 adjusted the consolidated consent boundary in the Main West Mining Area.
August 2014	Underground operations at Newstan Colliery were placed into care and maintenance.
29 September 2015	SSD-5145 was granted for the Northern Coal Logistic Project to regulate the approved existing coal handling, processing and transport operations at the Newstan Colliery Surface Site, Cooranbong Entry Site
1 December 2015	Modification 7 approved.
17 January 2019	Modification 8 approved to permits the extraction of up 2 Mt from first workings mining within the West Borehole seam in the southern portion of the Newstan Colliery mining lease area extend a further 12 months to 6 July 2021.

1.2 Approvals and licensing requirements

1.2.1 Development consent

The WMP addresses specific water components of development consent DA 73-11-98 which was originally granted in May 1999. Development consent DA 73-11-98 has had eight modifications. The latest of these in 2018 extended the project life for a further 12 months to 6 July 2021 and modified the development consent boundary shown in Figure 1-1.

The relevant requirements of the WMP specified by development consent DA 73-11-98 are outlined in Table 1-2, along with the sections of the plan where these have been addressed.

Table 1-2 Development consent DA 73-11-98 Schedule 2 conditions

Condition		Where addressed
Condition 3.5 (a)	<i>Prevention of Soil Erosion</i> The Applicant shall prepare Erosion and Sediment Control Plans for the surface facilities and the LEA in consultation with LMCC and to the satisfaction of DoI Water and the Secretary, and submit these Plans to the EPA as part of applications for a licence under the Protection of the Environment Act. The Plans shall be prepared and implemented prior to the commencement of work in the relevant areas.	Section 3.8
Condition 3.5 (b)	The Erosion and Sediment Control Plans shall include: (i) consideration and management of erosion and sedimentation of surface watercourses/waterbodies within the LEA; and (ii) considerations of LMCC's Erosion and Sediment Control Policy and Code of Practice (iii) a program for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in the approved erosion and sediment control management plans, and EIS. (refer also condition (d) (i) below)	Section 3.8 <i>Northern Coal Services: Water Management Plan</i> <i>Northern Operations, Regional Water Management Plan</i>
Condition 3.5 (d)	General Terms of Approval – EPA (i) <i>Stormwater / sediment Control – Construction Phase</i> The Erosion and Sediment Control Plan (ESCP) in sub clause (a) above must also be prepared to describe the measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities. The ESCP should be consistent with the requirements for such plans outlined in <i>Managing Urban Stormwater: Soils and Construction</i> , (Landcom), or most recent version of these guidelines. (ii) <i>Stormwater / sediment Control – Operational Phase</i>	Section 3.7 Section 3.8 <i>Northern Coal Services: Water Management Plan</i> <i>Northern Operations, Regional Water Management Plan</i> Section 3.2

Condition		Where addressed
	A Stormwater Management Scheme must be developed and implemented to mitigate the impacts of stormwater runoff from the site following the completion of construction activities. The Scheme should be consistent with the Stormwater Management Plan for the catchment and the Water Management Plan in Condition 4.1. Where a Stormwater Management Plan has not yet been prepared, the Scheme should be consistent with the guidance contained in Managing Urban Stormwater: Council Handbook (available from the EPA). The Scheme shall be prepared at the same time as the Water Management Plans in consideration 4.1.	
Condition 4.1. (a)	Water Management Surface & Ground Water Management Prior to construction of the new surface facilities, and prior to first workings within the LEA, prepare water management plans for the relevant developments, in consultation with DPIEW, EPA, LMCC, and DRE and to the satisfaction of the Secretary, which shall include, but not be limited to, the following matters:	This WMP
Condition 4.1. (a) (i)	management of the quality and quantity of surface and ground water within the areas covered by the water management plans, which shall include preparation of monitoring programs as provided by condition 8.2.;	This WMP <i>Northern Coal Services: Water Management Plan</i>
Condition 4.1. (a) (ii)	management of stormwater and general surface runoff diversion to ensure separate effective management of clean and dirty water; (refer also condition 3.5 (d) (ii)).	<i>Northern Coal Services: Water Management Plan</i>
Condition 4.1. (a) (iii)	measures to prevent the quality of any surface waters being degraded below the relevant water quality due to the operation of the mine workings;	This WMP
Condition 4.1. (a) (v)	identification of any possible adverse effects on water supply sources of surrounding land holders, as a result of the underground mining operations in the LEA and surface mine works, and implementation of mitigation measures as necessary;	Section 3.6
Condition 4.1. (a) (vi)	identification of changes in flow of surface waters including all creeks within the LEA, particularly in Lord's Creek, due to subsidence;	<i>Northern Coal Services: Water Management Plan</i>
Condition 4.1. (a) (vii)	identification of any stream rehabilitation works required to ameliorate subsidence effects on stream flows within Lords Creek;	<i>Northern Coal Services: Water Management Plan</i>

Condition		Where addressed
Condition 4.1. (a) (viii)	contingency plans for managing adverse impacts of the development on surface and groundwater quality, including the matter in condition 4.1(d)(iv);	This WMP <i>Northern Coal Services: Water Management Plan</i>
Condition 4.1. (a) (ix)	identification of the fresh quality groundwater resources within the project area, including the development of appropriate protection strategies;	Section 2.5.1
Condition 4.1. (a) (x)	projection of potential groundwater changes during mining (short term) and post-mining (long term) with particular attention given to the affect of changes to groundwater quality and mobilisation of salts;	Section 3.6
Condition 4.1. (a) (xi)	a monitoring and remediation strategy for all streams which may be adversely affected by subsidence including bed fracturing and/or degradation of the stream channel. Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW;	Section 4.6 Awaba Water Management Plan Sinkhole Rehabilitation Plan, Awaba Colliery Appendix D
Condition 4.1. (a) (xii)	consideration of the State Wetlands Management Policy for all significant downstream wetlands that may be effected by mining activity within the LEA or the relevant area; and	Section 2.3 Newstan Wetland Management Plan
Condition 4.1. (a) (xiii)	a program for reporting on the effectiveness of the water management systems and performance against objectives contained in the approved site water management plans, and EIS.	Section 7
Condition 4.1. (b)	implement remediation measures, to the satisfaction of DPI Water, where the development is responsible for the loss of groundwater quality or quantity below its current beneficial use; and	This WMP
Condition 4.1. (c)	obtain a license with DPIEW under part 5 of the Water Act (1912) prior to construction of all new excavations, test bores and production bores (including dewatering bores) that intersect the groundwater.	Section 1.2.2
Condition 4.1. (d)	<u>General Terms of Approval – DPIEW</u> Pursuant to Part 2 of the Water Act 1912: (i) Construction conditions (ii) Deleted (iii) An appropriate vegetative buffer shall be installed between the licensed works and any	Section 4.2 and 4.3 Appendix C

Condition		Where addressed
	adjacent mining activities; (iv) Groundwater and surface water quality monitoring shall be conducted, to the satisfaction of DPIEW, in the vicinity of the licensed works. The monitoring program is to identify any degradation in water quality as a result of the works (also refer to condition 8.2(ii)). A contingency plan shall be developed, to the satisfaction of DPIEW, to remediate any such degradation (also refer to condition 4.1 (a)(ix)). A copy of the finding shall be submitted to LMCC.	
	<u>General Terms of Approval – EPA</u> (i) Pollution of Waters: The licensee must design construct and operate all plant and equipment and any other facilities on the premises so as to minimise the pollution of waters. (ii) (iii) and (iv) deleted	Section 3
Condition 4.3. (a)	<i>Groundwater Monitoring Program – Main West Mining Areas</i> The Applicant shall prepare a Groundwater Monitoring Program for the Main West Mining Area. This program must be prepared in consultation with DPIEW, and be submitted to the Secretary by the end of August 2012 for approval	This WMP
Condition 4.3. (b)	The program must include: Baseline data of groundwater levels (including alluvial and weathered rock aquifers), yield and quality in the region, and any privately owned groundwater bores that may be affected by mining operations; groundwater assessment criteria based upon analysis of baseline data for groundwater, surface water, including trigger levels for investigating any potentially adverse groundwater impacts; and a program to monitor and/or validate the impacts of mining in Main West on alluvial and coal seam aquifers, and any groundwater bores.	Section 3.6, Section 4, Section 5.2, Section 6.1
Condition 8.2. (a) (i)	The Applicant shall construct and locate surface and ground water monitoring positions, as identified in the site water management plan (condition 4.1 (a)), in consultation with DPIEW, LMCC and EPA, and to the satisfaction of the Secretary , at least three months prior to the commencement of construction works in the relevant area and first workings in the LEA;	This WMP <i>Northern Coal Services: Water Management Plan</i>

Condition		Where addressed
Condition 8.2. (a) (ii)	The Applicant shall prepare a detailed monitoring program in respect of ground and surface water quality and quantity, including water in and around the Newstan mine site, Northern and Southern Emplacements, and LEA, and also consistent with condition 4.1(b) (iv), during construction works, mine operations and post mine operations in consultation with DPIEW, EPA, and to the satisfaction of the Secretary. The monitoring program shall also include surveys of drainage channels within the LEA to update information obtained in the preparation of Property Subsidence Management Plans. The monitoring program shall be prepared prior to commencement of construction in the relevant area.	Section 4, surface water aspects addressed in <i>Northern Coal Services: Water Management Plan</i>
Condition 8.2. (a) (iii)	The results and interpretation of surface and ground water monitoring are to be provided by the Applicant in an approved form to the DPIEW, LMCC and EPA on a six monthly basis, unless otherwise directed by the Secretary. The results are also to be contained and analysed in the Annual Review	Section 7.1
Condition 8.2. (b)	The Applicant must conduct water quality monitoring for pollutants in accordance with any current Environment Protection Licence under the Protection of the Environment Operations Act 1997 for the site.	Section 1.2.3 <i>Northern Coal Services: Water Management Plan</i>
Condition 8.7	The Applicant shall undertake a detailed and ongoing monitoring program of subsidence resulting from mining to the satisfaction of the Secretary and in consultation with Dol Water, DRG and SA NSW throughout the life of the mine and for a period of at least five years after the completion of mining, or other such period as determined by the Secretary in consultation with Dol Water and DRG. Monitoring shall include the following: (i) a survey of watercourses within areas mined within the DA Area; (ii) monitoring of groundwater levels and quality; (v) monitoring of remedial measures;	Inspections - Section 4.1 Groundwater monitoring - Section 4.3 Watercourse survey - Section 4.6

1.2.2 Groundwater licences

The North Coast Fractured and Porous Rock Groundwater Sources Water Sharing Plan commenced on 1 July 2016 and regulates the interception and extraction of groundwater from the fractured and porous rock aquifer within the water sharing plan boundary, which includes Newstan. Newstan is currently in consultation with the Department of Planning, Industry and Environment -Water (DPIEW) regarding the licensing of groundwater take from this source. Water licence applications were submitted by Newstan in 2015 and are awaiting determination. Follow up consultation has occurred in 2016 and 2017 and throughout 2018. Consultation with the regulator is ongoing on existing licence

applications. New licences will be obtained prior to any additional excavations, test or production bores (including dewatering bores) that intersect groundwater.

A number of licences are held by Newstan under the Water Act 1912 for groundwater monitoring bores. The details of these bores are provided in Section 4.3.

1.2.3 Environmental protection licence

Newstan currently holds environment protection licence (EPL) 395, with water currently licensed to be discharged for the NCSS through the following licensed discharge points (LDPs):

- LDP001 – Discharges from the Clean Water Plant to the upper reaches of the northern arm of LT Creek.
- LDP002 – Discharges from the Final Pollution Control Dam into the upper reaches of the northern arm of LT Creek
- LDP017 – Discharges from the Fassifern Underground Storage via the Stony Creek pipeline into a tributary of Stony Creek.
- LDP021 – Discharges from Graunches Dam into the upper reaches of the northern arm of LT Creek

LDP001, LDP002, LDP017 and LDP021 are managed as part of the NCSS and are now associated with Northern Coal Services and management requirements are covered in the WMP for that site. LDP001 is the discharge of water treated by the Clean Water Plant, while LDP002 and LDP021 discharge only as a result of rare rainfall events.

As part of the Northern Coal Logistics project, it was proposed to establish LDP003 at the outlet of the Clean Water Dam within the SREA at the NCSS. Overflows from the Clean Water Dam are directed into the southern arm of LT Creek and are expected to occur infrequently as a result of heavy rainfall.

The Fassifern Underground Storage receives inflows as a result of infiltration from the surface catchment, groundwater inflows and transfers from NCSS. Water levels in the storage are managed by transferring water to NCSS. During prolonged periods of heavy and above average rainfall when water within the Fassifern Underground Storage rises above 16.6 m below ground level (6.4 m AHD), the storage discharges water by gravity through two 600 mm diameter pipes into Stony Creek via Newstan LDP017.

Newstan design, construct and operate all plant and equipment on the premises such that the pollution of waters is minimised.

1.3 Water Management Plan objectives

The WMP has been developed to address the legislative, approvals and licensing requirements presented in Section 1.2. The objectives of the WMP are:

- Collate and review existing information and studies relating to the operation of the water management system at Newstan.
- Establish an understanding of the water management system at Newstan.
- Categorise the existing conditions that are specific to water management requirements.
- Undertake a surface water quality assessment and review existing water quality assessment criteria.
- Undertake a groundwater assessment and identify groundwater level and quality triggers.
- Determine the future water management requirements.
- Review and develop water monitoring requirements.

1.4 Relationship to other plans

Water management at Newstan is covered by three separate scales of management plan, which encompass a regional, site-specific and mine workings level. Water is managed regionally via the implementation of the *Northern Operations: Regional Water Management Plan* and at an operational-level via implementation of the site-specific WMP (this document). An extraction plan for all second workings at Newstan will also be developed as required, which must include a WMP.

Figure 1-2 presents the relationship between these plan types with respect to water management.

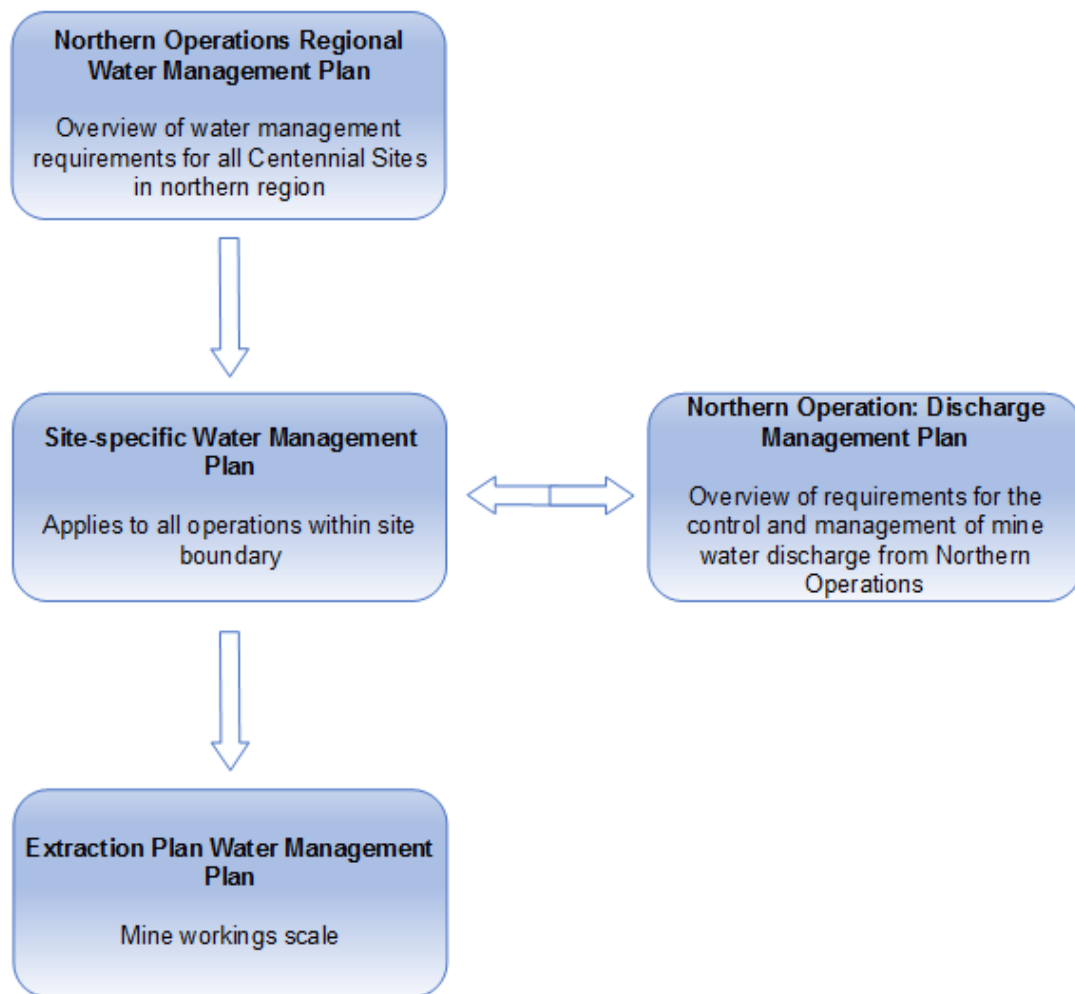


Figure 1-2 Water management plans at Newstan Colliery

1.4.1 Northern Operations: Regional Water Management Plan

The *Northern Operations: Regional Water Management Plan* has been developed to provide an overview of the water management requirements across Centennial sites within the Lake Macquarie catchment and to standardise the management of water. Site-specific WMPs, such as this plan, address specific development approval conditions and water management requirements for individual sites.

1.4.2 Northern Operations: Discharge Management Plan

The *Northern Operations: Discharge Management Plan* was prepared to outline the requirements for the control and management of mine water discharge from each of Centennial's northern operations.

The management plan focuses primarily on the management of discharges of underground mine water from LDPs at Myuna Colliery and the Cooranbong Entry Site (CES) and the NCSS.

1.4.3 Extraction plans

Extraction plans are developed for all secondary workings of each longwall panel prior to mining. Generally, extraction plans describe the applicable regulatory framework, mine planning and management and monitoring measures to be implemented to ensure the protection of all surface/subsurface natural and built features and the protection of public safety during extraction..

1.4.4 Northern Coal Services: Water Management Plan

The *Northern Coal Services: Water Management Plan* was prepared to outline the requirements for water management at Northern Coal Services. This plan is part of the *Northern Operations: Regional Water Management Plan*. Northern Coal Services integrates the coal processing, handling and transport operations from Mandalong Mine and Newstan Colliery. Northern Coal Services utilises infrastructure at the CES and the NCSS, along with private haul roads and rail loading infrastructure. Groundwater inflows into the underground workings at Newstan are managed by transfer to the NCSS prior to discharge via LDP001. All water management requirements associated with mine water discharges from the NCSS are detailed by the *Northern Coal Services: Water Management Plan*.

1.4.5 Awaba Colliery Water Management Plan

The *Awaba Colliery Water Management Plan* is a site specific WMP that identifies water management requirements at the Awaba Colliery pit top, underground water management of the historical underground workings and surface water and groundwater monitoring requirements for the site. In the past there has been transfers of underground water between Newstan and Awaba however the infrastructure for this transfer is no longer in place.

2 Environment

2.1 Climate

A historical record of daily rainfall and evaporation depths was obtained in the form of a patched point data set from the Scientific Information for Land Owners (SILO) database operated by the Science Delivery Division of the Queensland Department of Environment and Science (DES). SILO patched point data is based on observed historical data from a particular Bureau of Meteorology (BOM) station with missing data 'patched in' by interpolating with data from nearby stations (DSITI 2018).

For this assessment, SILO data was obtained for the Cooranbong (Avondale) station (station number 061012), which is located approximately 14 km south-west of the NCSS. This station was chosen based on proximity to the site and similarity of elevation. The period of rainfall data used for this assessment extended from 1 January 1889 to 1 January 2018 (a total of 129 years).

Figure 2-1 shows the distribution of annual rainfall near Newstan. Annual rainfall totals near Newstan have varied between 584 mm (1944) to 2059 mm (1990), with an average of about 1135 mm. Annual potential evaporation totals are about 1370 mm, resulting in an average net annual evaporation of about 235 mm.

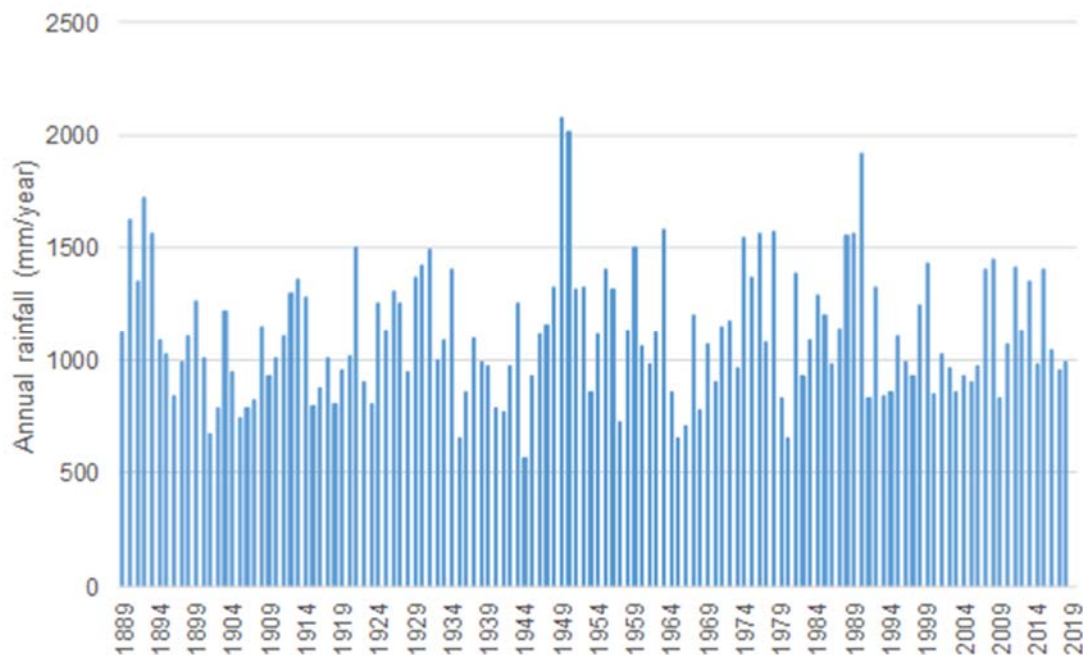


Figure 2-1 Annual rainfall totals

Figure 2-2 shows the average monthly rainfall and evaporation totals near Newstan. On average, more rainfall occurs in late summer and early autumn than in late winter and early spring. Evaporation is highest in summer and lowest in winter.

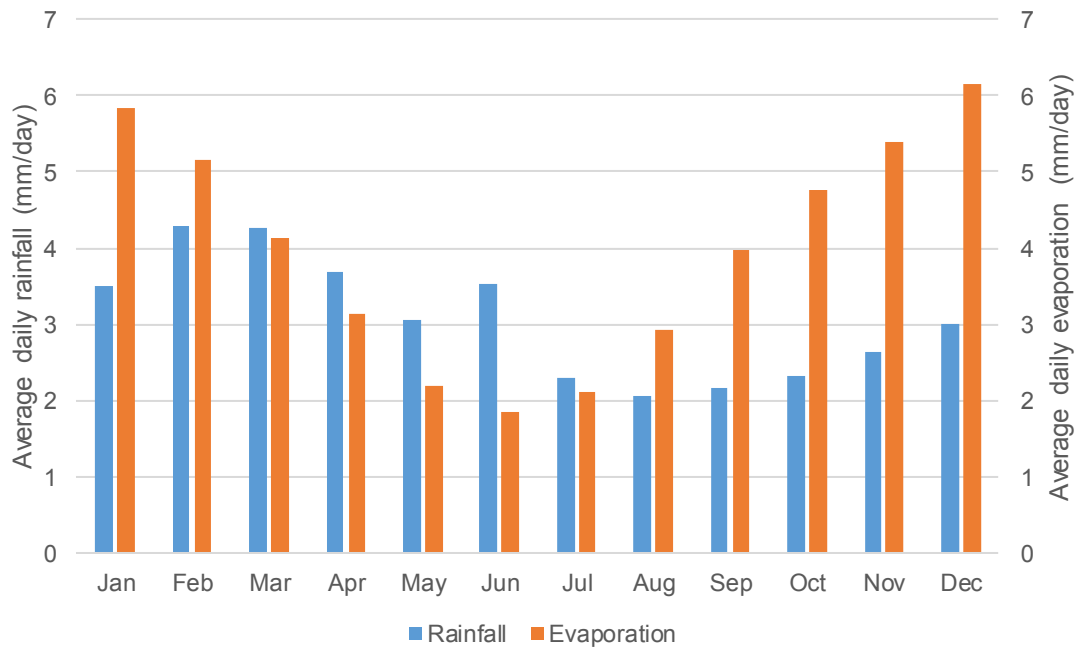


Figure 2-2 Monthly rainfall and evaporation totals

The SILO dataset from the BOM Cooranbong (Avondale) station was also used to generate a cumulative rainfall departure (CRD) curve over the period 1901 to 2018, presented in Figure 2-3. A CRD curve is the monthly accumulation of the difference between the observed monthly rainfall and long-term average monthly rainfall. Any increase in the CRD curve reflects above average rainfall while a decrease in CRD curve reflects below average rainfall. The CRD curve only deviates from zero due to atypical (above and below average) rainfall.

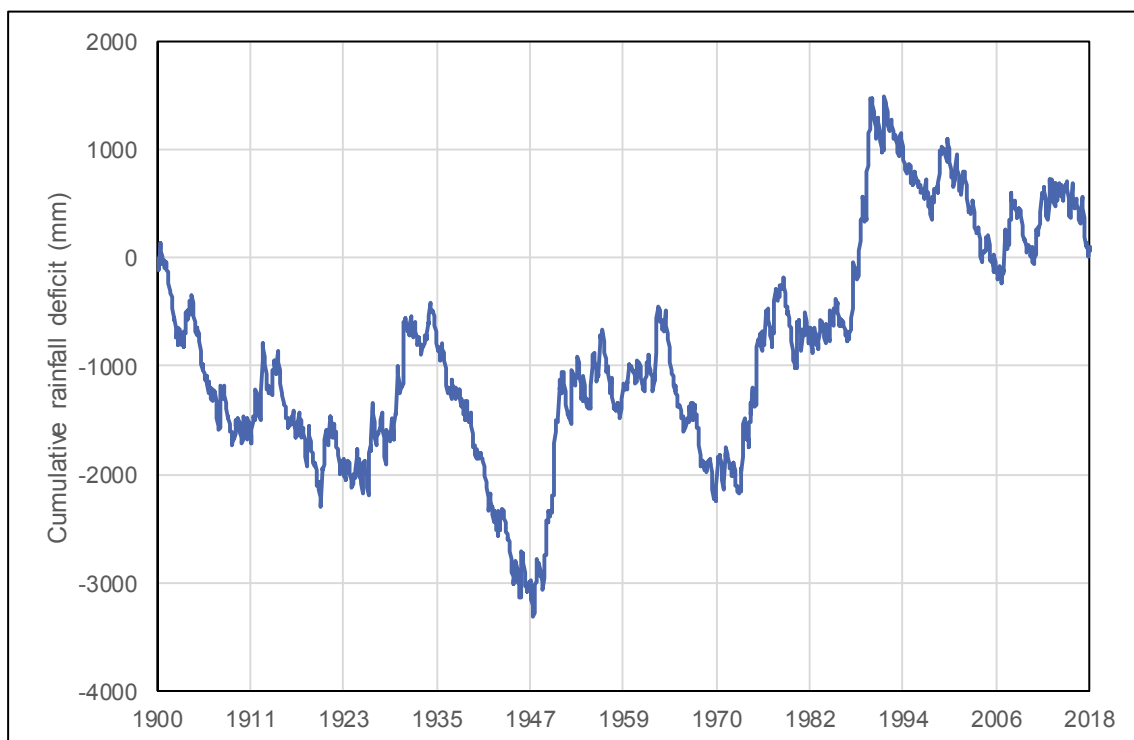


Figure 2-3 Cumulative rainfall departure curve

2.2 Topography and hydrology

The area surrounding Newstan is characterised by several ridgelines and creek valleys. Elevations within the Newstan holding boundary vary from approximately 0 m Australian Height Datum (AHD) to 110 m AHD.

Newstan is located in the Lake Macquarie catchment. All watercourses at Newstan drain to Lake Macquarie. Creek systems that overly the existing and proposed underground workings include:

- Stony Creek.
- Lords Creek
- Kilaben Creek.
- Stockyard Creek.
- Some unnamed creeks and tributaries.

2.3 Wetlands

A number of wetlands are identified within or downstream of the Newstan LEA (as per NSW Wetland Mapping by DPIE). The wetland areas identified include:

- Estuarine Wetlands on Cockle Creek.
- Estuarine Wetlands on Stony and LT Creeks.
- Whiteheads Lagoon, located upstream of Crooked Creek and is a Coastal Lagoon.
- Muddy Lake, which is a part fresh, part salt lake connected to Lake Eraring.

The management of wetlands, under the NSW Wetlands Policy, is as outlined in the *Newstan Colliery Wetland Management Plan*. Muddy Lake is specifically conditioned under an EPBC approval from the Department of Environment and Energy for the Northern Coal Services Project. Specific reference to the management of this system should also refer to the Northern Region Discharge Management Plan.

Wetland areas within the LEA are to protected from clearing and detrimental changes in surface water flow volume and water quality, as per the requirements of the NSW Wetland Policy.

2.4 Geology

Newstan is located in the south-western part of the Newcastle Coalfield, which occupies the north-eastern portion of the Sydney Basin. The stratigraphy of the region consists of rocks from the Triassic and Permian periods.

The stratigraphy at Newstan is listed and described in Table 2-1. This information has been sourced from the *Newcastle Coalfield Regional 1:100,000 Geology Map* (Hawley et al. 1995) and the *Newstan Colliery Life Extension Project Overburden Groundwater Study* (Pacific Power International 1997).

Table 2-1 Site stratigraphy

Period	Stratigraphy		Unit/Lithology	Coal Seams
	Group	Subgroup		
Quaternary			Alluvium	
Triassic	Narrabeen	Clifton	Conglomerate, sandstone, siltstone, claystone	
Permian	Newcastle Coal Measures	Moon Island Beach	Conglomerate, sandstone, siltstone, tuff, coal	Vales Point, Wallarah, Great Northern
		Awaba Tuff		
		Boolaroo	Sandstone, conglomerate, siltstone, coal, tuff	Fassifern, Upper Pilot, Lower Pilot, Hartley Hill
		Warners Bay Tuff		
		Adamstown	Conglomerate, sandstone, siltstone, coal, tuff	Australasian Montrose, Wave Hill, Fern Valley, Victoria Tunnel
		Nobby's Tuff		
		Lambton	Sandstone, siltstone, claystone, coal, tuff	Young Wallsend, Yard, Borehole
	Waratah Sandstone			

Based on a review of the Newcastle Coalfields Regional Geology map and exploration logs, the surface lithology in the vicinity of Newstan comprises shallow Quaternary alluvium (associated with the major watercourses) as well as bedrock and surface deposits from the Narrabeen Group and the Moon Island Beach Group of the Newcastle Coal Measures, which dip gently at approximately 1 to 2 degrees to the south-west. The Triassic and Permian rocks that comprise the surface lithology include conglomerate, sandstone, siltstone, claystone, tuff and coal.

The target coal seams are the Young Wallsend, Yard and Borehole Seams (referred to collectively as the West Borehole Seam). Centennial has previously developed 32 longwall panels within the West Borehole Seam. The West Borehole Seam subcrops to the west of Newstan. The depth of cover above the proposed first workings (which form part of Modification 8 to DA 73-11-98) ranges from approximately 180 m to 270 m and the Seam thickness ranges from 3.5 m to over 5.0 m.

The existing Awaba Colliery workings within the Great Northern Seam are located over 140 m above the proposed Modification 8 first workings within the West Borehole Seam.

2.5 Hydrogeology

The groundwater sources in the vicinity of Newstan are generally low yielding and predominantly within the Quaternary alluvium, weathered and/or fractured sandstone and coal seams. They would be 'less productive', in accordance with the NSW Aquifer Interference Policy.

2.5.1 Groundwater sources

Alluvial water sources

The alluvium forms an unconfined shallow aquifer with groundwater ranging in depth from less than 1 m to about 5 m below ground level (bgl) and aquifer thickness generally less than 15 m. Areas of alluvium generally only occur in the vicinity of creek lines. Due to the clay content of the alluvium, yields and beneficial use of this groundwater are generally low. The alluvial groundwater is generally fresh to brackish and slightly acidic.

Porous and fractured rock water sources

The piezometric head within the Permian coal seams tend to reflect the natural topography and orientation and dip of the seams, with reduced pressures at major surface drainage areas (i.e. Lake Macquarie) and in areas of coal extraction. Where coal seam groundwater has not been depressurised, the groundwater head tends to be in the order of 0 m AHD due to the coastal environment. Recharge of coal seams occurs in areas of seam subcrop.

Packer testing undertaken as part of previous exploration drilling at Newstan indicates that the hydraulic conductivities of the West Borehole and overlying seams are generally in the order of 10^{-8} to 10^{-7} m/s.

Monitoring by Centennial Newstan indicates that the existing workings within the West Borehole Seam currently receive groundwater inflow of approximately 1 to 2 ML/day. This water is brackish and slightly alkaline, and sodium bicarbonate-chloride dominant water type. Underground water within the existing workings flows under gravity to underground dams, where it is transferred to the 19 cut through dam and pumped to the Fassifern Underground Storage at Newstan.

The overburden and interseam strata within the Newcastle Coalfield tend to have very low hydraulic conductivities (in the order of 10^{-11} to 10^{-9} m/s), unless joints or fracturing creates a secondary permeability (Pacific Power International 1997).

2.5.2 Groundwater users

The search of groundwater bore database (operated by Water NSW) identified 67 registered bores within approximately 2 km of the Newstan holding boundary. Of these bores, the majority (45 bores) were registered as monitoring bores or test bores. One bore was registered for waste disposal and two bores were registered for dewatering or mining purposes and the remainder (19 bores) were registered for a combination of stock, domestic, irrigation and farming purposes.

The majority of stock, domestic, irrigation and farming bores are less than 50 m in depth and extract groundwater from the Triassic Narrabeen Sandstone and the Permian Coal Measures and interburden.

Registered bore locations are shown in Figure 2-4 and bore details are provided in Appendix C.

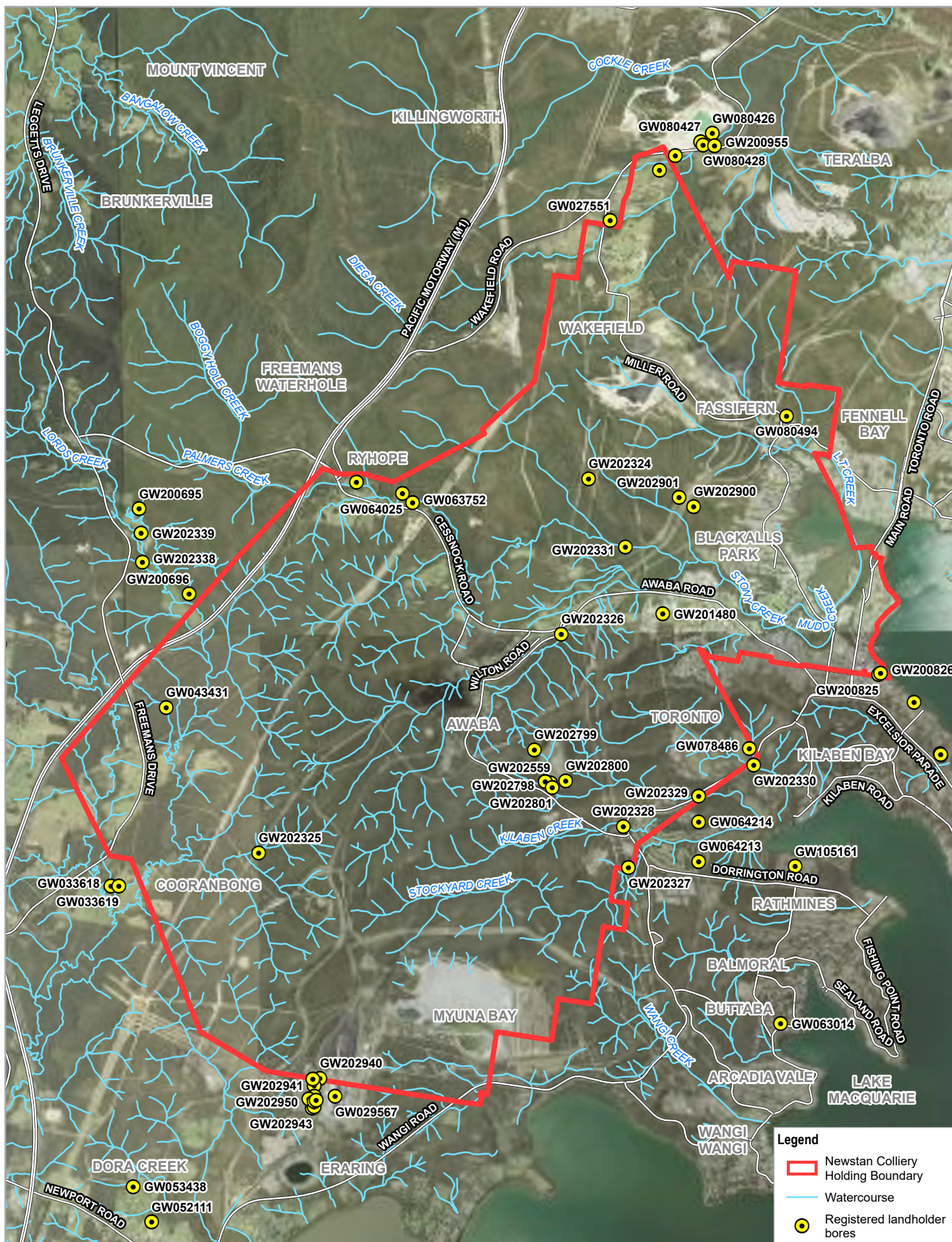
2.5.3 Groundwater dependent ecosystems

A search of the BOM Groundwater Dependent Ecosystem (GDE) Atlas (BOM 2018) has been used to identify GDEs in the vicinity of Newstan. Potential aquatic and terrestrial GDEs are listed in the vicinity of the site. The following terrestrial GDEs are present in the vicinity of the site:

- Narrow-leaved Apple/Parramatta Red Gum/Persoonia oblongata heathy woodland of the Howes Valley area

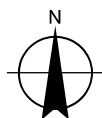
- Scribbly Gum/Red Bloodwood/Angophora inopina heathy woodland on lowlands of the central coast
- Smooth-barked Apple/Red Bloodwood/Brown Stringybark/Hairpin Banksia heathy open forest of the Central Coast
- Spotted gum/Broad-leaved Mahogany/Grey Gum grass/shrub open forest on Coastal Lowlands of the Central coast
- Spotted Gum/Broad-leaved Mahogany/Red Ironbark shrubby open forest
- Swamp Mahogany/Flax-leaved Paperbark swamp forest on coastal lowlands of the Central Coast
- Sydney Blue Gum/Lilly Pilly mesic tall open forest of coastal ranges and tablelands escarpment

Lake Macquarie, Muddy Lake and Whiteheads Lagoon are mapped as potential aquatic GDEs.



Paper Size ISO A4
 0 400 800 1,200 1,600 2,000
 Metres

Map Projection: Transverse Mercator
 Horizontal Datum: GDA 1994
 Grid: GDA 1994 MGA Zone 56



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 Underground Water Management Plan

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Registered groundwater bores

Figure 2-4

3 Water management

3.1 General

The water management system at Newstan is primarily comprised of underground water management. Surface water management at the NCSS is managed by Northern Coal Services in accordance with the Northern Coal Services WMP.

A schematic of water management at Newstan and interactions with other sites is shown in Figure 3-4.

3.2 Surface water management

The management of clean and dirty surface water, potable water and waste water at the NCSS is managed by Northern Coal Services. Refer to the Northern Coal Services WMP for details.

3.3 Underground water management

Newstan's primary underground water management features are the Fassifern Underground Storage (FUS) and existing West Borehole seam workings. The FUS is the void formed by previous mining activity in the Fassifern and Great Northern seams at Newstan.

The FUS receives inflows as a result of infiltration from the surface catchment, groundwater inflows and transfers from NCSS. Water levels in the storage are managed by transferring water to NCSS at a maximum rate of 11 ML/day via the Fassi 1 bore. During wet periods when water within the FUS rises above 16.6 m bgl (6.4 m AHD), the storage discharges water by gravity through two 600 mm diameter pipes into Stony Creek via LDP017. Centennial Newstan continuously transfers water from the FUS to NCSS (when water quality is acceptable) to maintain a low water level within the storage and minimise the risk of discharge through LDP017.

The West Borehole seam workings receive groundwater inflows and can be supplied with process water for underground operations transferred from NCSS. Water is collected in sumps and pumped to the FUS.

A water management and monitoring station at LDP017 was commissioned in 2013 to allow for emergency discharges in a controlled manner in order to ensure the safety of personnel in the underground workings at Newstan. The water management and monitoring station allows for:

- The control of the instances of discharge via the pipeline.
- The continuous monitoring of discharge water quality.
- In the event of poor water quality, discharges can be contained within the station and treated or extracted as required in a controlled manner.

3.4 Interaction with Newstan Colliery Surface Site

Dirty water is transferred from various surface water storages at NCSS to Newstan's Fassifern Underground Storage for temporary storage and management. NCSS can also provide water to Newstan for underground mining operations. Dewatering underground from surface water storages occurs at a controlled rate, controlled through automated pumping systems and injection boreholes.

Water levels in Newstan's Fassifern Underground Storage are managed by transferring water to NCSS's Clean Water Plant, which commenced operation at NCSS in late 2013. Water treated by the Clean Water Plant is either used to supply mining processes and the coal processing plant, or is discharged through LDP001. Further information on the operation of the Clean Water Plant can be found in the Northern Coal Services WMP.

3.5 Historical pumping into Awaba underground workings

Awaba Colliery is a former underground coal mine operation owned by Centennial Newstan. Bord and pillar mining operations commenced at Awaba Colliery in 1947 and coal production ceased in March 2012. Awaba is now closed with all coal reserves exhausted. The mine is sealed and there is no access to the underground workings, which have become flooded following the cessation of mine dewatering.

There was previously pumping infrastructure linking the underground storages at Newstan and Awaba via an area within the West Borehole Seam underground workings known as the 80 cut through. This infrastructure was previously used to transfer water from Newstan to Awaba. Water from 80 cut through was pumped to the surface via a borehole and then along a 200 mm surface pipeline to the Awaba surface site. This pipeline was reported to have a length of approximately 1 km and a typical operating flow rate of 40 L/s (3.4 ML/day). This pipeline is now disused and the associated pump has been removed.

3.6 Hydrogeological predictions

A hydrogeological model was developed as part of the *Newstan Mod 8 Water Resources Impact Assessment* (GHD 2018). The hydrogeological model predicted the lateral zone of impact through depressurisation of aquifers from existing West Borehole Seam workings (which remain dewatered) and future mining activities (within the Mod 8 extension of mining area) and future groundwater inflow.

Figure 3-1 presents the groundwater inflows predicted by hydrogeological modelling for Newstan. Current groundwater inflows into the West Borehole Seam workings are estimated to be 1.1 ML/day. Total groundwater inflows into the West Borehole Seam workings are predicted to very gradually decrease until the end of mining within the Mod 8 extension of mining area in mid-2021.

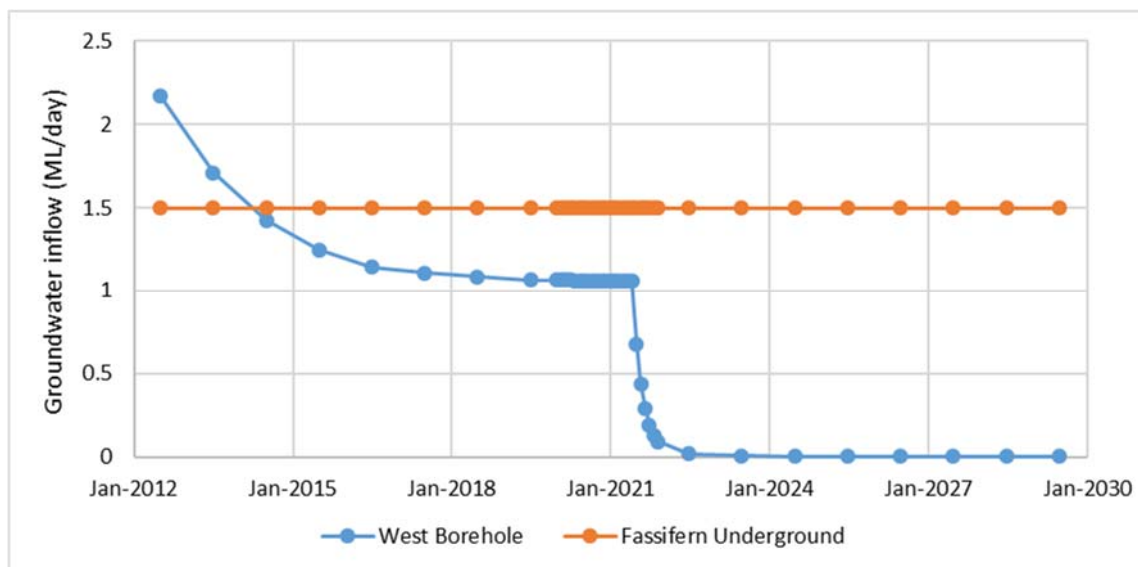
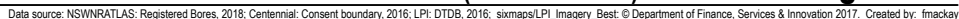
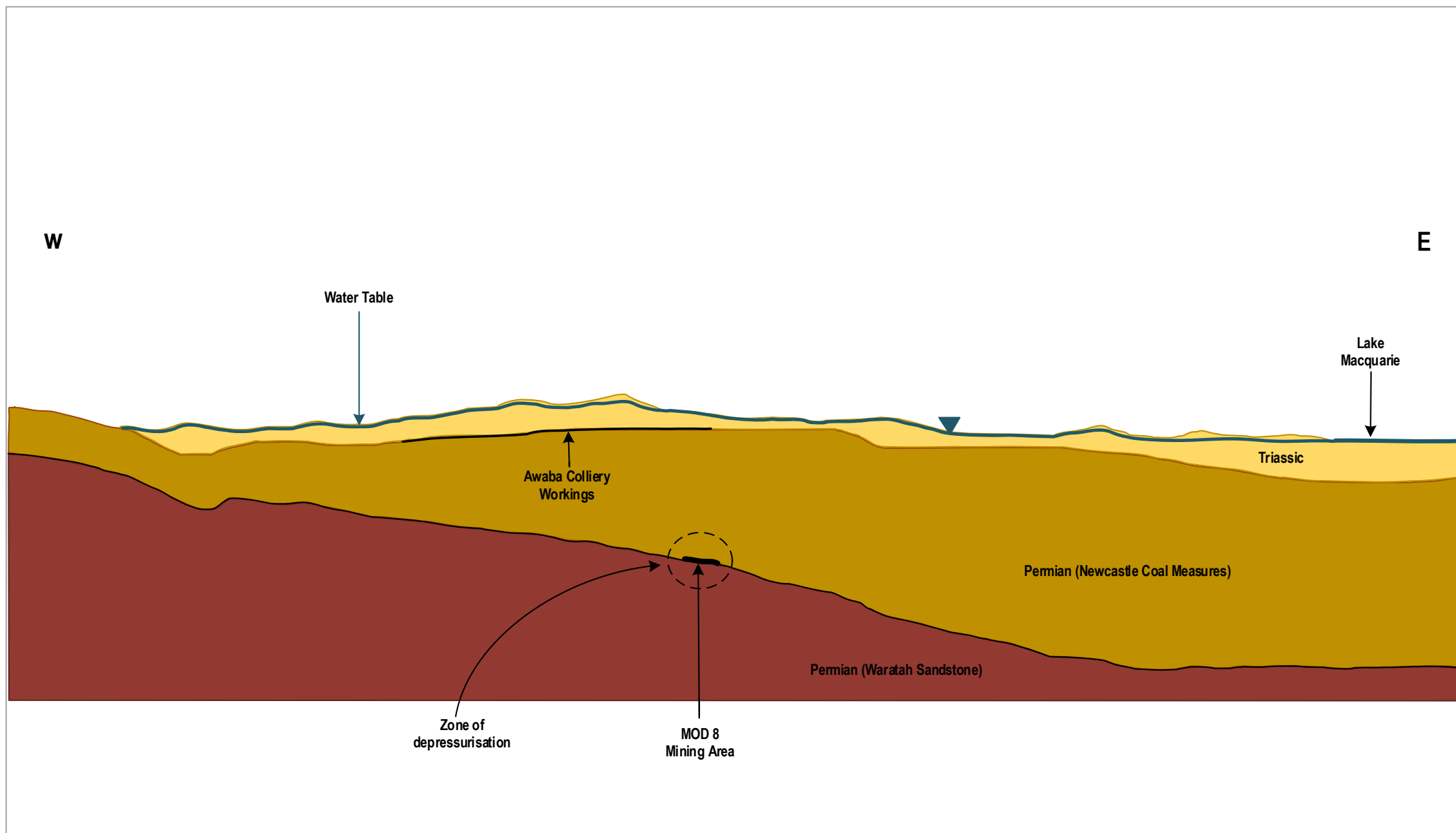


Figure 3-1 Predicted groundwater inflows

GHD (2018) predicts that there will be no change to groundwater quality as a result of mining at Newstan. Minor temporal variability in groundwater quality is expected within the coal seams and overburden due to the nature of the fractured and porous rock groundwater sources. This variability is expected to be within the bounds of the observed groundwater quality.

Mining at Newstan is not predicted to result in any drawdown of alluvial groundwater. The groundwater model predicts drawdown to occur within the lower Permian strata. Figure 3-2 presents modelled groundwater drawdown in the lower Permian strata due to mining of first workings associated with Newstan modification 8. The zone of drawdown is also shown schematically in cross section in Figure 3-3. Drawdown occurs over the mine workings. Additional drawdown is also expected to occur within the Permian strata due to the additional drawdown due to the life of mine plan being extended for one year.





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NEWSTAN WMP
**GEOLOGICAL CROSS SECTION
THROUGH THE MOD 8 AREA**

Project No. 22-19721
Revision No. A
Date 07/12/2018

FIGURE 3-3

Created by: Tyler Tinkler

Registered landholder bores, listed in Section 2.5.2, have been compared with the modelled radius of drawdown. All identified landholder bores are located at least 500 m from the modelled radius of drawdown, with the exception of GW063752, GW064025, GW202324, GW080494, GW027551, GW060852, GW045155, GW080427 and GW080428. Of these bores GW202324, GW080427 and GW080428 are registered as landholder bores. The remaining bores are registered as stock and domestic or livestock. All of these bores are shallow (less than 20 m deep) with the exception of GW080494 where the depth is unknown. Therefore the modelled drawdown is not expected to impact on any registered groundwater users.

3.7 Water and salt balance

The water and salt balance model for Newstan was recently updated as part of the *Newstan Mod 8 Water Resources Impact Assessment* (GHD 2018) to quantify average water transfers for the site under existing and future operational conditions using various rainfall patterns sampled from the historical record.

A schematic of the overall water management system is presented in Figure 3-4. A summary of the predicted average annual inputs and outputs is provided in Table 3-1. Given the relatively low production rate for the approved first workings, water for underground mining operations and ROM coal moisture are considered negligible and not included in the water balance.

Groundwater inflows into the Fassifern Underground Storage are estimated to currently be 1.5 ML/day based on a review of underground water transfer data. Groundwater inflows into the Fassifern workings are modelled to remain constant.

Table 3-1 Annual average water balance as at 2018

Water management element	Annual average flow (ML/year)	Annual average salt flux (tonnes)
INPUTS		
Groundwater inflows into underground	929	1833
Surface infiltration into underground	1160	1944
Transfers from NCSS	671	301
TOTAL INPUTS	2760	4078
OUTPUTS		
Transfers to NCSS	2765	4054
TOTAL OUTPUTS	2765	4054
CHANGE IN STORAGE		
Underground water storages	-5	+24
TOTAL CHANGE IN STORAGE	-5	+24
BALANCE		
Inputs – outputs – change in storage	0	0

**Northern Coal Logistics project
(SSD 5145)**

Hawkmount
Quarry

Cooranbong
Entry site

Newstan Colliery
surface site

EPL 395

LDP001

LDP002

LDP003
(Planned)

LDP017

LT Creek

Stony Creek

**Newstan Colliery
(DA 73-11-98)**

Groundwater
inflows

Infiltration

Groundwater
inflows

Fassifern
underground

West Borehole
seam workings

Legend



Underground storage



Non-impacted operations



Surface water flow



Underground process



Licensed discharge point



Groundwater flow



Surface process



Pump



Centennial Newstan Pty Ltd
Newstan Colliery
Newstan Underground Water Management Plan

Water management schematic

Project No. 2219721
Revision No. 0
Date 8 Nov 2018

Figure 3-4

Created by Tyler Tinkler

Table 3-1 shows that dominant flux in the site water balance is the dewatering groundwater inflows and surface infiltration of the underground workings to NCSS for treatment and discharge. The transfers from NCSS are minor compared to the groundwater inflows and surface infiltration.

Given the abundance of groundwater and connection of mains water, water security is not of concern at Newstan. Discharge via EPL 395 is managed by Northern Coal Services, as described in the relevant WMP.

Salt loads in Table 3-1 represent an average concentration of 2000 to 3000 $\mu\text{S}/\text{cm}$ for groundwater being extracted from the mine compared to a conductivity of 600 to 700 $\mu\text{S}/\text{cm}$ for water being injected from NCS. Given that a majority of surface infiltration into the underground working occur via the reject emplacement areas, the average electrical conductivity is similar to that of groundwater.

3.8 Erosion and sediment control plan

There is no ongoing surface disturbance at Newstan Colliery and therefore the erosion and sediment risks are considered low.

Erosion and sediment control at the NCSS is managed by Northern Coal Services, as described in the NCSS WMP.

No new surface construction activities are planned or approved at Newstan Colliery.

In the unlikely event of surface disturbance due to subsidence resulting in loss of vegetation cover or watercourse instability, a specific rehabilitation or construction erosion and sediment control plan will be prepared in accordance with:

- Managing Urban Stormwater: Soils and Construction (Landcom 2004).
- The principles and guidelines outlined in the Northern Operations Regional WMP (GHD 2016).
- Lake Macquarie City Council's Erosion and Sediment Control Policy
- Approved remediation strategy by DPIEW

4 Monitoring requirements

4.1 Inspections

Inspections of the LEA are undertaken in conjunction with surface and groundwater monitoring, on a monthly basis. Inspection of matters relating to post mining subsidence are undertaken quarterly. Inspections are undertaken as per Appendix D. .

4.2 Surface water monitoring

The surface water quality monitoring network comprises of sampling locations within the upper, mid and lower reaches of Stony Creek, Stockyard Creek, Kilaben Creek and Lords Creek. Regular monitoring of these locations has been undertaken since January 2013.

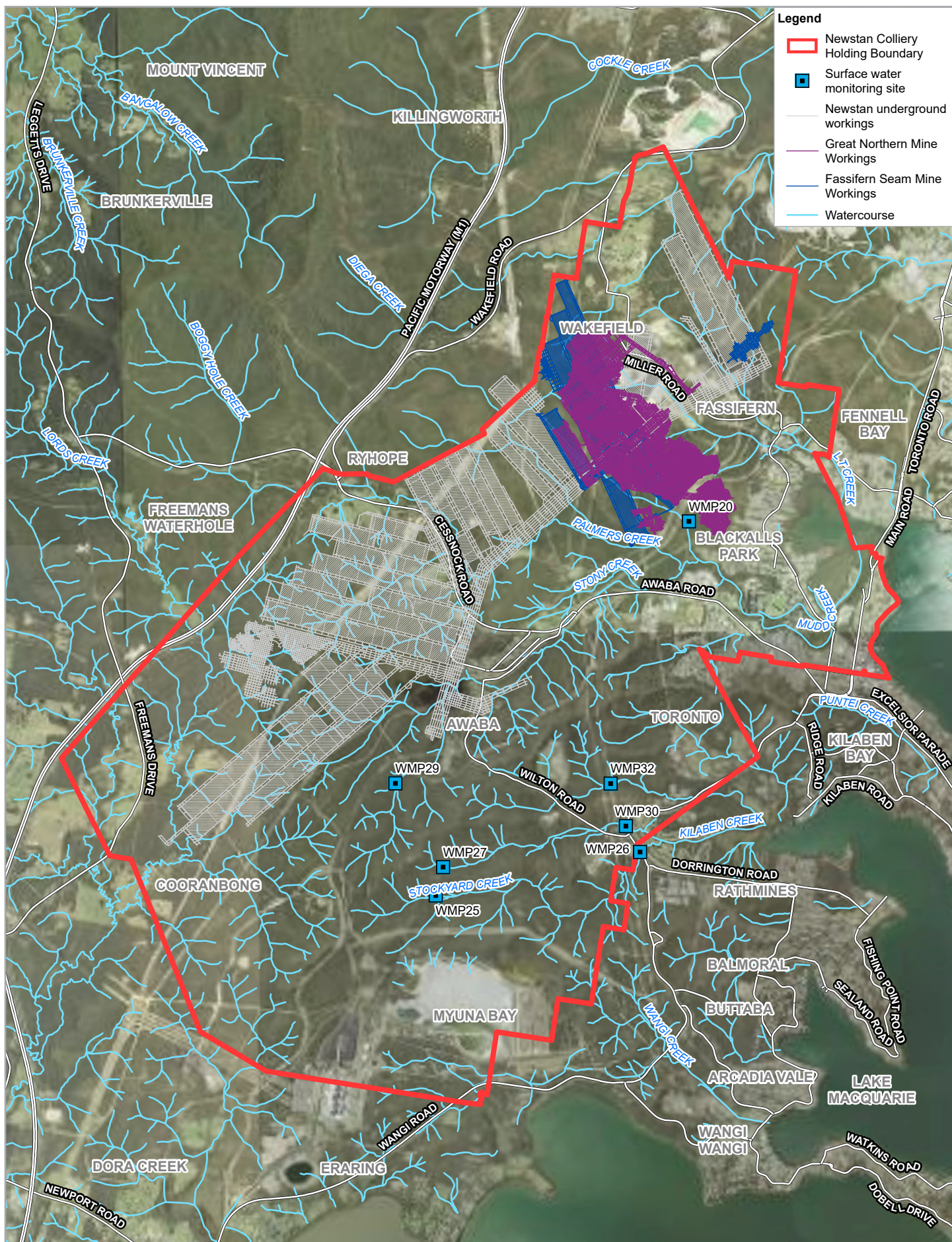
Surface water quality monitoring locations are shown in Figure 4-1. Details of surface water monitoring sites at Newstan are summarised in Table 4-1. Parameters for surface water quality monitoring are summarised in Table 4-2.

Table 4-1 Surface water monitoring sites

Monitoring site	Monitoring period	Description
WMP20	Jan 2016 to May 2019	Located in a tributary of Stony Creek, upstream of MP19
WMP25	Jan 2016 to May 2019	Upstream of Stockyard Creek
WMP26	Jan 2013 to Mar 2019	Stockyard Creek upstream of Wangi Road
WMP27	Jan 2016 to May 2019	Upstream Kilaben Creek
WMP29	Jan 2013 to Mar 2019	Stony Creek upstream of Awaba Colliery
WMP30	Jan 2013 to Mar 2019	Kilaben Creek upstream of Wangi Road
WMP32	Jan 2013 to Mar 2019	Unnamed Creek downstream of Awaba Waste Management Facility
WMP35	Jan 2013 – Jun 2017	Tributary of Lords Creek
WMP50	New	Located in the upper reaches of Lords Creek upstream of existing monitoring location WMP35
WMP51	New	Located on Stony Creek downstream of existing monitoring location WMP29.
WMP52	New	Proposed Stockyard Creek site directly downstream of the Extension of Mining Area.

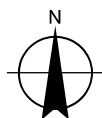
Table 4-2 Surface water monitoring parameters

Type	Parameters
Physicochemical	Electrical conductivity (EC), pH, TSS, turbidity
Major ions	Alkalinity, chloride, sulfate, calcium, magnesium, potassium, sodium, hardness
Metals	Aluminium, arsenic, barium, beryllium, boron, cadmium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, tin, titanium, vanadium, zinc
Nutrients	Ammonia, nitrate, nitrite, nitrate + nitrite, total Kjeldahl nitrogen, total phosphorus.
Other	Oil and grease, silica, fluoride, cyanide



Paper Size ISO A4
0 400 800 1,200 1,600 2,000
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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Surface water monitoring network

Figure 4-1

4.3 Groundwater monitoring bore network

The groundwater monitoring network has been progressively established at Newstan since 2005 and consists of monitoring bores installed in alluvial and coal seam strata. The bores are generally monitored twice per year for groundwater level and groundwater quality (mainly pH and EC), although some alluvial bores also contain water level loggers. Coal seam monitoring previously consisted of vibrating wire piezometers (VWPs). Note that the coal seam VWPs (CN036 and CN038) have not been in operation since October 2009.

Monitoring bore locations are shown in Figure 4-2. Details of monitoring bores at Newstan are summarised in Table 4-3. Parameters for groundwater quality monitoring are summarised in Table 4-4.

Table 4-3 Groundwater monitoring bore details

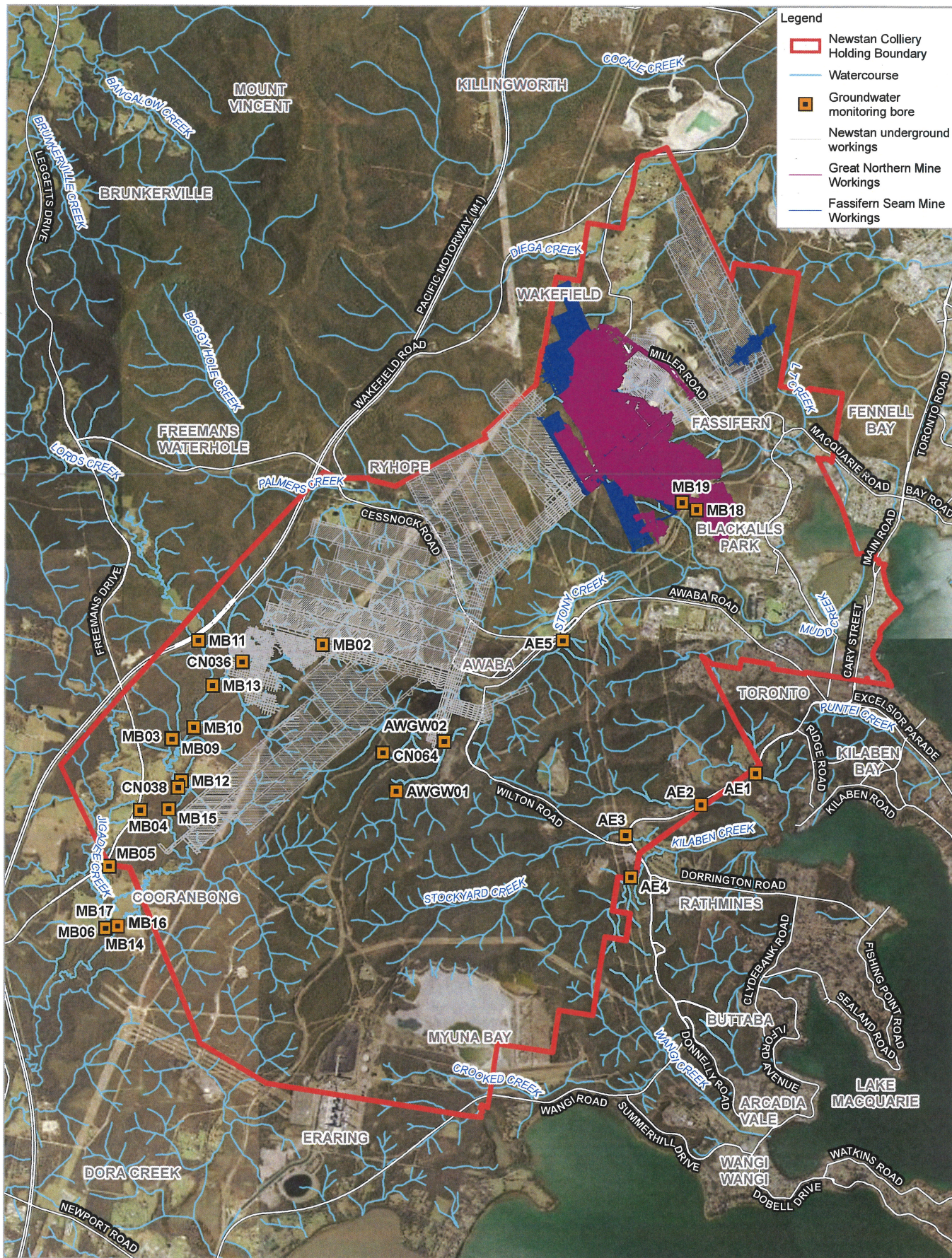
Bore	Monitoring period	Lithology
MB02	Mar 11 – Sep 12	Fassifern Seam
MB03	Mar 11 – current	Permian Coal Measures
MB04	Mar 11 – current	Great Northern Seam/ Fassifern Seam
MB05	Mar 11 – current	Great Northern Seam
MB06	Mar 11 – current	Great Northern Seam
MB09	Mar 11 – current	Lords Creek Alluvium
MB10	Jan 06 – current	Lords Creek Alluvium
MB11	Jan 06 – current	Lords Creek Alluvium
MB12	Jan 06 – current	Lords Creek Alluvium
MB13	Jan 06 – current	Lords Creek Alluvium
MB14	Mar 11 – current	Lords Creek Alluvium
MB15	Jan 06 – current	Lords Creek Alluvium
MB16	Mar 11 – current	Great Northern Seam
MB17	Mar 11 – current	Lords Creek Alluvium
MB18	Mar 11 – current	Fassifern storage
MB19	Mar 11 – current	Fassifern storage
AE1	May 09 – Nov 17	Kilaben Creek Alluvium
AE2	Mar 09 – Nov 17	Kilaben Creek Alluvium

Bore	Monitoring period	Lithology
AE3	Mar 09 – Nov 17	Kilaben Creek Alluvium
AE4	Mar 09 – Nov 17	Stockyard Creek Alluvium
AE5	Mar 09 – Nov 17	Stony Creek Alluvium
AWG01	Feb 12 - current	Stony Creek Alluvium
AWG02	Feb 12 - current	Stony Creek Alluvium
CN036	Aug – 2005 – Oct 09	West Borehole Seam
CN038	Aug – 2005 – Oct 09	West Borehole Seam
CN064	January 2019 – current	Munmorah Conglomerate Fassifern Lower Seam Permian Interburden West Borehole Seam

Table 4-4 Groundwater quality monitoring parameters

Location	Parameters
All groundwater monitoring bores	Physicochemical parameters: electrical conductivity (EC), pH. Major ions: alkalinity, chloride, sulfate, calcium, magnesium, potassium, sodium. Metals (dissolved): iron
MB18	Metals (dissolved): aluminium, arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, selenium, silver, vanadium, zinc, boron, mercury, antimony, lithium, barium. Metals (total): aluminium, arsenic, cadmium, copper, chromium, iron, manganese, lead, selenium, zinc, beryllium, cobalt, molybdenum, nickel, silver, vanadium, boron, mercury, barium. Nutrients: ammonia, nitrate, nitrite, nitrate + nitrite, total Kjeldahl nitrogen, total phosphorus.

Where the monitoring indicates any adverse impacts due to mining, Newstan shall implement the remediation strategy to the satisfaction of DPIEW.



Paper Size ISO A4
0 400 800 1,200 1,600 2,000
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



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Groundwater monitoring network

Figure 4-2

4.4 Underground water extraction and transfers

Monitoring of the following underground water transfers is undertaken:

- Transfers from the West Borehole Seam workings to the FUS.
- Transfers from the FUS to the NCSS.

All monitoring is done using inline meters and recorded within a SCADA system. Where flows are not metered, then these transfers are estimated based on operational conditions. Continuous monitoring of the underground water level within the FUS is undertaken and reviewed as part of day to day operational meetings.

4.5 Aquatic ecology

Aquatic ecology monitoring is undertaken biannually in autumn and spring to assess the potential impacts of underground mining on overlying watercourses and licensed discharges from LDP017 on Stony Creek. Aquatic ecology monitoring site locations are shown in Figure 4-3. Details of aquatic ecology monitoring sites at Newstan are summarised in Table 4-5.

The aquatic ecology monitoring includes:

- Sampling, sorting and identification of macroinvertebrates, associated with pool edge habitat in accordance with the Australian Rivers Assessment System (AUSRIVAS) protocols (Turak *et al.* 2004).
- Sampling, sorting and identification of estuarine benthic infauna collected in benthic cores at intertidal sites.
- Assessment of the condition of the aquatic habitat using modified NSW AUSRIVAS field sheets, including a modified Riparian, Channel and Environmental (RCE) inventory field sheet (Peterson 1992).
- Measurement of DO, EC, pH, temperature and turbidity just below the surface of the water column and at depth where sufficient water is available.
- Collection of surface water and sediment grab samples for water and sediment quality analysis.

Further detail of the aquatic ecology monitoring methodology is provided in the spring 2018 Newstan Aquatic Ecology report (GHD 2019).

Table 4-5 Aquatic ecology monitoring sites

Monitoring site	Monitoring period	Description
CCSC1	Winter 2012 – Spring 2014, and autumn 2019 - present	Jigadee Creek downstream monitoring site
LCDS	Autumn 2019 - present	Lords Creek downstream monitoring site
LCRef	Autumn 2019 - present	Lords Creek reference site
KCDS	Autumn 2019 - present	Kilaben Creek downstream monitoring site
PCMH	Spring 2015 - present	Reference intertidal monitoring site for benthic infauna
SCCIZ	Autumn 2014 - present	Intertidal site for the monitoring of potential impacts from LDP017 discharges

Monitoring site	Monitoring period	Description
SCDS	Autumn 2019 - present	Stony Creek downstream monitoring site
SCMid	Autumn 2019 - present	Stony Creek monitoring site within the Newstan Extension project boundary
SKDS	Autumn 2019 - present	Downstream monitoring site on Stockyard Creek
WMP20	Autumn 2014 - present	Reference site on Stony Creek
WMP27	Spring 2015 - present	Reference/potential impact site on Kilaben Creek.
WMP38	Autumn 2015 - present	Freshwater Stony Creek site for the monitoring of potential impacts from LDP017 discharges

4.6 Geomorphological stability monitoring

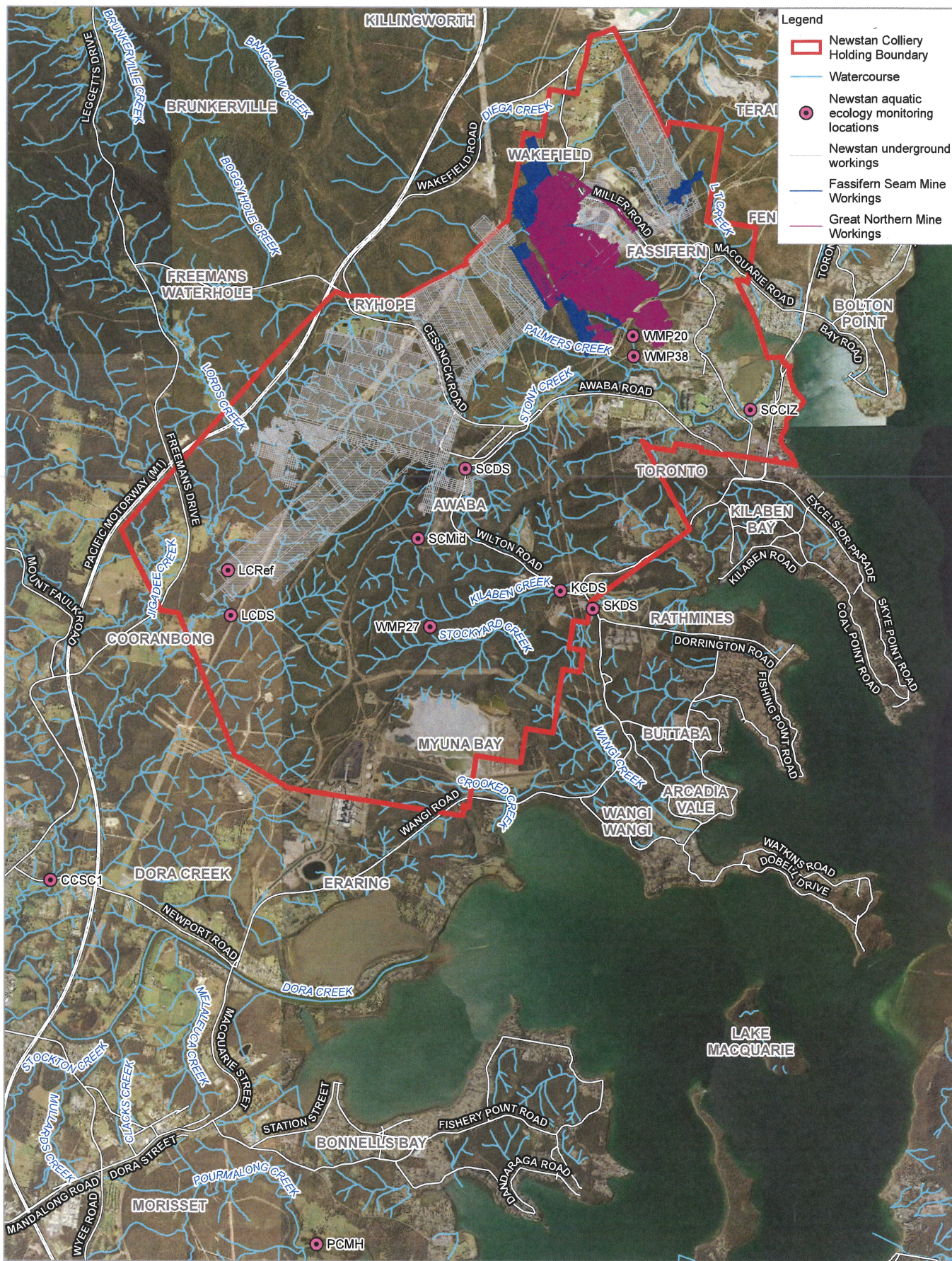
Where mining results in potential subsidence impacts within waterways, survey will be undertaken pre- and post- the mining proceeding below the waterway.

Geomorphological stability monitoring in LT Creek is managed under the Northern Coal Services WMP.

Geomorphological stability is assessed in Stony Creek downstream of discharges from LDP017. This monitoring occurs following any discharge event, with 250 metres to be monitored downstream of the discharge point. Visual inspections are aided by indicators and photographs taken along the monitored length of the creek. Where monitoring indicates any adverse impacts due to mining, the Newstan shall implement the remediation strategy to the satisfaction of DPIEW. Remediation strategies will guided by the Sinkhole Rehabilitation Plan (SLR 2020) which seeks to:

- Create a stable post rehabilitation landform.
- Preserve downstream water quality.
- Re-establish habitat and landforms that will support fauna and flora communities.

The plan provides a number of general strategies and advice including, erosion and sediment guidance, monitoring and maintenance requirements, implementation advice and responsibilities.



Paper Size ISO A4
0 490 980 1,470 1,960 2,450
Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56



Cenennial Coal
Newstan
Underground Water Management Plan

Project No. 22-19721
Revision No. 1
Date 29/01/2021

Aquatic ecology monitoring sites

Figure 4-3

5 Baseline data

5.1 Surface water quality

Surface water quality monitoring data reported since January 2013 are plotted in Appendix C. Surface water quality is generally fresh and slightly acidic. Details regarding the number of monitoring events at each site are shown in Table 5-1.

Table 5-1 Details of baseline surface water quality data

Location	Period from	Period to	Number of samples
WMP20	13/01/2016	01/05/2019	40
WMP25	13/01/2016	01/05/2019	28
WMP26	14/01/2013	12/03/2019	43
WMP27	13/01/2016	01/05/2019	29
WMP29	14/01/2013	12/03/2019	35
WMP30	14/01/2013	12/03/2019	37
WMP32	14/01/2013	12/03/2019	35
WMP35	14/01/2013	9/06/2017	10
WMP50	New WMP		
WMP51	New WMP		
WMP52	New WMP		

5.2 Groundwater levels and quality

Table 5-2 presents the extent of baseline data for groundwater levels and quality.

Table 5-2 Details of baseline groundwater data

Location	Period from	Period to	Number of points
MB02	16/03/2011	30/03/2012	3 – 4
MB03	16/03/2011	17/09/2018	1 – 18
MB04	16/03/2011	24/09/2018	1 – 18
MB05	17/03/2011	24/09/2018	1 – 18
MB06	17/03/2011	24/09/2018	1 – 17
MB09	16/03/2011	24/09/2018	12 – 16

Location	Period from	Period to	Number of points
MB10	16/03/2011	17/09/2018	14 – 28
MB11	16/03/2011	17/09/2018	1 – 26
MB12	16/03/2011	18/09/2018	14 – 27
MB13	16/03/2011	17/09/2018	12 – 24
MB14	17/03/2011	24/09/2018	15 – 17
MB15	16/03/2011	18/09/2018	15 – 28
MB16	17/03/2011	24/09/2018	1 – 18
MB17	17/03/2011	24/09/2018	15 – 17
MB18	16/09/2011	26/04/2016	4 – 475
MB19	20/09/2012	17/09/2018	7 – 11
AE1	26/10/2011	22/11/2017	1 – 17
AE2	26/10/2011	22/11/2017	1 – 17
AE3	26/10/2011	22/11/2017	1 – 17
AE4	26/10/2011	22/11/2017	1 – 13
AE5	26/10/2011	22/11/2017	1 – 17
CN036	29/08/2005	21/10/2009	NA
CN038	29/08/2005	27/10/2009	NA

Groundwater level hydrographs have been plotted with CRD and are shown in Appendix C. In the hydrographs, groundwater level is plotted in blue and the CRD curve is plotted in black. Visual review of alluvial groundwater levels indicates that there is response to CRD (below and above average rainfall) at a majority of the alluvial monitoring bores. Alluvial groundwater levels typically vary by 1 to 2 m.

Alluvial groundwater quality is generally slightly acidic. Within Lords Creek, alluvial groundwater quality varies from fresh at MB09, MB14, MB15 and MB17, to brackish at MB11. Monitoring data indicates that alluvial groundwater in Kilaben Creek, Stockyard Creek and Stony Creek is slightly brackish.

Identified trends in pH and electrical conductivity (EC) at alluvial monitoring bores include:

- a slight increase in EC at MB13 and MB09 and a slight decrease in EC at MB11,
- slightly decreasing acidity at MB15 (from approximately 6 pH units to 7 pH units) and an increase in pH at MB11 (increasingly basic).

These trends do not indicate any impact from existing mining activities from Newstan operations on shallow groundwater systems such as alluvial areas.

Visual review of groundwater hydrographs for monitoring bores installed in the Permian Coal Measures indicates that groundwater levels at MB04, MB05 and MB06 fluctuate with CRD. Due to their proximity to the coal seam outcrop, groundwater levels at MB04, MB05 and MB06 may have a stronger influence from rainfall recharge.

Groundwater levels at remaining locations installed in the Permian Coal Measures (MB02, MB03, MB16) are relatively constant with levels generally varying by less than 2 m. Levels within bores installed within the FUS (MB18 and MB19) are influenced by inputs and outputs of water from the FUS.

Generally, there is no evidence of groundwater drawdown attributable to mining at Newstan at monitoring bores installed in the Permian Coal Measures.

Groundwater quality within the Permian Coal Measures is generally slightly brackish and varies from very slightly acidic to very slightly basic. The exception to this is at MB04 where groundwater is fresh and acidic and at MB16 where groundwater is slightly acidic and generally very slightly brackish. There are no obvious trends in EC or pH at groundwater bores installed in the Permian Coal Measures with the exception of a slight increase in EC over the last two years at MB04. This trend is not considered attributable to mining activities at Newstan given mining was completed in the area by 2009. The variation in conductivity has been from approximately 200 $\mu\text{S}/\text{cm}$ to 500 $\mu\text{S}/\text{cm}$, which is considered to be minor, and this corresponds with a reduction in water level. The bore recovered in both average EC and water level by September 2019.

5.3 Underground water extraction and transfers

The observed underground water transfers are shown in Figure 5-1 and observed water levels in the FUS are shown in Figure 5-2.

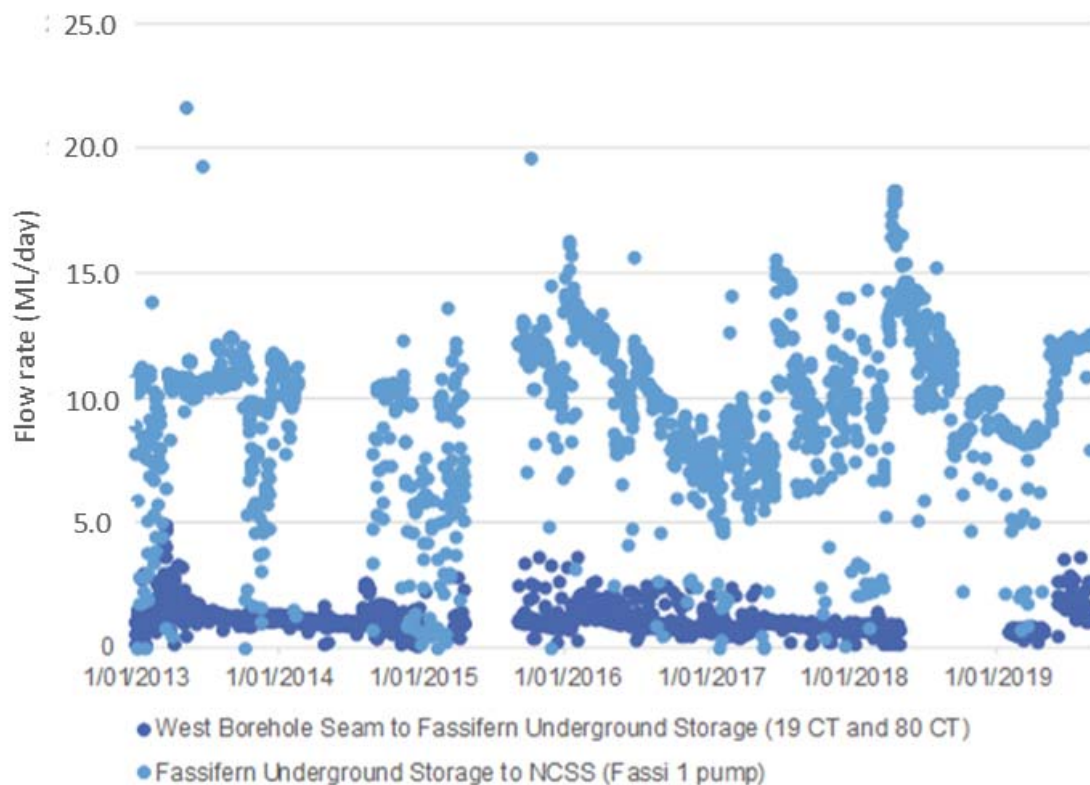


Figure 5-1 Observed underground water transfers

Figure 5-1 shows that transfers from the West Borehole Seam to the FUS are typically 1 to 2 ML/day, varying with day to day operations. Given the limited water storage capacity in the West Borehole Seam, the average transfer rate is representative of the groundwater inflows into the West Borehole Seam workings. The transfers from the FUS to NCSS are typically around 11 ML/day, corresponding to the typical treatment rate of the Clean Water Plant at NCSS, with some variation between 0 and up to 15 ML/day with day to day operations.

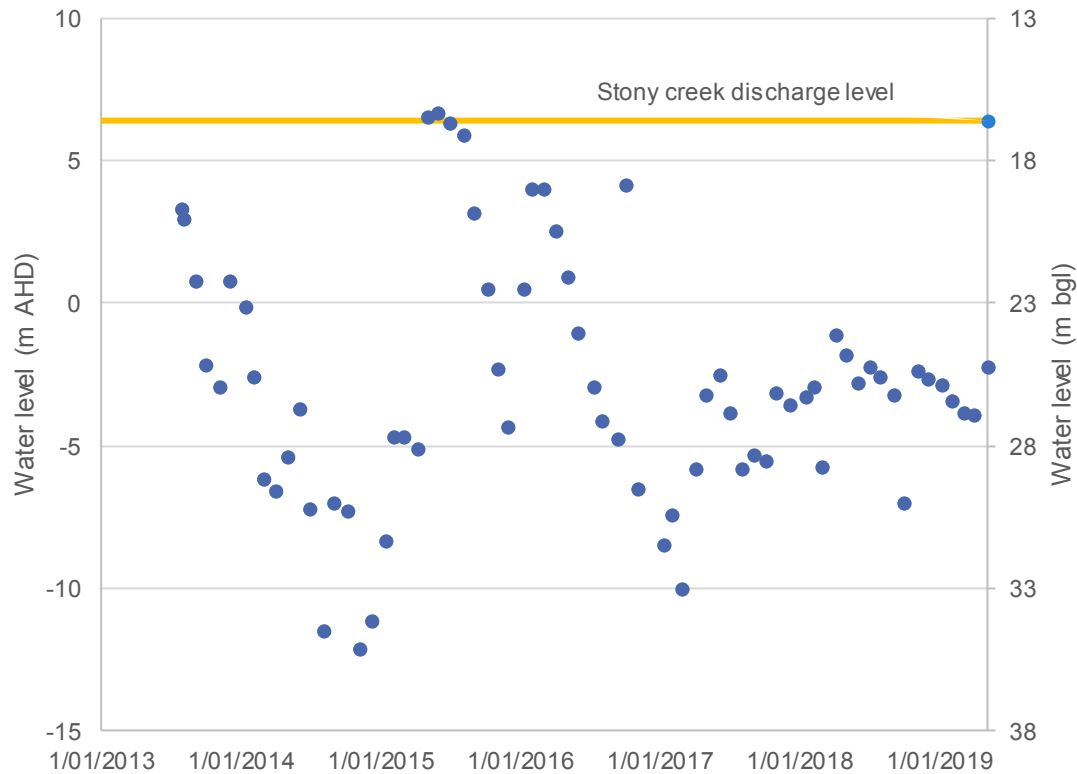


Figure 5-2 Observed water levels in the Fassifern Underground Storage

Figure 5-2 shows that water levels in the FUS have typically been maintained at around between 0 and -5 m AHD since 2017. LDP017 discharged during May 2015 due to high rainfall infiltration into the underground seam workings.

5.4 Aquatic ecology

Details of the baseline aquatic ecology data are provided in Table 5-3.

Key outcomes from recent investigations include:

- Elevated concentrations of metals, including aluminium, copper and zinc have been observed in Stony Creek and in the creeks overlying the Newstan Extension project area. These concentrations were indicative of the local lithology and occasionally elevated concentrations of suspended sediments following rainfall.
- Elevated concentration of nickel was observed in the sediment at Stony Creek site WMP38 in spring 2018, however, as Stony Creek has not received discharges from LDP017 since 2015, the nickel concentration was not attributed to the discharge.
- The poorest freshwater macroinvertebrate condition in 2018 was observed in Stony Creek in spring, which was attributable to the poor habitat conditions associated with the ephemeral

nature of the creek. Generally, macroinvertebrate community condition has been best at sites with refuge habitat.

- Temporal patterns in estuarine macroinvertebrate community diversity and abundance have been observed at both SCCIZ and PCMH. The results have indicated that there has been no adverse impact of historic LDP017 discharges on the estuarine macroinvertebrate community in Stony Creek.

Table 5-3 Details of baseline aquatic ecology data

Location	Period from	Period to	Number of samples
CCSC1	Winter 2012	Autumn 2019	4
LCDS	Autumn 2019	Autumn 2019	1
LCRef	Autumn 2019	Autumn 2019	1
KCDS	Autumn 2019	Autumn 2019	1
PCMH	Spring 2015	Autumn 2019	8
SCCIZ	Autumn 2014	Autumn 2019	11
SCDS	Autumn 2019	Autumn 2019	1
SCMid	Autumn 2019	Autumn 2019	1
SKDS	Autumn 2019	Autumn 2019	1
WMP20	Autumn 2014	Autumn 2019	6
WMP27	Spring 2015	Autumn 2019	5
WMP38	Autumn 2015	Autumn 2019	4

6 Response plans

6.1 Triggers

6.1.1 Surface water quality triggers – Mining lease

Surface water quality trigger values have been assigned based on a review of baseline monitoring data. They are based on maximum and minimum values on the basis that surface water quality has not been impacted by historical mining activities. Trigger values for EC for each site has been defined as the maximum observed EC. Trigger values for pH have been assigned as the maximum and minimum observed pH at each monitoring site. Surface water quality trigger values are presented in Table 6-1. These triggers should be considered preliminary at this stage and will be updated as part of the update to this WMP following approval of the Newstan Extension of Mining Project.

Table 6-1 Surface water quality triggers

Monitoring Site	EC trigger value ($\mu\text{S}/\text{cm}$)	Lower level pH trigger value (pH units)	Upper level pH trigger value (pH units)
WMP20	385	5.8	6.7
WMP25	126	5.0	6.7
WMP26	641	5.3	7.7
WMP27	142	5.0	5.7
WMP29	351	5.7	6.7
WMP30	831	5.6	7.0
WMP32*	5690	6.7	8.1
WMP35	254	6.0	7.1
WMP50	Water quality triggers to be calculated after 2 years of monitoring data.		
WMP51			
WMP52			

* Baseline monitoring indicates external influence on the waterways within this area and hence an elevated EC trigger value has been adopted. Existing land uses within the catchment include a landfill and electricity easements. There are no mining operations within the catchment.

6.1.2 Groundwater level triggers

Groundwater level trigger values have been defined with reference to observed groundwater level data and groundwater level drawdown predictions (GHD 2018). Trigger values for groundwater level are presented in Table 6-2.

As discussed in Section 5.2, there have been no observable impacts to alluvial groundwater levels due to mining. Review of monitoring data indicates that alluvial groundwater levels have varied by up to 2 m due to variation in rainfall.

As discussed in Section 5.2, there have been no observable impacts on groundwater levels at groundwater monitoring bores installed in the coal seam. Groundwater levels at MB04, MB05 and MB06 respond to rainfall trends. Groundwater levels at MB04 have varied by over 3.5 m during the period of monitoring. Groundwater levels at MB05 and MB06 have varied by approximately 1.5 m during the period of monitoring.

As discussed in Section 3.6, all groundwater monitoring bores are located outside the radius of drawdown in the coal measures attributable to additional longwall mining at Newstan.

Based on the review of monitoring data, groundwater level trigger values for all monitoring bores has been assigned as 2 m below the maximum observed depth to groundwater. Trigger values do not apply to bores that periodically go dry. Maximum observed groundwater level at AE2, AE3, AE4 and AE5 is less than 2 m above the base of the monitoring bore. Therefore the trigger value for AE2, AE3, AE4 and AE5 has been assigned as the bore going dry.

Table 6-2 Groundwater level trigger values

Monitoring location	Maximum recorded depth to groundwater (m bTOC)	Trigger value (m bTOC)
MB03	17.73	19.73
MB04	21.41	23.41
MB05	25.04	27.04
MB06	45.99	47.99
MB10	3.595	5.595
MB11	3.34	5.34
MB12	5.80	7.80
MB13	5.68	7.68
MB14	4.349	6.349
MB15	3.784	5.784
MB16	38.108	40.108
MB17	3.90	5.90
AE1	2.12	4.12
AE2	1.85	3.60*
AE3	3.31	4.50*

Monitoring location	Maximum recorded depth to groundwater (m bTOC)	Trigger value (m bTOC)
AE4	1.48	3.44*
AE5	1.37	2.32*

Note:

m bTOC: metres below top of casing.

No trigger value is recommended for MB09 and MB19 as monitoring bore is periodically dry.

No trigger value for MB18 as the bore is dry.

* Trigger value corresponds to bore going dry.

6.1.3 Groundwater quality triggers

Groundwater quality trigger values have been assigned based on a review of monitoring data. As for surface water quality, trigger values for groundwater quality are based on minimum and maximum historical values on the basis that mining activities to date have not impacted groundwater quality. Trigger values for EC for each bore been defined as the maximum observed EC. Trigger values for pH have been assigned as the maximum and minimum observed pH at each monitoring bore. Groundwater quality trigger values are presented in Table 6-3.

Groundwater quality trigger values were not assigned for other groundwater quality monitoring parameters due to the limited number of data points. Similarly, groundwater quality trigger values have not been assigned to MB19 and AE1 to AE5 due to the limited number of sampling events. Less than 10 sampling events have occurred at these sites. It is recommended that triggers are assigned to these sites following collection of sufficient data.

Table 6-3 Groundwater quality trigger values

Monitoring location	EC trigger value (µS/cm)	Lower level pH trigger value (pH units)	Upper level pH trigger value (pH units)
MB03	1640	6.1	7.9
MB04	488	4.7	7.5
MB05	1920	6.3	7.3
MB06	1430	6.5	7.4
MB09	269	5.8	7.7
MB10	1720	6.1	7.7
MB11	4040	6.0	7.6
MB12	1140	6.5	7.2
MB13	1260	6.7	7.3
MB14	450	6.4	7.0

Monitoring location	EC trigger value (µS/cm)	Lower level pH trigger value (pH units)	Upper level pH trigger value (pH units)
MB15	565	6.0	6.7
MB16	722	6.0	6.7
MB17	223	6.2	7.0
MB18	2280	6.7	8.1

6.1.4 Underground storage operating levels

The FUS will discharge to Stony Creek via LDP017 when the level reaches 6.4 m AHD. The SCADA alarm is triggered when the water level is 2 m below the discharge level i.e. 4.4 m AHD.

The Fassi bore pumps cut out at a minimum water level to avoid the transfer of poorer quality underground water to the Clean Water Plant. The pumps currently cut out at a level of 27 m bgl (or -4 m AHD).

6.2 Performance criteria

Performance criteria have been developed from baseline information. These criteria form the basis of the WMP trigger action response plan (TARP) provided in Appendix D.

6.2.1 Surface water environment

Table 6-4 ESCP criteria

Aspect	Criteria
Surface storages	Storages sized in accordance with Landcom (2004) and DECC (2008) and maintained to have this capacity during operation.
Water quality management	Clean and dirty water separation.
Erosion and sediment control	Minimising disturbance area. Managed in accordance with the approach and guidelines outlined in the Northern Operations RWMP and Lake Macquarie City Council's Erosion and Sediment Control Policy and Code of Practice. Where construction works are significant an erosion and sediment control plan (ESCP) and construction environmental management plan will be prepared.

Table 6-5 Water Quality criteria

Aspect	Criteria
Watercourses overlying the project area	Surface water quality is within historical range the range of values in Table 6-1, and/or consistent with reference sites

Table 6-6 Aquatic ecology criteria

Aspect	Criteria
Aquatic ecology	ANZG (2018) weight of evidence approach indicates no significant effects attributable to the project.

Table 6-7 Geomorphology criteria

Aspect	Criteria
Geomorphological stability monitoring	No headcuts observed in Stony Creek that are attributable to discharges from LDP017.

6.2.2 Groundwater environment

Based on the triggers derived in Section 6.1, Table 6-8 presents the groundwater environment management criteria for Newstan underground workings.

Based on triggers derived in Section 6.1.4, Table 6-8 and Table 6-9 presents management criteria for the water level in the Fassifern underground storage.

Table 6-8 Groundwater environment criteria

Aspect	Criteria
Groundwater level	Depth to groundwater is not greater than the trigger values provided in Table 6-2. No groundwater access complaints.
Groundwater quality	Within or below trigger values provided in Table 6-3. Current beneficial usage category is maintained. No complaints regarding groundwater quality.
Groundwater inflows	Consistent with hydrogeological model predictions.

Table 6-9 Underground Storage criteria

Aspect	Criteria
FUS level	FUS water levels are within the range – 4 m to 4.4 mAHD No groundwater access complaints.

6.3 Trigger action response plans

A TARP for groundwater and surface water management is provided in Appendix D.

7 Site-specific reviews and reports

7.1 Annual review contents

The results and interpretation of groundwater monitoring are provided to the NSW DPIEW (formerly Department of Primary Industries – Water), Lake Macquarie City Council and the NSW Environment Protection Authority on a six monthly basis. The monitoring results and interpretation are also included in the annual review.

7.2 Hydrogeological model

The groundwater model validation program compares groundwater monitoring results with modelled groundwater level predictions on an annual basis. Where the validation process identifies significant variances between monitored and predicted groundwater inflows, then a recalibration process may be required to be undertaken.

7.3 Site water balance

The site water balance will be reviewed and revised annually as a minimum or as necessary when there are changes to operations. The results of the site water balance will be reported in the annual review for Newstan.

8 References

- ANZG (2018) Australian and New Zealand Guidelines for Fresh and Marine Water Quality: Default Guideline Values, <http://www.waterquality.gov.au/anz-guidelines/guideline-values/default>
- BOM (2018) *Groundwater Dependent Ecosystem Atlas*, Bureau of Meteorology, retrieved from: <http://www.bom.gov.au/water/groundwater/gde/>
- DES (2018) SILO Patched Point Data for Cooranbong (Avondale) station (station number 061412), Queensland Department of Environment and Science.
- GHD (2009) *Newstan Colliery Revised Water Management Plan*, prepared by GHD Pty Ltd for Centennial Newstan Pty Ltd.
- GHD (2012) *Main West Groundwater Monitoring Program*, prepared by GHD Pty Ltd for Centennial Newstan Pty Ltd.
- GHD (2016) *Northern Operations Regional Water Management Plan*, prepared by GHD Pty Ltd for Centennial Coal Company Limited.
- GHD (2017) *Northern Coal Services Water Management Plan*, prepared by GHD Pty Ltd for Centennial Coal Company Limited.
- GHD (2018) *Newstan Mod 8 Water Resources Impact Assessment*, prepared by GHD Pty Ltd for Centennial Newstan Pty Limited.
- GHD (2018) *Awaba Colliery Water Management Plan*, prepared by GHD Pty Ltd for Centennial Newstan Pty Ltd.
- GHD (2019) *Newstan Aquatic Ecology Spring 2018 Report*, prepared by GHD Pty Ltd for Centennial Newstan Pty Limited.
- Hawley, S.P., Glen, R.A. and Baker, C. J. (1995). *Newcastle Coalfield Regional 1:100,000 Geology Map*, 1st edition, Geological Survey of New South Wales, Sydney.
- Pacific Power International (1997) *Newstan Colliery Life Extension Project Overburden Groundwater Study*.
- Peterson Jr, RC (1992) *The RCE: a Riparian, Channel, and Environmental Inventory for small streams in the agricultural landscape*, *Freshwater Biology*, 27(2) pp. 295-306.
- SLR (2020) *Sinkhole Rehabilitation Plan, Awaba Colliery*, prepared for Centennial Awaba, SLR Consulting Australia Pty Ltd, Newcastle.
- WaterNSW (2018) *NSW Water Register*, retrieved from: <https://waterregister.watarnsw.com.au/water-register-frame>

Appendices

Appendix A

Correspondence with regulators

SUBMISSION FOR APPROVAL DETAILS	Revision	Circulation date	Feedback date	Approval date
	0	18 December 2019		
	1	1 February 2021		
CONSULTATION DETAILS	Department		Circulation date	Feedback date
	Natural Resource Access Regulator		27 September 2019	Not received
	Department of Planning, Infrastructure & Environment - Resources Regulator		27 September 2019	18 October 2019
	Environmental Protection Agency NSW		27 September 2019	Not received
	Lake Macquarie City Council		27 September 2019	22 October 2019
	Department of Planning Infrastructure & Environment		18 December 2019	18 November 2020

27 September 2019

Matthew Sprott
A/Director
Coal & Quarries Assessments
Department of Planning, Infrastructure & Environment
PO Box 39
Sydney NSW 2001

Dear Mr Sprott

Submission of Revised Newstan Mine Water Management Plan

Following the Newstan (DA 73-11-98) 2018 Independent Environmental Audit (IEA), revisions to the Newstan Mine Water Management Plan were required.

This management plan, that forms an appendix to the Northern Operations Regional Water Management Plan, has been updated to take into consideration the feedback received by the IEA. The revised water management plan has been enclosed for review and approval by the Department.

If you have any questions in regards to the enclosed management plans, please contact me on my mobile, 0407 207 530 or email james.wearne@centennialcoal.com.au.

Yours sincerely



James Wearne
Group Approvals Manager

Enclosed:

- Newstan Mine Water Management Plan

30 September 2019

Matthew Quinn
Inspector Environment
Resources Regulator
PO Box 344
Hunter Region Mail Centre NSW 2310

Dear Mr Quinn

Newstan Mine - Water Management Plan

Centennial Newstan has recently revised the Newstan Mine Water Management Plan. The revised Water Management Plan has been updated to align with Centennial's regional management plan framework and reflect current operational requirements. In accordance with the Newstan Mine development consent, a copy of the revised Water Management Plan has been enclosed for your review and comment.

Any feedback on the Water Management Plan should be provided in writing by 5pm on Friday 25 October 2019 to:

James Wearne
Group Approvals Manager
Centennial Coal
PO Box 1000
TORONTO NSW 2283
Email: james.wearne@centennialcoal.com.au

Yours sincerely



James Wearne
Group Approvals Manager

Enclosed

- Newstan Mine Water Management Plan

30 September 2019

Department of Planning, Industry & Environment
Natural Resources Access Regulator
Locked Bag 5123
Parramatta NSW 2124

Email: water.referrals@nrar.nsw.gov.au

To Whom It May Concern:

Newstan Mine - Water Management Plan

Centennial Newstan has recently revised the Newstan Mine Water Management Plan. The revised Water Management Plan has been updated to align with Centennial's regional management plan framework and reflect current operational requirements. In accordance with the Newstan Mine development consent, a copy of the revised Water Management Plan has been enclosed for your review and comment.

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James Wearne
Group Approvals Manager
Centennial Coal
PO Box 1000
TORONTO NSW 2283
Email: james.wearne@centennialcoal.com.au

Yours sincerely



James Wearne
Group Approvals Manager

Enclosed

- Newstan Mine Water Management Plan

30 September 2019

Ms. Morven Cameron
Chief Executive Officer
Lake Macquarie City Council
PO Box 1906
Hunter Region Mail Centre NSW 2310

Dear Ms Cameron

Newstan Mine - Water Management Plan

Centennial Newstan has recently revised the Newstan Mine Water Management Plan. The revised Water Management Plan has been updated to align with Centennial's regional management plan framework and reflect current operational requirements. In accordance with the Newstan Mine development consent, a copy of the revised Water Management Plan has been enclosed for your review and comment.

Any feedback on the Water Management Plan should be provided in writing by 5pm on Friday 25 October 2019 to:

James Wearne
Group Approvals Manager
Centennial Coal
PO Box 1000
TORONTO NSW 2283
Email: james.wearne@centennialcoal.com.au

Yours sincerely



James Wearne
Group Approvals Manager

Enclosed

- Newstan Mine Water Management Plan

30 September 2019

Claire McGarity
Regional Operations Officer - Hunter
Environment Protection Authority
Department of Planning, Industry & Environment
PO Box 488G
Newcastle NSW 2300

Dear Ms McGarity

Newstan Mine - Water Management Plan

Centennial Newstan has recently revised the Newstan Mine Water Management Plan. The revised Water Management Plan has been updated to align with Centennial's regional management plan framework and reflect current operational requirements. In accordance with the Newstan Mine development consent, a copy of the revised Water Management Plan has been enclosed for your review and comment.

Any feedback on the Water Management Plan should be provided in writing by 5pm on Friday 25 October 2019 to:

James Wearne
Group Approvals Manager
Centennial Coal
PO Box 1000
TORONTO NSW 2283
Email: james.wearne@centennialcoal.com.au

Yours sincerely



James Wearne
Group Approvals Manager

Enclosed

- Newstan Mine Water Management Plan

CENTENNIAL COAL COMPANY LIMITED
LEVEL 18 - BT TOWER
1 MARKET STREET
SYDNEY NSW 2000
Attn: James Wearne

Dear James Wearne

Pursuant to condition 4.1 of DA 73-11-98 Newstan are required to prepare water management plans for the relevant developments, in consultation with the Resources Regulator within the Department of Planning, Industry & Environment (Resources Regulator). The Regulator acknowledges receipt of 'The Newstan Mine - Water Management Plan September 2019' that was submitted to the Resources Regulator on 30 September 2019 (Department Reference: MAAG0004528).

The Regulator has no further comment on this management plan and would like to remind Newstan Mine that it is the responsibility of the Authorisation Holder to ensure that all mining and mining related operations comply with an approved Mining Operations Plan (MOP) and are as approved within the relevant Project Approval or Development Consent and all necessary approvals, consents or permits required under the relevant NSW or Commonwealth regulations have been obtained prior to carrying out the operations.

The Regulator would expect that any significant changes to the 'The Newstan Mine - Water Management Plan September 2019' that are inconsistent with the approved MOP "Newstan - Mining Operations Plan (MOP) 2018-2020 Complex MOP" approved on the 23 March 2019 would be addressed through an amendment to the MOP.

If you require additional information, please contact the Resources Regulator on 1300 814 609 (Option 2, then 5), or via email at nswresourcesregulator@service-now.com.

Yours sincerely,

Matthew Quinn
Inspector Environment
Mining Act Inspectorate
Resources Regulator
NSW Department of Planning, Industry & Environment

18 October 2019



Fw: Newstan Mine Water Management Plan for Review

James Wearne to: Lachlan Hammersley, Nerida Manley

22/10/2019 09:51 AM

From: James Wearne/CentennialCoal
To: Lachlan Hammersley/CentennialCoal@CENTENNIALCOAL, Nerida Manley/CentennialCoal@CENTENNIALCOAL

Regards

James Wearne

Group Manager Approvals

p: +61 (0) 2 4935 8944 | m: +61 (0) 407 207 530



Centennial Coal Company Limited | Fassifern

100 Miller Road, Fassifern NSW 2283 Australia

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From: "Georgie Williams" <gwilliams@lakemac.nsw.gov.au>
To: "James.Wearne@centennialcoal.com.au" <James.Wearne@centennialcoal.com.au>
Date: 22/10/2019 09:35 AM
Subject: Re: Newstan Mine Water Management Plan for Review

Good morning James,

In regard to your letter, dated 30 September 2019, requesting feedback from Council on the submitted Newstan Colliery Water Management Plan, dated September 2019, please be advised that Council staff have reviewed and have no comments.

Thank you for the opportunity to make comment.

Regards

Georgie Williams

Senior Development Planner



T 02 4921 0119 M 0439 685 573

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From: James Wearne <James.Wearne@centennialcoal.com.au>

Sent: Monday, 30 September 2019 1:45 PM

To: council@lakemac.nsw.gov.au

Subject: Newstan Mine Water Management Plan for Review

Please find attached correspondence regarding the provision of the Newstan Mine Water Management Plan for review and comment.

Regards

James Wearne

Group Manager Approvals

p: +61 (0) 2 4935 8944 | m: +61 (0) 407 207 530



Centennial Coal Company Limited | Fassifern

100 Miller Road, Fassifern NSW 2283 Australia

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Mr James Wearne
Group Manager Approvals
Centennial Coal Company Limited
100 Miller Road
Fassifern NSW 2283

18/11/2020

Dear James

Newstan Colliery (DA 73-11-98)

Newstan Colliery Water Management Plan - Request for Additional Information

I refer to the Newstan Colliery Water Management Plan submitted to the Department as required under the conditions of consent for the Newstan Colliery. After careful consideration, the Department is requesting that you provide additional information as set out in the Department's review of the document in Attachment A, dated November 2020.

You are requested to provide the information, or notification that the information will not be provided, to the Department by Wed 02 December 2020. If you are unable to provide the requested information within this timeframe, you are required to provide, and commit to, a timeframe detailing the provision of this information.

If you have any questions, please contact Mark Davis, who can be contacted on 82751518 or at mark.p.davis@planning.nsw.gov.au.

Yours sincerely

A handwritten signature in black ink that reads 'Colin Phillips'.

Colin Phillips
Team Leader
Resource Assessments (Coal & Quarries)

Attachment A
Newstan Colliery Surface Site (NCSS)

Dec 2019 Water Management Plan. Review undertaken November 2020

Water Management Plan NCS DA 73-11-98 Schedule 2: Conditions 3.5, 4.1 and 4.3	Satisfactory (Yes/No)	Comment	Action Required
Condition 3.5 Prevention of Soil Erosion (a) The Applicant shall prepare Erosion and Sediment Control Plans for the surface facilities and the LEA* in consultation with LMCC and to the satisfaction of DPIEW and the Secretary, and submit these Plans to the EPA as part of applications for a licence under the Protection of the Environment Act. The Plans shall be prepared and implemented prior to the commencement of work in the relevant areas.	Partial	- Replace "Schedule" with "Condition" where occurring in Table 2-2. - Section 3.8: there is no ongoing surface disturbance or new surface construction activities planned at Newstan Colliery. - Figure 1-2 Newstan WMP is a part of the Northern Operations Regional Water Management Plan (NORWMP). The (Section 1.4.2) Northern Operations: Discharge Management Plan should also be included in the diagram.	This plan must be updated to address the DPIEs comments.
The Erosion and Sediment Control Plans shall include: (b)(i) consideration and management of erosion and sedimentation of surface watercourses/waterbodies within the LEA; and (ii) consideration of LMCC's Erosion and Sediment Control Policy and Code of Practice. (iii) a program for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in the approved erosion and sediment control management plans, and EIS. (refer also condition (d) (i) below)	Yes		
General Terms of Approval – EPA (d)(i) <i>Stormwater / sediment Control – Construction Phase</i> The Erosion and Sediment Control Plan (ESCP) in sub clause (a) above must also be prepared to describe the measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities. The ESCP should be consistent with the requirements for such plans outlined in Managing Urban Stormwater: Soils and Construction, (Landcom), or most recent version of these guidelines. (ii) <i>Stormwater / sediment Control – Operational Phase</i> A Stormwater Management Scheme must be developed and implemented to mitigate the impacts of stormwater runoff from the site following the completion of construction	Yes		

Water Management Plan NCS DA 73-11-98 Schedule 2: Conditions 3.5, 4.1 and 4.3	Satisfactory (Yes/No)	Comment	Action Required
activities. The Scheme should be consistent with the Stormwater Management Plan for the catchment and the Water Management Plan in Condition 4.1. Where a Stormwater Management Plan has not yet been prepared, the Scheme should be consistent with the guidance contained in Managing Urban Stormwater: Council Handbook (available from the EPA). The Scheme shall be prepared at the same time as the Water Management Plans in consideration 4.1.			
4. Water Management Condition 4.1 Surface & Ground Water Management (a) Prior to construction of the new surface facilities, and prior to first workings within the LEA, prepare water management plans for the relevant developments, in consultation with DPIEW, EPA, LMCC, and DRE and to the satisfaction of the Secretary, which shall include, but not be limited to, the following matters:	Partial	- Appendix A indicates consultation with DPIE Resource Regulator, EPA, LMCC and NRAR was undertaken. - Section 1.2.2 Where is Section 0? Please identify correct reference.	Please replace Section 0 with correct reference.
(i) management of the quality and quantity of surface and ground water within the areas covered by the water management plans, which shall include preparation of monitoring programs as provided by condition 8.2;	Partial	- The information in T.4-3 and Fig.4-2 do not completely correlate. - Missing from Table 4-3 are bores: MB01 MB02B AWG01 AWG02 - Missing from Figure 4-2 are bores: MB09 MB14 MB16 MB17 - Figure 4-3 does not display the following aquatic ecology monitoring sites: CCSC1 PCMH SCCIZ	Please correct Table 4.3 and Figure 4-2 so that they correlate. Please correct Table 4.5 and Figure 4-3 so that they correlate.
(ii) management of stormwater and general surface runoff diversion to ensure separate effective management of clean and dirty water; (refer also condition 3.5 (d) (ii)).	Yes		
(iii) measures to prevent the quality of any surface waters being degraded below the relevant water quality due to the operation of the mine workings;	Yes		

Water Management Plan NCS DA 73-11-98 Schedule 2: Conditions 3.5, 4.1 and 4.3	Satisfactory (Yes/No)	Comment	Action Required
(iv) Deleted.			
(v) identification of any possible adverse effects on water supply sources of surrounding land holders, as a result of the underground mining operations in the LEA and surface mine works, and implementation of mitigation measures as necessary;	Yes		
(vi) identification of changes in flow of surface waters including all creeks within the LEA, particularly in Lord's Creek, due to subsidence;	Yes		
(vii) identification of any stream rehabilitation works required to ameliorate subsidence effects on stream flows within Lords Creek;	Yes		
(viii) contingency plans for managing adverse impacts of the development on surface and groundwater quality, including the matter in condition 4.1(d)(iv);	Yes		
(ix) identification of the fresh quality groundwater resources within the project area, including the development of appropriate protection strategies;	Yes		
(x) projection of potential groundwater changes during mining (short term) and post-mining (long term) with particular attention given to the effect of changes to groundwater quality and mobilisation of salts;	No	Section 3.7 there is no discussion regarding salt.	Provide information on salt.
(xi) a monitoring and remediation strategy for all streams which may be adversely affected by subsidence including bed fracturing and/or degradation of the stream channel. Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW;	Yes		
(xii) consideration of the State Wetlands Management Policy for all significant downstream wetlands that may be affected by mining activity within the LEA or the relevant area; and	Partial	There is no reference to the NSW Wetlands Policy.	Provide information on how the Wetlands Policy is applied.
(xiii) a program for reporting on the effectiveness of the water management systems and performance against objectives contained in the approved site water management plans, and EIS.	Yes		
(b) implement remediation measures, to the satisfaction of DPIEW, where the development is responsible for the loss of groundwater quality or quantity below its current beneficial use; and	Yes		

Water Management Plan NCS DA 73-11-98 Schedule 2: Conditions 3.5, 4.1 and 4.3	Satisfactory (Yes/No)	Comment	Action Required
(c) obtain a license with DPIEW under part 5 of the Water Act (1912) prior to construction of all new excavations, test bores and production bores (including dewatering bores) that intersect the groundwater.	Partial	The details of these bores are provided in Section 0, whereas it should be Section 4.3.	
(d) General Terms of Approval – DPIEW Pursuant to Part 2 of the Water Act, 1912: (iv) groundwater and surface water quality monitoring shall be conducted, to the satisfaction of DPIEW, in the vicinity of the licensed works. The monitoring program is to identify any degradation in water quality as a result of the works (also refer to condition 8.2(ii)). A contingency plan shall be developed, to the satisfaction of DPIEW, to remediate any such degradation (also refer to condition 4.1(a)(ix)). A copy of the finding shall be submitted to LMCC.	Yes		
Condition 4.3 Groundwater Monitoring Program – Main West Mining Areas (a) The Applicant shall prepare a Groundwater Monitoring Program for the Main West Mining Area. This program must be prepared in consultation with DPIEW, and be submitted to the Secretary by the end of August 2012 for approval;	Yes		
(b) The program must include: Baseline data of groundwater levels (including alluvial and weathered rock aquifers), yield and quality in the region, and any privately-owned groundwater bores that may be affected by mining operations; groundwater assessment criteria based upon analysis of baseline data for groundwater, surface water, including trigger levels for investigating any potentially adverse groundwater impacts; and a program to monitor and/or validate the impacts of mining in Main West on alluvial and coal seam aquifers, and any groundwater bores.	Partial	- Water management and the monitoring program in the Main West area is covered by this WMP. - Section 5.2 There is a slight increase in EC over the last two years at MB04 (and MB11 is high). This trend is not considered attributable to mining activities at Newstan, however the attribution is not clarified given it has the greatest water level fluctuation (MB04 is approx. 4m, 2m above AIP level). Is this due to rainfall (CRD) and surface outcrop infiltration near Freemans Drive? - What is the likely reason for elevated salts (EC)?	Please provide clarification regarding the elevated salt.
Condition 8.2 Surface and Ground Water (a)(i) The Applicant shall construct and locate surface and ground water monitoring positions, as identified in the site water management plan (condition 4.1 (a)), in consultation with DPIEW, LMCC and EPA, and to the satisfaction of the Secretary, at least three months prior to the commencement of construction works in the relevant area and first workings in the LEA;	Yes		

Water Management Plan NCS DA 73-11-98 Schedule 2: Conditions 3.5, 4.1 and 4.3	Satisfactory (Yes/No)	Comment	Action Required
(ii) The Applicant shall prepare a detailed monitoring program in respect of ground and surface water quality and quantity, including water in and around the Newstan mine site, Northern and Southern Emplacements, and LEA, and also consistent with condition 4.1(b) (iv), during construction works, mine operations and post mine operations in consultation with DPIEW, EPA, and to the satisfaction of the Secretary. The monitoring program shall also include surveys of drainage channels within the LEA to update information obtained in the preparation of Property Subsidence Management Plans. The monitoring program shall be prepared prior to commencement of construction in the relevant area.	Yes		
(iii) The results and interpretation of surface and ground water monitoring are to be provided by the Applicant in an approved form to the DPIEW, LMCC and EPA on a six monthly basis, unless otherwise directed by the Secretary. The results are also to be contained and analysed in the Annual Review (Condition 9.1).	Yes		
(b) The Applicant must conduct water quality monitoring for pollutants in accordance with any current Environment Protection Licence under the Protection of the Environment Operations Act 1997 for this site.	Yes	This is included under the EPA EPL requirements.	

Other Comments on Water Management Plan
Update the cover from December 2019 to November 2020 Section 1.2.3 LDP001 add the word “to” after Clean Water Plant. Section 2 Remove the words “and evaporation” from paragraph 3 and the title to Fig. 2-1 Section 3.4 What is the meaning of the following sentence “<i>Dewatering underground from surface water storages occurs at a controlled rate, controlled through automated systems</i>”? Table 4.2 Nutrients- “NOx” is usually an air quality parameter. Compare this with Table 4-4 MB18 “<i>ammonia, nitrate, nitrite, nitrate + nitrite, total Kjeldahl nitrogen</i>”

Section 4.4: Underground water extraction and transfer states “daily monitoring ... is undertaken daily”.

Section 4.6 Please change second paragraph to read *“Geomorphological stability is assessed in Stony Creek downstream of discharges from LDP017. This monitoring occurs following any discharge event, with 250 metres to be monitored downstream of the discharge point. Visual inspections are aided by indicators and photographs taken along the monitored length of the creek.”*

Figure 5-1 It would be helpful if the flow rate in the x-axis was in ML/day to match the units used in the text.

Section 6.1 Triggers Table 6-1 Please provide an explanation for the EC trigger value for WMP32. DPIE is unwilling to accept the high trigger value of 5690 $\mu\text{S}/\text{cm}$ without an acceptable explanation

Section 6.2.2 DPIE would prefer the following text to be moved to come after Table 6-8: *“Based on triggers derived in Section 6.1.4, Table 6-9 presents management criteria for the water level in the Fassifern underground storage”*.

Section 7.1 NSW DoI W should be DPIE-Water.

**Newstan Colliery (DA 73-11-98)
Post Approval Review**



Document: Environmental Management Strategy

Revision: Version 1 Dated 02 September 2020

Reviewed: Heather Tilley on 23 February 2021

Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
Centennial Newstan has developed a new site-specific Water Management Plan, which replaces the previous Newstan Revised Water Management Plan (GHD, 2009) and the Main West Groundwater Monitoring Program (GHD, 2012). The new plan is Newstan Colliery Water Management Plan dated February 2021 Revision 1.						
Schedule 2: Conditions 3.5	Satisfactory	Comment	Action Required	Proponent Updates: Rev 1 February 2021	Residually Satisfactory?	Company Response
Prevention of Soil Erosion (a) The Applicant shall prepare Erosion and Sediment Control Plans for the surface facilities and the LEA* in consultation with LMCC and to the satisfaction of DPIEW and the Secretary, and submit these Plans to the EPA as part of applications for a licence under the Protection of the Environment Act. The Plans shall be prepared and implemented prior to the commencement of work in the relevant areas.	Partial	- Replace "Schedule" with "Condition" where occurring in Table 2-2. - Section 3.8: there is no ongoing surface disturbance or new surface construction activities planned at Newstan Colliery. - Figure 1-2 Newstan WMP is a part of the Northern Operations Regional Water Management Plan (NORWMP). The (Section 1.4.2) Northern Operations: Discharge Management Plan should also be included in the diagram.	This plan must be updated to address the DPIEs comments.	- There is no Table 2-2, it is assumed this update is for Table 1-2, which is the compliance matrix. The table references "Condition" - Section 3.8 states that there is no ongoing surface disturbance at Newstan Colliery and therefore the erosion and sediment risks are considered low. - Northern Operation: Discharge Management Plan has been included in Figure 1-2 and refers to the requirements for the control and management of mine water discharge from the northern operations No further action required	Yes	
The Erosion and Sediment Control Plans shall include: (b)(i) consideration and management of erosion and sedimentation of surface watercourses/waterbodies within the LEA; and (ii) consideration of LMCC's Erosion and Sediment Control Policy and Code of Practice. (iii) a program for reporting on the effectiveness of the sediment and erosion control systems and performance against objectives contained in the approved erosion and sediment control management plans, and EIS. (refer also condition (d) (i) below)	Yes	No action required	NA	- Section 3.8 states that there is no ongoing surface disturbance at Newstan Colliery and therefore the erosion and sediment risks are considered low. - Table 1-2 references Section 3.8 and also the Northern Coal Service (NCS) Water Management Plan and the Northern Operation Regional (NOR) Water Management Plan. - These plans were not available for review. No further action required	Yes	
(c) Deleted.	NA	NA	NA	NA	NA	
General Terms of Approval – EPA (d)(i) Stormwater / sediment Control – Construction Phase. The Erosion and Sediment Control Plan (ESCP) in sub clause (a) above must also be prepared to describe the measures that will be employed to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction activities. The ESCP should be consistent with the requirements for such plans outlined in Managing Urban Stormwater: Soils and Construction, (Landcom), or most recent version of these guidelines.	Yes	No action required	NA	Table 1-2 references Sections 3.2, 3.7, 3.8 and NCS WMP and NOR WMP to address this condition - Section 3.8 states that there is no ongoing surface disturbance at Newstan Colliery and therefore the erosion and sediment risks are considered low. - Section 3.8 reference Landcom 2004, NOR WMP and the Lake Macquarie City Council (LMCC) ERSER control policy. No further action required	Yes	
(ii) Stormwater / sediment Control – Operational Phase A Stormwater Management Scheme must be developed and implemented to mitigate the impacts of stormwater runoff from the site following the completion of construction activities. The Scheme should be consistent with the Stormwater Management Plan for the catchment				Table 1-2 references Sections 3.2, 3.7, 3.8 and NCS WMP and NOR WMP to address this condition - Section 3.2 states that management of clean and dirty surface water, potable water and wastewater at the Newstan Colliery Surface Site (NCSS) is managed by NCS. The section references the NCS WMP. - Section 3.8 references Landcom 2004, NOR WMP and the Lake Macquarie City Council (LMCC) ERSER	Yes	

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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
and the Water Management Plan in Condition 4.1. Where a Stormwater Management Plan has not yet been prepared, the Scheme should be consistent with the guidance contained in Managing Urban Stormwater: Council Handbook (available from the EPA). The Scheme shall be prepared at the same time as the Water Management Plans in consideration 4.1.				control policy. Section 3.7 addresses water and salt balance which aims to quantify average water transfers for the site under existing and future operational conditions. The section also discusses the overall water management system, which is also presented in Figure 3-4. No further action required		
<i>Schedule 2:Condition 4.1</i>		Comment	Action Required	Proponent response	Residually Satisfactory?	Company Response
Surface & Ground Water Management (a) Prior to construction of the new surface facilities, and prior to first workings within the LEA, prepare water management plans for the relevant developments, in consultation with DPIEW, EPA, LMCC, and DRE and to the satisfaction of the Secretary, which shall include, but not be limited to, the following matters:	Partial	- Appendix A indicates consultation with DPIE Resource Regulator, EPA, LMCC and NRAR was undertaken. - Section 1.2.2 Where is Section 0? Please identify correct reference.	Please replace Section 0 with correct reference.	- Appendix A provided evidence of correspondence with regulators. The correspondence relates to consultation in October 2019 DPIE Resource Regulator, EPA, LMCC and NRAR was undertaken. The most recent correspondence is with DPIE from December 2020. - The plan requires consultation <i>Prior to construction of the new surface facilities, and prior to first workings</i>. It is assumed therefore that no further consultation with the agencies is required - The last paragraph in Section 1.2.2 refers to Section 4.3. No further action	Yes	
(i) management of the quality and quantity of surface and ground water within the areas covered by the water management plans, which shall include preparation of monitoring programs as provided by condition 8.2;	Partial	- The information in T.4-3 and Fig.4-2 do not completely correlate. - Missing from Table 4-3 are bores: MB01, MB02B AWG01 AWG02 - Missing from Figure 4-2 are bores: MB09, MB14 MB16 MB17 - Figure 4-3 does not display the following aquatic ecology monitoring sites: CCSC1, PCMH SCCIZ	Please correct Table 4.3 and Figure 4-2 so that they correlate. Please correct Table 4.5 and Figure 4-3 so that they correlate.	Section 4 addresses monitoring requirements and included inspections (S4.1), surface water monitoring (S4.2), groundwater (S4.3), underground extraction (S4.4), aquatic ecology (S4.5) - Bores AWG01 and AWG02 have been included in Table 4-3 and bores MB09, MB14 MB16 MB17 are included in Figure 4-3. Action: Bore AE6 is in the table, but does not appear to be on Figure 4-3. Update the table or the figure, whichever is correct. - The proponent stated that Table 4-3 was updated to include AWG01 and AWG02. Other points were removed from Figure 4-2 as they are not currently part of the monitoring program or form the basis for management requirements. - CCSC1, PCMH, SCCIZ sites are included in Table 4-5 and included on Figure 4-3	Partial Action: Bore AE6 is in the table, but does not appear to be on Figure 4-3. Update the table or the figure, whichever is correct.	
(ii) management of stormwater and general surface runoff diversion to ensure separate effective management of clean and dirty water; (refer also condition 3.5 (d) (ii)).	Yes	No updates required	NA	- Section 3.2 states that management of clean and dirty surface water, potable water and wastewater at the Newstan Colliery Surface Site (NCSS) is managed by NCS. The section references the NCS WMP. - This plan was not available for review. No further action	Yes	
(iii) measures to prevent the quality of any surface waters being degraded below the relevant water quality due to the operation of the mine workings;	Yes	No updates required	NA	Section 3.2 states that management of clean and dirty surface water, potable water and wastewater at the Newstan Colliery Surface Site (NCSS) is managed by NCS. The section references the NCS WMP.	Yes	

**Newstan Colliery (DA 73-11-98)
Post Approval Review**



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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
				This plan was not available for review. No further action		
iv) Deleted.	NA	NA	NA	NA	Yes	
(v) identification of any possible adverse effects on water supply sources of surrounding land holders, as a result of the underground mining operations in the LEA and surface mine works, and implementation of mitigation measures as necessary;	Yes	No updates required	NA	- Section 3.3 addresses underground water management. The primary underground water management features are the Fassifern Underground Storage (FUS) and existing West Borehole seam workings. - Section 3.4 addressed interactions with NCSS. No further action	Yes	
(vi) identification of changes in flow of surface waters including all creeks within the LEA, particularly in Lord's Creek, due to subsidence;	Yes	No updates required	NA	Table 1-2 references the NCS WMP. This plan was not available for review. No further action	Yes	
(vii) identification of any stream rehabilitation works required to ameliorate subsidence effects on stream flows within Lords Creek;	Yes	No updates required	NA	Table 1-2 references the NCS WMP. This plan was not available for review. No further action	Yes	
(viii) contingency plans for managing adverse impacts of the development on surface and groundwater quality, including the matter in condition 4.1(d)(iv);	Yes	No updates required	NA	- Table 1-2 references the NCS WMP. - Section 6 addresses response plans including S6.1 (triggers) for groundwater, surface water and underground storage. - Appendix D includes the TARP (Trigger Action Response Plans) No further action	Yes	
(ix) identification of the fresh quality groundwater resources within the project area, including the development of appropriate protection strategies;	Yes	No updates required	NA	- Section 2.5.1 addresses groundwater sources - Section 4.3 address the groundwater monitoring bore network. No further action	Yes	
(x) projection of potential groundwater changes during mining (short term) and post-mining (long term) with particular attention given to the effect of changes to groundwater quality and mobilisation of salts;	No	Section 3.7 there is no discussion regarding salt.	Provide information on salt.	- Section 3.7 addresses the water and salt balance at the site. This section states that salt loads in groundwater being extracted from the mine have been compared to water being injected from NCS. Given that a majority of surface infiltration into the underground working occur via the reject emplacement areas, the average electrical conductivity is similar to that of groundwater. - Table 3-1 includes detail on annual average salt flux. No further action	Yes	
(xi) a monitoring and remediation strategy for all streams which may be adversely affected by subsidence including bed fracturing and/or degradation of the stream channel. Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW;	Yes	No updates required	NA	- Section 4 details the water monitoring requirements for the site. Section 4.1 states that inspection of matters relating to post mining subsidence are undertaken quarterly in conjunction with the Awaba Colliery Water Management Plan. Action: Update Table 1-2 to include relevant sections, including the Awaba Colliery Water Management Plan. Currently the table refers to the WMP. - Section 3.8 states that in the unlikely event that watercourse instability occurs due to due to	Partial Action: Update Table 1-2 to include relevant sections, including the Awaba Colliery Water Management Plan. Currently the table refers to the WMP.	

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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
				subsidence resulting in loss of vegetation a specific rehabilitation or construction erosion and sediment control plan will be prepared in accordance with Landcom 2004, principles and guidelines outlined in the NOR WMP and Lake Macquarie City Council's ERSED Control Policy. Table C1 details the actions required to address impacts associated with mining related activity. The TARP in Table C-1 mentions notification to DPIEW for impacts but does not currently state specifically that a remediation strategy will be implemented to the satisfaction of the DPIEW. Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4.	Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4.	
(xii) consideration of the State Wetlands Management Policy for all significant downstream wetlands that may be affected by mining activity within the LEA or the relevant area; and	Partial	There is no reference to the NSW Wetlands Policy.	Provide information on how the Wetlands Policy is applied.	- Table 1-2 references the Newstan Wetland Management Plan. This plan was not available for review. Action: Update Table 1-2 to reference Section 2.3. - Section 2.3 discusses wetlands and references the NSW Wetland Mapping by DPIE, but does not specifically reference the NSW Wetland Policy. Action: Include a specific reference to the NSW Wetland Policy in Section 2.3 to ensure full compliance with this condition.	Partial Action: Include a specific reference to the NSW Wetland Policy in Section 2.3 to ensure full compliance with this condition.	
(xiii) a program for reporting on the effectiveness of the water management systems and performance against objectives contained in the approved site water management plans, and EIS.	Yes	No updates required	NA	- Section 7 discusses reporting including Annual review, hydrological model and site water balance. - The monitoring results and interpretation are also included in the annual review. No further action	Yes	
(b) implement remediation measures, to the satisfaction of DPIEW, where the development is responsible for the loss of groundwater quality or quantity below its current beneficial use; and	Yes	No updates required	NA	- Table 1-2 references this WMP as covering this condition. - As above, the TARP in Table C-1 mentions notification to DPIEW for impacts but does not currently state specifically that a remediation strategy will be implemented to the satisfaction of the DPIEW. Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4.	Partial Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4.	
(c) obtain a license with DPIEW under part 5 of the Water Act (1912) prior to construction of all new excavations, test bores and production bores (including dewatering bores) that intersect the groundwater.	Partial	The details of these bores are provided in Section 0, whereas it should be Section 4.3.		- Section 1.2.2 addresses groundwater licences and states that a number of licences are held by Newstan under the Water Act 1912. - Centennial Newstan is currently in consultation with the DPIE regarding the licensing of groundwater take from this source. - This section does not specifically state that a licence will be obtained prior to construction all new	Partial Action: to ensure full compliance with this condition, includes a sentence that this will be done.	

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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
				excavations, test bores and production bores. Action: to ensure full compliance with this condition, includes a sentence that this will be done.		
<u>(d) General Terms of Approval – DPIEW</u> Pursuant to Part 2 of the Water Act, 1912: (i) Construction conditions (ii) Deleted (iii) an appropriate vegetative buffer zone shall be installed between the licensed works and any adjacent mining activities; (iv) groundwater and surface water quality monitoring shall be conducted, to the satisfaction of DPIEW, in the vicinity of the licensed works. The monitoring program is to identify any degradation in water quality as a result of the works (also refer to condition 8.2(ii)). A contingency plan shall be developed, to the satisfaction of DPIEW, to remediate any such degradation (also refer to condition 4.1(a)(ix)). A copy of the finding shall be submitted to LMCC.	Yes	No updates required	NA	- Section 4 addresses monitoring requirements (Section 4.2 surface water monitoring, and Section 4.3 groundwater monitoring) - Section 3.8 states that in the unlikely event that watercourse instability occurs due to due to subsidence resulting in loss of vegetation a specific rehabilitation or construction erosion and sediment control plan will be prepared in accordance with Landcom 2004, principles and guidelines outlined in the NOR WMP and Lake Macquarie City Council's ERSED Control Policy. Table C1 details the actions required to address impacts associated with mining related activity. The TARP in Table C-1 mentions notification to DPIEW for impacts but does not currently state specifically that a remediation strategy will be implemented to the satisfaction of the DPIEW. Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4 to full satisfy this condition. Include this condition is Table 2-1	Partial	Action: Include a statement "Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW" is included in Section 4 to full satisfy this condition. Include this condition is Table 2-1
<u>General Terms of Approval - EPA</u> (i) Pollution of Waters: The licensee must design construct and operate all plant and equipment and any other facilities on the premises so as to minimise the pollution of waters. (ii), (iii) and (iv) Deleted.				- Section 1.2.3 addresses EPLs and discusses the licenced discharge point for the site. - The section does not specifically state the "...to minimise the pollution of waters". Action: Include this condition is Table 2-1 and include a commitment to minimize the pollution of water to fully satisfy this condition.	Partial	Action: Include this condition is Table 2-1 and include a commitment to minimize the pollution of water to fully satisfy this condition.
4.2 Deleted.		NA	NA	NA	NA	
Schedule 2:Condition 4.3	Satisfactory	Comment	Action Required	Proponent Updates: Rev 1 February 2021	Residually Satisfactory?	Company Response
Groundwater Monitoring Program – Main West Mining Areas (a) The Applicant shall prepare a Groundwater Monitoring Program for the Main West Mining Area. This program must be prepared in consultation with DPIEW, and be submitted to the Secretary by the end of August 2012 for approval;	Yes	No updates required	NA	- Appendix A provides the evidence of consultation with the regulators. - The table shows that the updated management plan date December 2019 was submitted for review and comments were received back from DPIE (Resources Regulator), LMCC, DPIE. No comments were received from NRAR and EPA. No further action	Yes	
(b) The program must include: Baseline data of groundwater levels (including alluvial and weathered rock aquifers), yield and quality in the region, and any privately-owned groundwater bores that may be affected by	Partial	- Water management and the monitoring program in the Main West area is covered by this WMP. - Section 5.2 There is a slight increase in EC over the last two years at MB04 (and MB11	Please provide clarification regarding the elevated salt.	Addressed in Section 3.6 (hydrological predictions), Section 4 (monitoring), Section 5.2 (baseline surface water monitoring), Section 6.1 (triggers), with Section 6.1.2 specific groundwater level triggers.	Partial	Action: Update table 1-2 to correctly reference Section 5.2 for baseline

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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
mining operations; - Groundwater assessment criteria based upon analysis of baseline data for groundwater, surface water, including trigger levels for investigating any potentially adverse groundwater impacts; and - A program to monitor and/or validate the impacts of mining in Main West on alluvial and coal seam aquifers, and any groundwater bores.		is high). This trend is not considered attributable to mining activities at Newstan, however the attribution is not clarified given it has the greatest water level fluctuation (MB04 is approx. 4m, 2m above AIP level). Is this due to rainfall (CRD) and surface outcrop infiltration near Freemans Drive? What is the likely reason for elevated salts (EC)?		Action: Update table 1-2 to correctly reference Section 5.2 for baseline groundwater levels and quality The proponent has stated that the review of the data at MB04, MB15, MB11 and MB04 from in monitoring undertaken in 2020 has indicated a recovery in water level and EC being recorded. MB15 and MB11 have indicated consistent water levels and EC data through the same period. The increase in EC is likely due to rainfall trends.	groundwater levels and quality	
Schedule 2:Condition 8.2	Satisfactory	Comment	Action Required	Proponent Updates: Rev 1 February 2021	Residually Satisfactory?	Company Response
Surface and Ground Water (a)(i) The Applicant shall construct and locate surface and ground water monitoring positions, as identified in the site water management plan (condition 4.1 (a)), in consultation with DPIEW, LMCC and EPA, and to the satisfaction of the Secretary, at least three months prior to the commencement of construction works in the relevant area and first workings in the LEA;	Yes	No updates required	NA	- Section 4 addresses the monitoring requirements. - Figure 4-1 shows the surface water monitoring network - Figure 4-2 shows the groundwater monitoring network - Evidence of consultation has been included in Appendix A. No further action	Yes	
(ii) The Applicant shall prepare a detailed monitoring program in respect of ground and surface water quality and quantity, including water in and around the Newstan mine site, Northern and Southern Emplacements, and LEA, and also consistent with condition 4.1(b) (iv), during construction works, mine operations and post mine operations in consultation with DPIEW, EPA, and to the satisfaction of the Secretary. The monitoring program shall also include surveys of drainage channels within the LEA to update information obtained in the preparation of Property Subsidence Management Plans. The monitoring program shall be prepared prior to commencement of construction in the relevant area.	Yes	No updates required	NA	As discussed above and shown on Figures 4-1 and 4-2	Yes	
(iii) The results and interpretation of surface and ground water monitoring are to be provided by the Applicant in an approved form to the DPIEW, LMCC and EPA on a six-monthly basis, unless otherwise directed by the Secretary. The results are also to be contained and analysed in the Annual Review (Condition 9.1).	Yes	No updates required	NA	- Section 7.1 states that the results and interpretation of the groundwater monitoring are provided to the NSW DPIEW, LMCC, NSW EPA on a six-monthly basis. - The monitoring results and interpretation are also included in the annual review. No further action	Yes	

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Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
(b) The Applicant must conduct water quality monitoring for pollutants in accordance with any current Environment Protection Licence under the Protection of the Environment Operations Act 1997 for this site.	Yes	This is included under the EPA EPL requirements.	NA	- The WMP Table 1-2 states that this is covered by the NCSS WMP, which was not reviewed. - Section 1.2.3 also details the EPL395 licence and the licenced discharge point and states that LDP001, LDP002, LDP017 and LDP021 are managed as part of the NCSS Action: Update Table 1-2 to also correctly reference Section 1.2.3	Partial Action: Update Table 1-2 to also correctly reference Section 1.2.3	
Schedule 2:Condition 8.7	Satisfactory	Comment	Action Required	Proponent Updates: Rev 1 February 2021	Residually Satisfactory?	Company Response
Subsidence Monitoring The Applicant shall undertake a detailed and ongoing monitoring program of subsidence resulting from mining to the satisfaction of the Secretary and in consultation with DoI Water , DRG and SA NSW throughout the life of the mine and for a period of at least five years after the completion of mining, or other such periodas determined by the Secretary in consultation with DoI Water and DRG . Monitoring shall include the following: (i) a survey of watercourses within areas mined within the DA Area ; (ii) monitoring of groundwater levels and quality; (iii) monitoring of impacts on any buildings, structures and roads within areas mined within the DA Area ; (iv) a monitoring program to identify any subsidence impacts on the 330kV power transmission lines and towers in the Main West Mining Area, developed in consultation with DRG and TransGrid ; (v) monitoring of remedial measures; and (vi) a comparison of predicted impacts with actual impacts, including mapping of subsidence profiles within areas mined within the DA Area . The Applicant shall include information on monitoring conducted and the results in the Annual Review (condition 9.2).	Partial			This Condition has not been included in Table 1-2 Action: Include Condition 8.37 items (i), (ii) and (v) within Table 1-2 with appropriate references to the sections in the WMP.	Partial Action: Include Condition 8.37 items (i), (ii) and (v) within Table 1-2 with appropriate references to the sections in the WMP.	
Other Comments on Water Management Plan					Residually Satisfactory?	Company Response
Update the cover from December 2019 to November 2020				Updated to February 2021	Yes	
Section1.2.3 LDP001 add the word "to" after Clean Water Plant.				Updated	Yes	
Section 2 Remove the words "and evaporation" from paragraph 3 and the title to Fig. 2-1				Updated	Yes	
Section 3.4 What is the meaning of the following sentence "Dewatering underground from surface water storages occurs at a controlled rate, controlled through automated systems"?				Sentence updated: Dewatering underground from surface water storages occurs at a controlled rate, controlled through automated pumping systems and injection boreholes	Yes	
Table 4.2 Nutrients- "NOx" is usually an air quality parameter. Compare this with Table 4-4 MB18 "ammonia, nitrate, nitrite, nitrate + nitrite, total Kjeldahl nitrogen"				Table updated	Yes	

**Newstan Colliery (DA 73-11-98)
Post Approval Review**



Document: Environmental Management Strategy

Revision: Version 1 Dated 02 September 2020

Reviewed: Heather Tilley on 23 February 2021

Water Management Plan (WMP) NCS DA 73-11-98	Satisfactory (Yes/No)	Comment Water Management Plan (Dec 2019). Review undertaken November 2020	Action Required November 2020	Proponent Updates Rev 1 February 2021	Residually Satisfactory?	Company Response
Section 4.4: Underground water extraction and transfer states "daily monitoring ... is undertaken daily".				Section reviewed and amended for clarity now states "Continuous monitoring of the underground water level within the FUS is undertaken and reviewed as part of day to day operational meetings"	Yes	
Section 4.6 Please change second paragraph to read "Geomorphological stability is assessed in Stony Creek downstream of discharges from LDP017. This monitoring occurs following any discharge event, with 250 metres to be monitored downstream of the discharge point. Visual inspections are aided by indicators and photographs taken along the monitored length of the creek."				Section updated as per the comment.	Yes	
Figure 5-1 It would be helpful if the flow rate in the x-axis was in ML/day to match the units used in the text.				The x-axis legend has been updated to ML/day	Yes	
Section 6.1 Triggers Table 6-1 Please provide an explanation for the EC trigger value for WMP32. DPIE is unwilling to accept the high trigger value of 5690 $\mu\text{S}/\text{cm}$ without an acceptable explanation				A note has been added Table 6-1 which states <i>* Baseline monitoring indicates external influence on the waterways within this area and hence an elevated EC trigger value has been adopted. Existing land uses within the catchment include a landfill and electricity easements. There are no mining operations within the catchment.</i> See also the response to the DPIE question around the elevated EC levels discussed in Schedule 2: Condition 4.3 (b) which states that the proponent has reviewed the data after the 2020 monitoring.	Yes	
Section 6.2.2 DPIE would prefer the following text to be moved to come after Table 6-8: "Based on triggers derived in Section 6.1.4, Table 6-9 presents management criteria for the water level in the Fassifern underground storage".				Section updated to reference both Tables, but text still above the tables	Yes	
Section 7.1 NSW DoI W should be DPIE-Water.				Section updated	Yes	

Appendix B

Consultation Outcomes

Comments from DPIE on 18 November 2020

Comment	Response
Replace “Schedule” with “Condition” where occurring in Table 2-2.	Update complete
Figure 1-2 Newstan WMP is a part of the Northern Operations Regional Water Management Plan (NORWMP). The (Section 1.4.2) Northern Operations: Discharge Management Plan should also be included in the diagram.	Update complete
Section 1.2.2 Where is Section 0? Please identify correct reference.	Amendment complete
The information in T.4-3 and Fig.4-2 do not completely correlate. • Missing from Table 4-3 are bores: MB01, MB02B, AWG01, AWG02 • Missing from Figure 4-2 are bores: MB09, MB14, MB16, MB17 • Figure 4-3 does not display the following aquatic ecology monitoring sites: CCSC1, PCMH, SCCIZ	Table 4-3 updated to include AWG01 and AWG02. Other points were removed from Figure 4-2 as they are not currently part of the monitoring program or form the basis for management requirements. Figure 4-2 has been updated Figure 4-3 has been updated
Section 3.7 there is no discussion regarding salt. Provide information on salt.	Additional information provided for the salt fluxes through site
There is no reference to the NSW Wetlands Policy. Provide information on how the Wetlands Policy is applied.	Additional information provided including cross reference to existing management plans
The details of these bores are provided in Section 0, whereas it should be Section 4.3.	Amendment complete

Comment	Response
Water management and the monitoring program in the Main West area is covered by this WMP. • Section 5.2 There is a slight increase in EC over the last two years at MB04 (and MB11 is high). This trend is not considered attributable to mining activities at Newstan, however the attribution is not clarified given it has the greatest water level fluctuation (MB04 is approx. 4m, 2m above AIP level). Is this due to rainfall (CRD) and surface outcrop infiltration near Freemans Drive? • What is the likely reason for elevated salts (EC)?	On closer review of the data at MB04, MB15 and MB11. MB04 from monitoring in 2020 has indicated a recovery in water level and EC being recorded. MB15 and MB11 have indicated consistent water levels and EC data through the same period. The increase in EC is likely due to rainfall trends. Additional discussion has been added to the section to be updated following future revisions.
<u>General comments</u>	
Update the cover from December 2019 to November 2020	Updated to issue date of May 2021
Section 1.2.3 LDP001 add the word “to” after Clean Water Plant.	Amendment complete
Section 2 Remove the words “and evaporation” from paragraph 3 and the title to Fig. 2-1	Amendment complete
Section 3.4 What is the meaning of the following sentence “ <i>Dewatering underground from surface water storages occurs at a controlled rate, controlled through automated systems</i> ”?	Sentence updated for clarity
Table 4.2 Nutrients- “NO _x ” is usually an air quality parameter. Compare this with Table 4-4 MB18 “ <i>ammonia, nitrate, nitrite, nitrate + nitrite, total Kjeldahl nitrogen</i> ”	Updated as suggested
Section 4.4: Underground water extraction and transfer states “daily monitoring ... is undertaken daily”.	Section reviewed and amended for clarity
Section 4.6 Please change second paragraph to read “ <i>Geomorphological stability is assessed in Stony Creek downstream of discharges from LDP017. This monitoring occurs following any discharge event, with 250 metres to be monitored downstream of the discharge point. Visual inspections are aided by indicators and photographs taken along the monitored length of the creek.</i> ”	Amendment complete

Comment	Response
Figure 5-1 It would be helpful if the flow rate in the x-axis was in ML/day to match the units used in the text.	Amendment complete
Section 6.1 Triggers Table 6-1 Please provide an explanation for the EC trigger value for WMP32. DPIE is unwilling to accept the high trigger value of 5690 $\mu\text{S}/\text{cm}$ without an acceptable explanation	Amendment complete
Section 6.2.2 DPIE would prefer the following text to be moved to come after Table 6-8: <i>"Based on triggers derived in Section 6.1.4, Table 6-9 presents management criteria for the water level in the Fassifern underground storage"</i> .	Section updated to reference both Tables.
Section 7.1 NSW DoI W should be DPIE-Water.	Amendment complete

Comments from DPIE on 2 March 2020

Comment	Response
<u>General comments on Schedule 2: Condition 4.1</u>	
Bore AE6 is in the table, but does not appear to be on Figure 4-3. Update the table or the figure, whichever is correct	AE6 references have been deleted, it is no longer part of the monitoring program
Update Table 1-2 to include [Condition a) (xi)] relevant sections, including the Awaba Colliery Water Management Plan. Currently the table refers to the WMP	Addressed
With respect to monitoring and remediation strategies for streams adversely affected by subsidence...Include a statement <i>"Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW"</i> is included in Section 4.	Addressed
Include a specific reference to the <i>NSW Wetland Policy</i> in Section 2.3 to ensure full compliance with this condition	Addressed, additional detail added around NSW Wetland Policy relevance.
With respect to loss of groundwater quality or quantity...Include a statement <i>"Where the monitoring indicates any adverse impacts due to mining, the company shall implement the</i>	Addressed

Comment	Response
<i>remediation strategy to the satisfaction of DPIEW</i> is included in Section 4.	
To ensure full compliance with Schedule 2, Condition 4.1 (c)...include a sentence that this will be done	Addressed
With respect to monitoring and remediation strategies for streams AND groundwater quality and quantity adversely affected by subsidence...Include a statement <i>"Where the monitoring indicates any adverse impacts due to mining, the company shall implement the remediation strategy to the satisfaction of DPIEW"</i> is included in Section 4. Include this condition [d)] in Table 1-2.	Condition added and commentary added
Include this condition [d)] in Table 2-1 and include a commitment to minimise the pollution of water to fully satisfy this condition.	Condition added and commentary added
General Comments on Schedule 2: Condition 4.3	
Update Table 1-2 to correctly reference Section 5.2 for baseline groundwater levels and quality	Addressed
General Comments on Schedule 2: Condition 8.2	
Update Table 1-2 to also correctly reference Section 1.2.3	Addressed
General Comments on Schedule 2: Condition 8.7	
Include Condition 8.37 items (i), (ii) and (v) within Table 1-2 with appropriate references to the sections in the WMP.	Addressed

Appendix C

Supporting data

Registered landholder bores

Bore	Easting	Northing	Depth (m)	Purpose	Salinity (mg/L)	Yield (L/s)	Strata
GW029567	361864	6340863		Stock, irrigation, domestic, farming			Sandstone
GW033618	358945	6343594		Stock			Shale, sandstone
GW033619	359049	6343596		Stock			Shale, sandstone
GW043431	359665	6345915	38.1	Stock, irrigation			
GW052111	359475	6339227	49	Stock	Good	2.27	Conglomerate, sandstone
GW052381	357498	6346746	35	Stock, domestic	Good	0.76	Coal, sandstone
GW053438	359235	6339686	53	Stock, irrigation, domestic	1001-3000	0.44	Coal, shale
GW057310	356467	6342726	61	Stock domestic, farming		0.07	Shale
GW061202	357061	6344737	50.3	Stock, domestic	1001-3000	0.2	Siltstone, sandstone, coal
GW063014	367661	6341806	7	Waste disposal			
GW063752	362871	6348578	12.2	Stock, domestic	0-500	0.46	Sand, gravel, coal
GW063947	369396	6345987	22.2	Stock, domestic	1001-3000	0.79	Shale, Sandstone
GW064025	362740	6348700	12.2	Stock, domestic	0-500	0.9	Sandstone, shale, coal
GW064067	362141	6348845	12.1	Stock, domestic	1001-3000	0.4	Gravel

Bore	Easting	Northing	Depth (m)	Purpose	Salinity (mg/L)	Yield (L/s)	Strata
GW064213	366595	6343917		Monitoring bore		0.1	Sandstone, conglomerate, coal
GW064214	366595	6344432		Monitoring bore		0.1	Sandstone, conglomerate, coal
GW078138	356976	6345167	120	Test bore	320-470	0.2-0.6	Sandstone, coal
GW078486	367252	6345381	5.73	Domestic		90	
GW080494	367738	6349710		Stock, domestic			
GW105161	367850	6343850	5	Domestic		0.1	
GW200695	359313	6348500		Test bore			
GW200696	359964	6347393		Test bore			
GW200825	368935	6346345	3.3	Monitoring bore			Fill
GW200826	368962	6346364	3	Monitoring bore			Sandy, gravelly clay
GW201480	366126	6347135	11.6	Monitoring bore			Sandstone
GW202324	365162	6348895	74.14	Monitoring bore			Sandstone, siltstone, shale, coal
GW202325	360869	6344024	3	Monitoring bore, test bore			Sand
GW202326	364806	6346872	2	Monitoring bore, test bore			Sandy clay
GW202327	365681	6343836	3.1	Monitoring bore, test bore			Sand, sandy clay

Bore	Easting	Northing	Depth (m)	Purpose	Salinity (mg/L)	Yield (L/s)	Strata
GW202328	365615	6344372	4	Monitoring bore			Sandy clay, silty sand
GW202329	366595	6344766	4	Monitoring bore			Silty sand
GW202330	367311	6345170	4.1	Monitoring bore			Clayey sand
GW202331	365639	6348010	2.8	Monitoring bore			Sandy clay, clayey gravel
GW202338	359356	6347809	102	Test bore	730-2300	3.3	Siltstone, sandstone, coal
GW202339	359340	6348185	68.5	Test bore	100-2100	10	Sandstone
GW202559	364665	6344935	7.5	Monitoring bore			Sand
GW202685	369735	6345316	4	Monitoring bore			Clay, gravelly
GW202686	369748	6345300	4.4	Monitoring bore			Clay, gravelly
GW202687	369744	6345305	4.9	Monitoring bore			Clay, gravelly
GW202798	364598	6344953	9	Monitoring bore			Shale
GW202799	364456	6345369	12.5	Monitoring bore			Sandstone
GW202800	364864	6344964	11	Monitoring bore			Clay
GW202801	364689	6344873	11.7	Monitoring bore			Sandstone
GW202802	364597	6344955	5	Monitoring bore			Shale, clay

Bore	Easting	Northing	Depth (m)	Purpose	Salinity (mg/L)	Yield (L/s)	Strata
GW202803	364689	6344874	8	Monitoring bore			Sandy clay
GW202900	366529	6348534	23.6	Monitoring bore			
GW202901	366340	6348647	29.9	Monitoring bore			
GW202940	361666	6341097	4.5	Monitoring bore			Clayey sand, silty clay
GW202941	361591	6341004	5.5	Monitoring bore			Sand, sandy clay
GW202942	361575	6341085	6	Monitoring bore			Silty clay, gravelly sandy clay
GW202943	361566	6340704	8	Monitoring bore			Conglomerate
GW202944	361571	6340770	8.5	Monitoring bore			Conglomerate
GW202945	361591	6340725	9	Monitoring bore			Conglomerate, coal
GW202946	361568	6340833	8.4	Monitoring bore			Sandstone, conglomerate, coal
GW202947	361596	6340822	9	Monitoring bore			Silty clay, silty sandy clay
GW202948	361613	6340821	9.5	Monitoring bore			Silty sand, sandy gravelly clay
GW202949	361593	6340864	9	Monitoring bore			Gravelly sandy clay, sandy silty clay
GW202950	361523	6340829	9	Monitoring bore			Clay
GW202951	361592	6340796	9	Monitoring bore			Fill

Bore	Easting	Northing	Depth (m)	Purpose	Salinity (mg/L)	Yield (L/s)	Strata
GW202952	361618	6340813	19	Monitoring bore			Clay
GW027551	365443	6352249	2.4	Poultry (Groundwater)			Sand
GW060852	366083	6352905	18.3	Stock, domestic	3001-7000		
GW045155	366289	6353092	4.3	Stock, domestic	0-500		Permian sandstone
GW080427	366621	6353279	28	Monitoring bore			Sandstone, shale, coal, tuff
GW080428	366650	6353232	24	Monitoring bore			Coal, sandstone, shale
GW080426	366772	6353383	23	Dewatering (Groundwater)			Tuff, coal, sandstone, shale
GW200955	366801	6353226	280	Dewatering (Groundwater), mining			Sandstone

Groundwater Bore Construction Details

Bore	Easting	Northing	Collar level (mAHD)	Depth (m)	Purpose	Licence Status	Strata
Fassifern No.1 Bore Pump Station	Pump 1: 366348.5 Pump 2: 366350.989	Pump 1: 6348637.5 Pump 2: 6348640.577	23.10	52	Dewatering – 600mm diameter, steel casing	Pending	Fassifern Seam
GNS No 2 Pump	Pump 1: 367615.495 Pump 2: 367612.447	Pump 1: 6350083.294 Pump 2: 6350085.858	13.0	30.50	Dewatering – 650mm diameter, steel casing	Pending	Fassifern Seam

Bore	Easting	Northing	Collar level (mAHD)	Depth (m)	Purpose	Licence Status	Strata
Pump Bore 19CT	365023.58	6348818.71	26.56	242	Dewatering	Pending	West Borehole Seam
6 HDG to 21CT (Main South)	365050.92	6348823.99	32.28	21.90	Injection	NA	Fassifern Seam
NTB22 / NSH011	365488.93	6350093.99	28.91	45.50	Injection	NA	Fassifern Seam
Stony Creek Pipeline Outlet	366404	6348315	NA	NA	Overflow	EPL	Fassifern Seam to Natural Surface
MB02B	361694.55	6346816.28	56.91	21.74	Monitoring	Water Act 1912, Part 5	20BL167832
MB03	359733.01	6345608.64	24.54	28.84	Monitoring	Water Act 1912, Part 5	20BL169871
MB04	359336.60	6344685.80	40.18	41.25	Monitoring	Water Act 1912, Part 5	20BL169863
MB05	358942.30	6343966.40	17.30	38.90	Monitoring	Water Act 1912, Part 5	20BL169861
MB06	358899.57	6343172.67	15.44	54.65	Monitoring	Water Act 1912, Part 5	20BL169870
MB09	359738.57	6345599.38	24.49	4.00	Monitoring	Water Act 1912, Part 5	20BL169871
MB10	360015.53	6345749.98	26.37	6.50	Monitoring	Water Act 1912,	20BL169871

Bore	Easting	Northing	Collar level (mAHD)	Depth (m)	Purpose	Licence Status	Strata
						Part 5	
MB11	360077.05	6346865.02	32.10	11.30	Monitoring	Water Act 1912, Part 5	20BL173649
MB12	359858.68	6345063.47	23.74	8.80	Monitoring	Water Act 1912, Part 5	20BL169867
MB13	360259.80	6346287.40	30.16	8.20	Monitoring	Water Act 1912, Part 5	20BL169866
MB14	358899.66	6343169.19	15.40	13.46	Monitoring	Water Act 1912, Part 5	20BL169870
MB15	359697.83	6344703.57	21.26	8.50	Monitoring	Water Act 1912, Part 5	20BL169869
MB16	359054.37	6343193.90	14.17	53.75	Monitoring	Water Act 1912, Part 5	20BL169870
MB17	359055.00	6343197.33	14.18	8.75	Monitoring	Water Act 1912, Part 5	20BL169870
MB18	366529.28	6348553.57	22.99	23.60	Monitoring	Pending	Great Northern Seam
MB19	366340.46	6348646.72	23.83	29.90	Monitoring	Pending	Great Northern Seam
AE1	367307	6345155	NA	4.470	Monitoring	20BL172209	Alluvial
AE2	366587	6344758	NA	3.600	Monitoring	20BL172267	Alluvial
AE3	365613	6344372	NA	4.500	Monitoring	20BL172266	Alluvial
AE4	365669	6343855	NA	4.0	Monitoring	20BL172269	Alluvial
AE5	364806	6346843	NA	2.290	Monitoring	20BL172270	Alluvial

Bore	Easting	Northing	Collar level (mAHD)	Depth (m)	Purpose	Licence Status	Strata
AWG01	362641	6344934	NA	7.455	Monitoring	20BL173582	Alluvial
AWG02	363263	6345575	NA	9.2	Monitoring	20BL173232	Alluvial

Surface water monitoring data

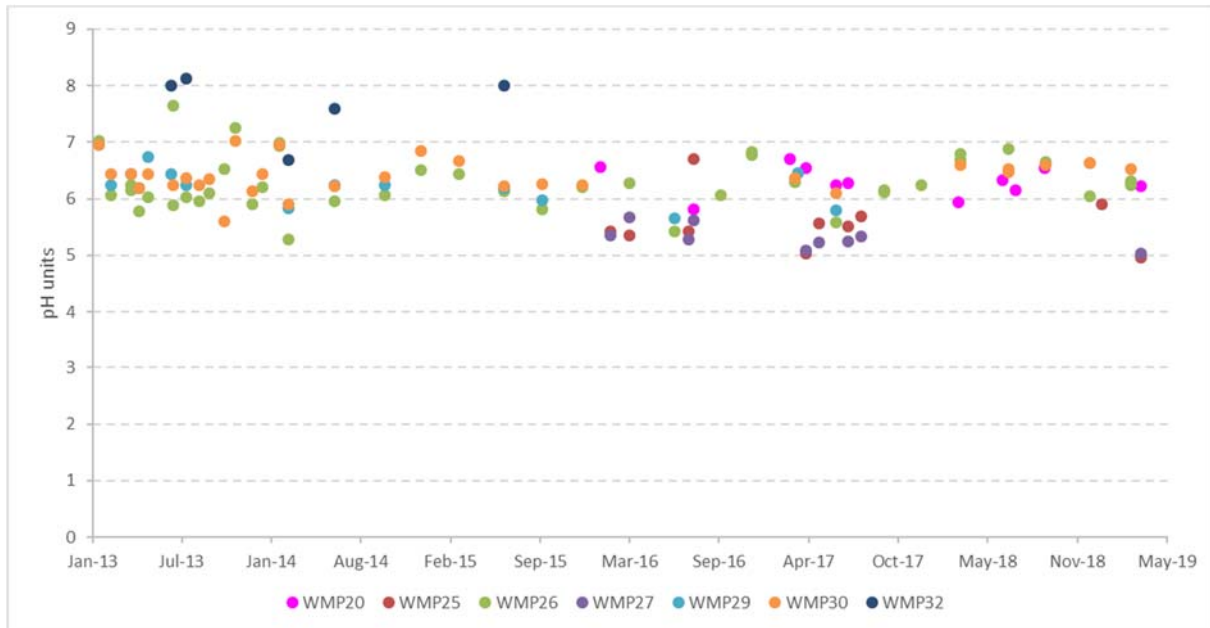


Figure C-1 pH monitored in surface water

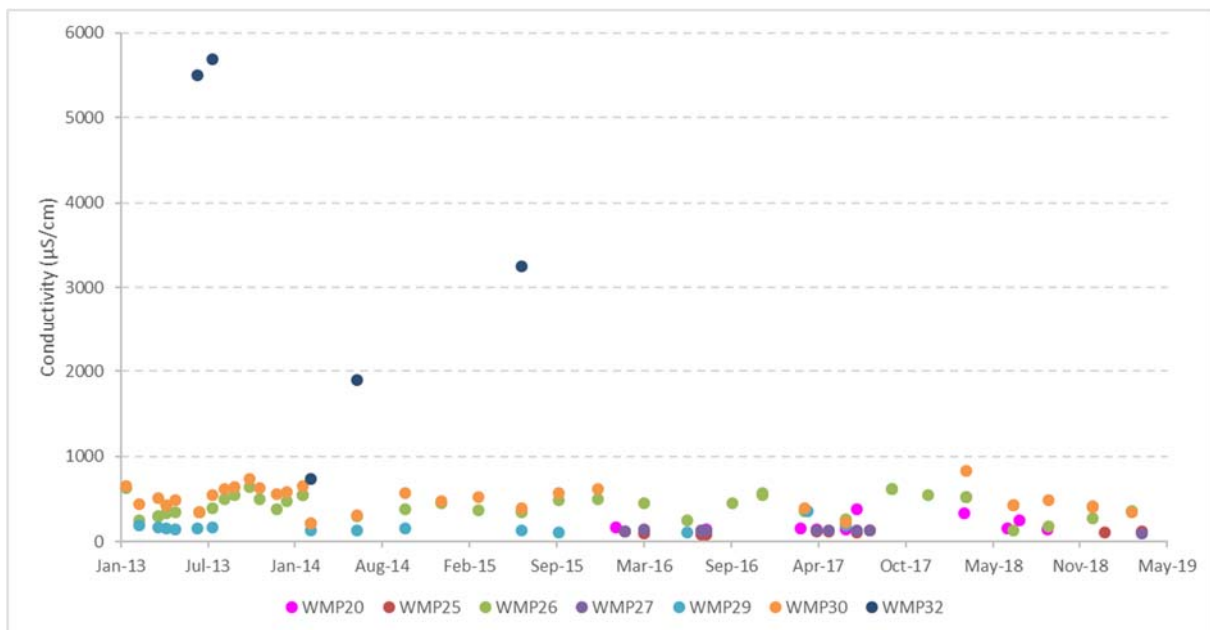


Figure C-2 Electrical conductivity monitored in surface water

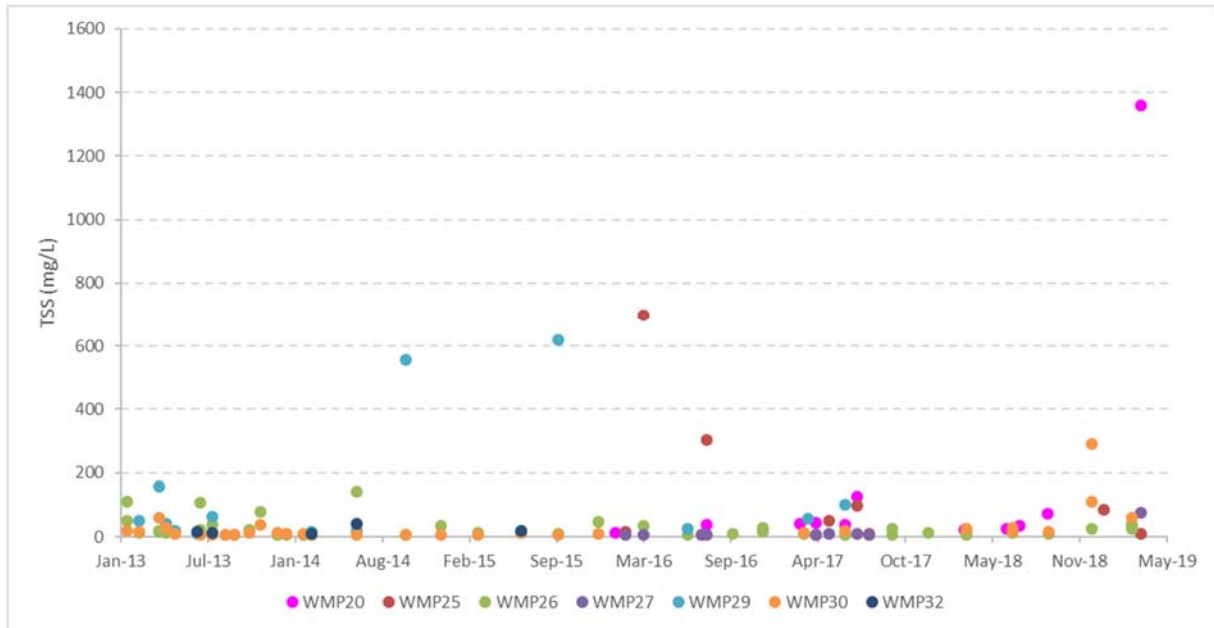


Figure C-3 TSS monitored in surface water

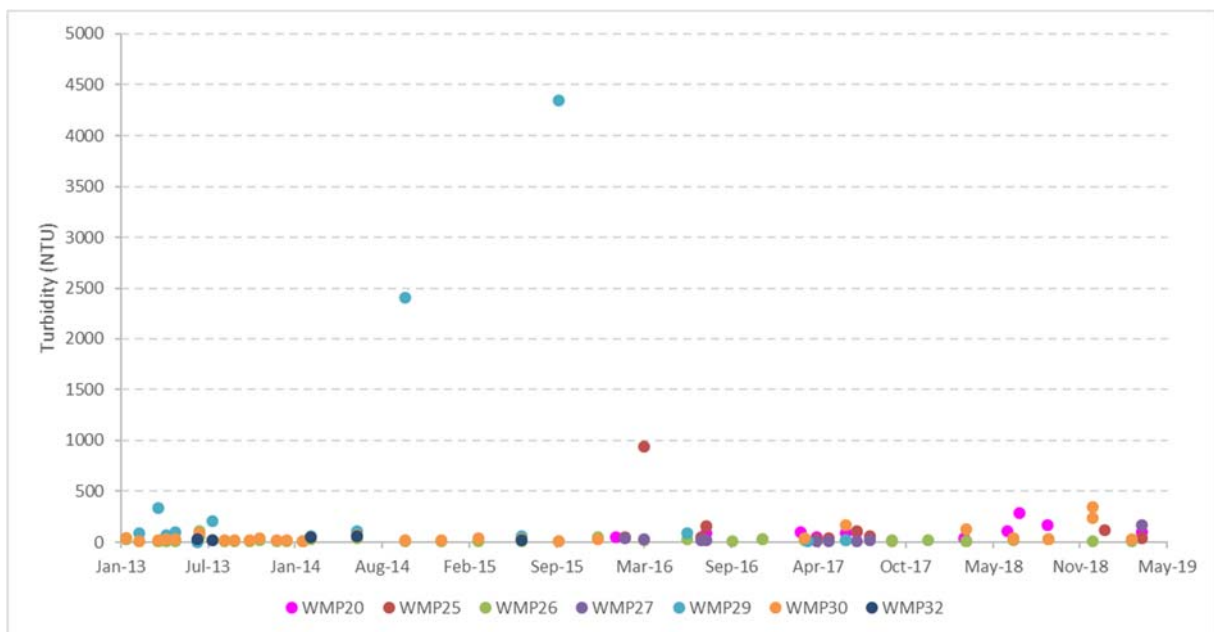


Figure C-4 Turbidity monitored in surface water

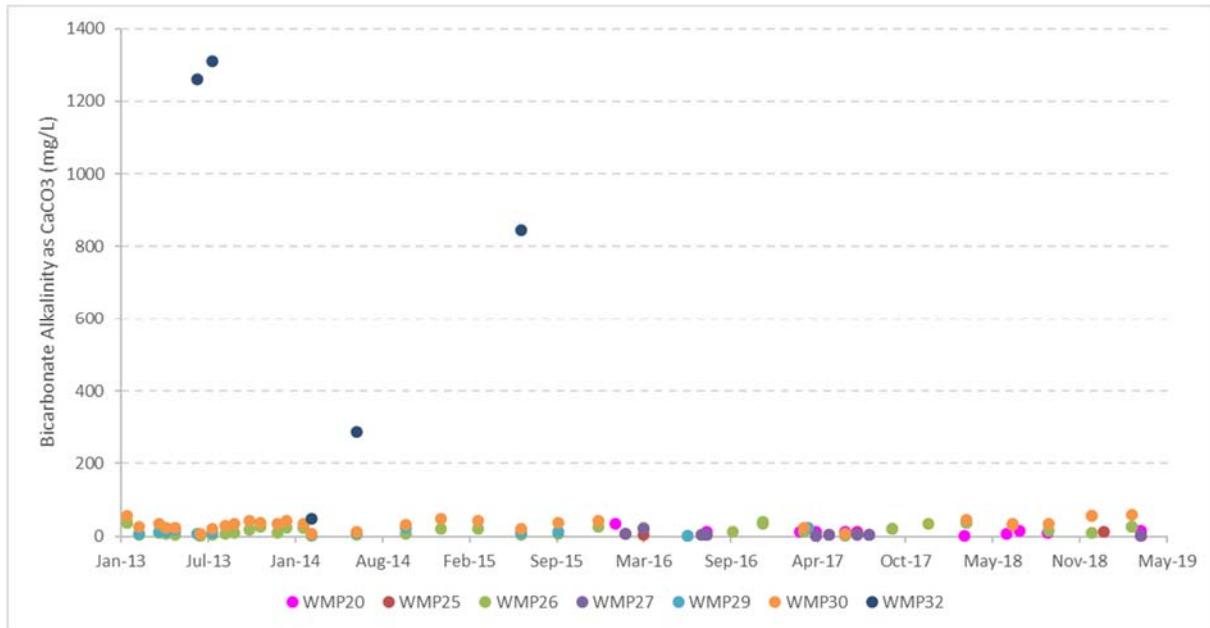


Figure C-5 Bicarbonate alkalinity as CaCO₃ monitored in surface water

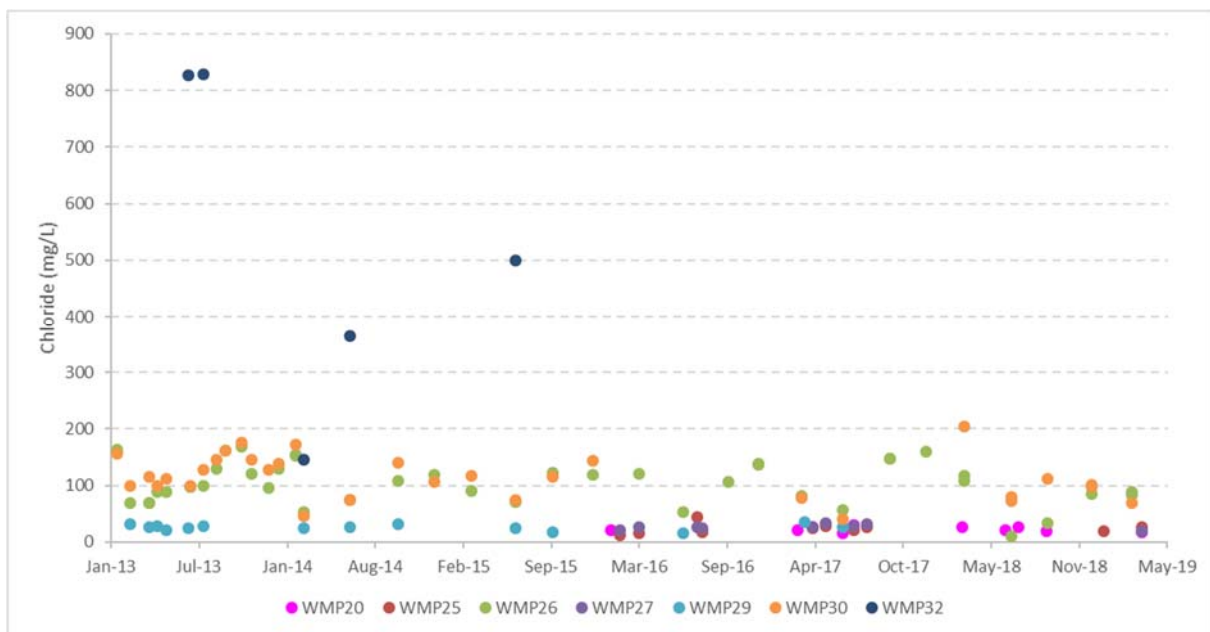


Figure C-6 Chloride monitored in surface water

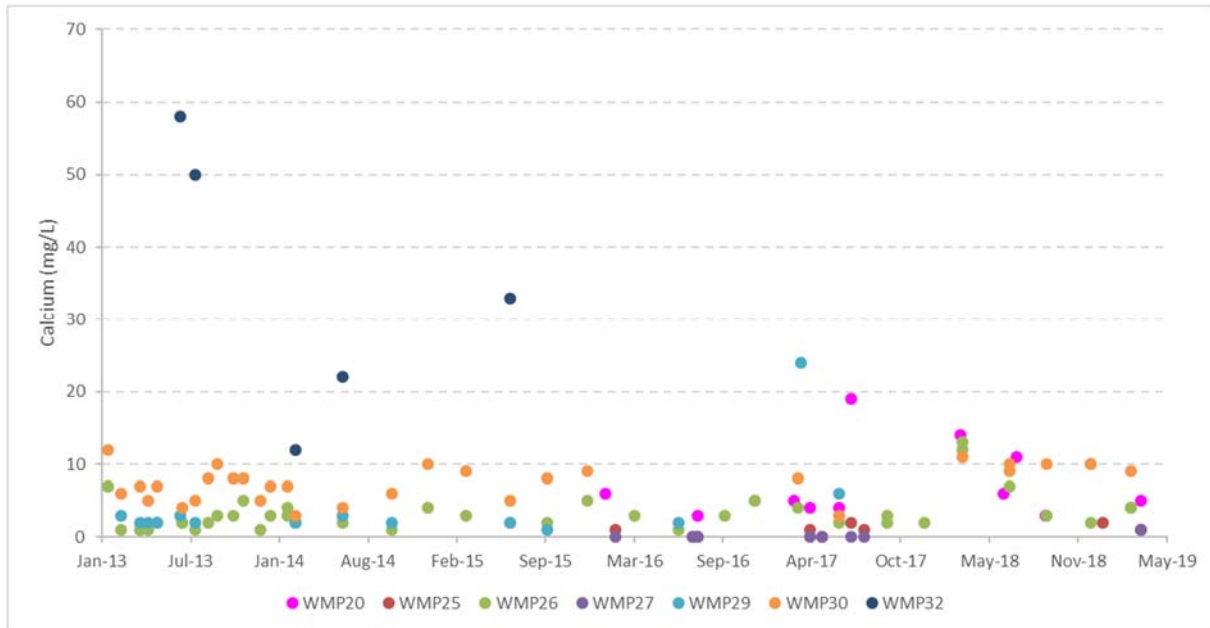


Figure C-7 Calcium monitored in surface water

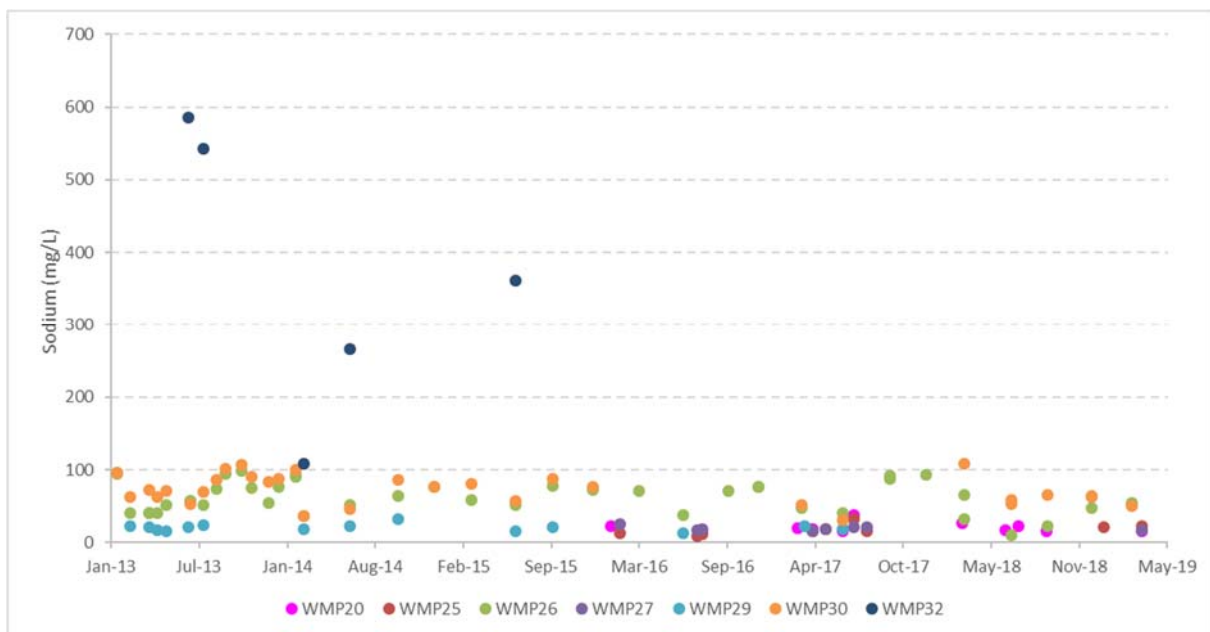


Figure C-8 Sodium monitored in surface water

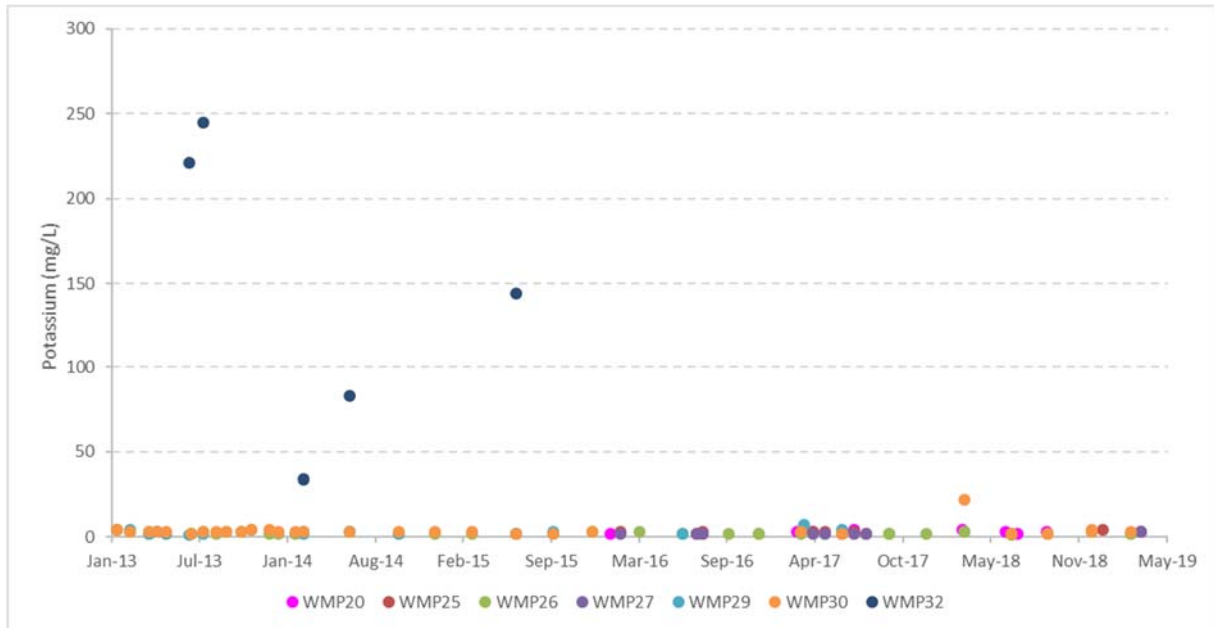


Figure C-9 Potassium monitored in surface water

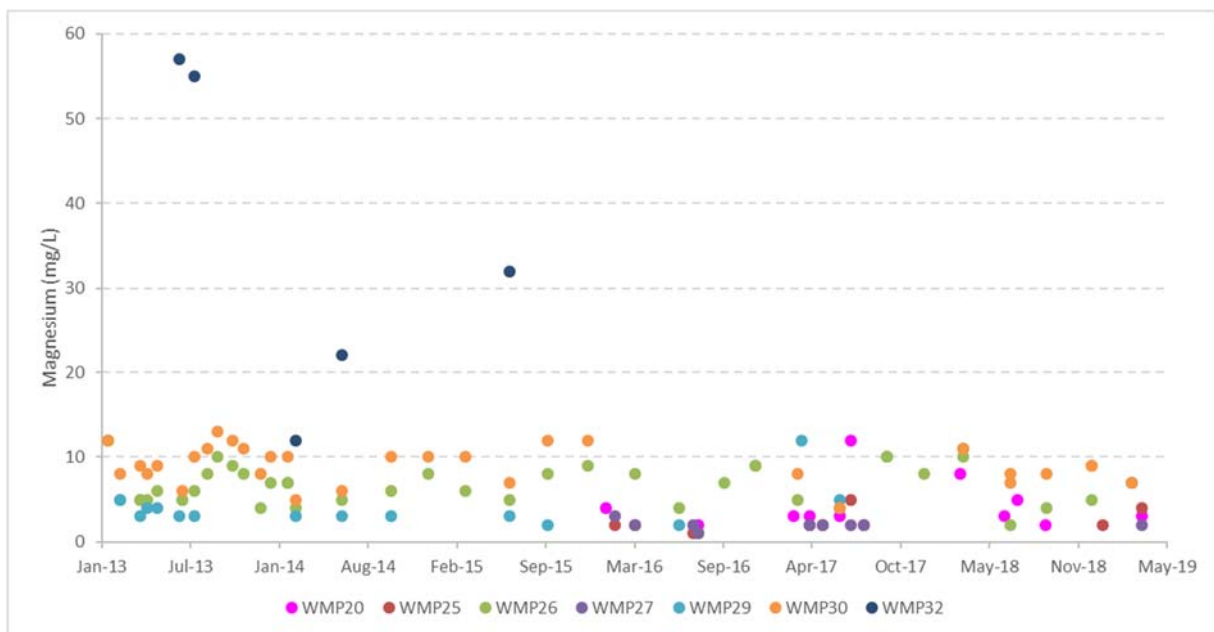


Figure C-10 Magnesium monitored in surface water

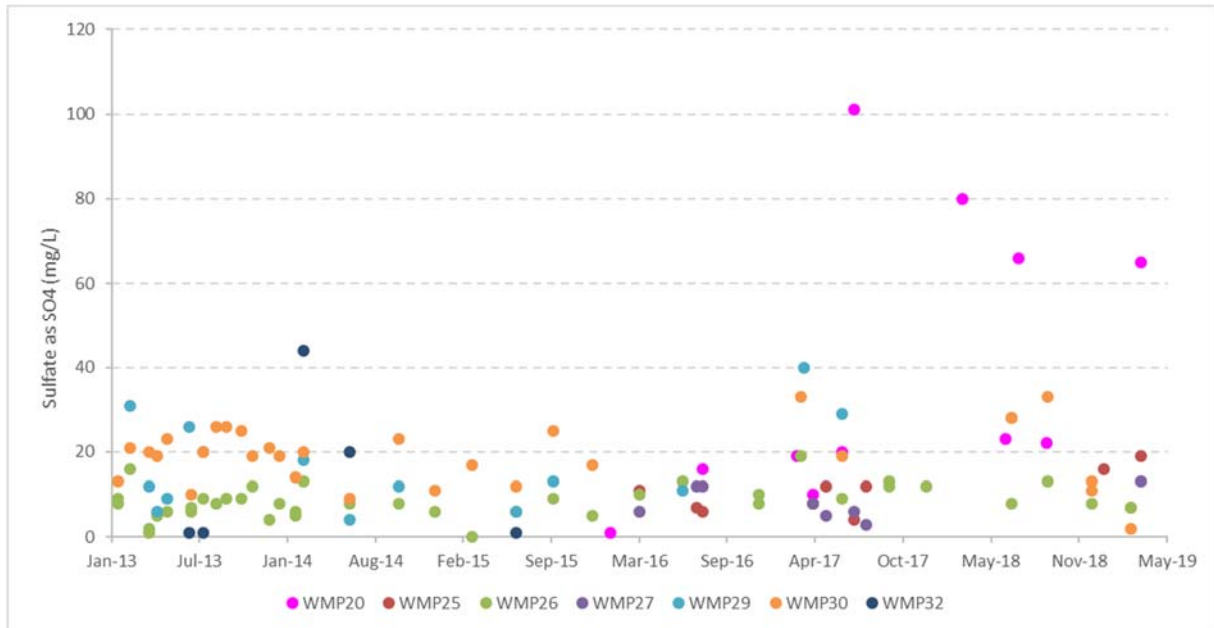


Figure C-11 Sulfate as SO₄ monitored in surface water

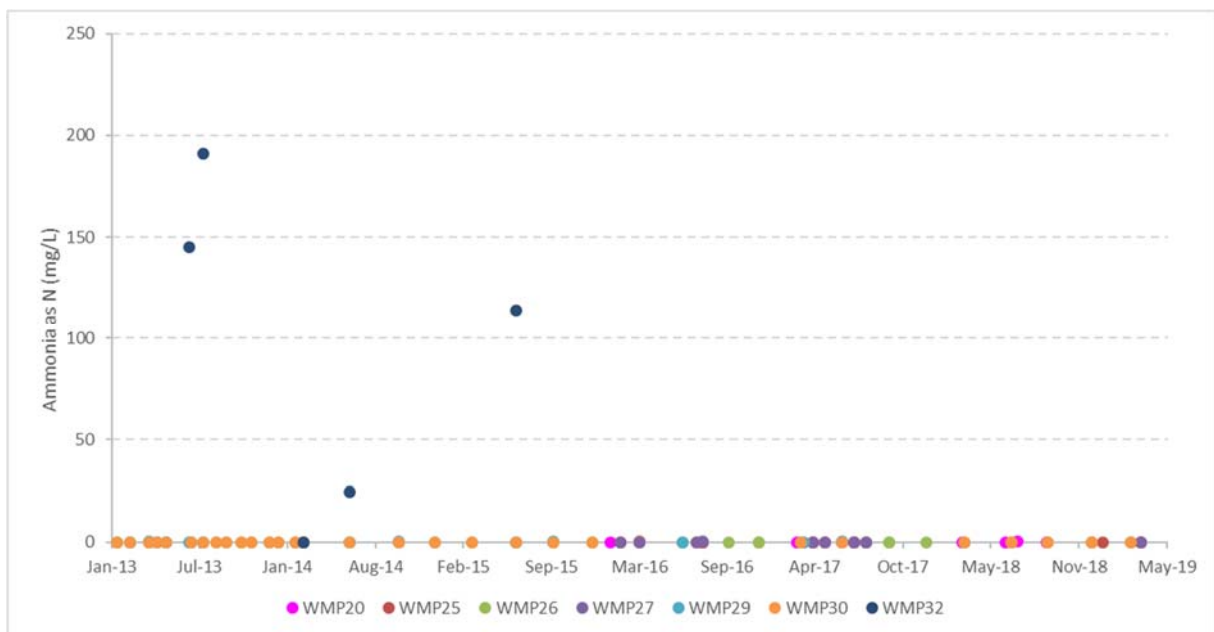


Figure C-12 Ammonia as N monitored in surface water

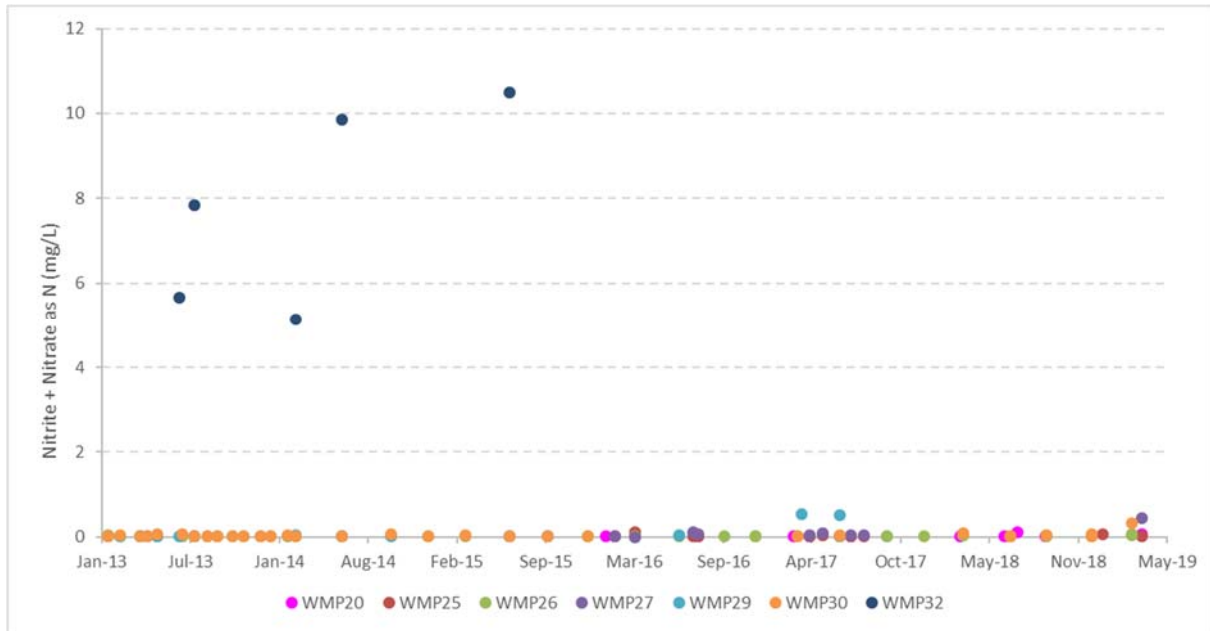


Figure C-13 Nitrite + Nitrate monitored in surface water

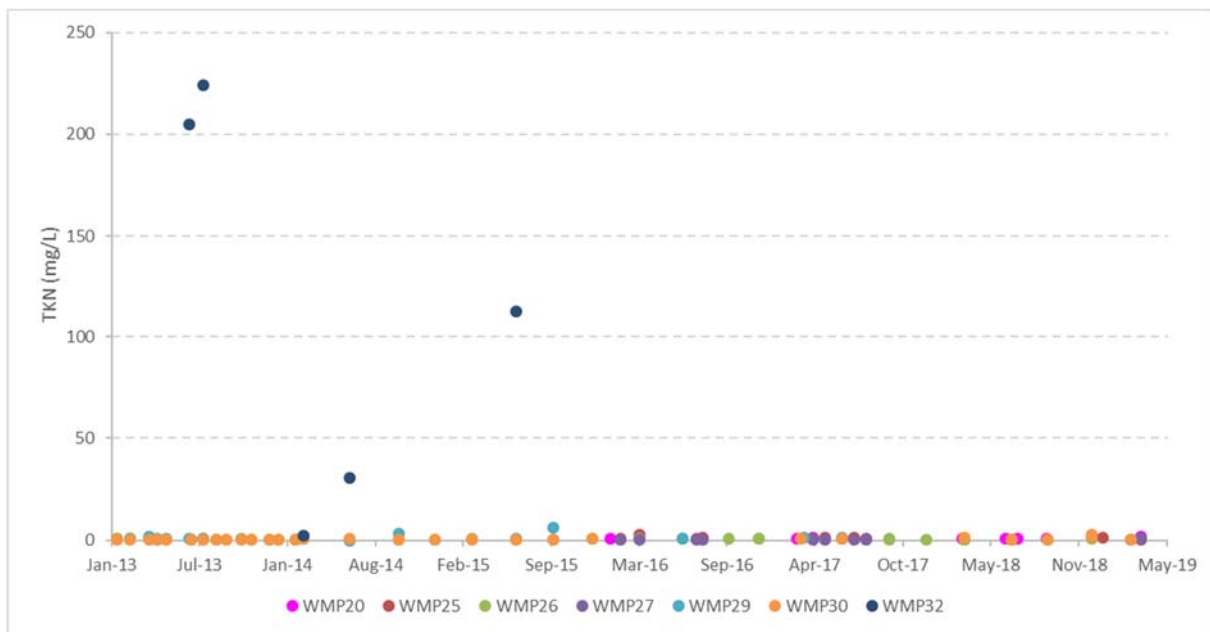


Figure C-14 TKN monitored in surface water

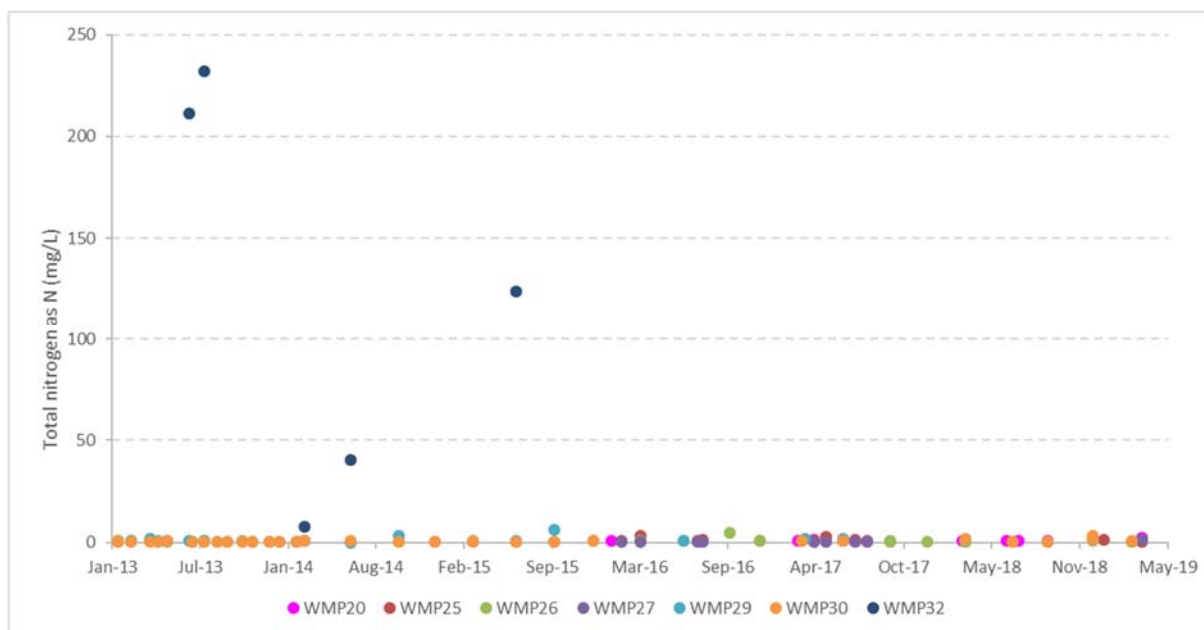


Figure C-15 Total nitrogen as N monitored in surface water

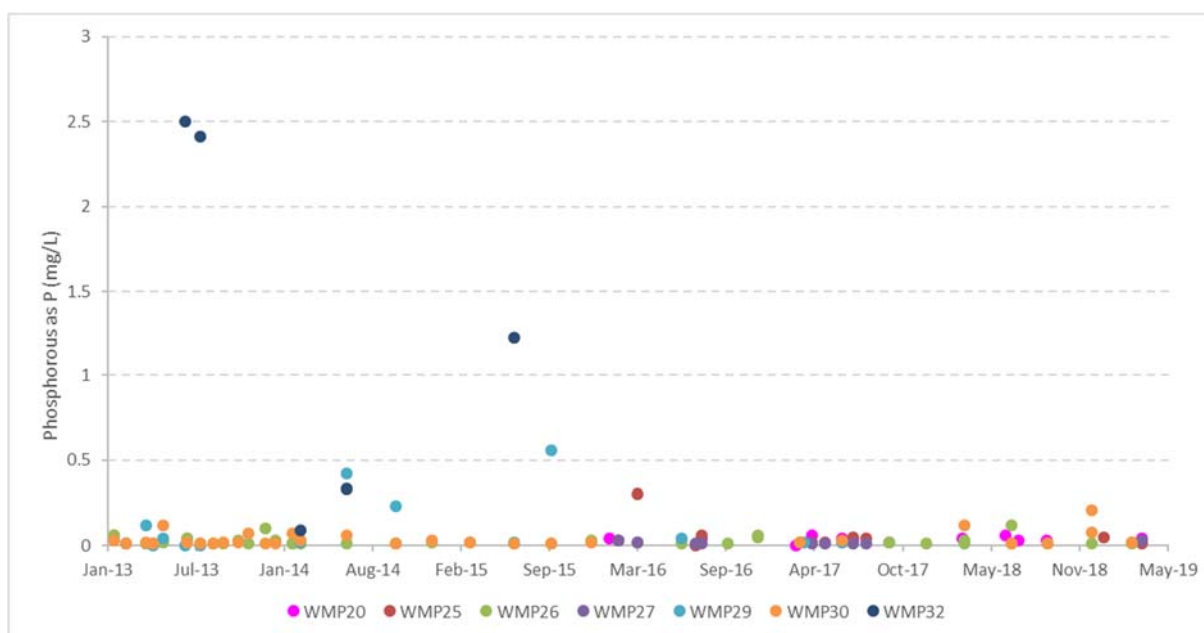


Figure C-16 Phosphorous as P monitored in surface water

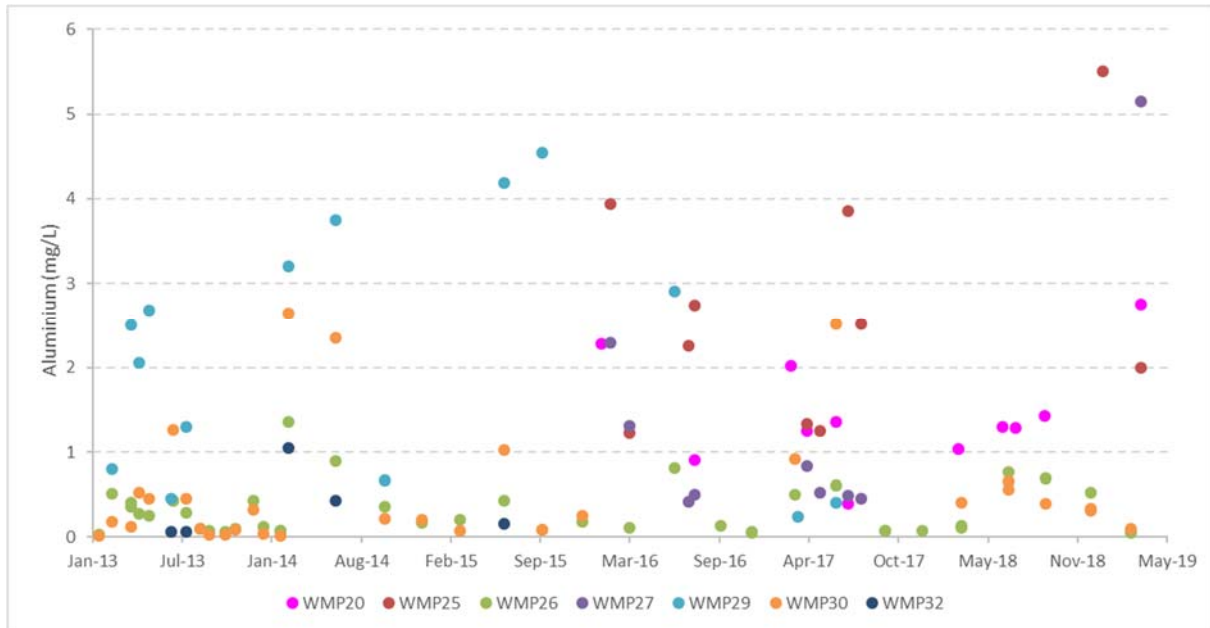


Figure C-17 Dissolved aluminium monitored in surface water

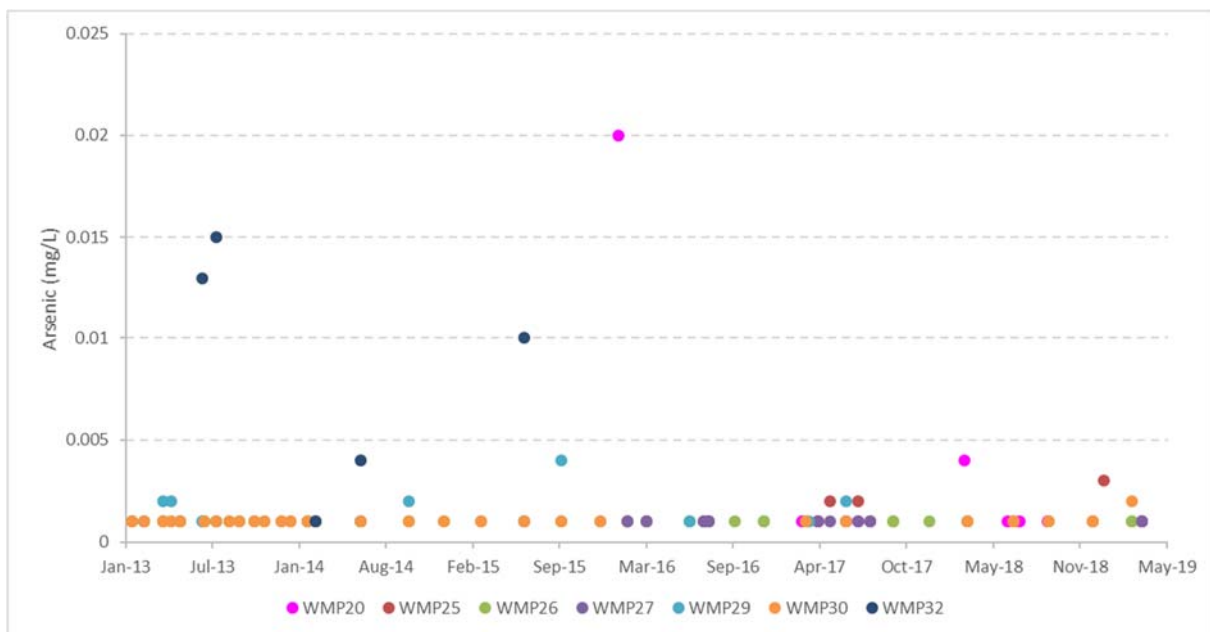


Figure C-18 Dissolved arsenic monitored in surface water

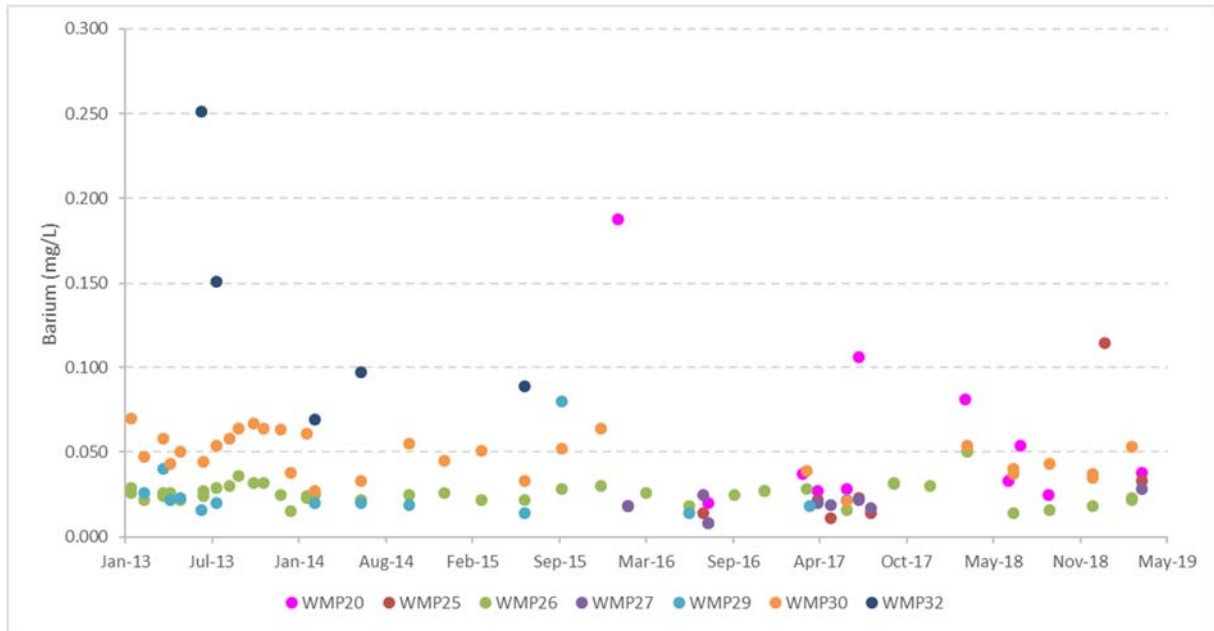


Figure C-19 Dissolved barium monitored in surface water

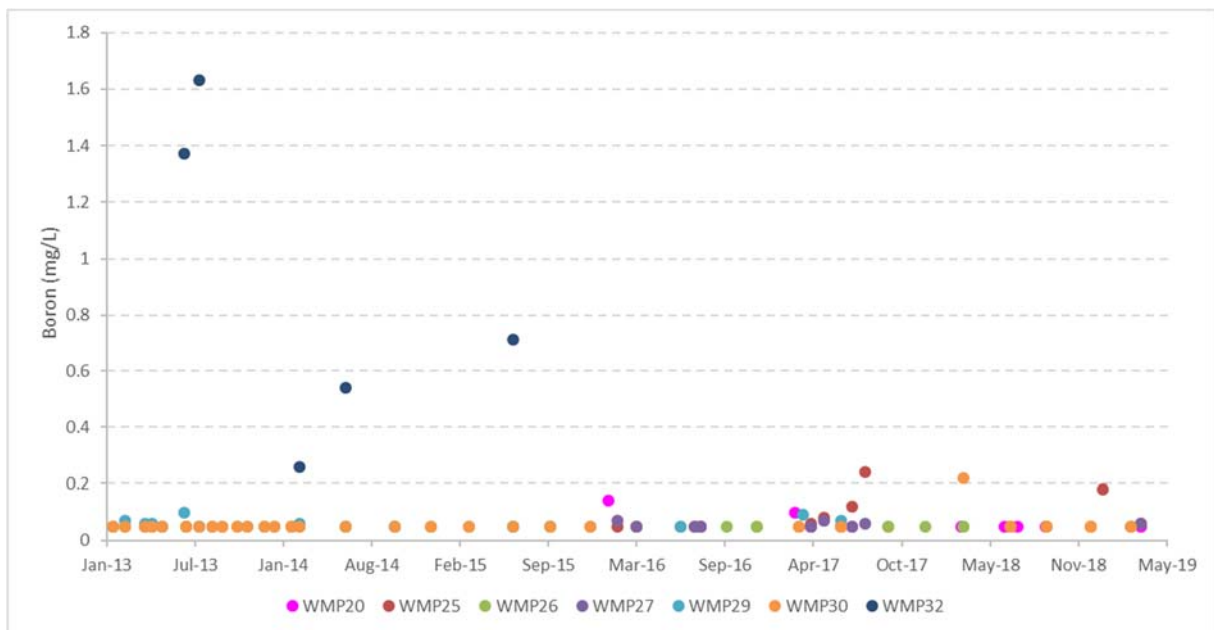


Figure C-20 Dissolved boron monitored in surface water

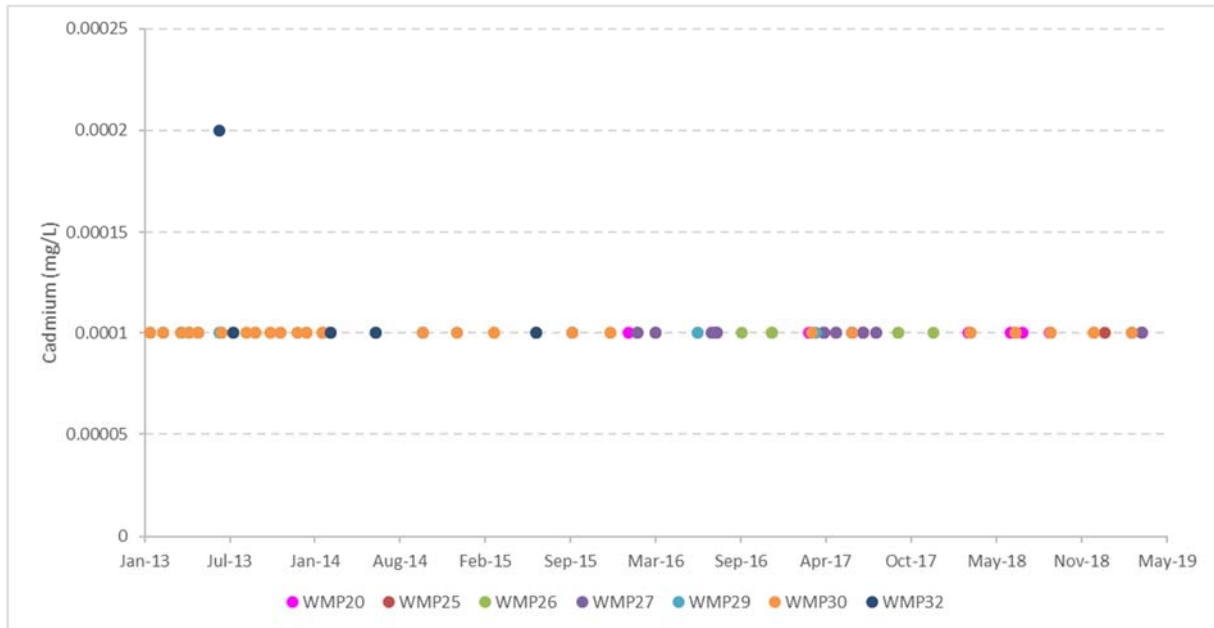


Figure C-22 Dissolved cadmium monitored in surface water

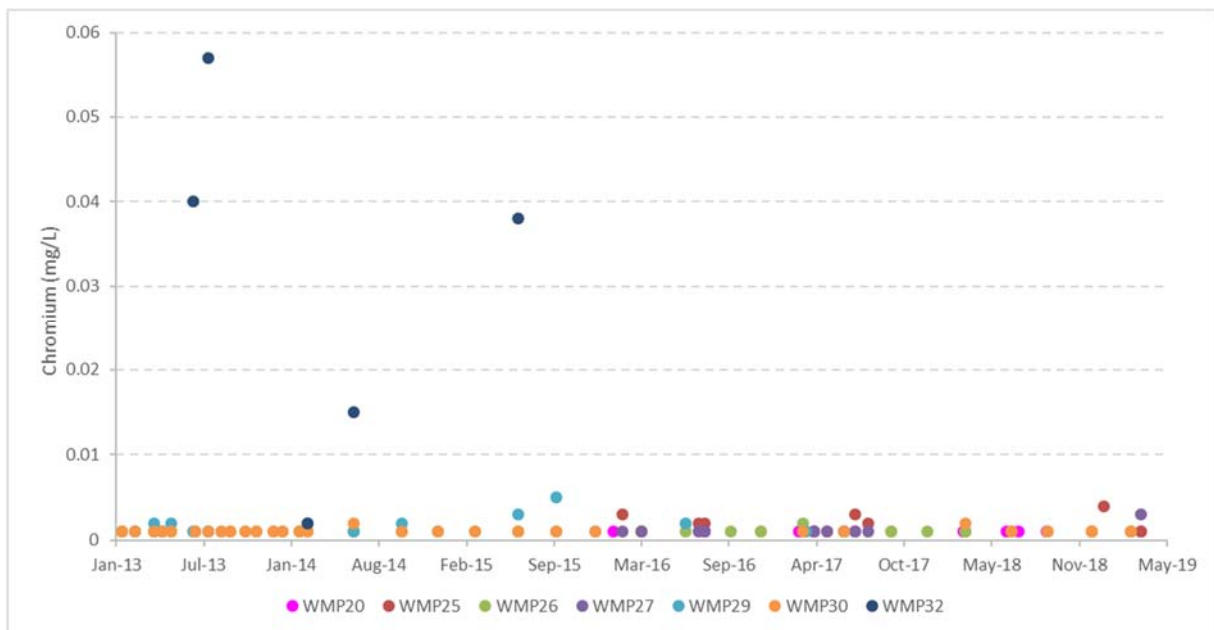


Figure C-23 Dissolved chromium monitored in surface water

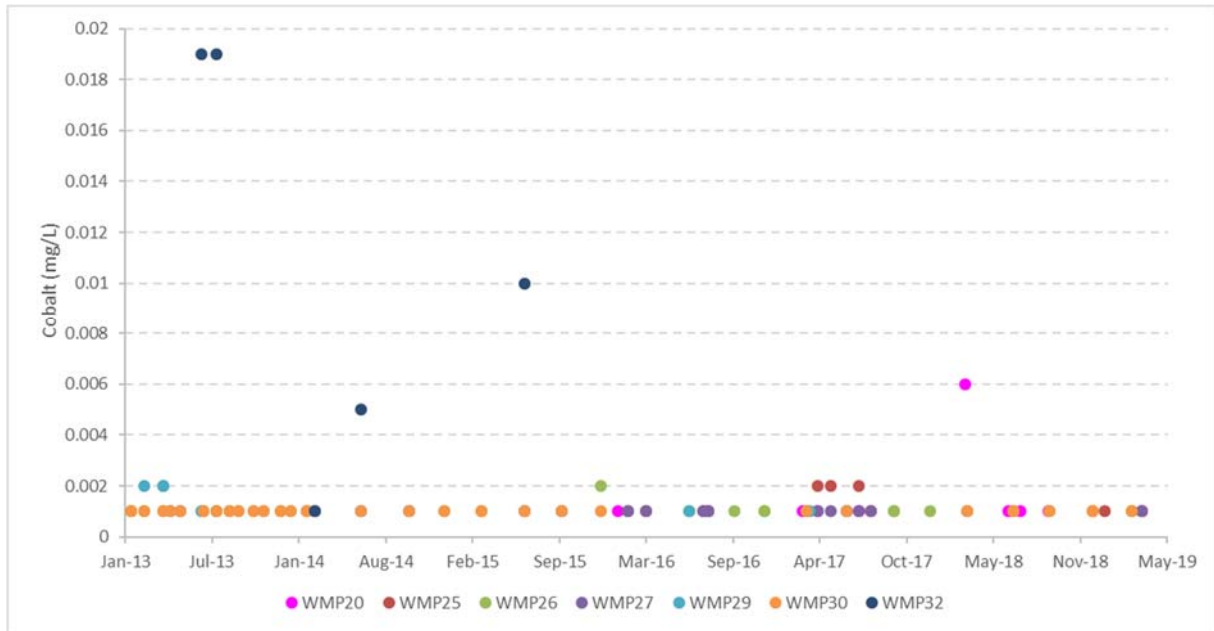


Figure C-24 Dissolved cobalt monitored in surface water

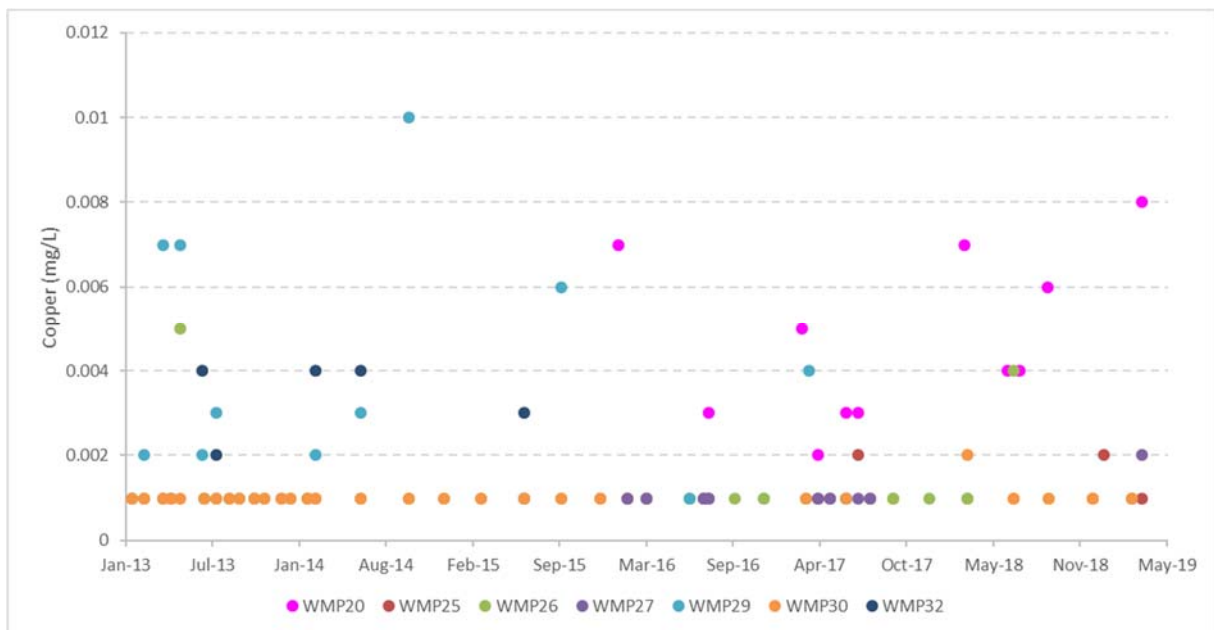


Figure C-25 Dissolved copper monitored in surface water

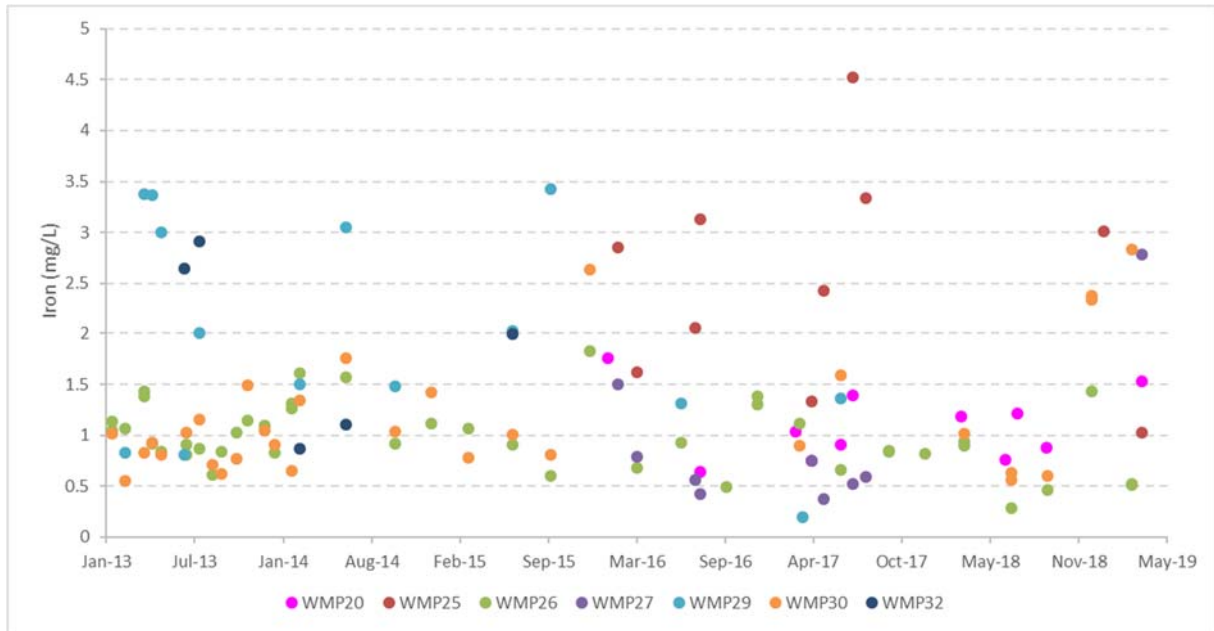


Figure C-26 Dissolved iron monitored in surface water

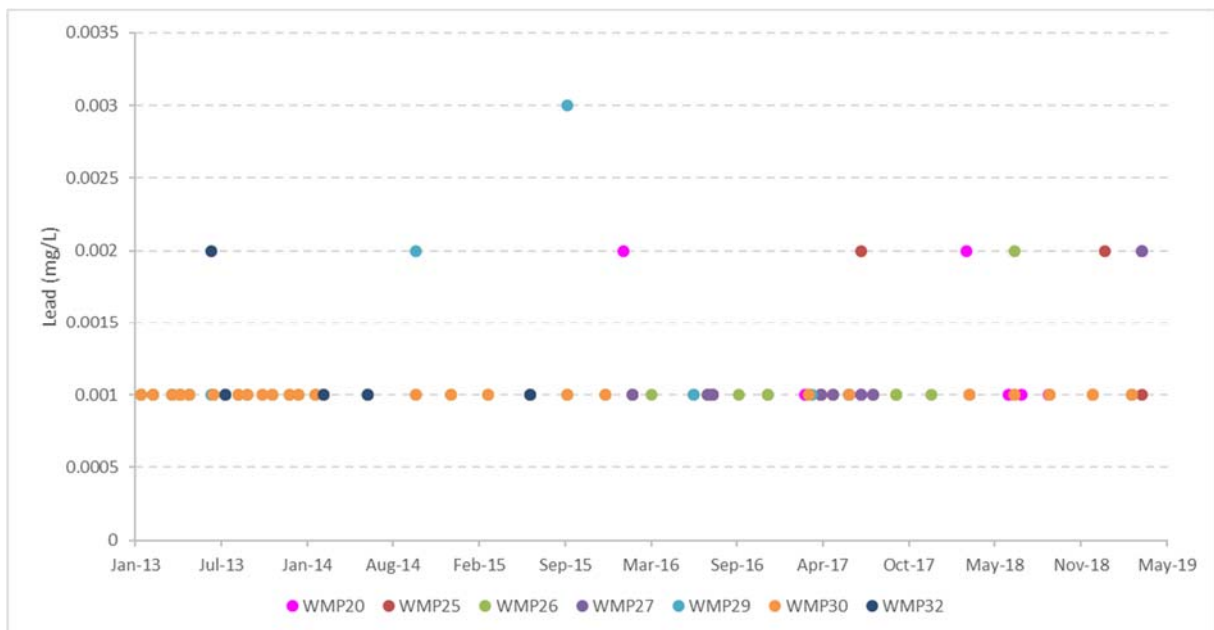


Figure C-27 Dissolved lead monitored in surface water

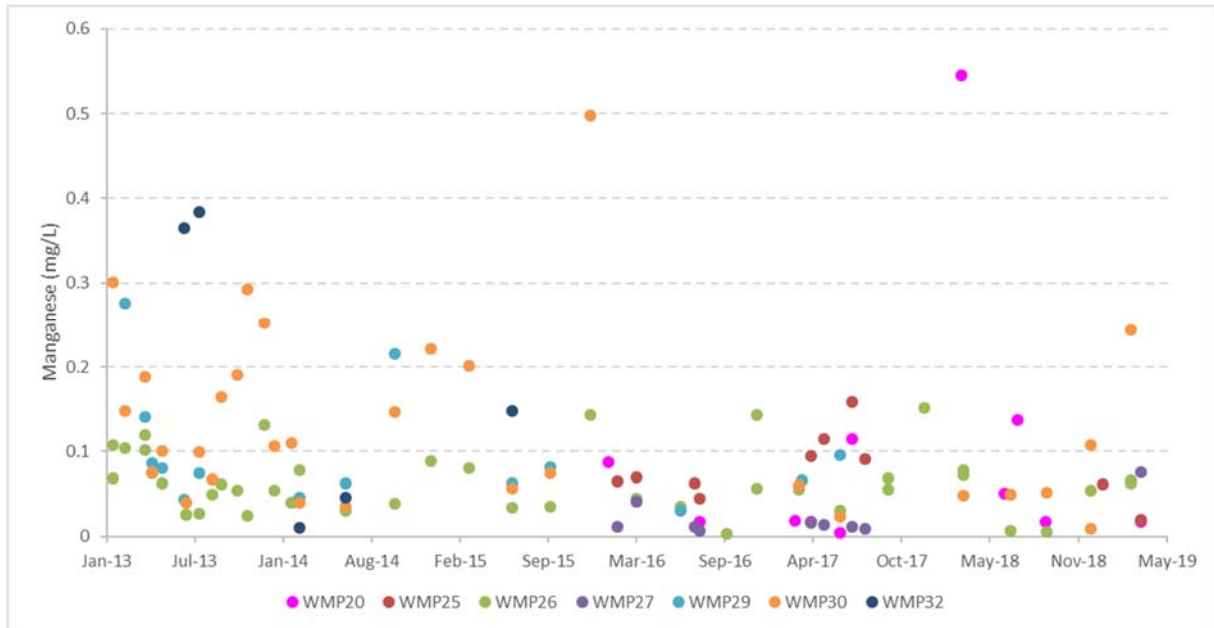


Figure C-28 Dissolved manganese monitored in surface water

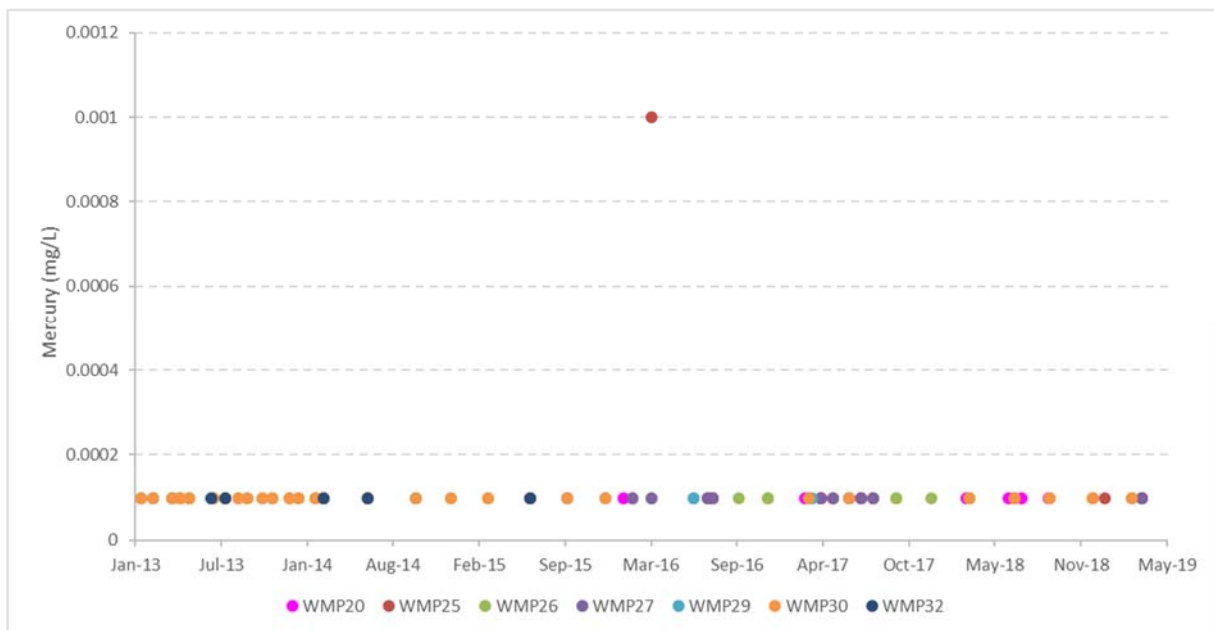


Figure C-29 Dissolved mercury monitored in surface water

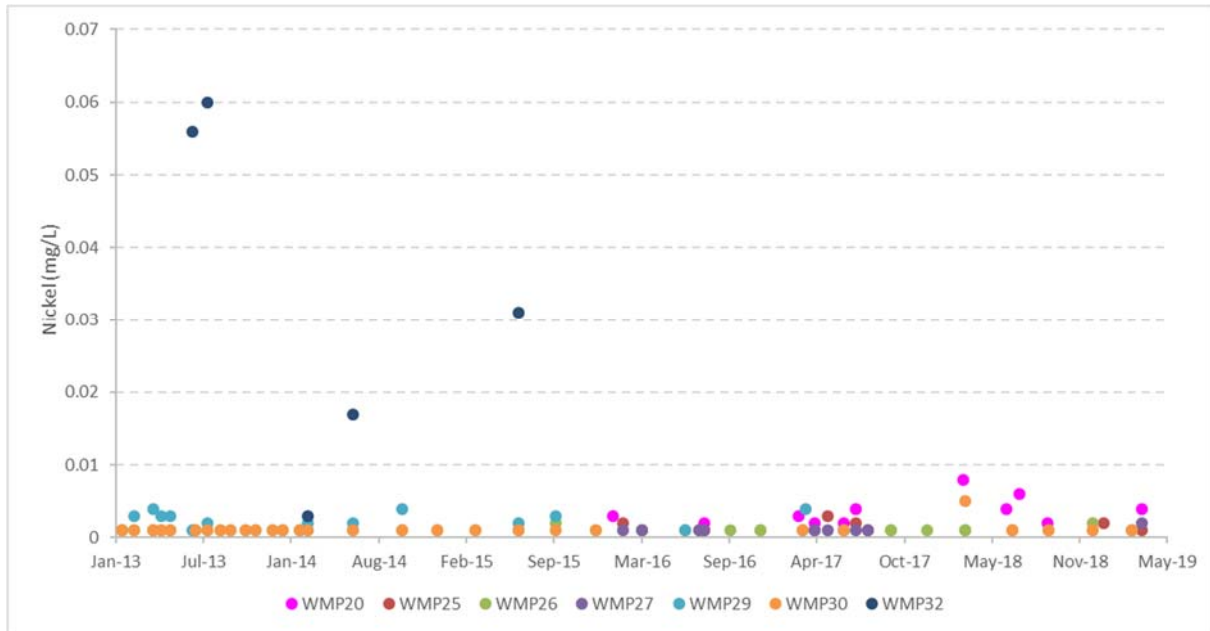


Figure C-30 Dissolved nickel monitored in surface water

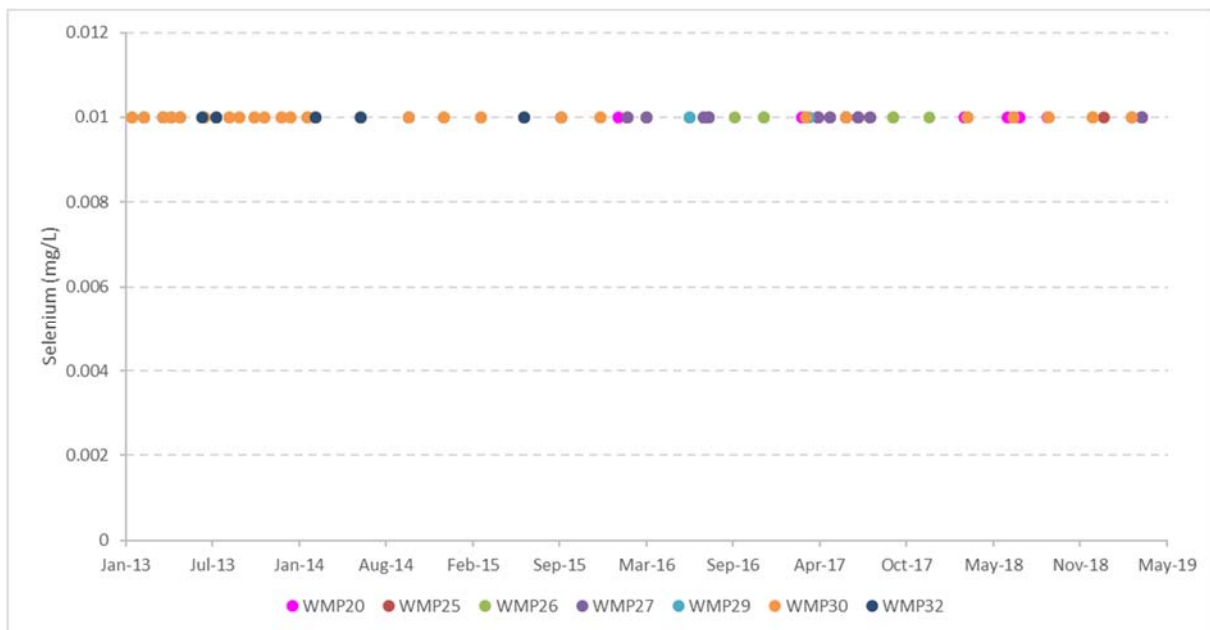


Figure C-31 Dissolved selenium monitored in surface water

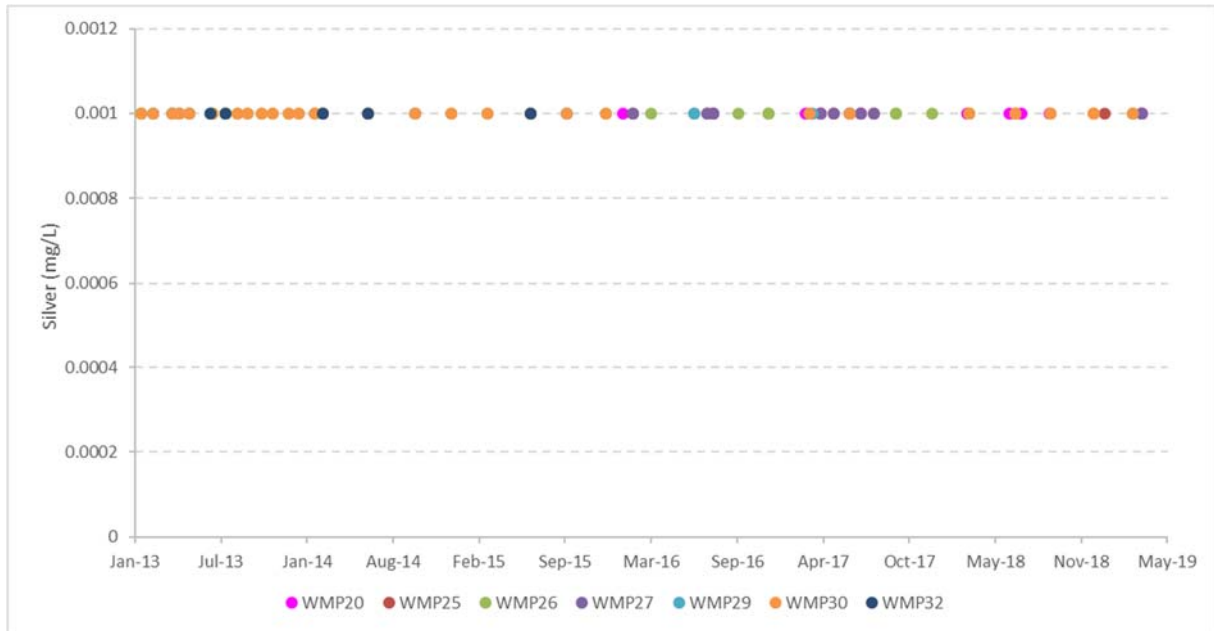


Figure C-32 Dissolved silver monitored in surface water

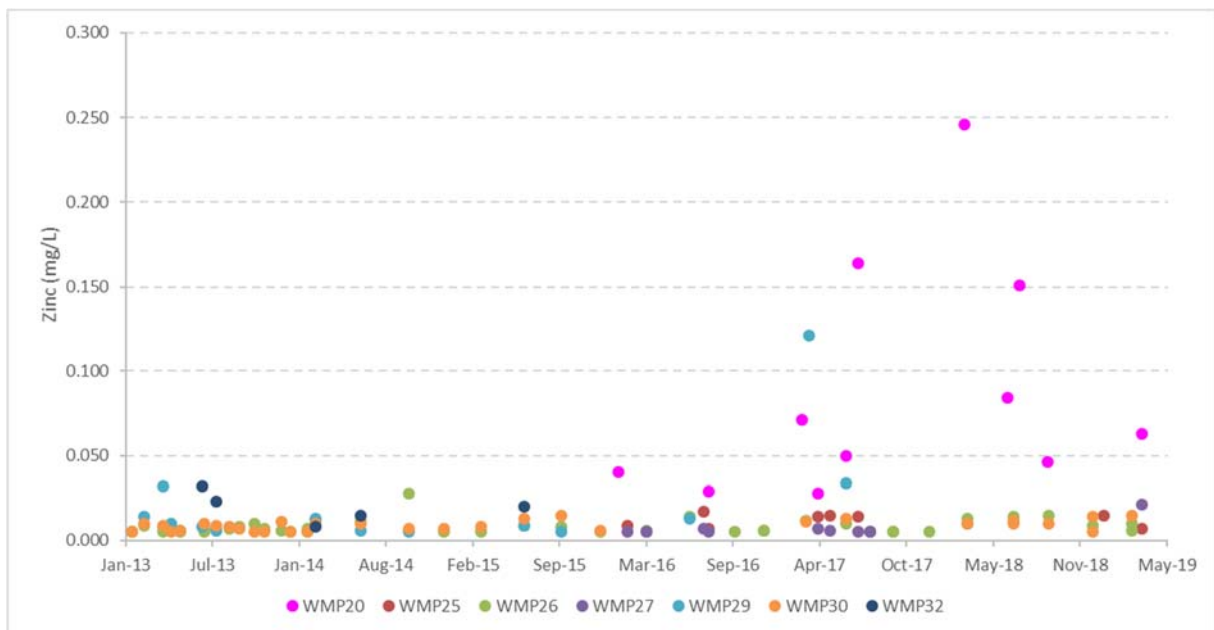


Figure C-33 Dissolved zinc monitored in surface water

Groundwater monitoring data

Groundwater levels

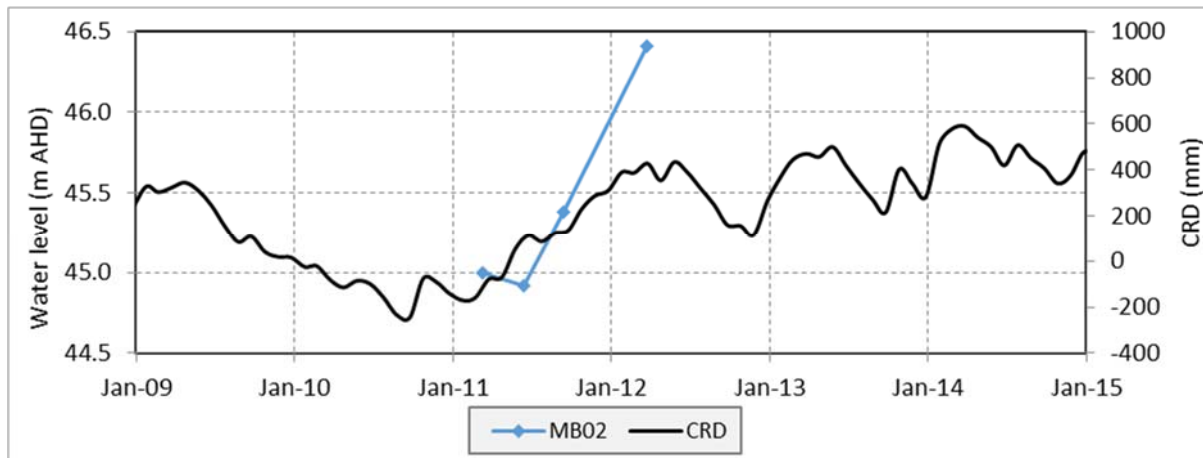


Figure C-34 Groundwater level recorded at MB02

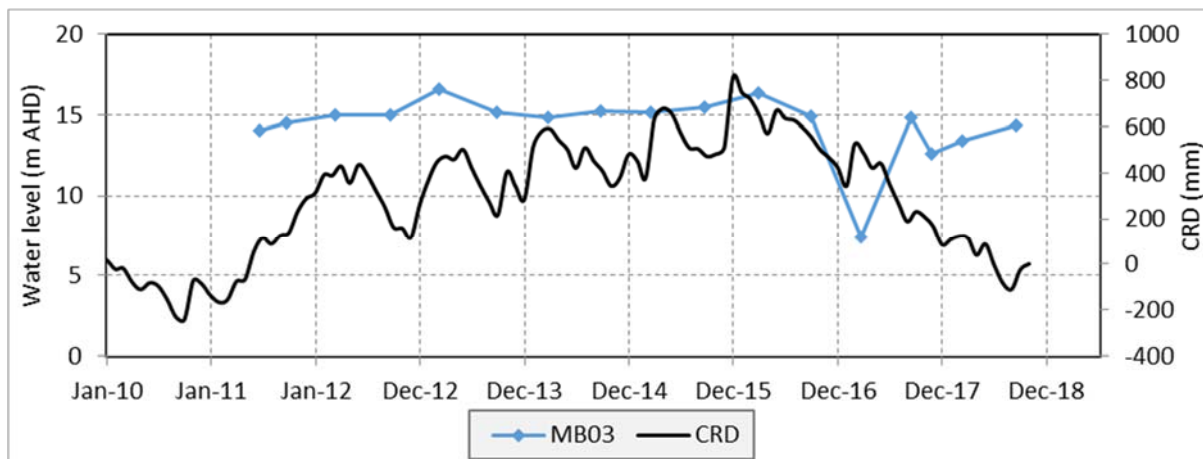


Figure C-35 Groundwater level recorded at MB03

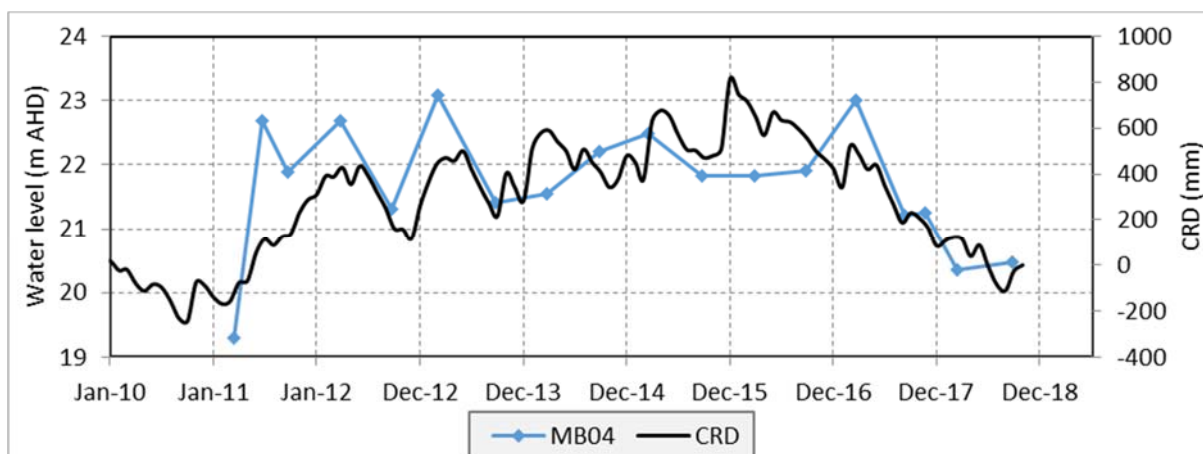


Figure C-36 Groundwater level recorded at MB04

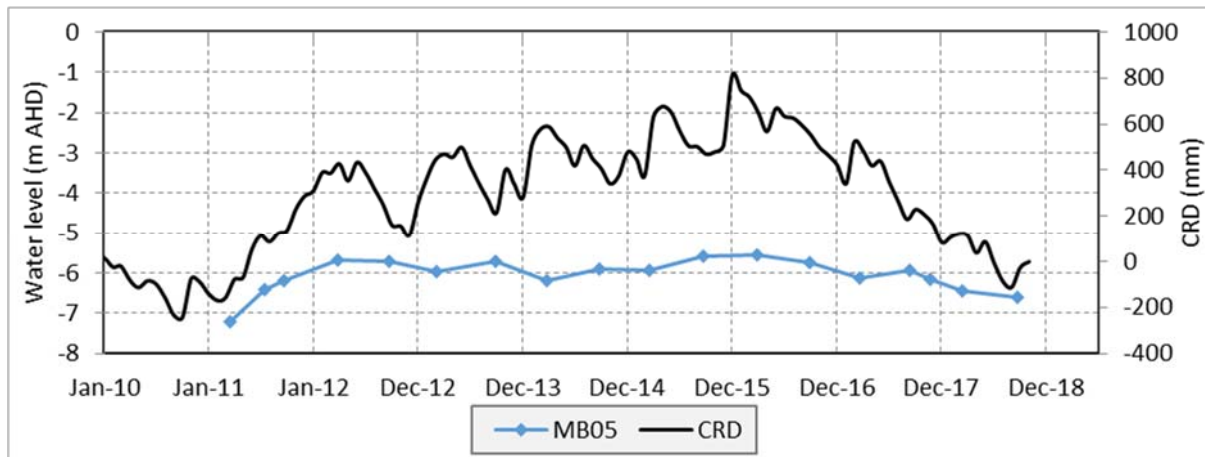


Figure C-37 Groundwater level recorded at MB05

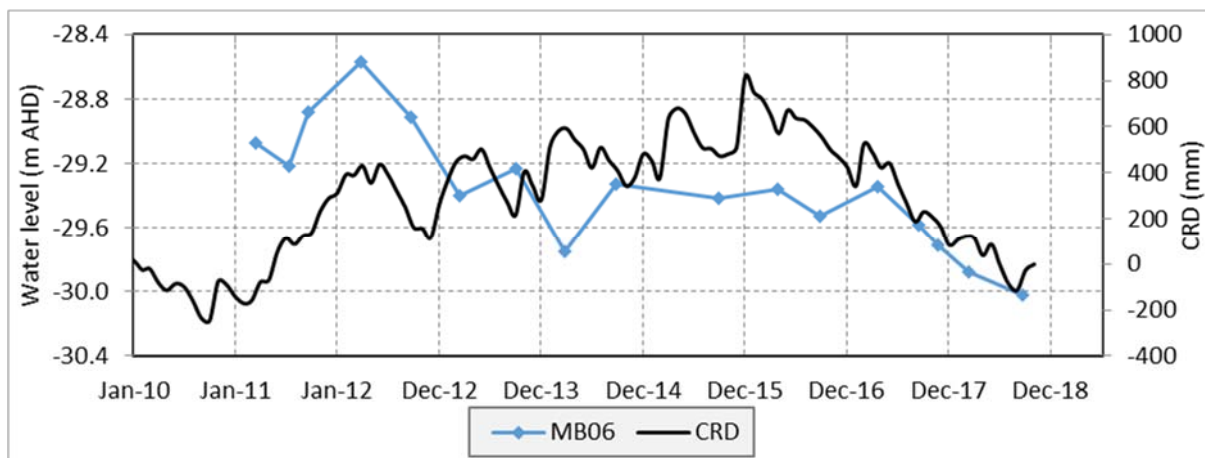


Figure C-38 Groundwater level recorded at MB06

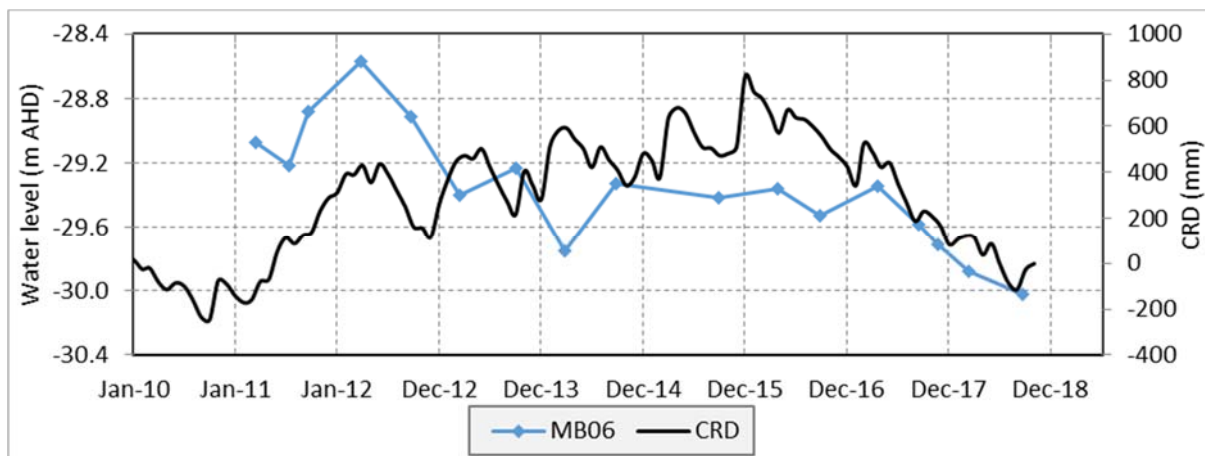


Figure C-39 Depth to groundwater recorded at MB09

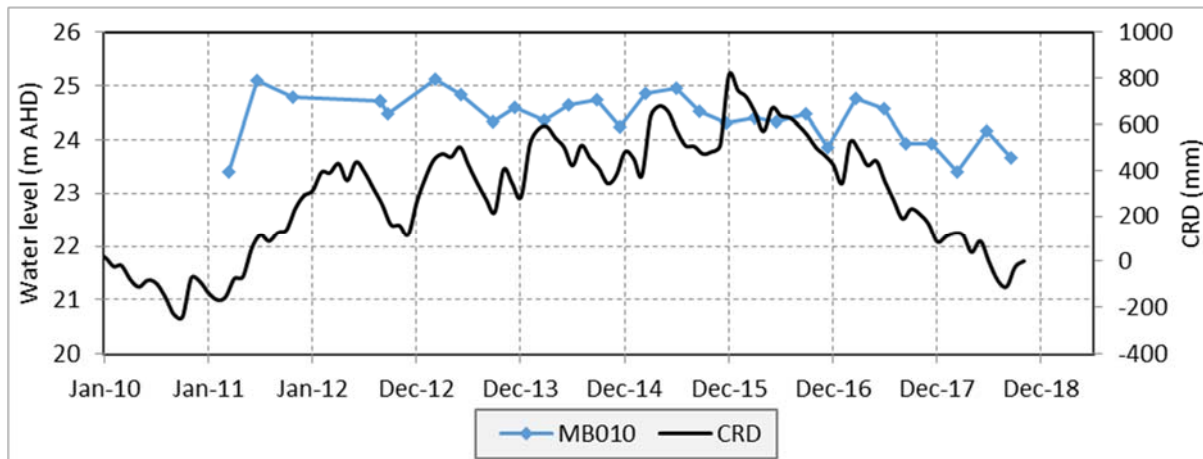


Figure C-40 Groundwater level recorded at MB10

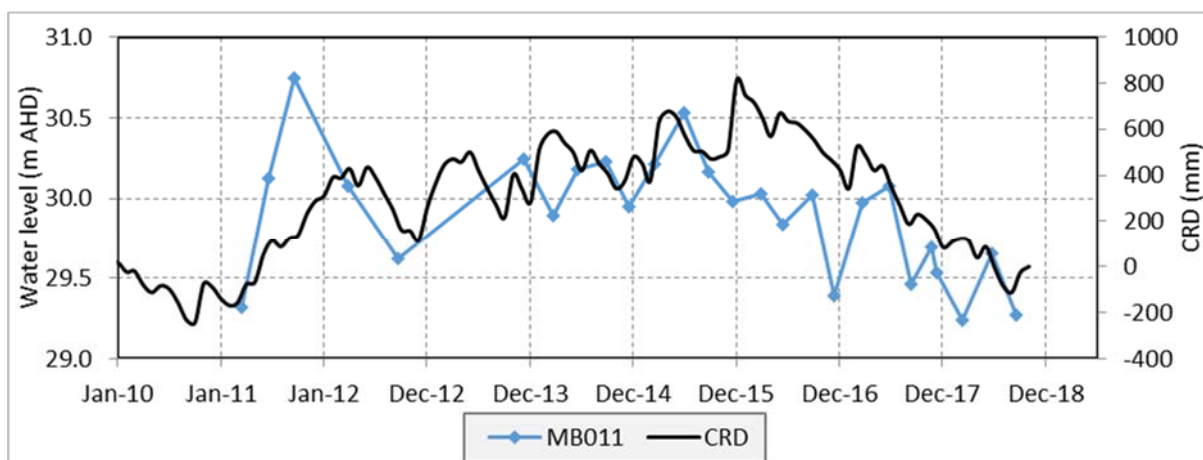


Figure C-41 Groundwater level recorded at MB11

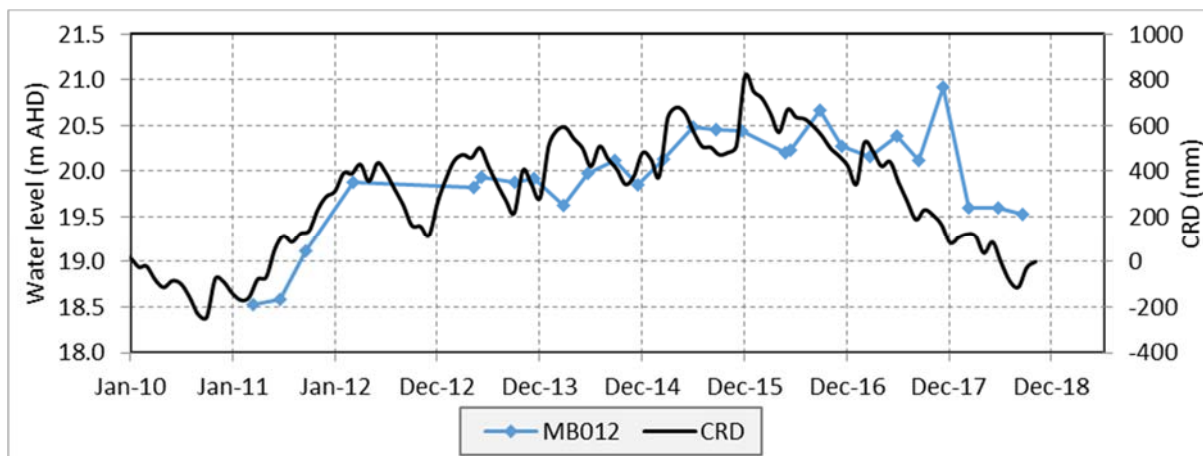


Figure C-42 Groundwater level recorded at MB12

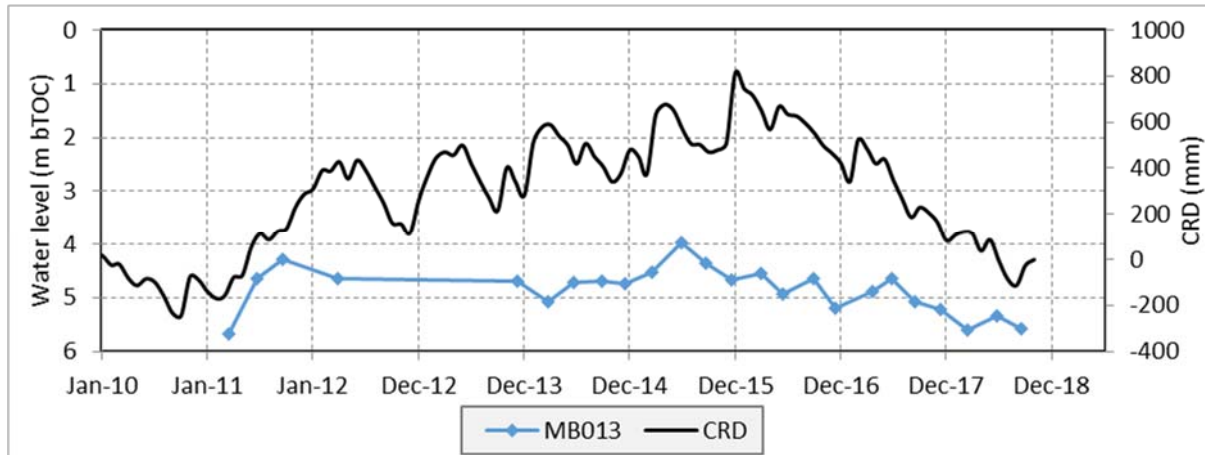


Figure C-43 Depth to groundwater recorded at MB13

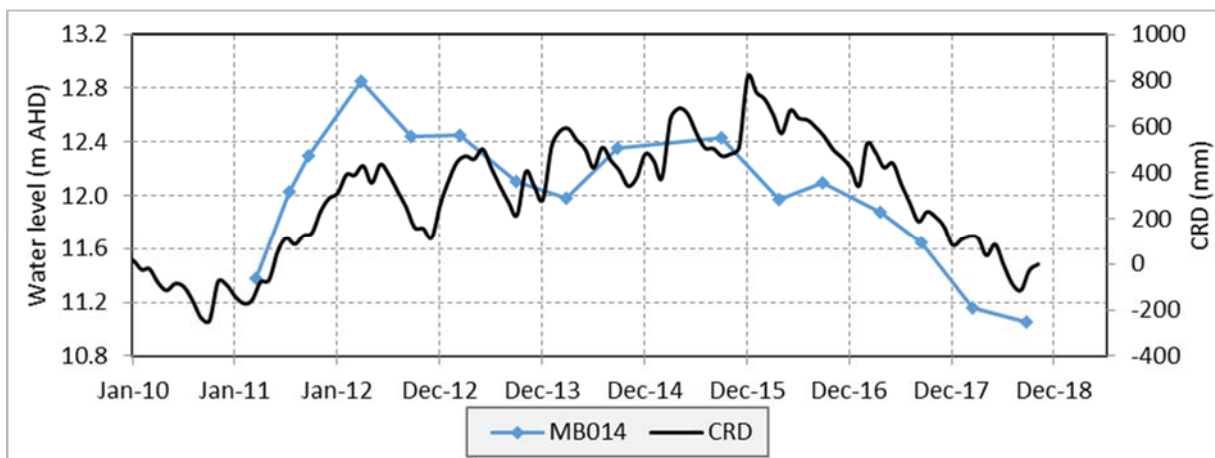


Figure C-44 Groundwater level recorded at MB14

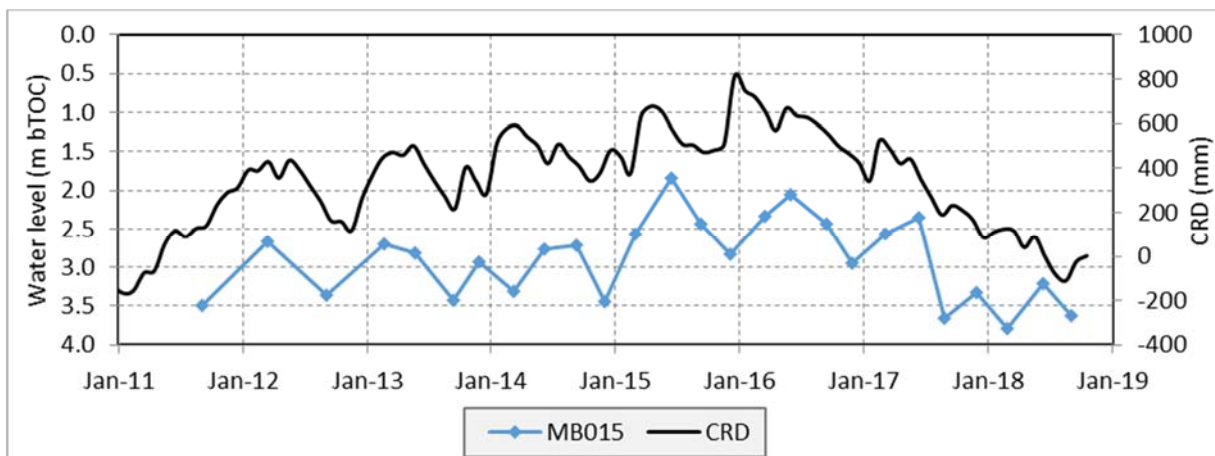


Figure C-45 Depth to groundwater recorded at MB15

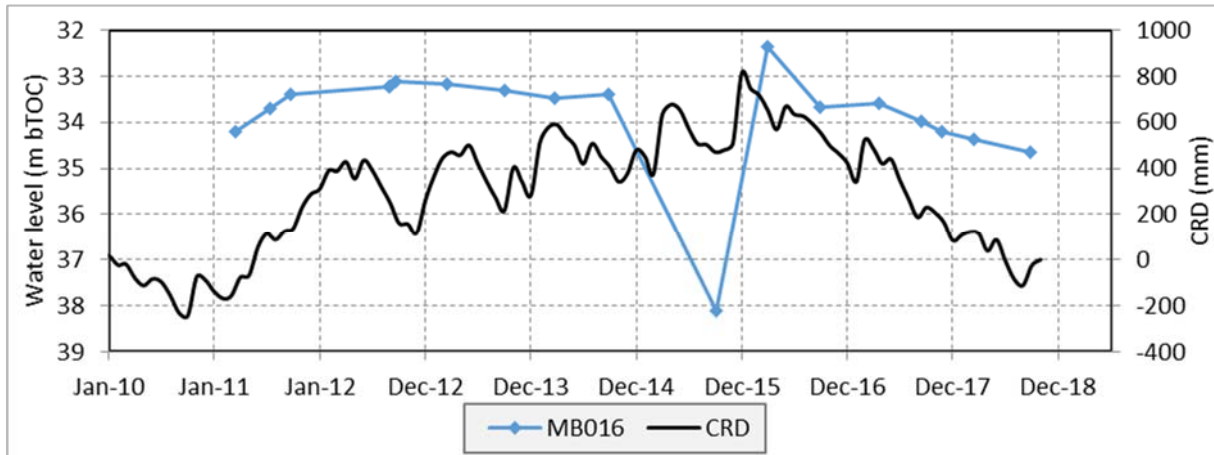


Figure C-46 Depth to groundwater recorded at MB16

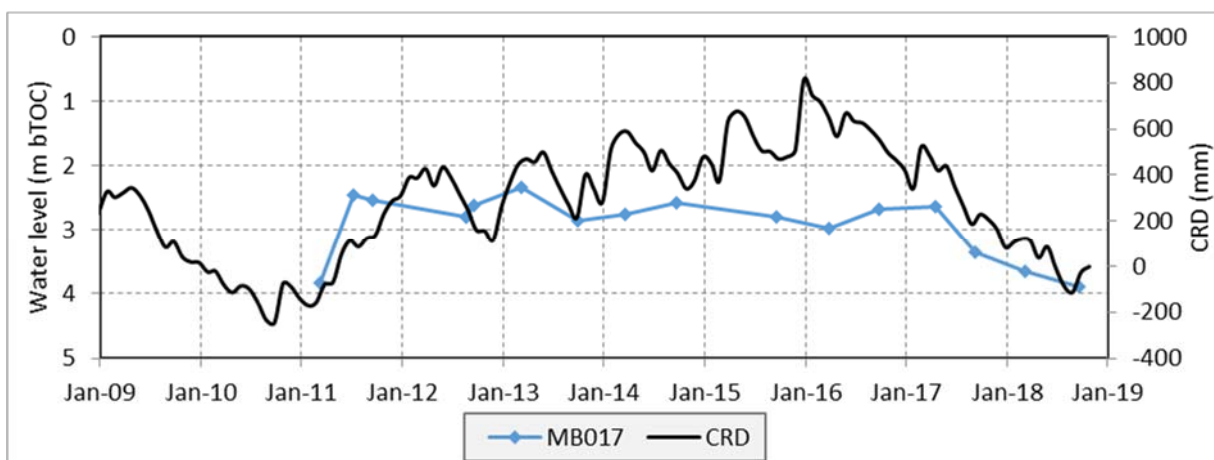


Figure C-47 Depth to groundwater recorded at MB17

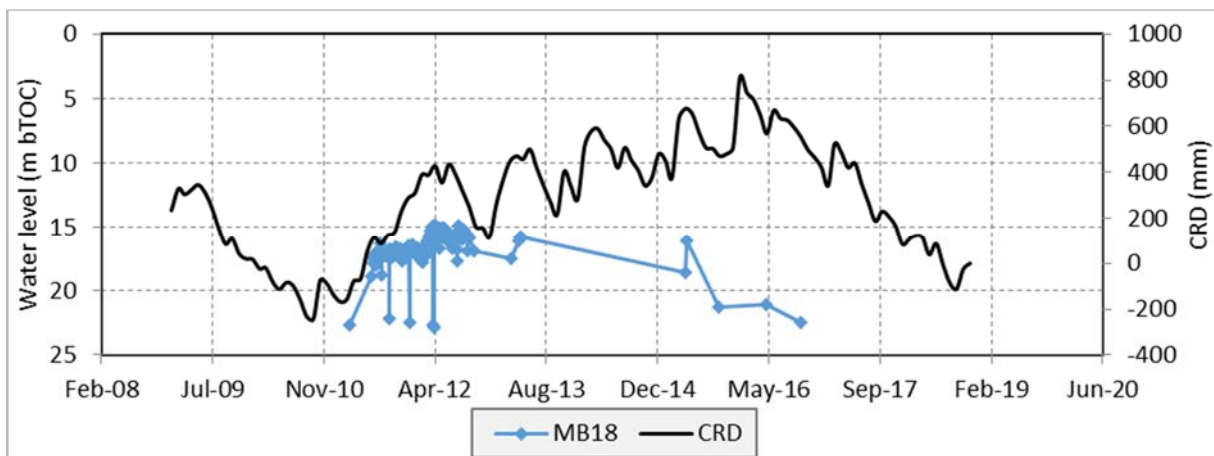


Figure C-48 Depth to groundwater recorded at MB18

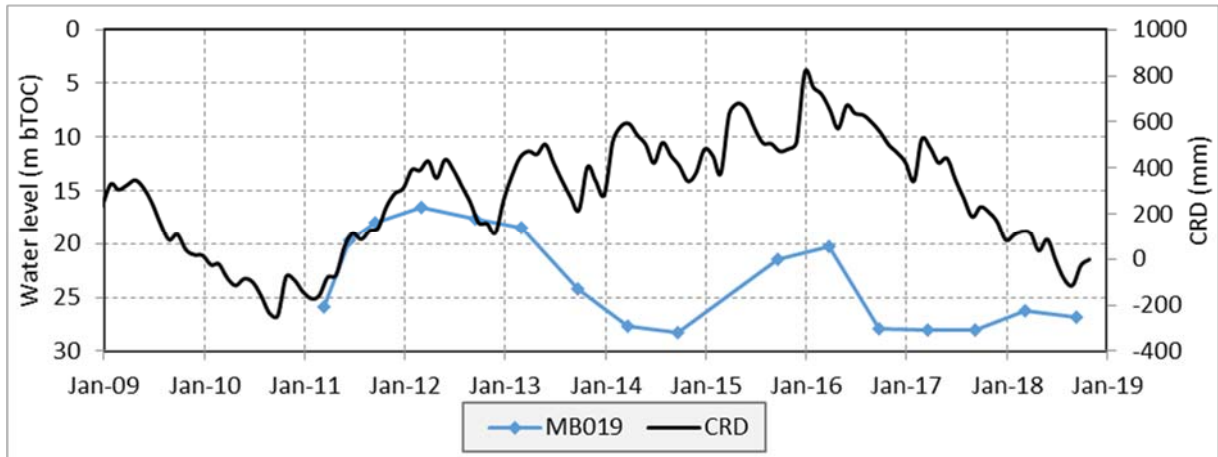


Figure C-49 Depth to groundwater recorded at MB19

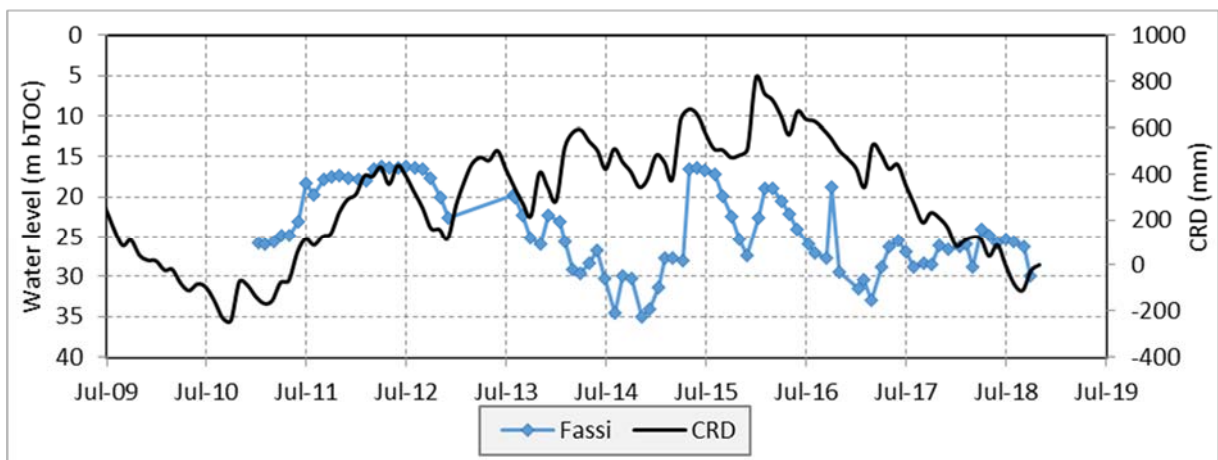


Figure C-50 Depth to groundwater recorded at Fassi

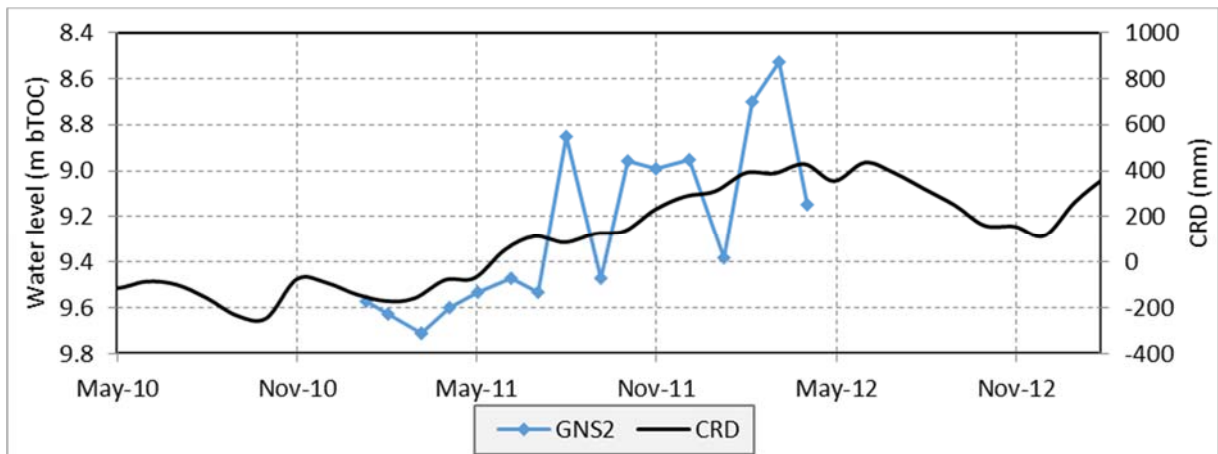


Figure C-51 Depth to groundwater recorded at GNS

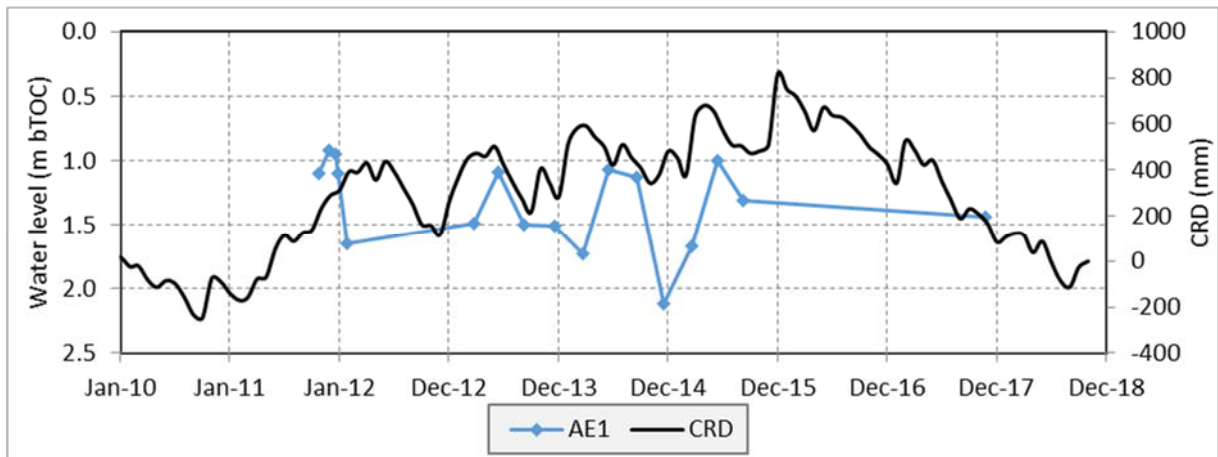


Figure C-52 Depth to groundwater recorded at AE1

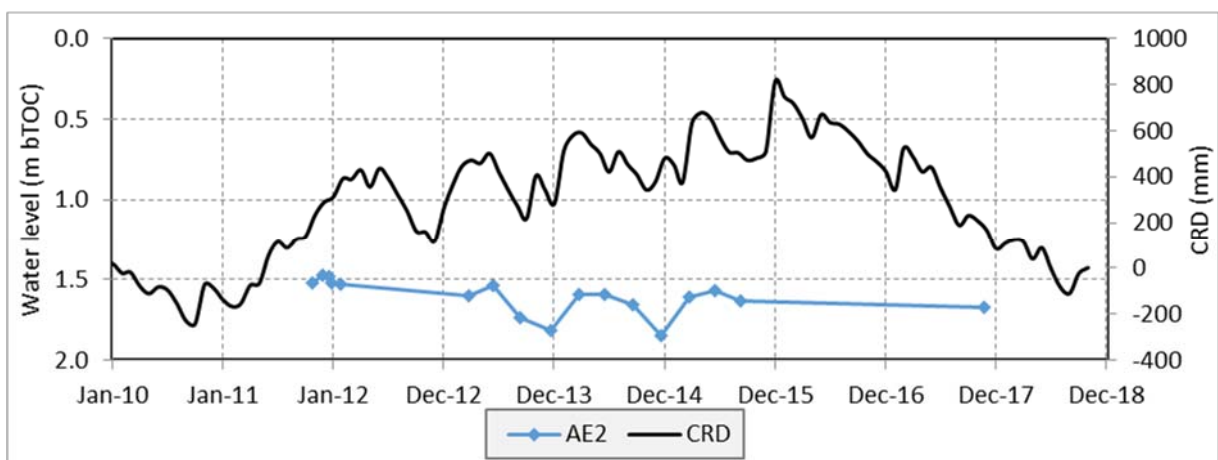


Figure C-53 Depth to groundwater recorded at AE2

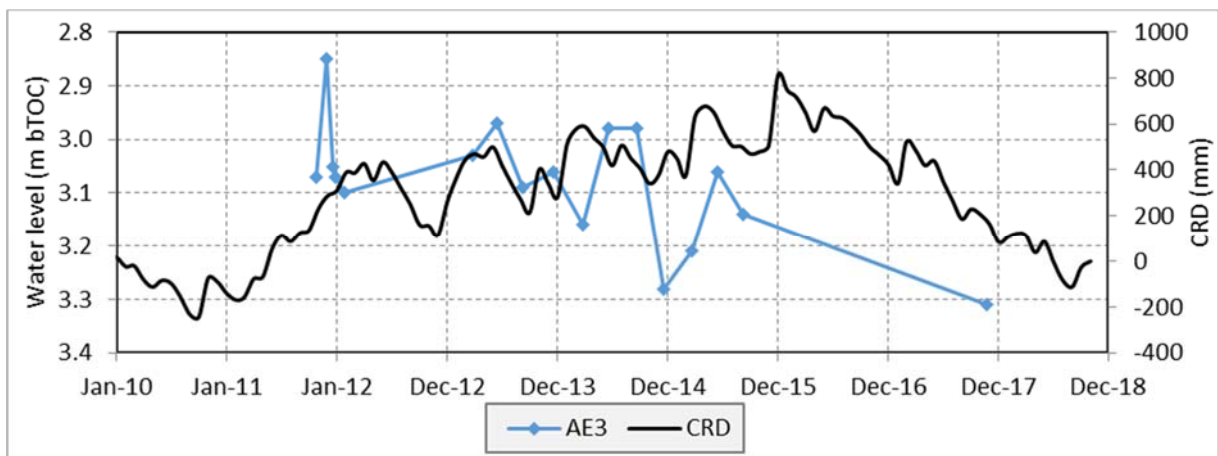


Figure C-54 Depth to groundwater recorded at AE3

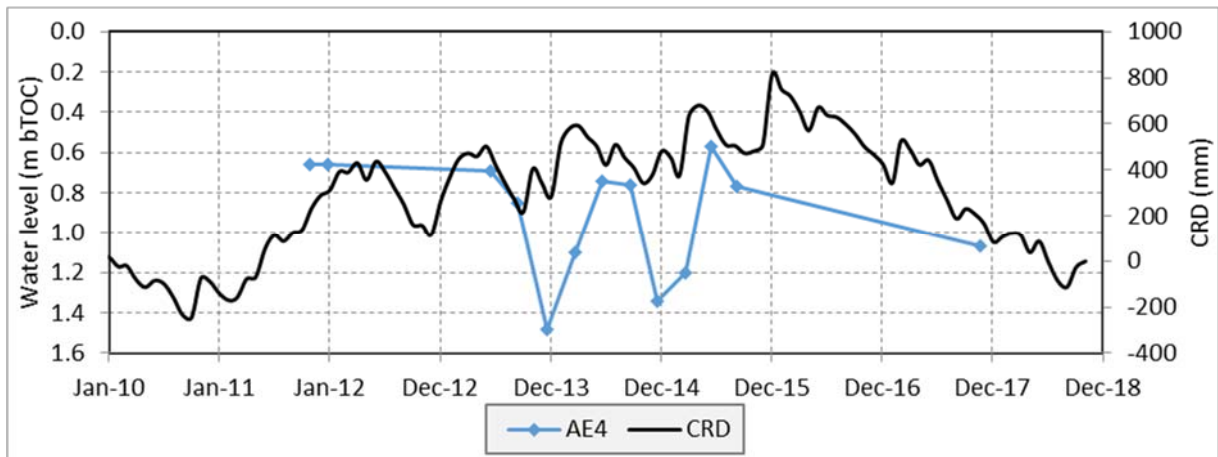


Figure C-55 Depth to groundwater recorded at AE4

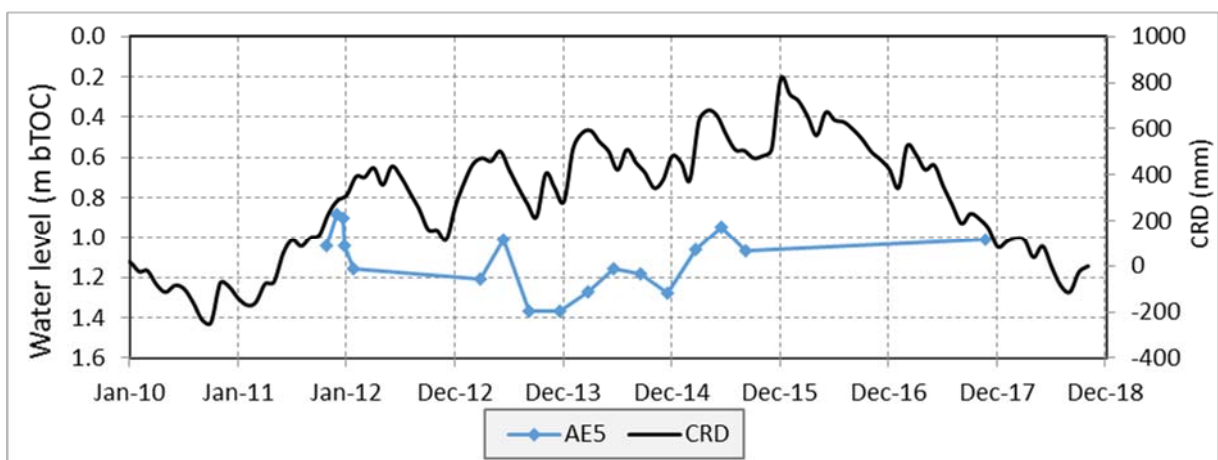


Figure C-56 Depth to groundwater recorded at AE5

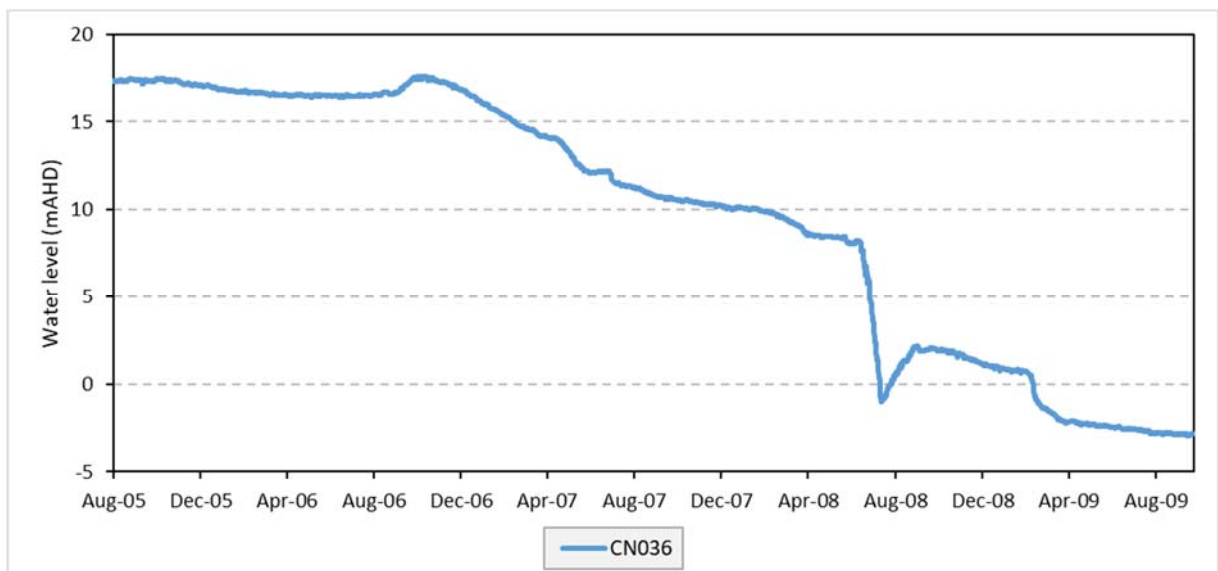


Figure C-58 Depth to groundwater recorded at CN036

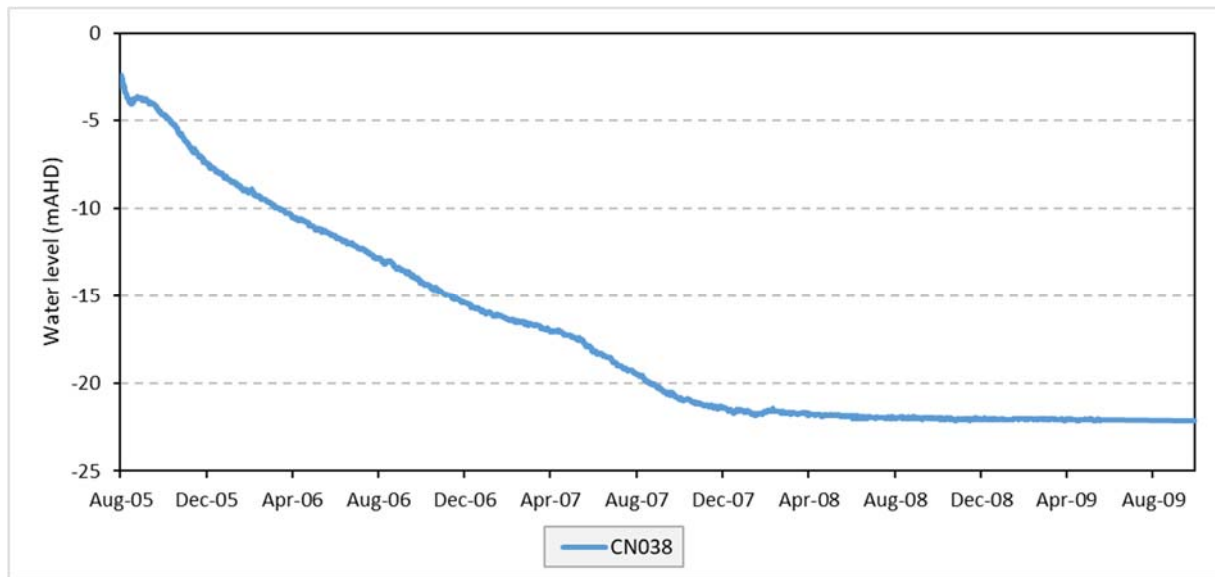


Figure C-59 Depth to groundwater recorded at CN038

Groundwater quality

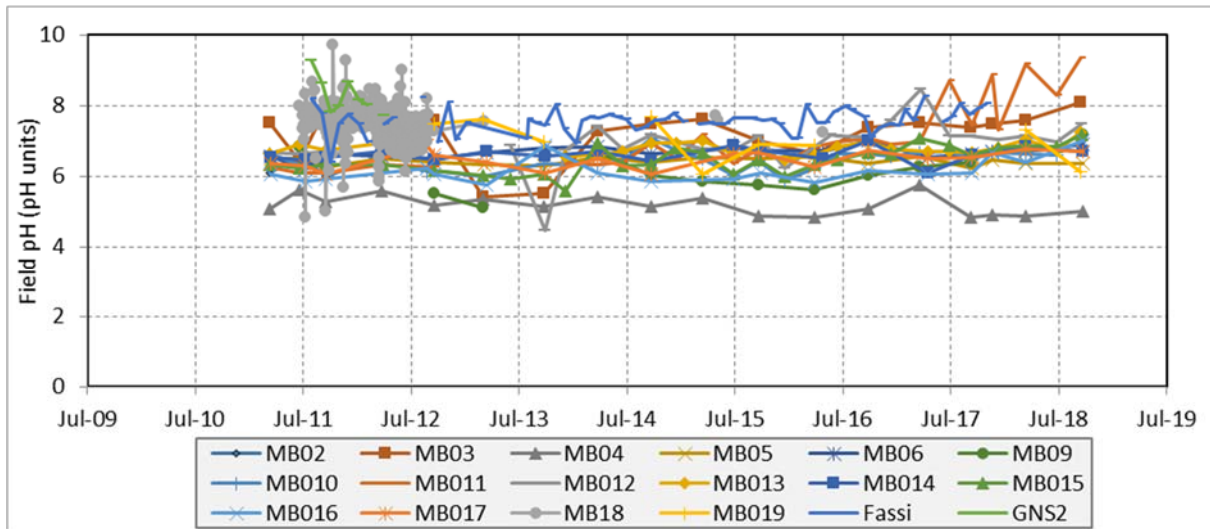


Figure C-58 Field pH monitored in groundwater

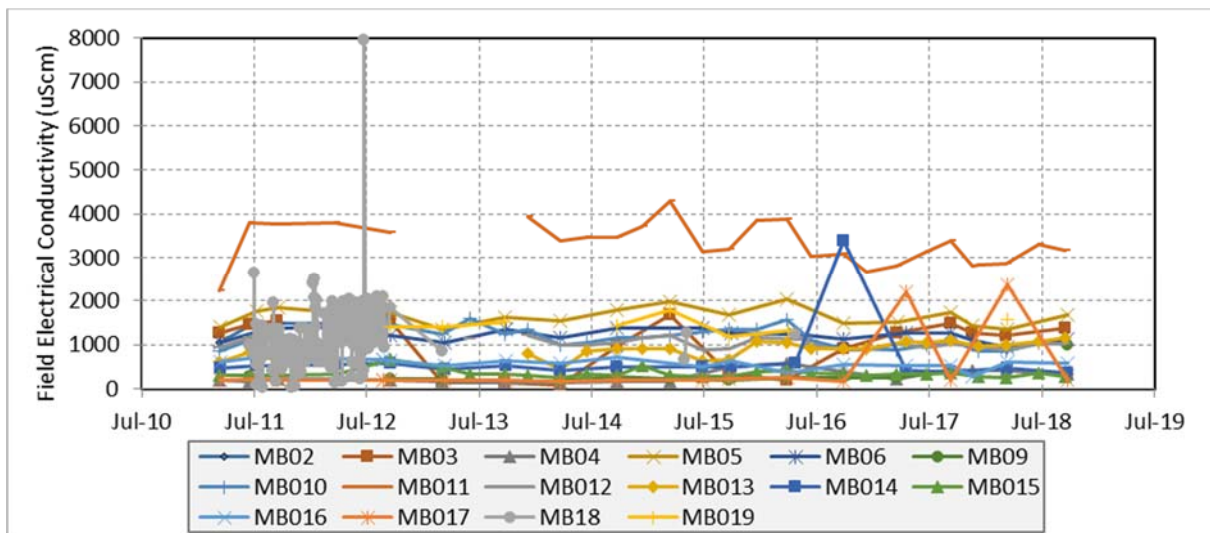


Figure C-59 Field electrical conductivity monitored in groundwater

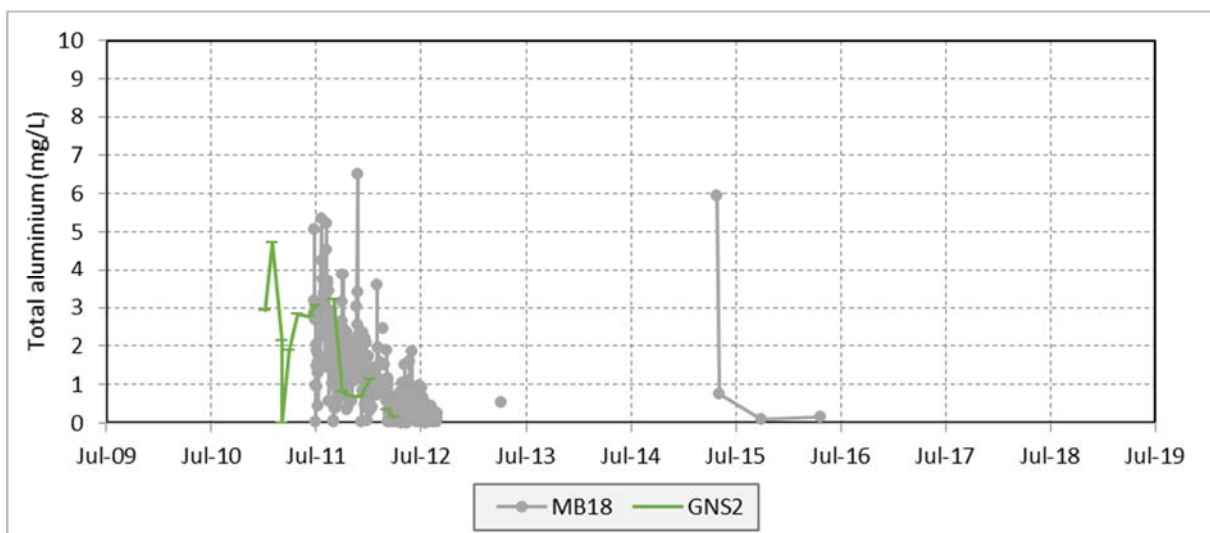


Figure C-60 Total aluminium monitored in groundwater

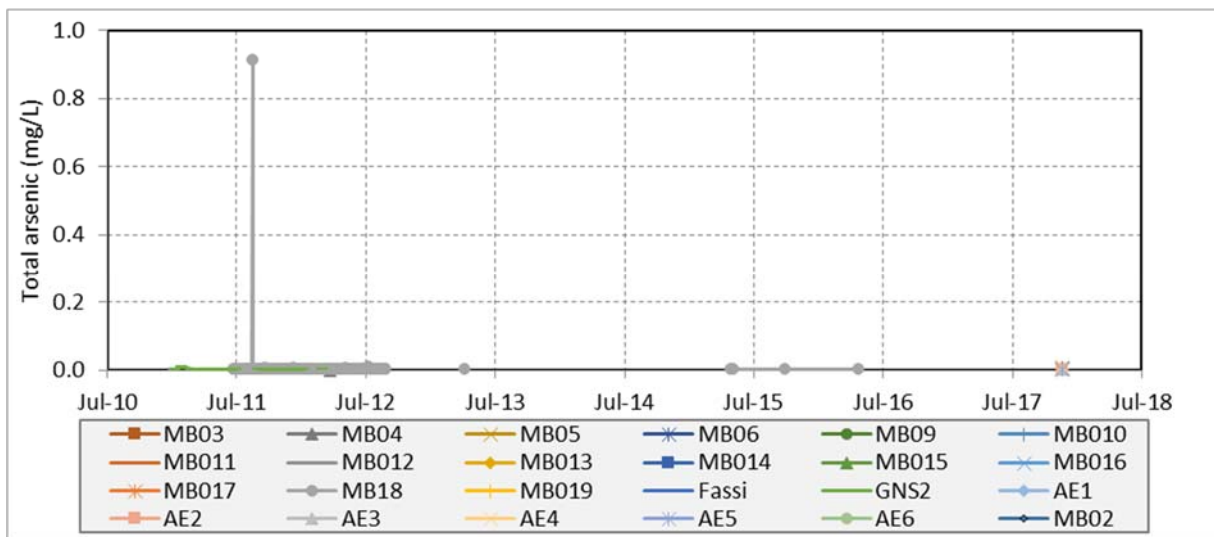


Figure C-61 Total arsenic monitored in groundwater

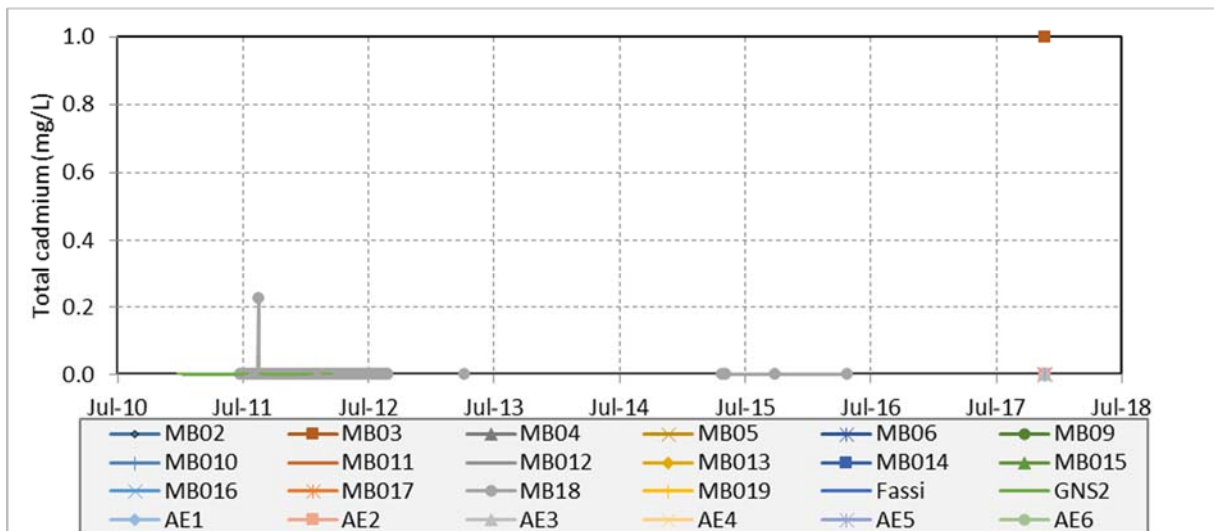


Figure C-62 Total cadmium monitored in groundwater

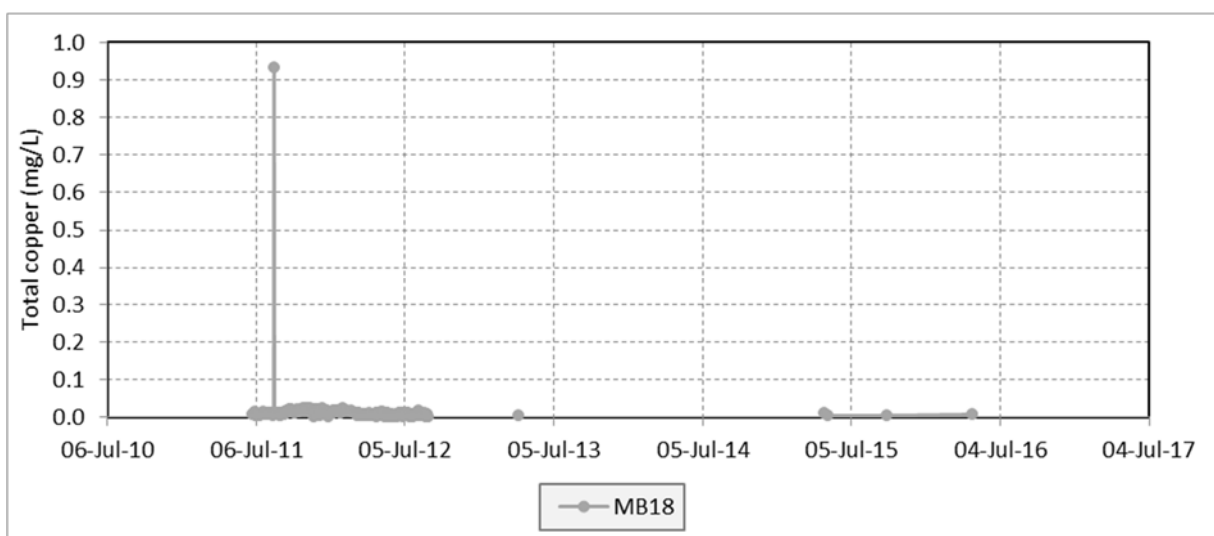


Figure C-63 Total copper monitored in groundwater

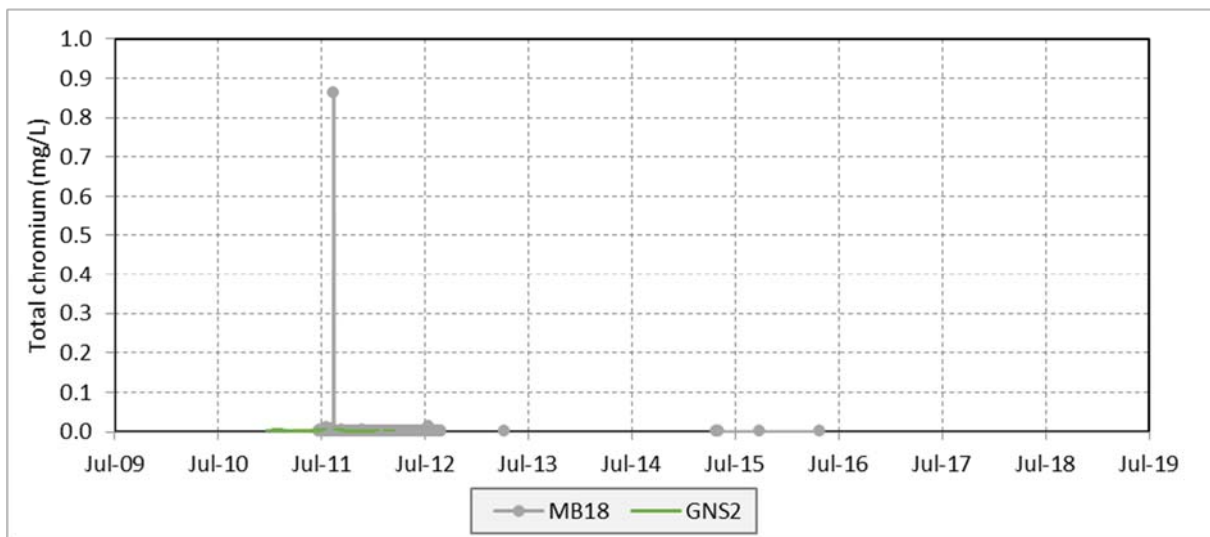


Figure C-64 Total chromium monitored in groundwater

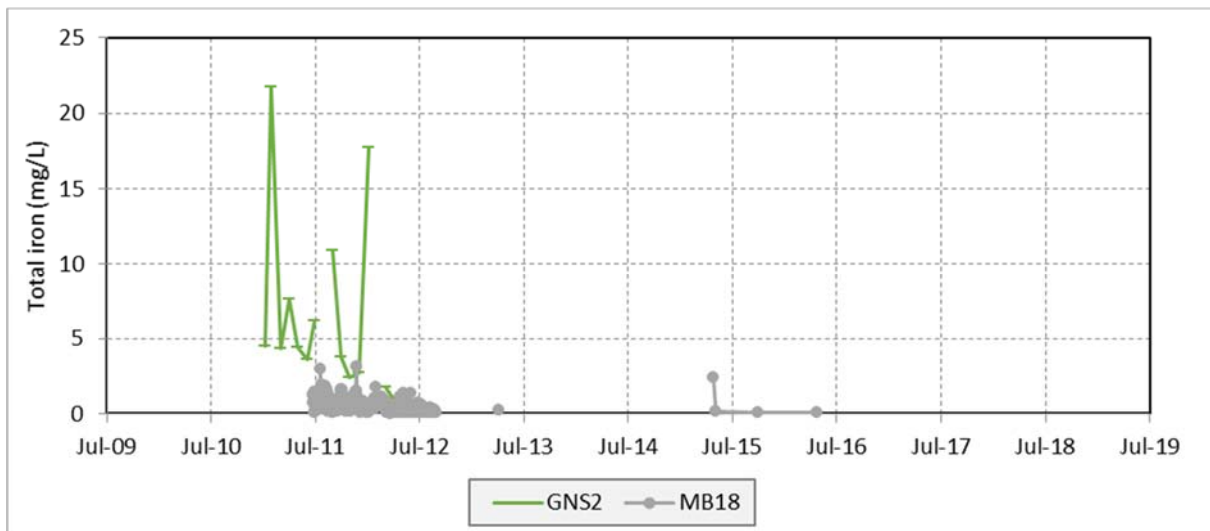


Figure C-65 Total iron monitored in groundwater

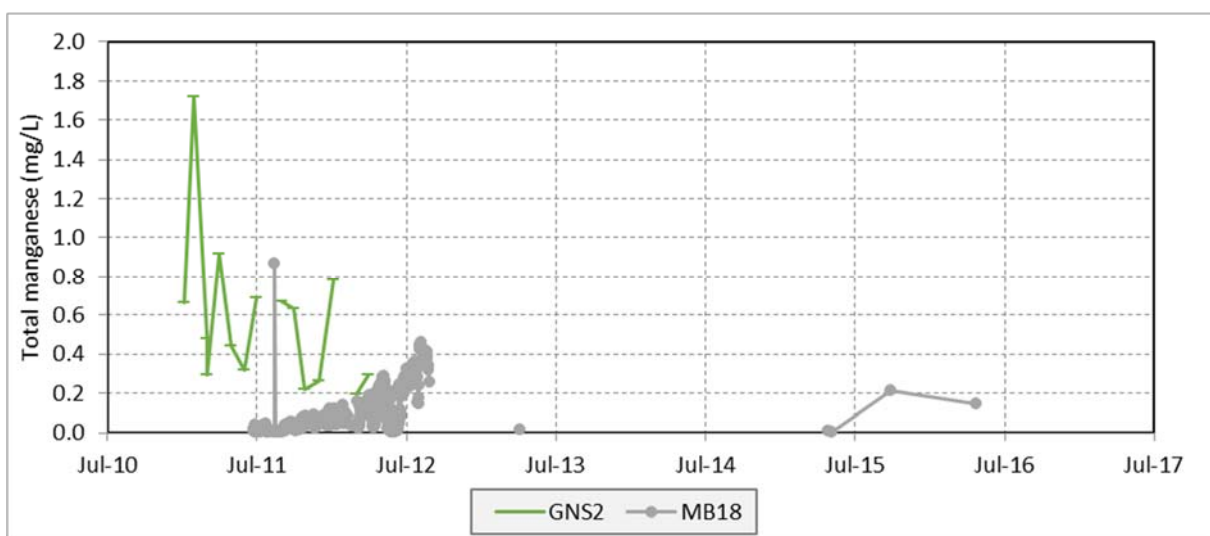


Figure C-66 Total manganese monitored in groundwater

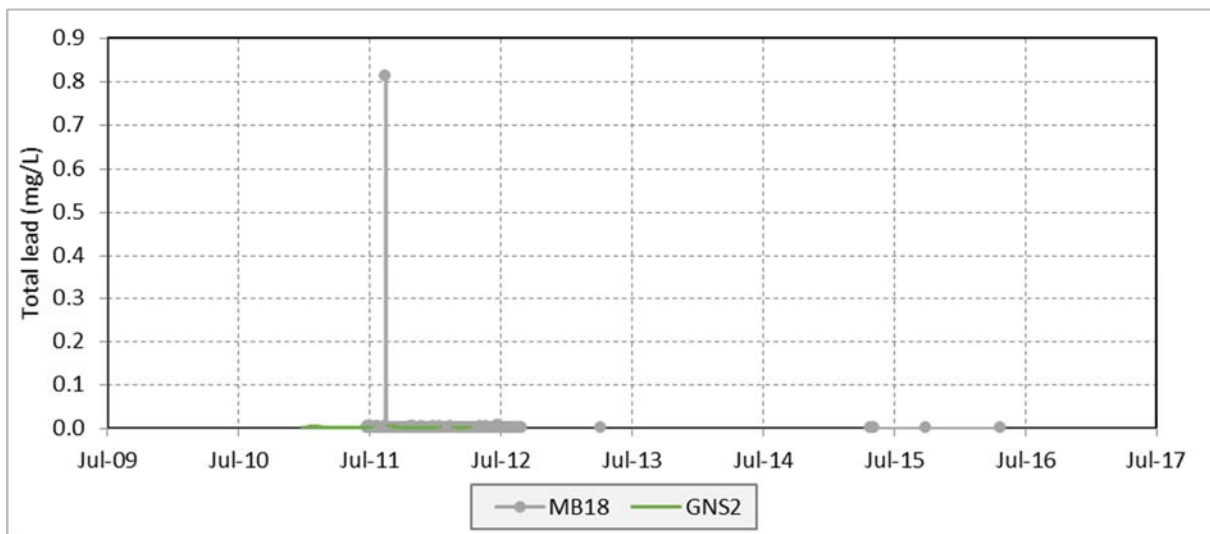


Figure C-67 Total lead monitored in groundwater

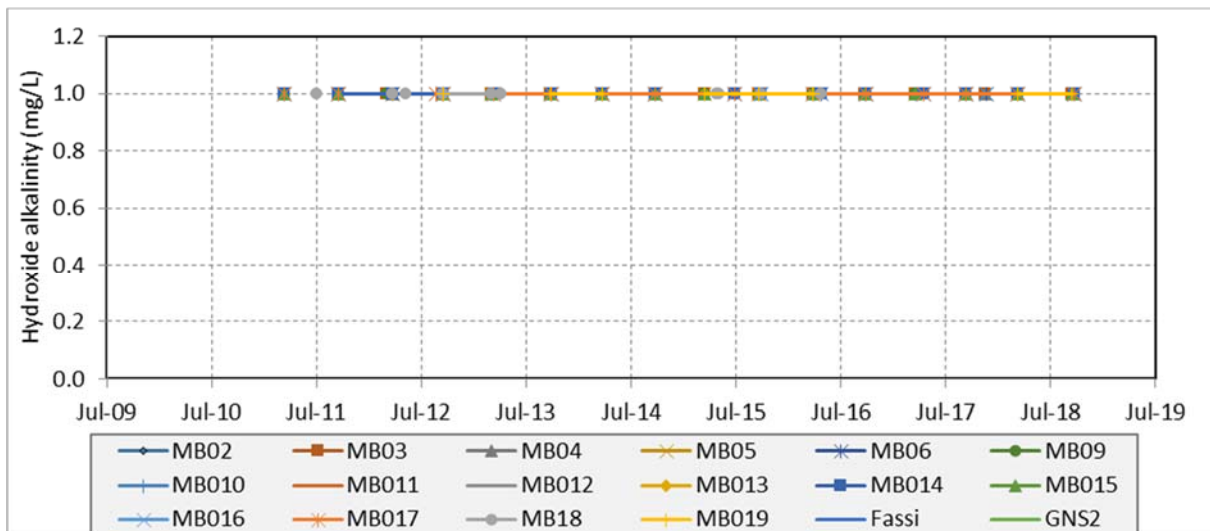


Figure C-68 Hydroxide alkalinity monitored in groundwater

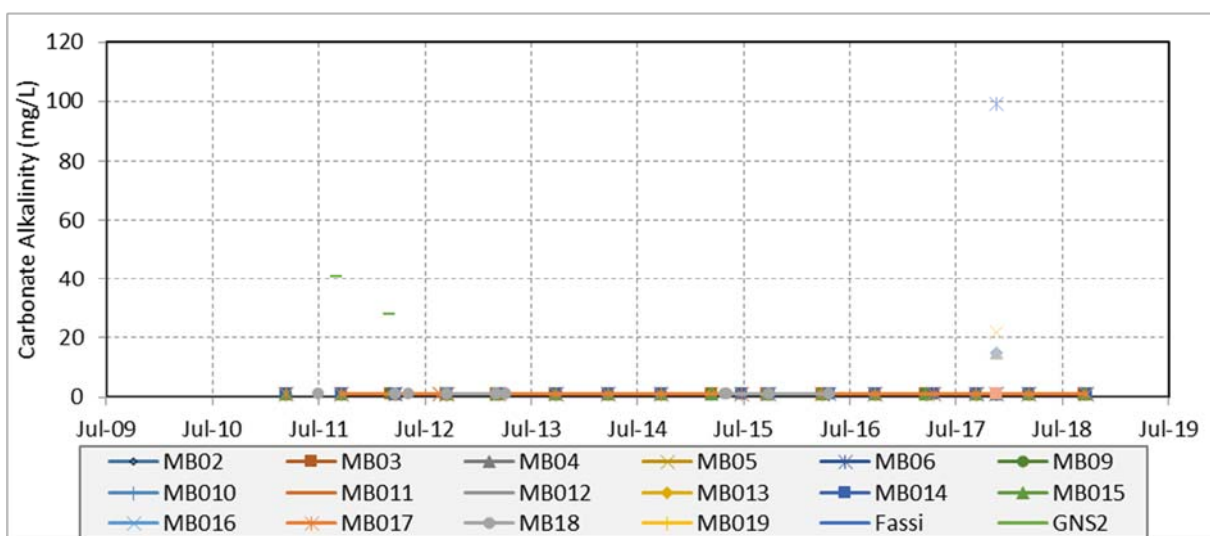


Figure C-69 Carbonate alkalinity monitored in groundwater

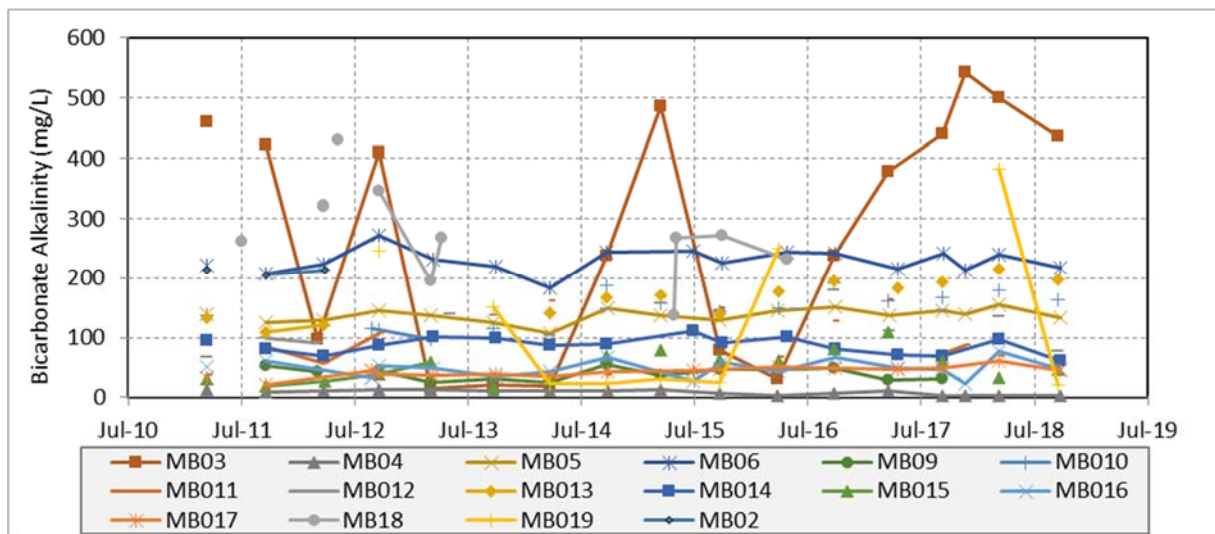


Figure C-70 Bicarbonate alkalinity monitored in groundwater

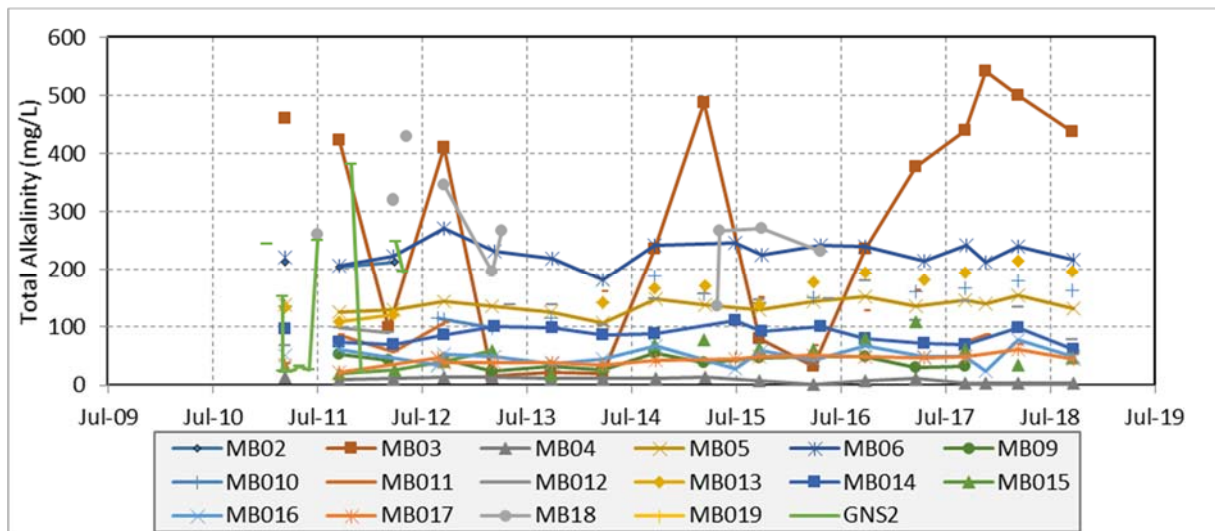


Figure C-71 Total alkalinity monitored in groundwater

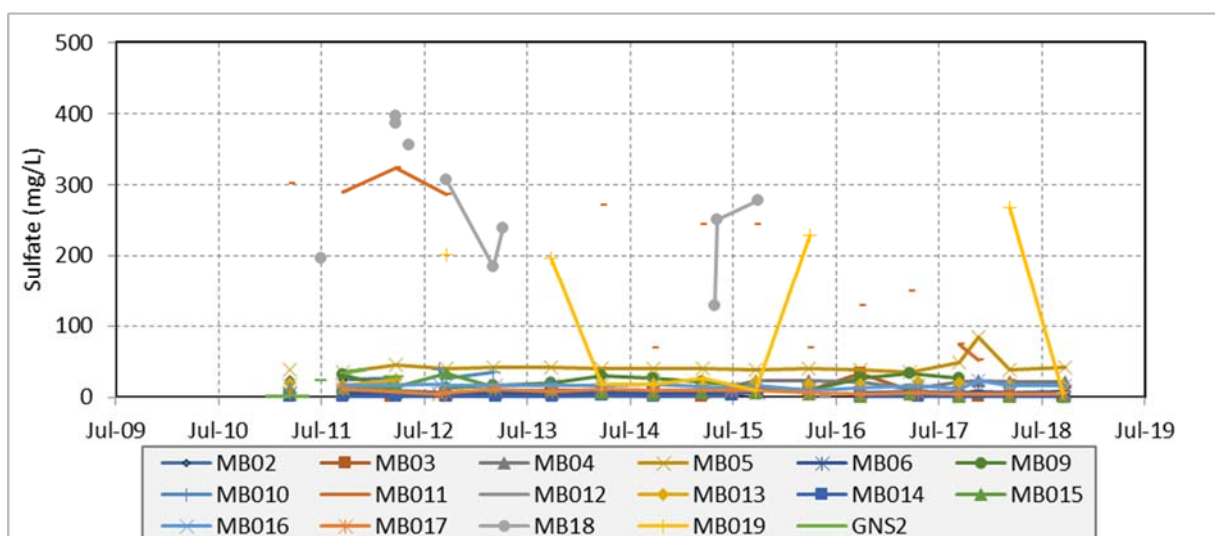


Figure C-72 Sulfate monitored in groundwater

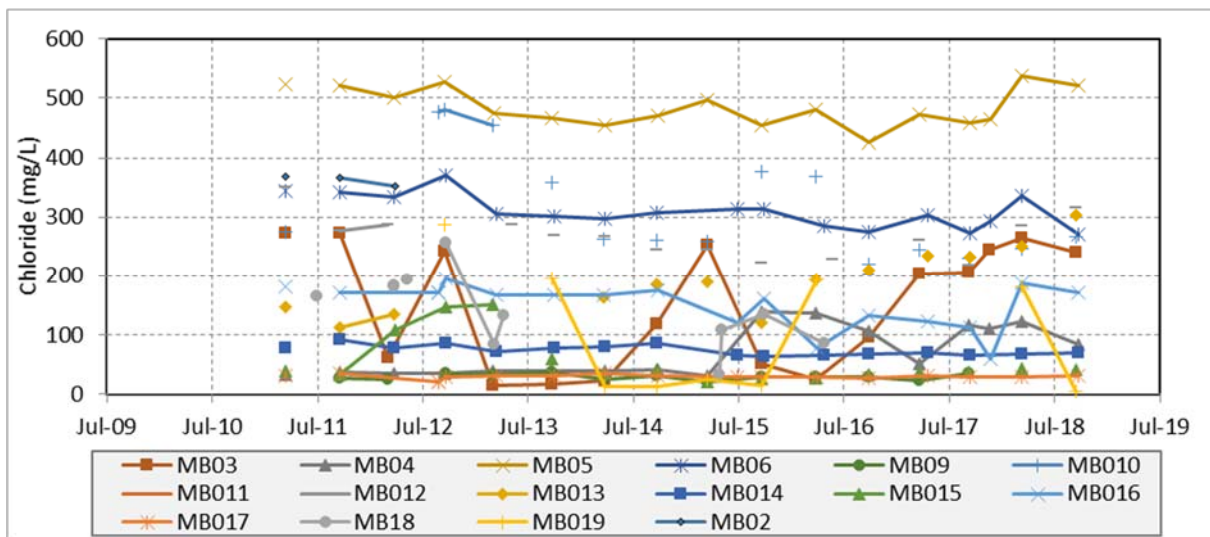


Figure C-73 Chloride monitored in groundwater

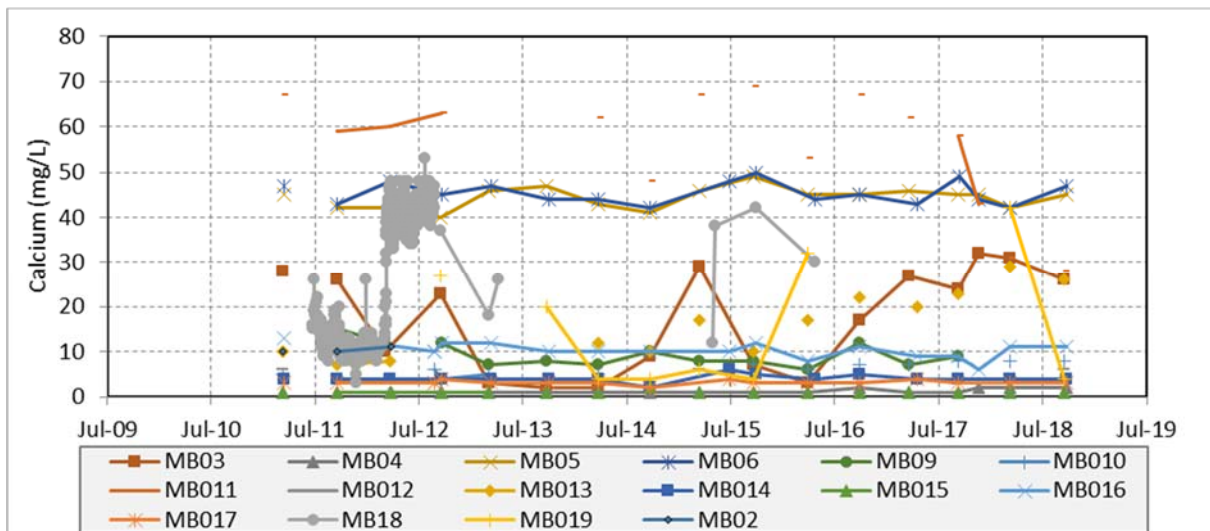


Figure C-74 Calcium monitored in groundwater

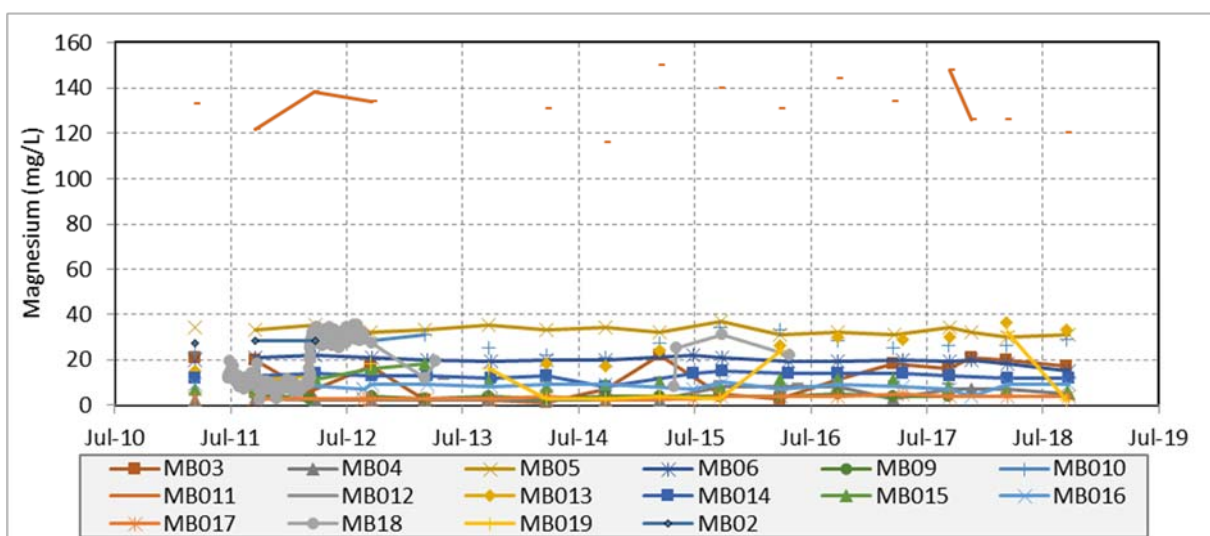


Figure C-75 Magnesium monitored in groundwater

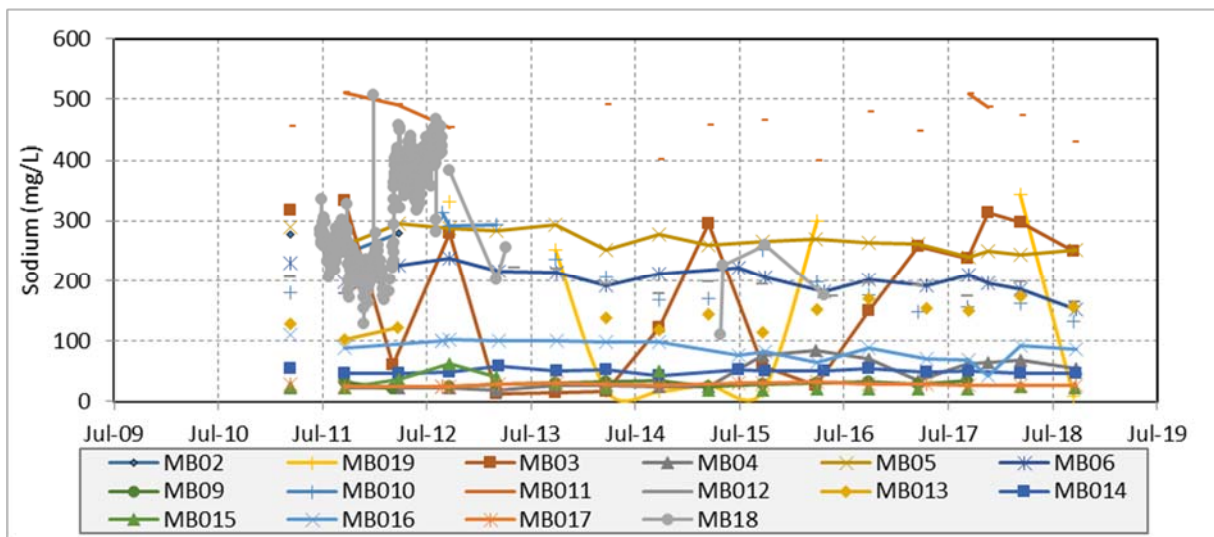


Figure C-76 Sodium monitored in groundwater

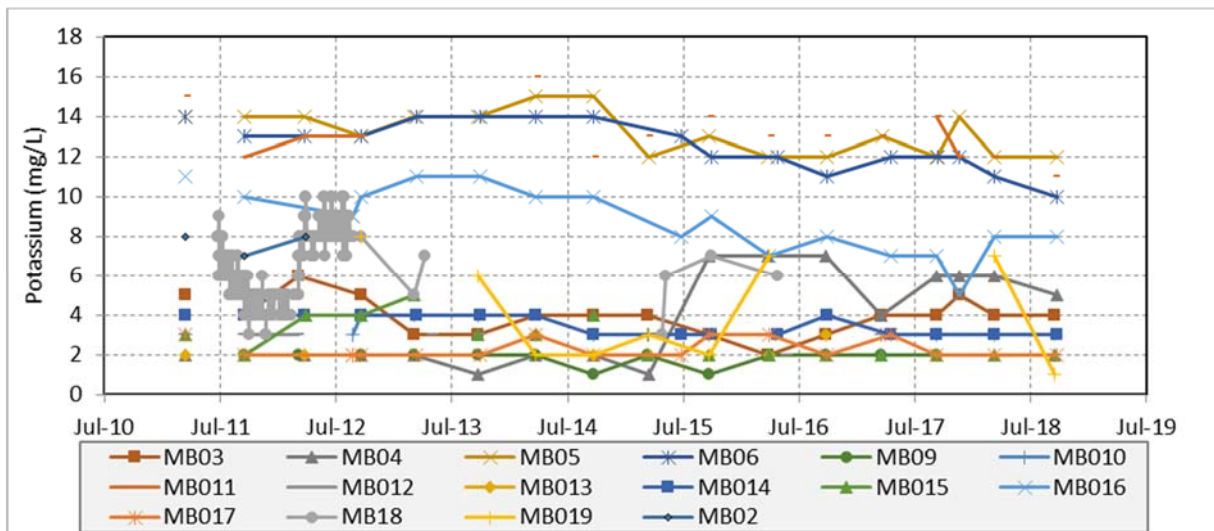


Figure C-77 Potassium monitored in groundwater

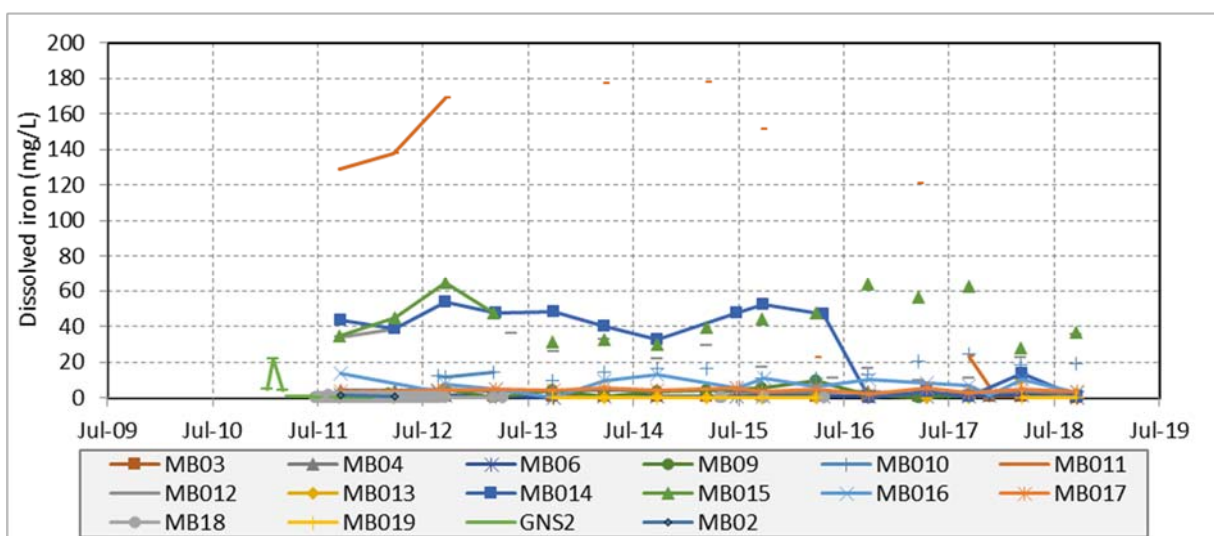


Figure C-78 Dissolved iron monitored in groundwater

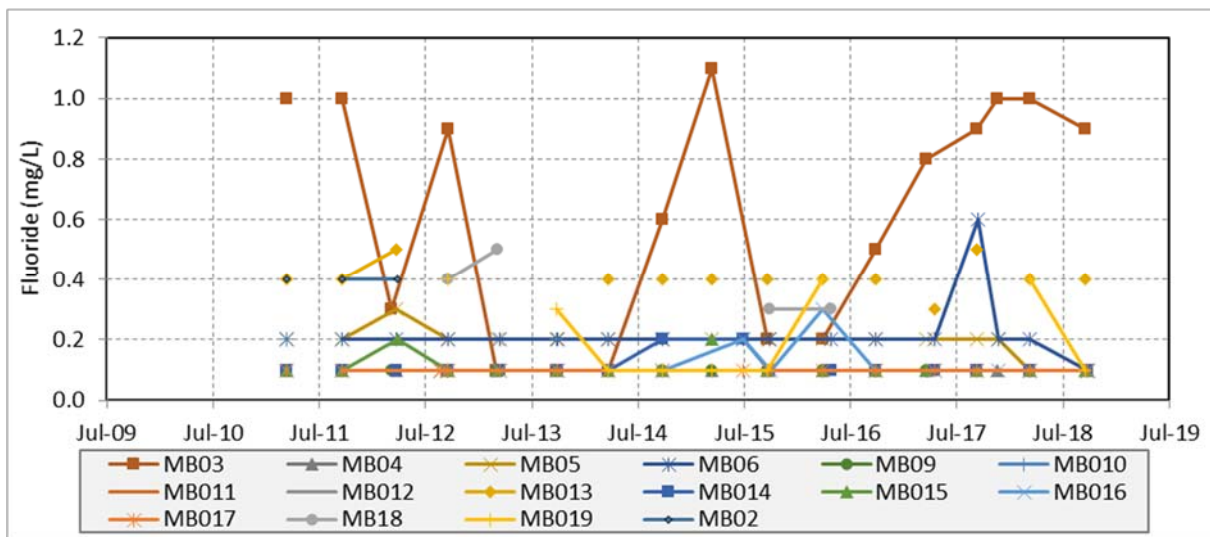


Figure C-79 Fluoride monitored in groundwater

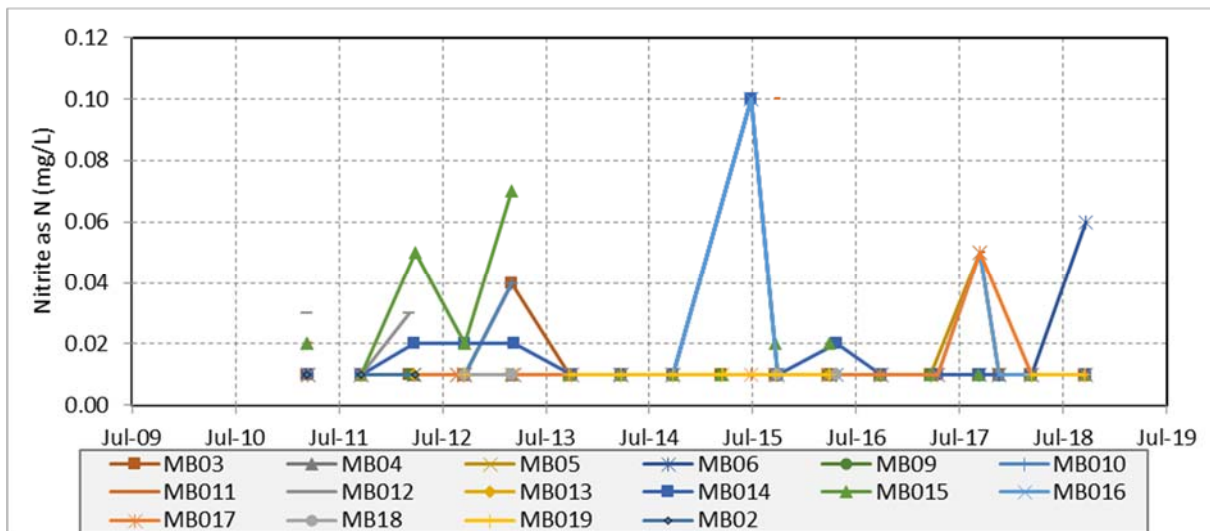


Figure C-80 Nitrite monitored in groundwater

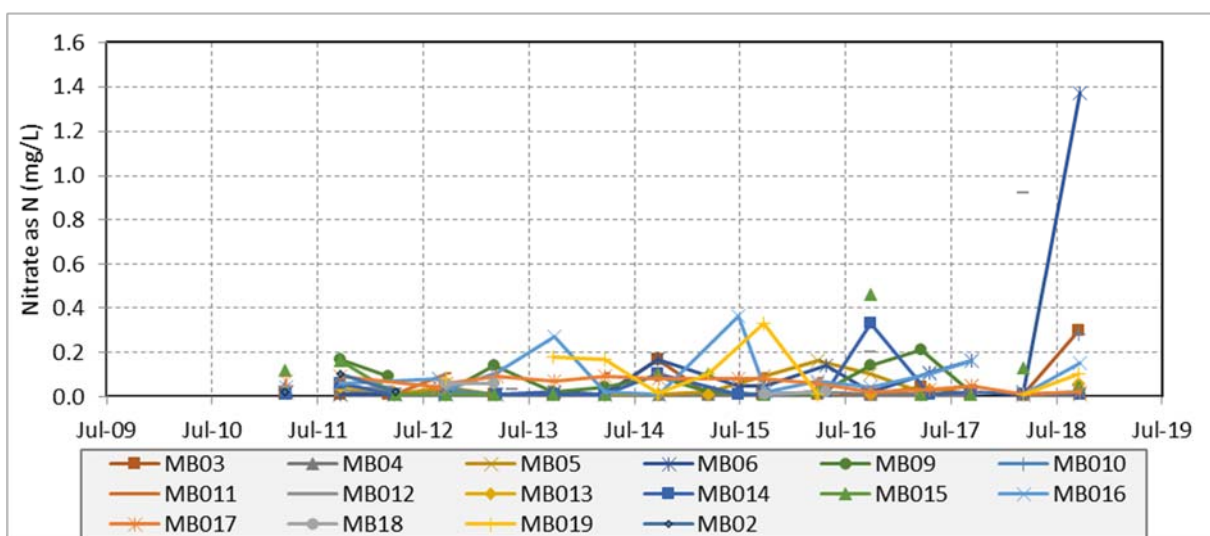


Figure C-81 Nitrate monitored in groundwater

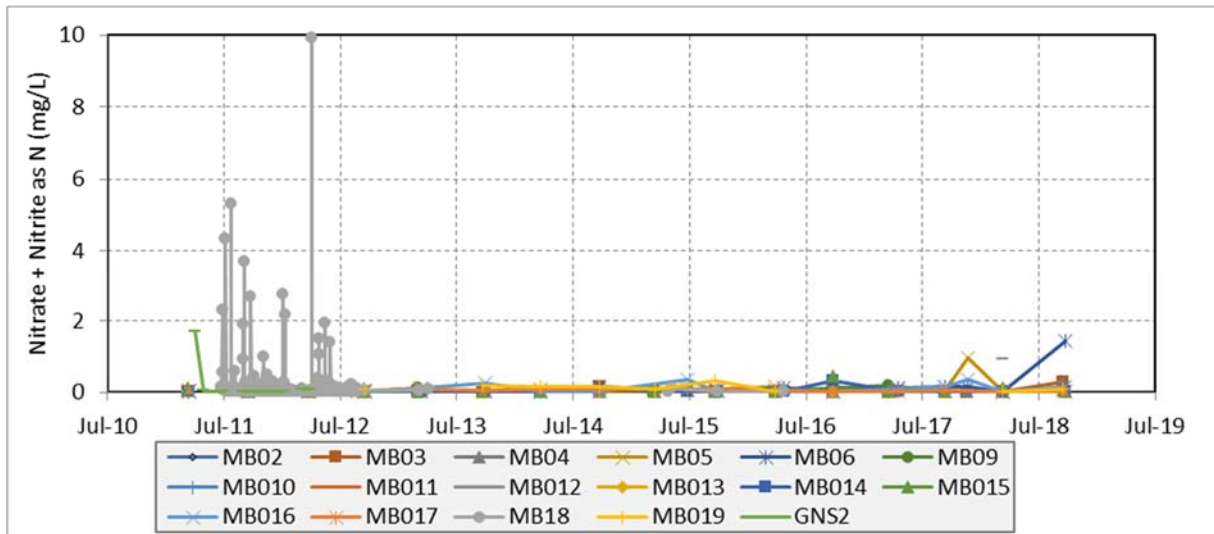


Figure C-82 Nitrate + nitrite monitored in groundwater

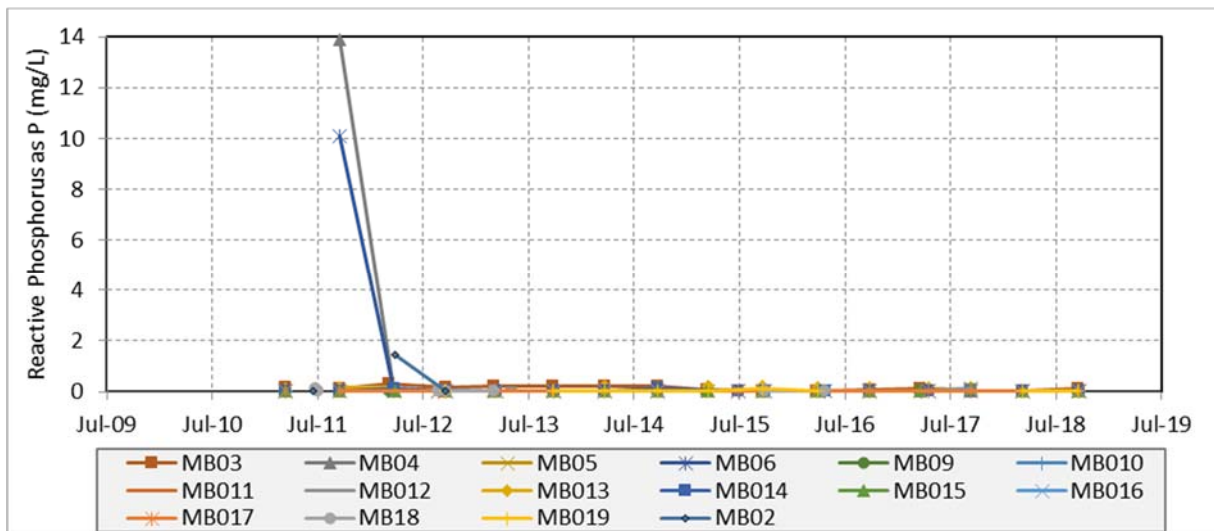


Figure C-83 Reactive phosphorus monitored in groundwater

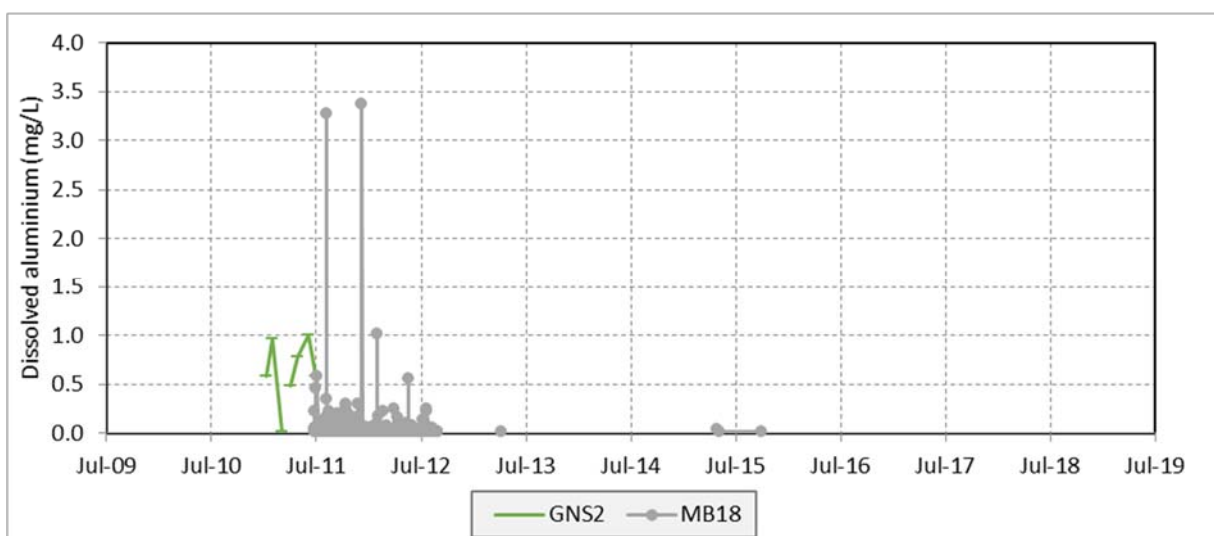


Figure C-84 Dissolved aluminium monitored in groundwater

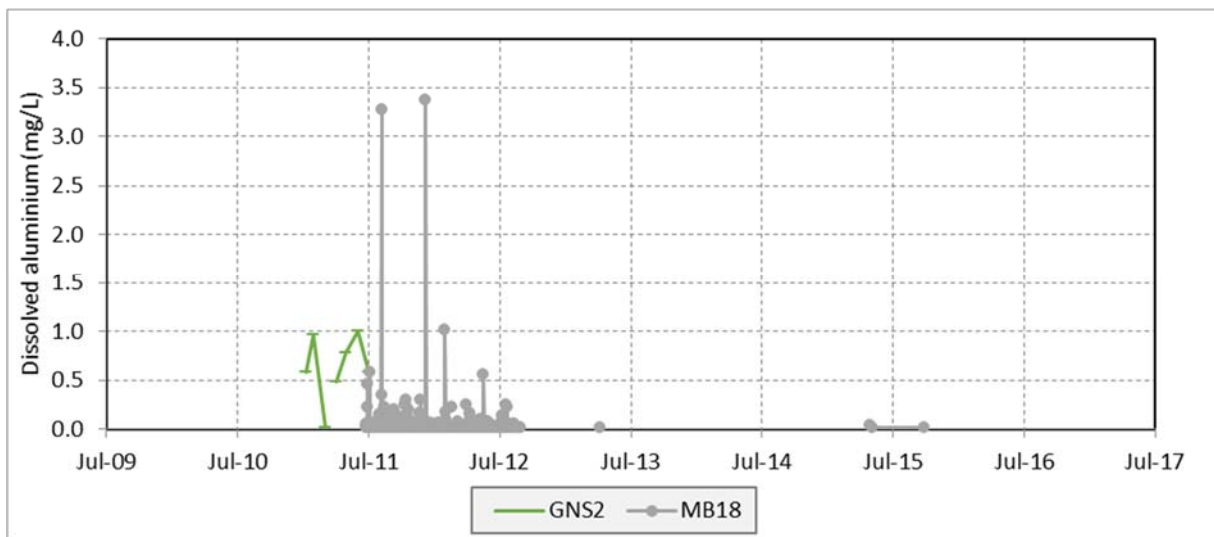


Figure C-85 Dissolved aluminium monitored in groundwater

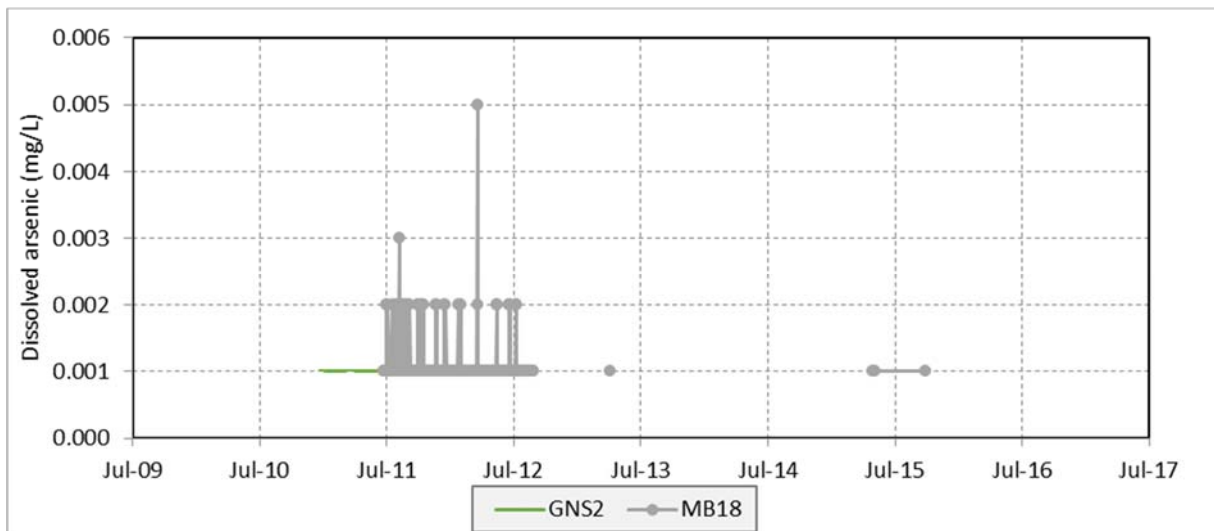


Figure C-86 Dissolved arsenic monitored in groundwater

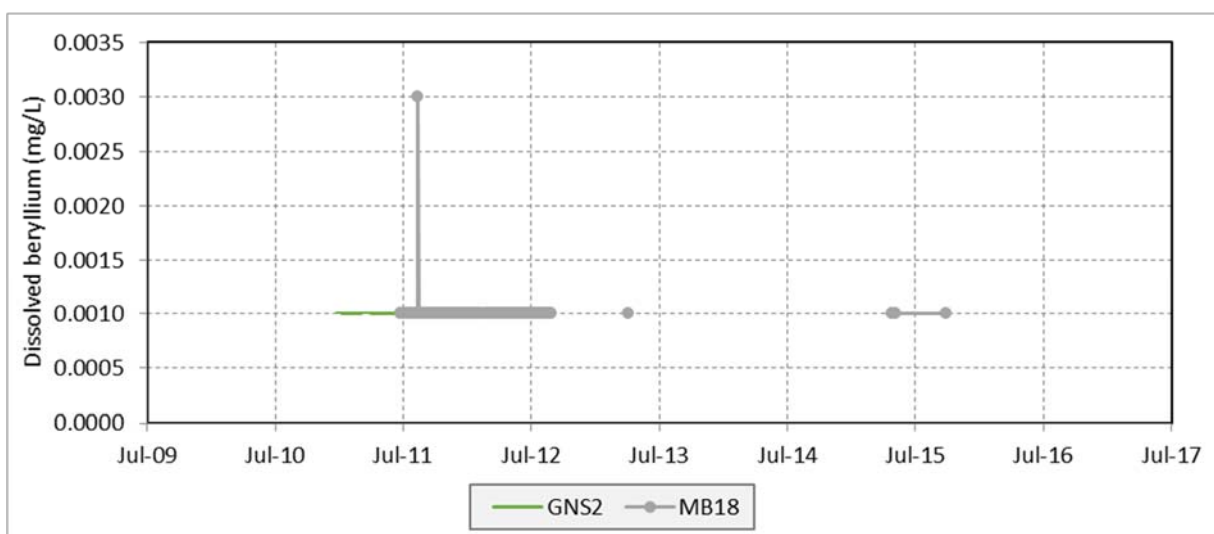


Figure C-87 Dissolved beryllium monitored in groundwater

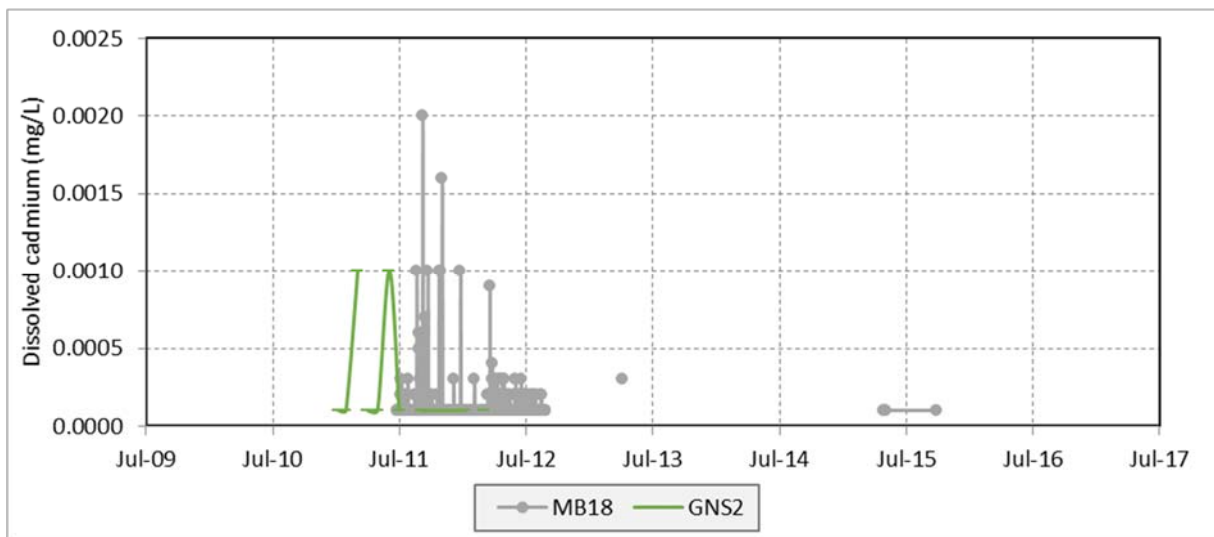


Figure C-88 Dissolved cadmium monitored in groundwater

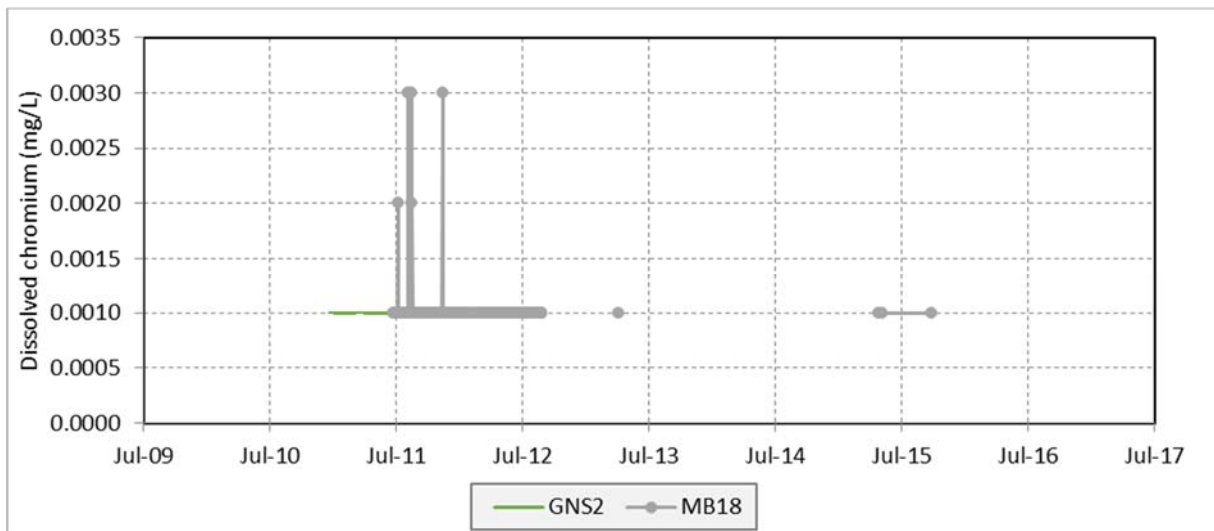


Figure C-89 Dissolved chromium monitored in groundwater

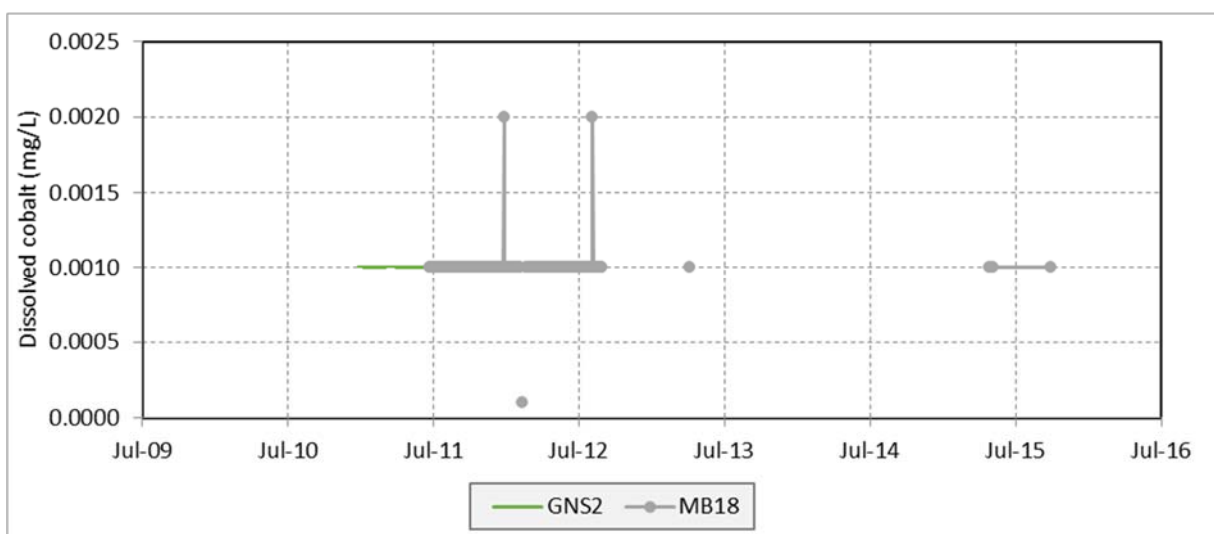


Figure C-90 Dissolved cobalt monitored in groundwater

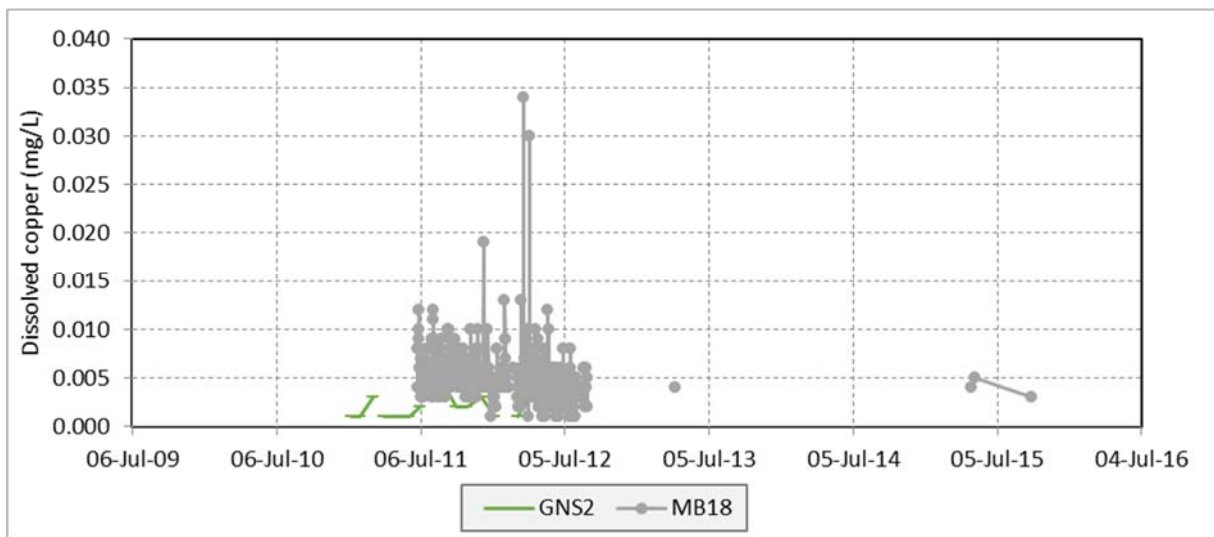


Figure C-91 Dissolved copper monitored in groundwater

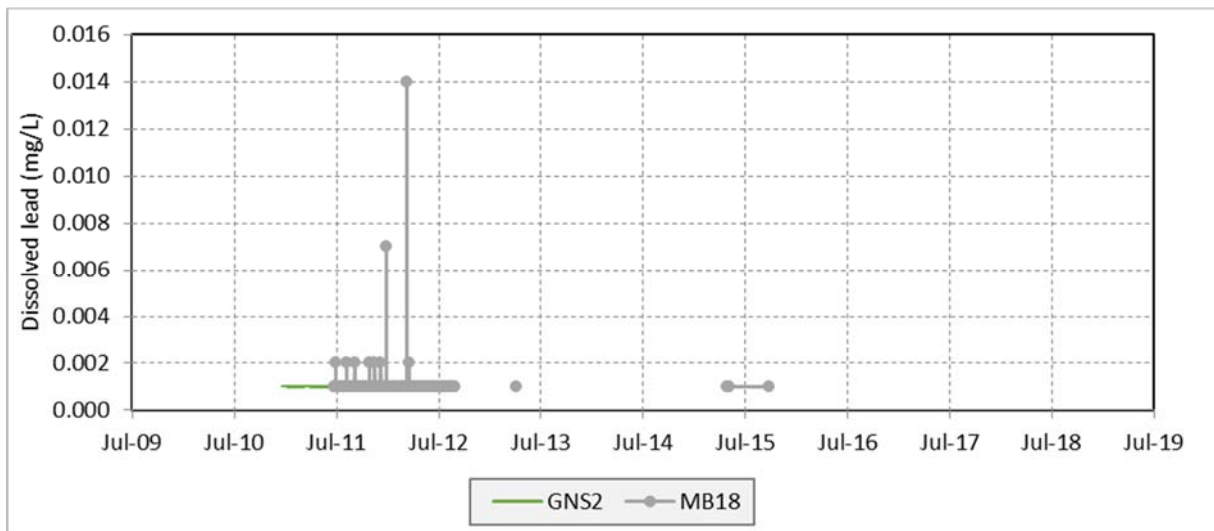


Figure C-92 Dissolved lead monitored in groundwater

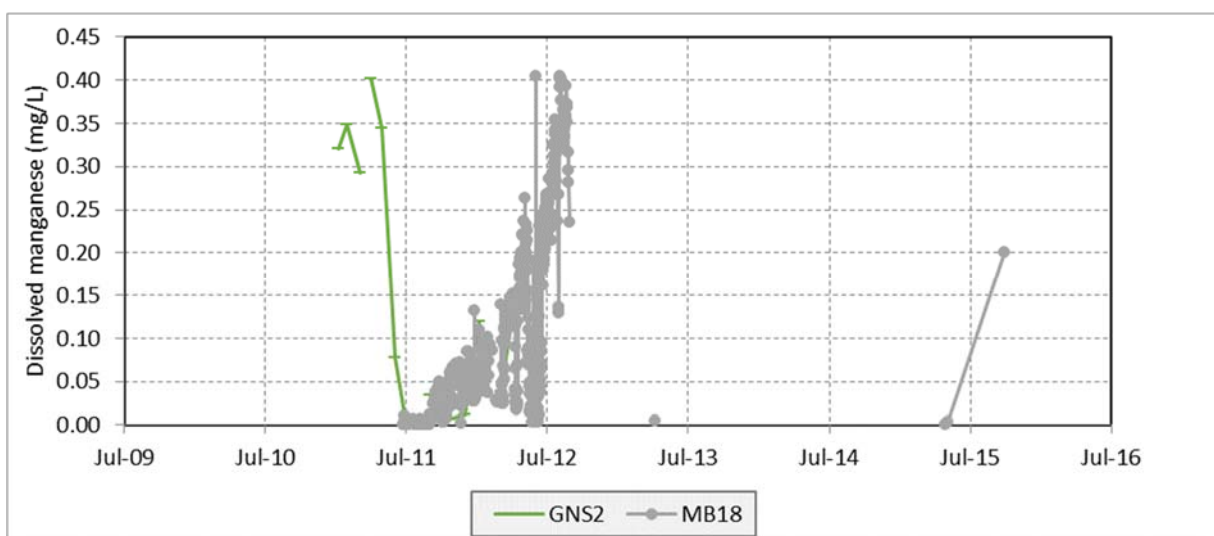


Figure C-93 Dissolved manganese monitored in groundwater

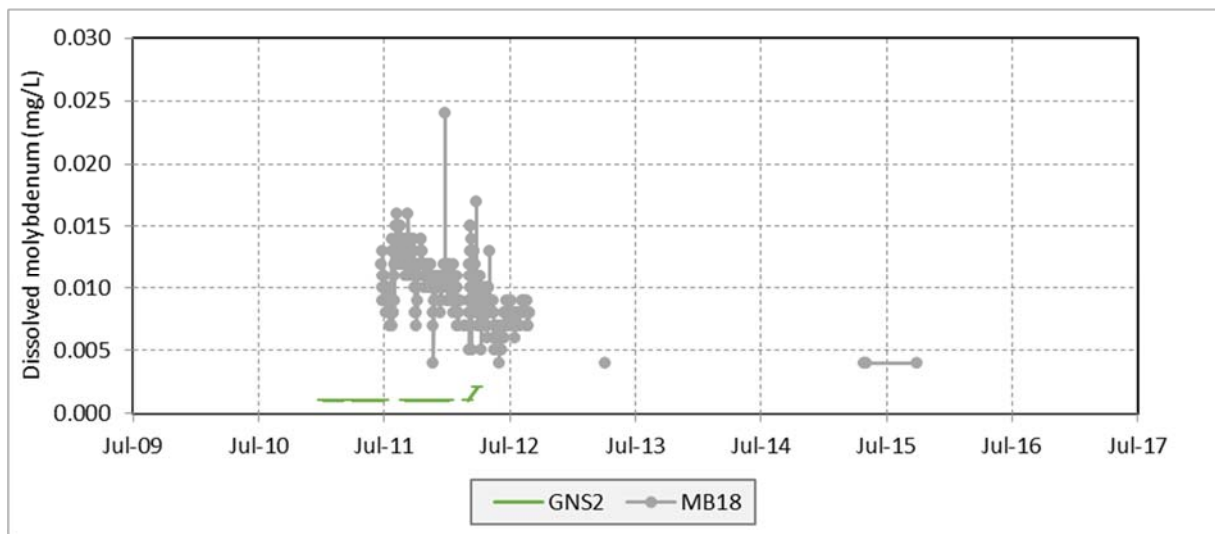


Figure C-94 Dissolved molybdenum monitored in groundwater

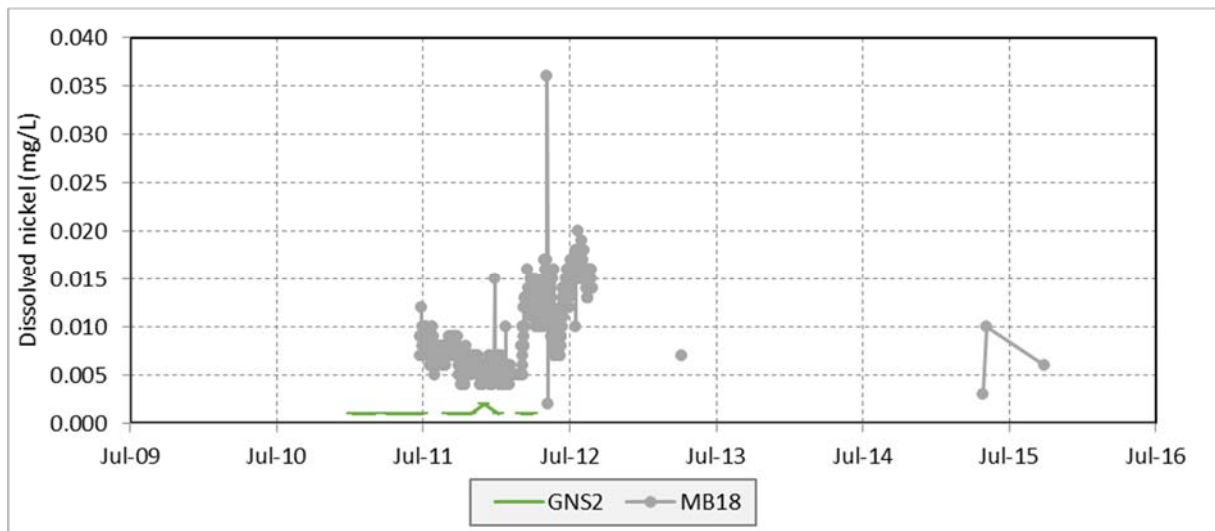


Figure C-95 Dissolved nickel monitored in groundwater

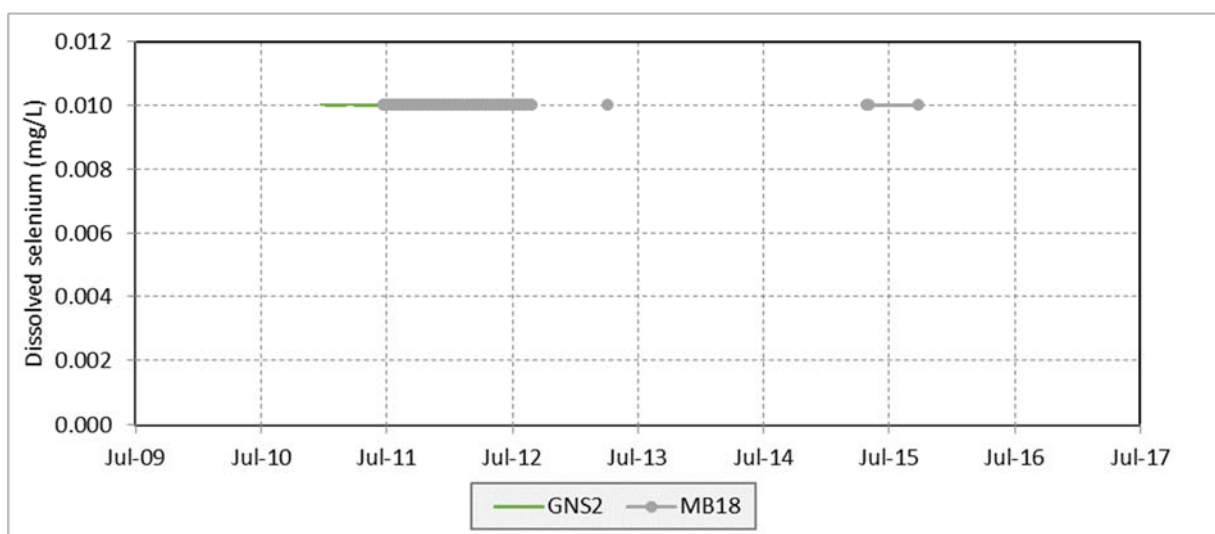


Figure C-96 Dissolved selenium monitored in groundwater

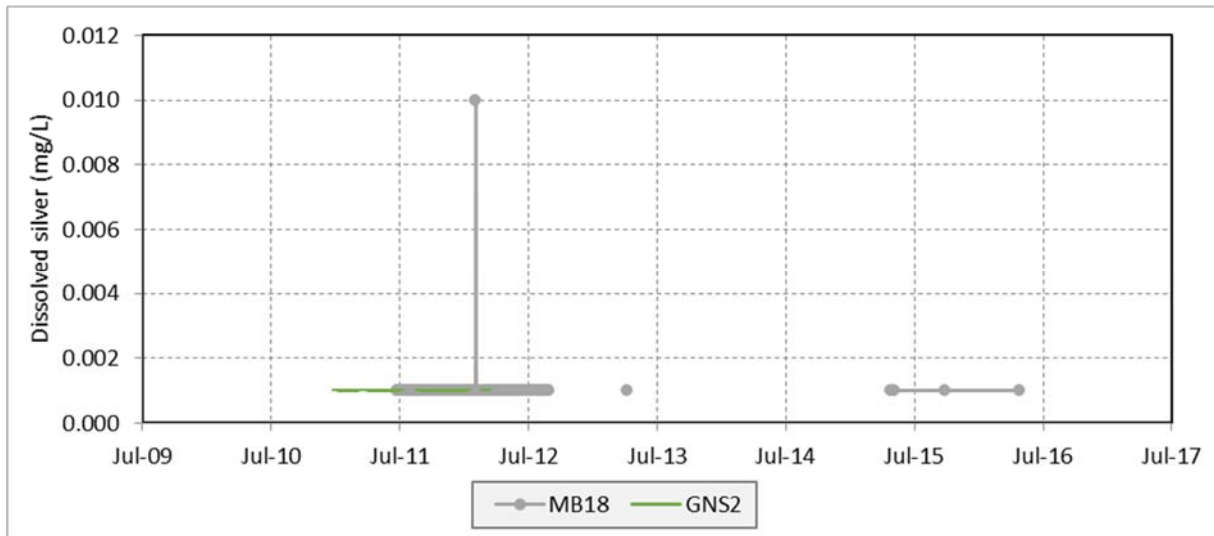


Figure C-97 Dissolved silver monitored in groundwater

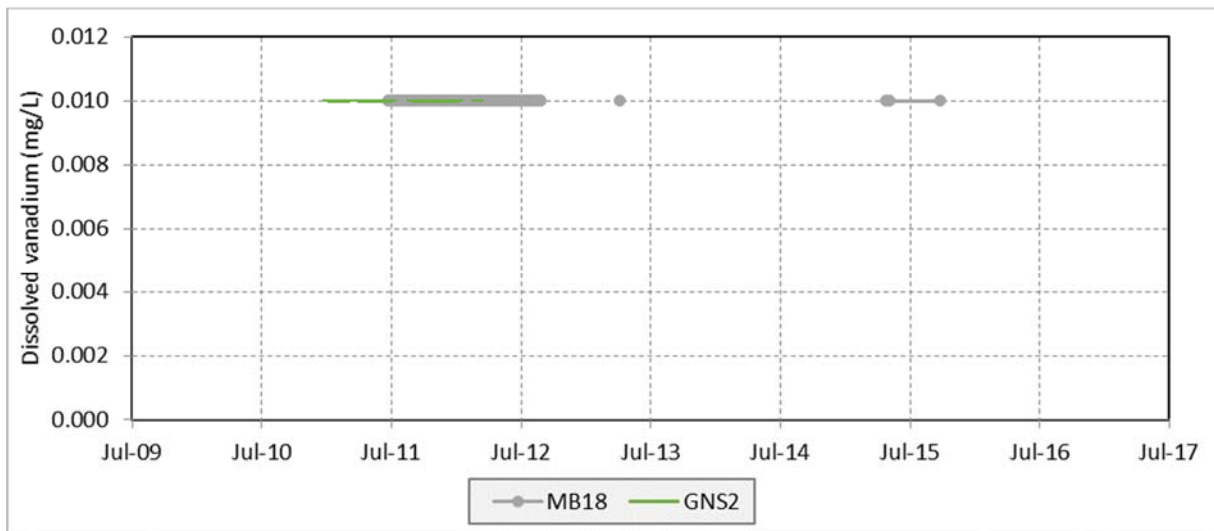


Figure C-98 Dissolved vanadium monitored in groundwater

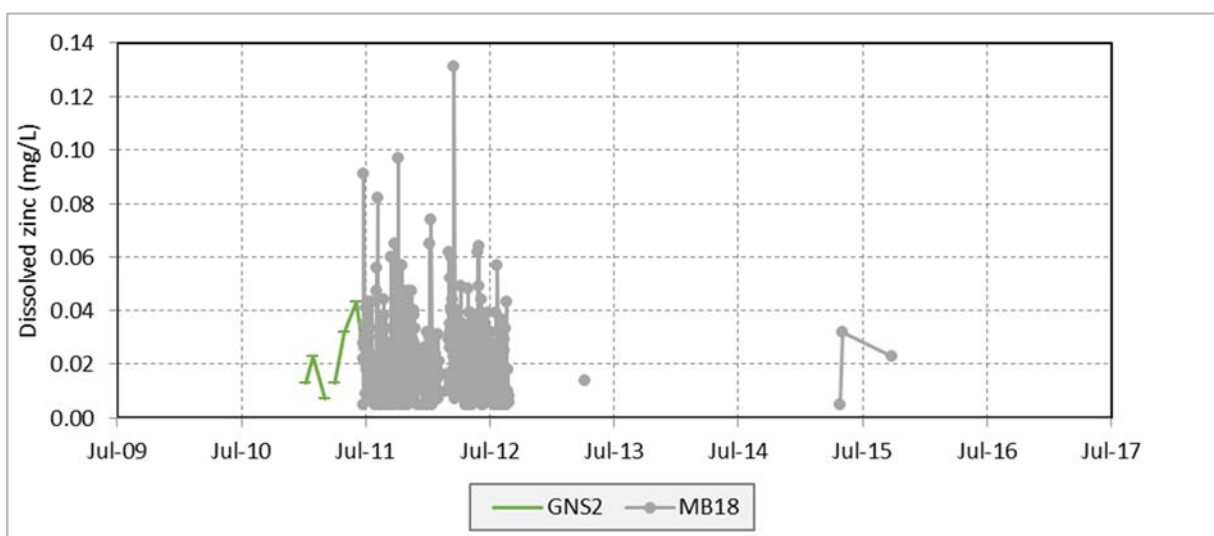


Figure C-99 Dissolved zinc monitored in groundwater

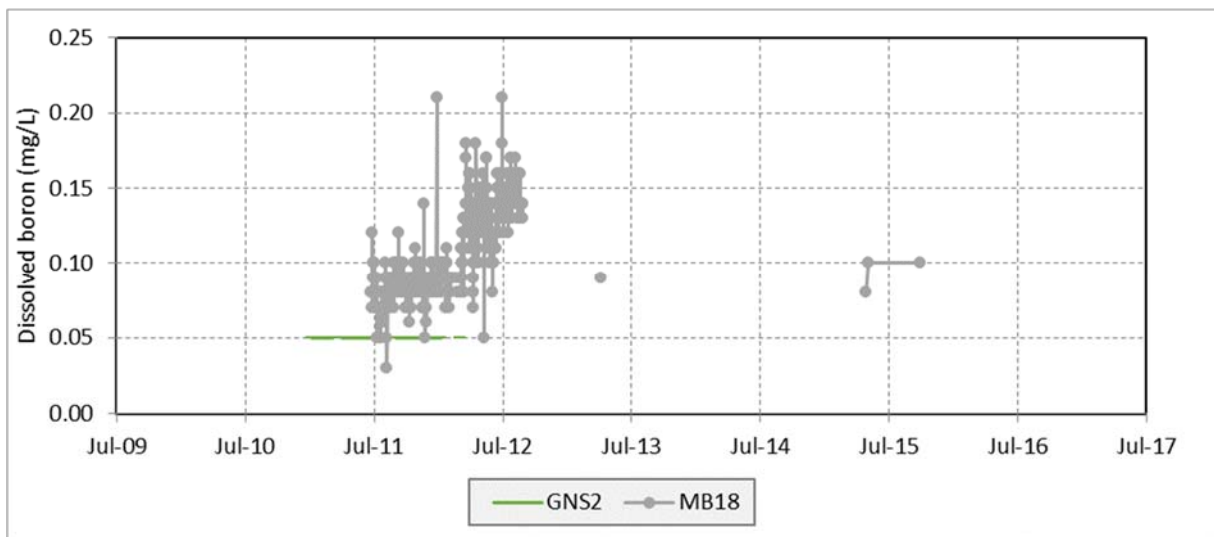


Figure C-100 Dissolved boron monitored in groundwater

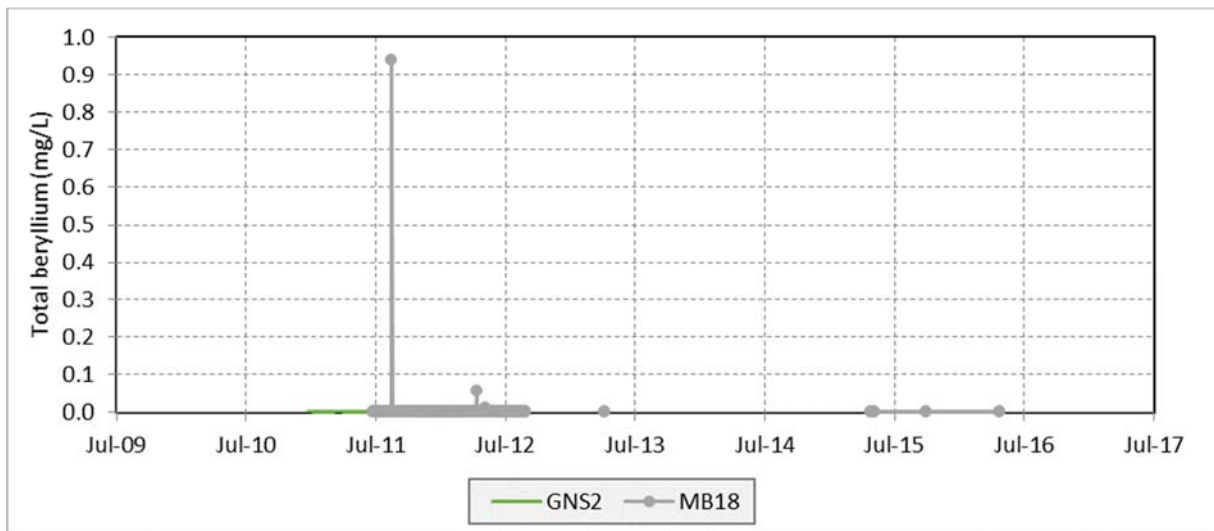


Figure C-101 Total beryllium monitored in groundwater

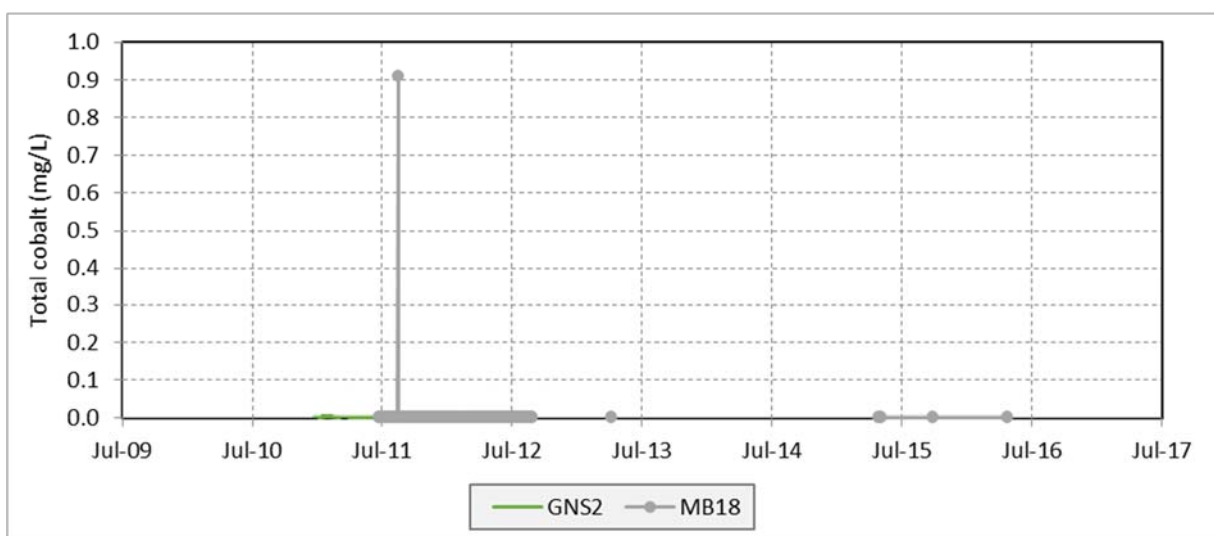


Figure C-102 Total cobalt monitored in groundwater

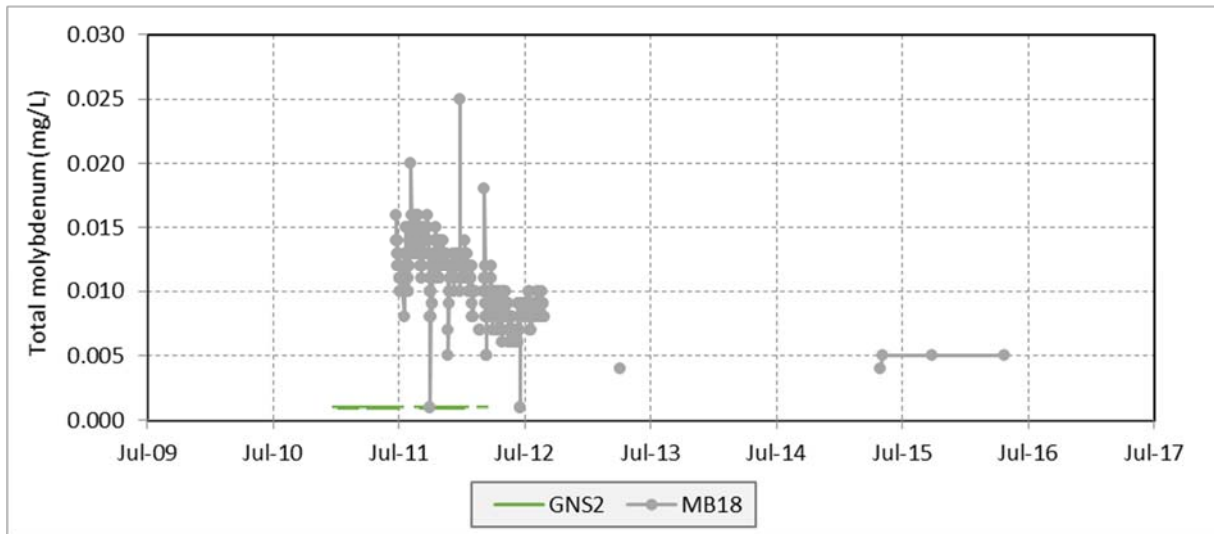


Figure C-103 Total molybdenum monitored in groundwater

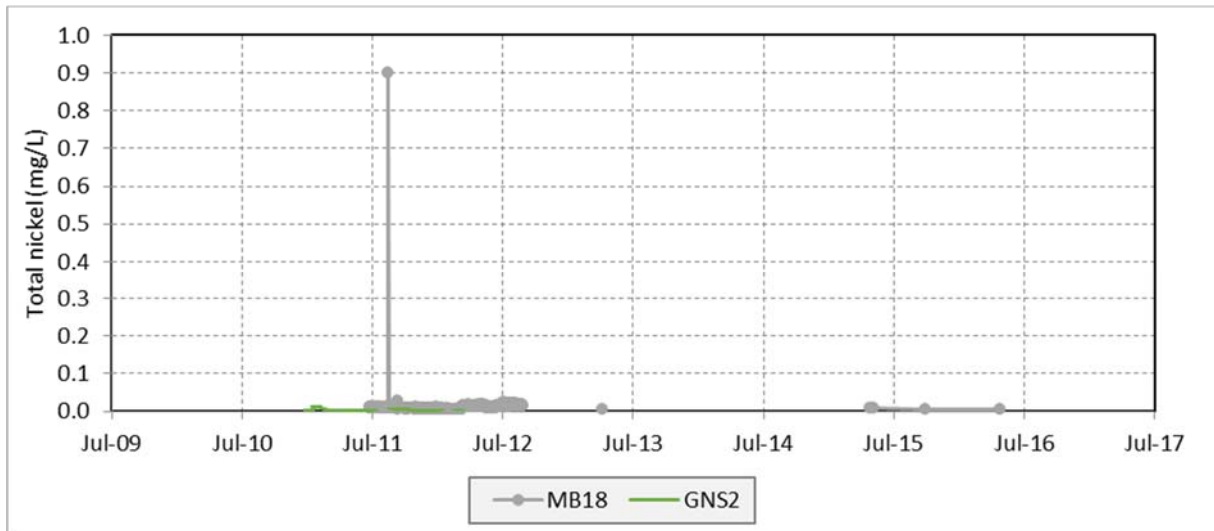


Figure C-104 Total nickel monitored in groundwater

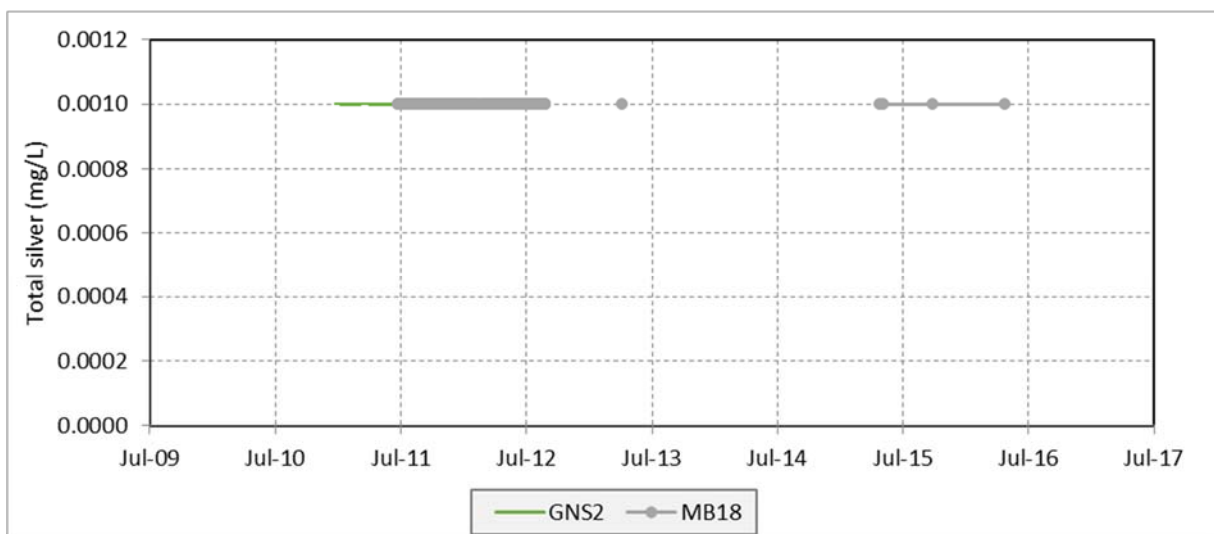


Figure C-105 Total silver monitored in groundwater

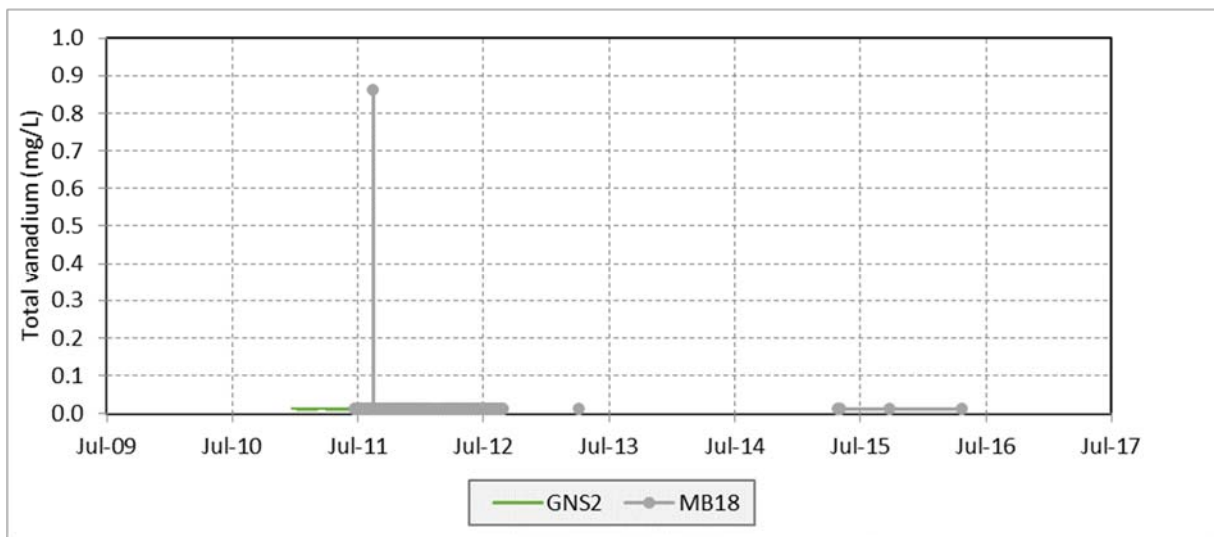


Figure C-106 Total vanadium monitored in groundwater

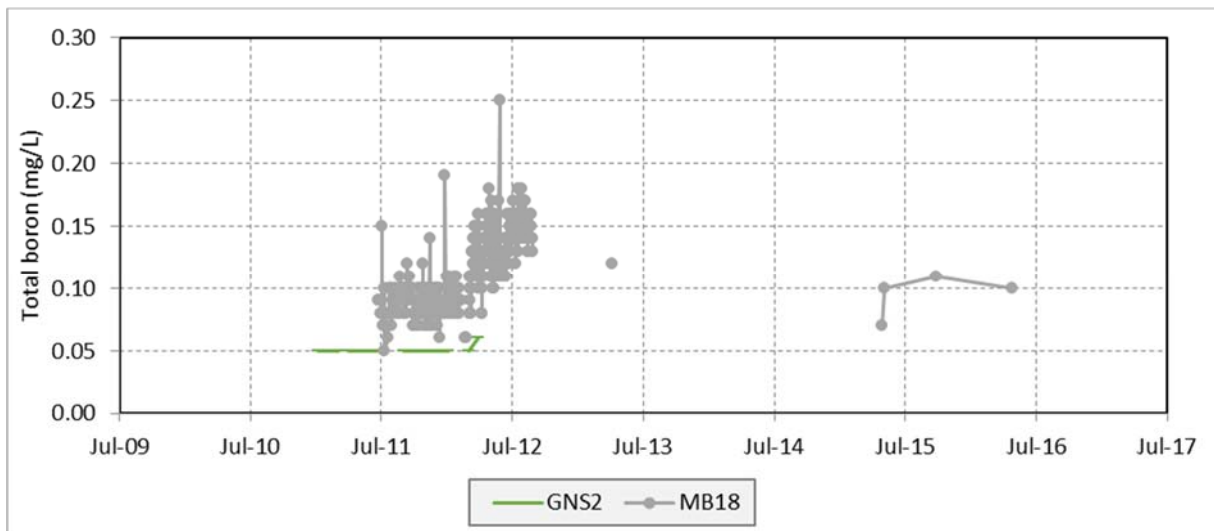


Figure C-107 Total boron monitored in groundwater

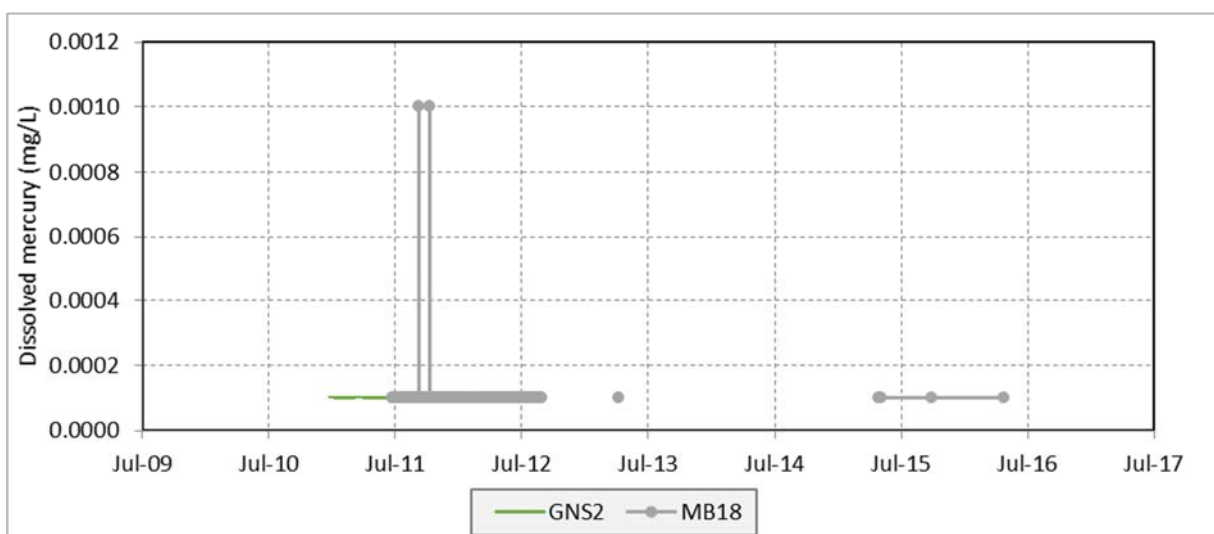


Figure C-108 Dissolved mercury monitored in groundwater

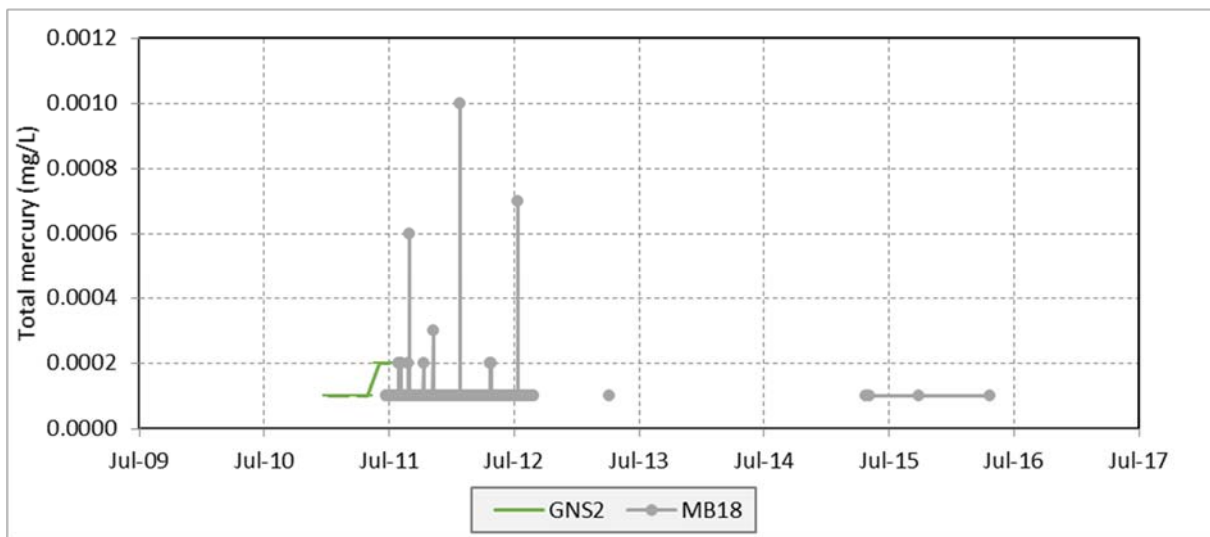


Figure C-109 Total mercury monitored in groundwater

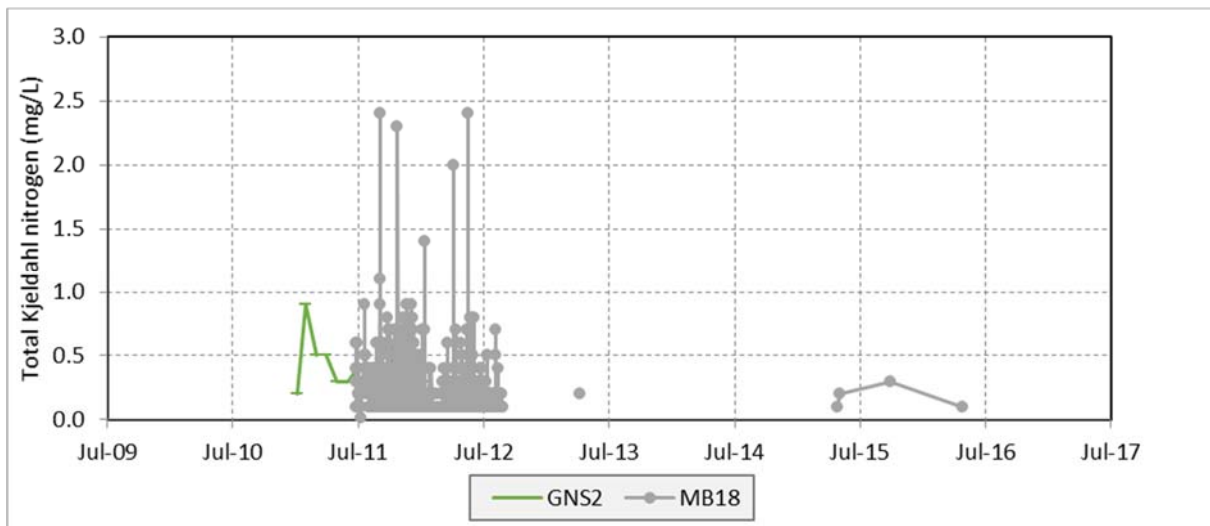


Figure C-110 Total Kjeldahl nitrogen monitored in groundwater

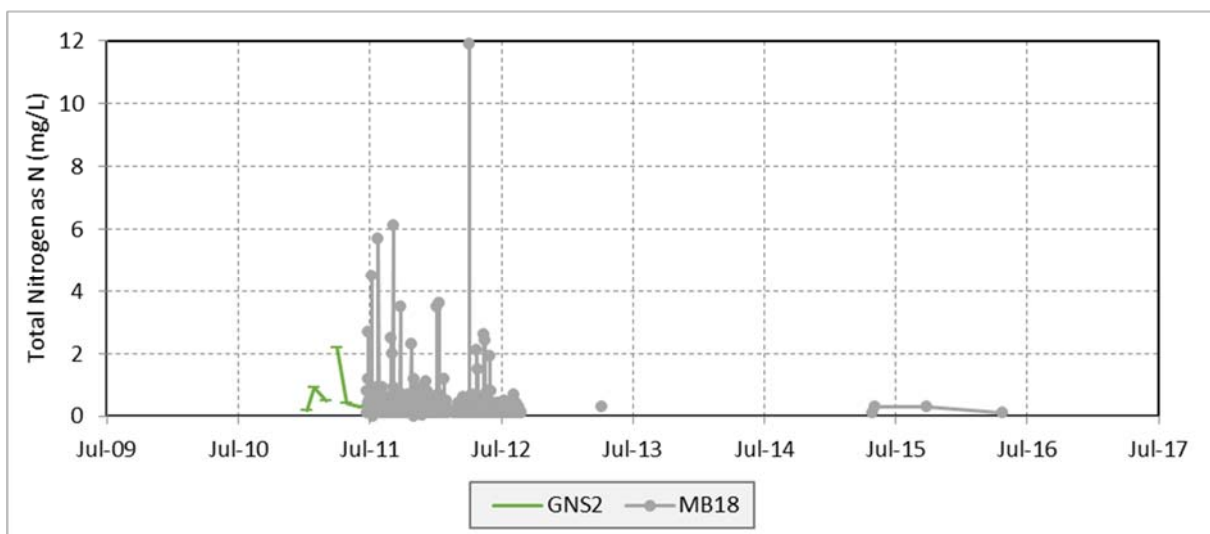


Figure C-111 Total nitrogen monitored in groundwater

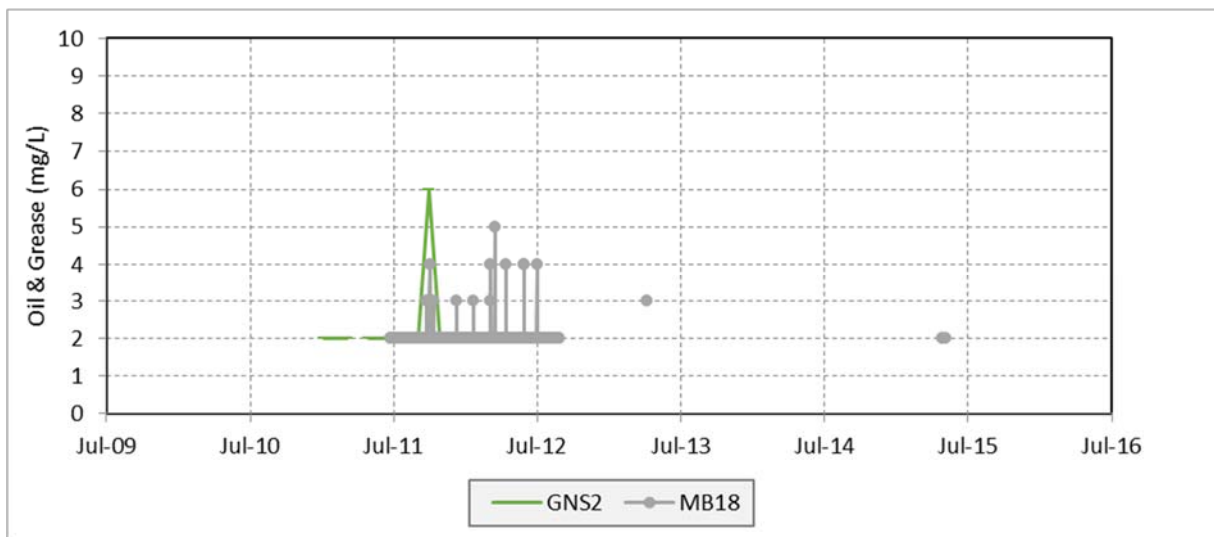


Figure C-112 Oil and grease monitored in groundwater

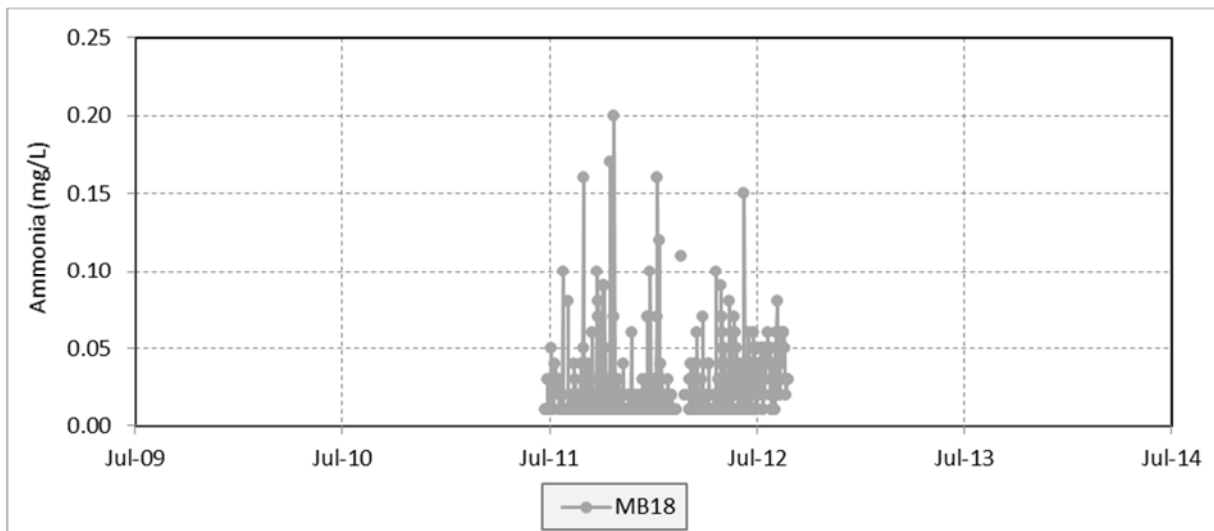


Figure C-113 Ammonia monitored in groundwater

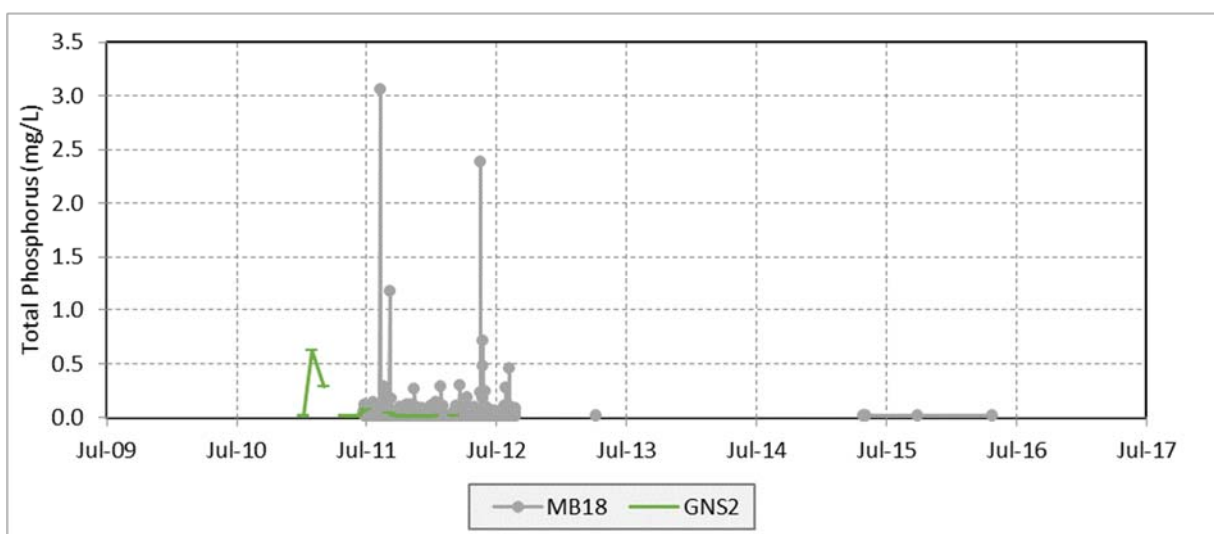


Figure C-114 Total phosphorus monitored in groundwater

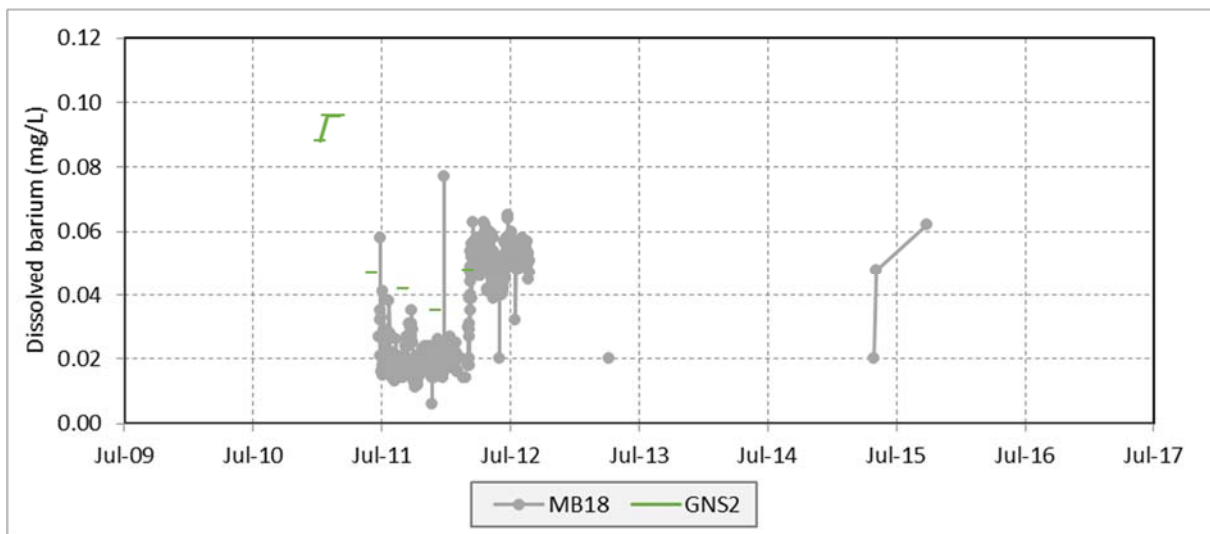


Figure C-115 Dissolved barium monitored in groundwater

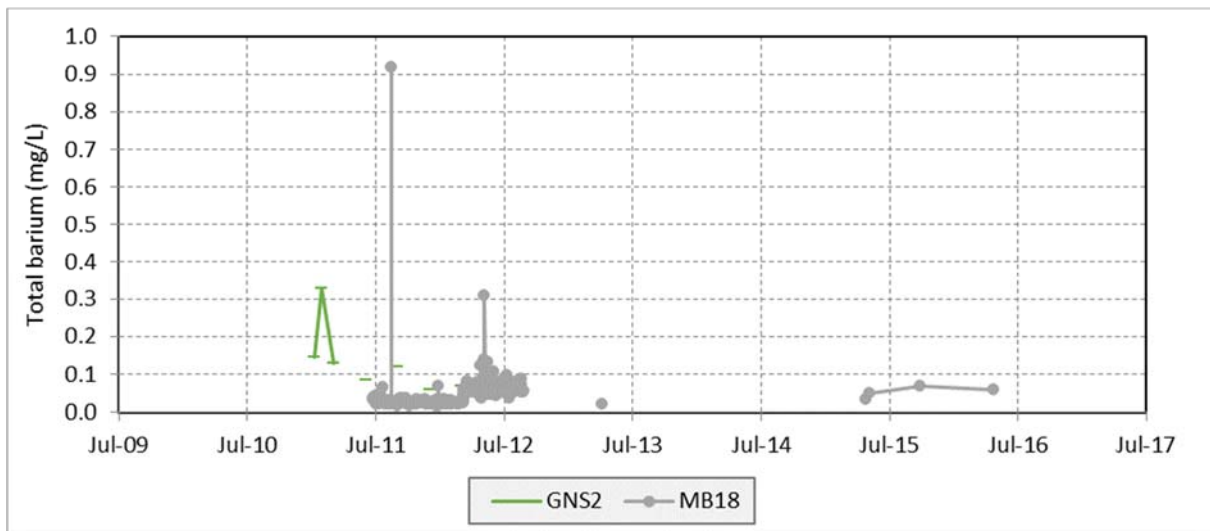


Figure C-116 Total barium monitored in groundwater

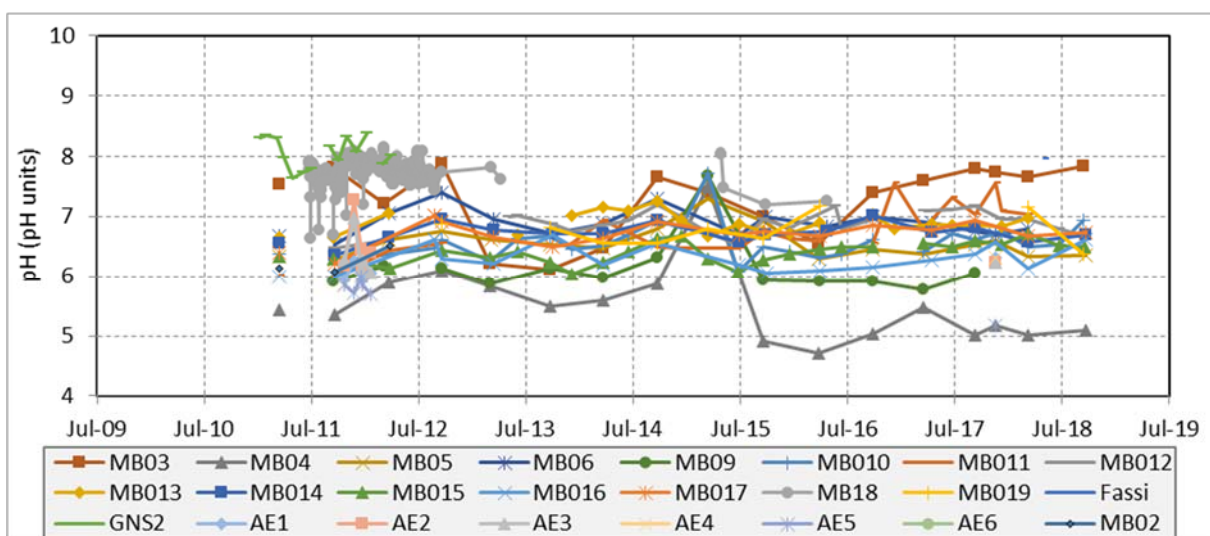


Figure C-117 Laboratory pH monitored in groundwater

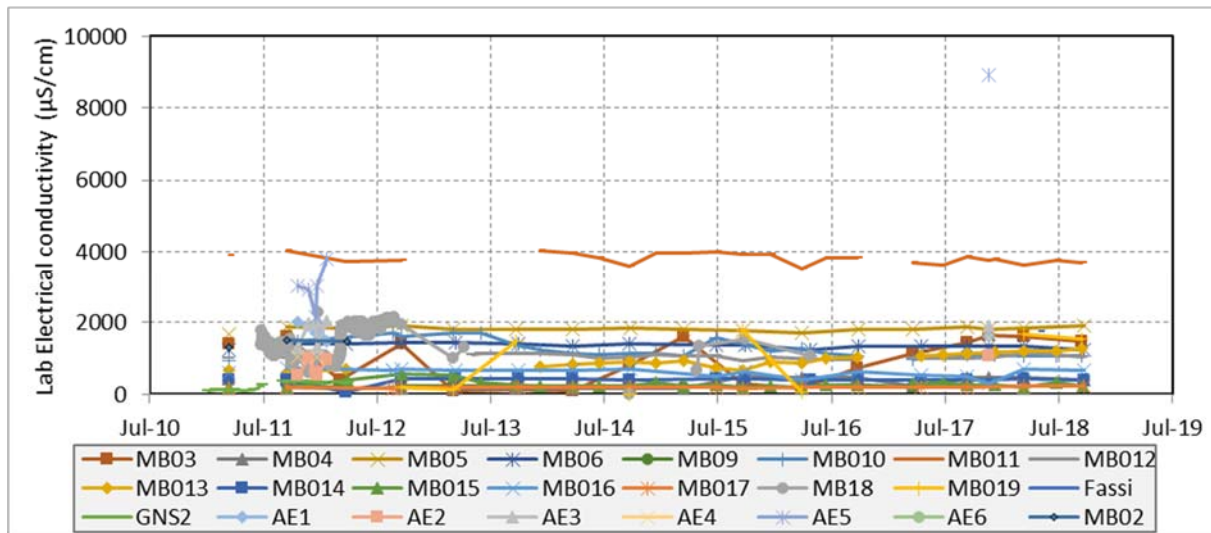


Figure C-118 Laboratory electrical conductivity monitored in groundwater

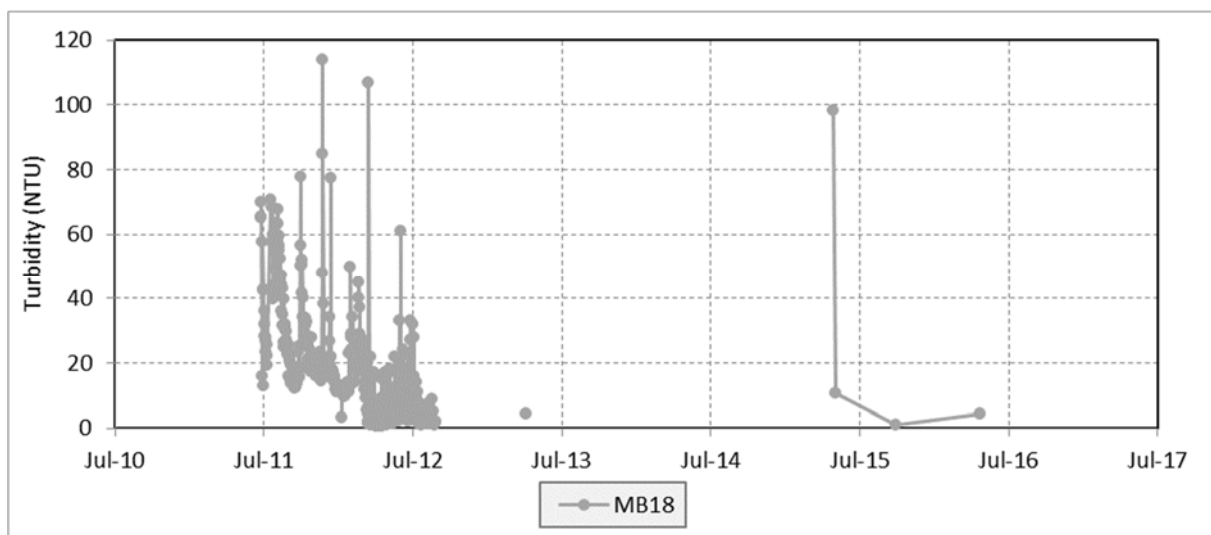


Figure C-119 Turbidity monitored in groundwater

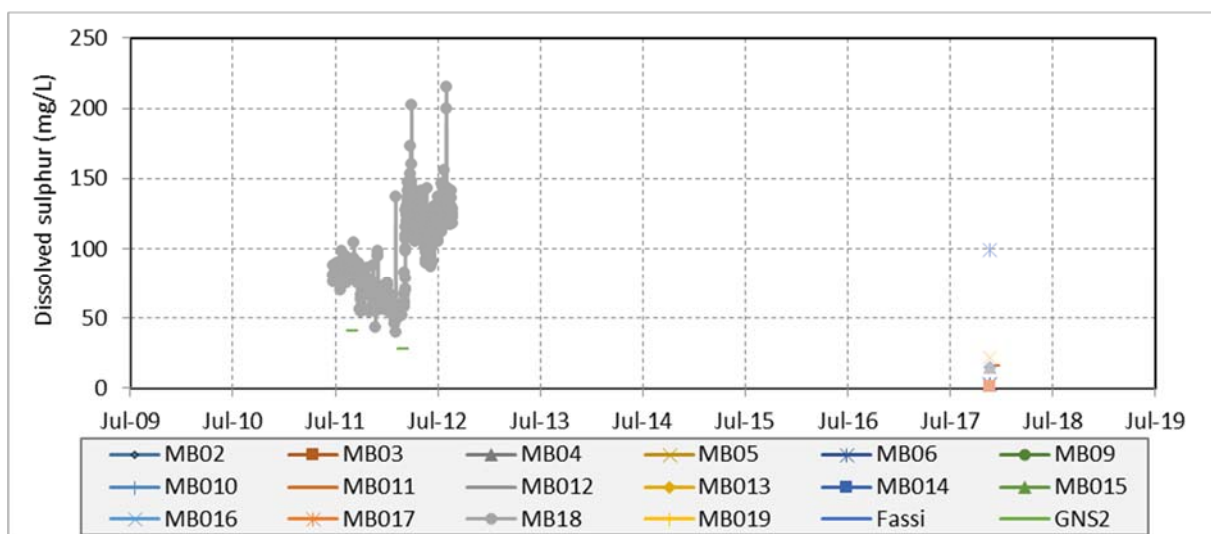


Figure C-120 Dissolved sulphur monitored in groundwater

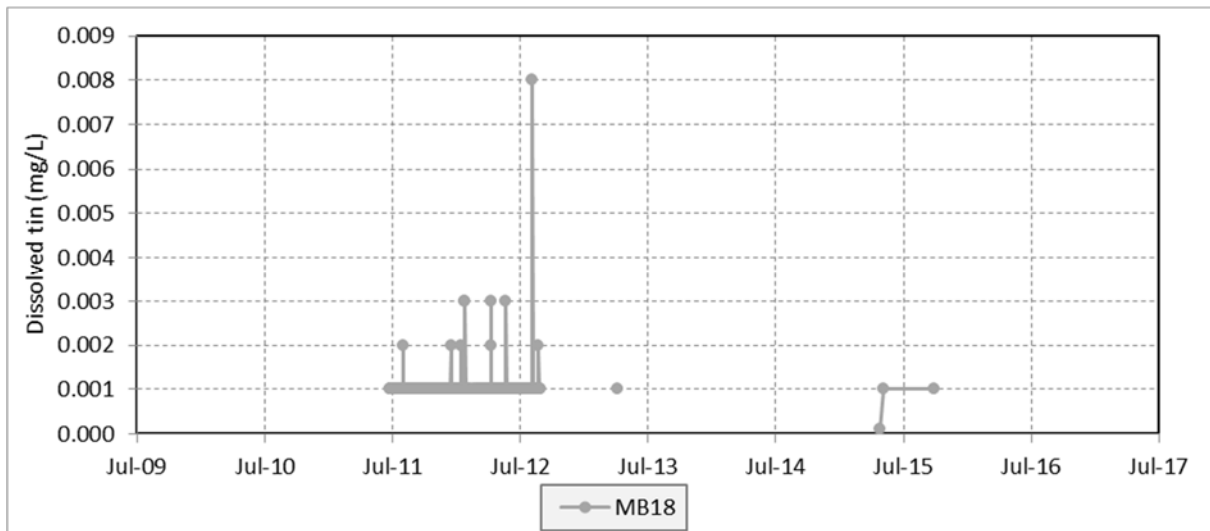


Figure C-121 Dissolved tin monitored in groundwater

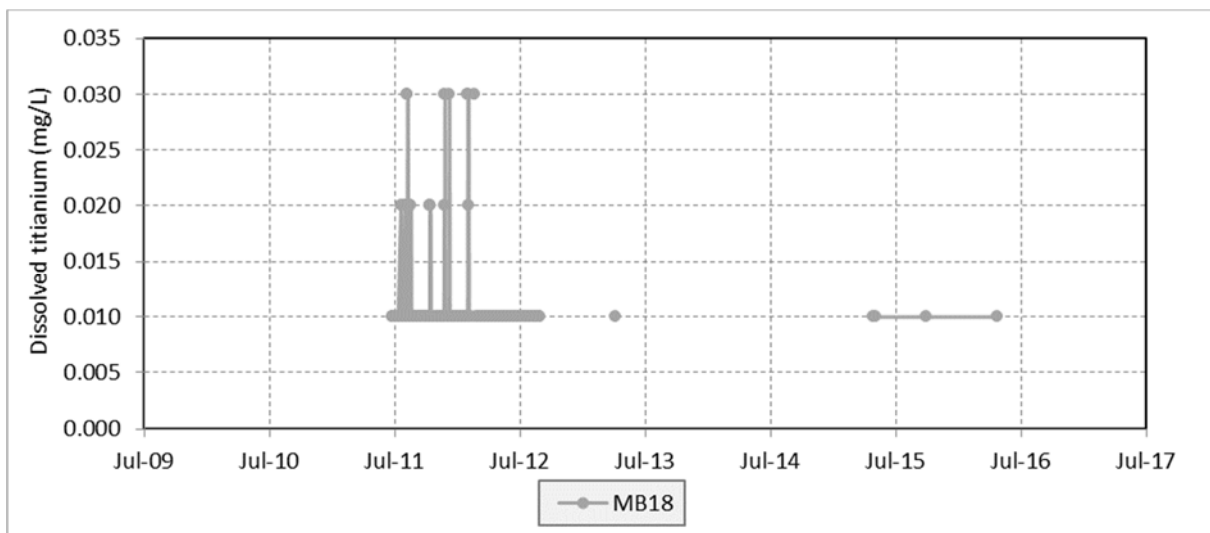


Figure C-122 Dissolved titanium monitored in groundwater

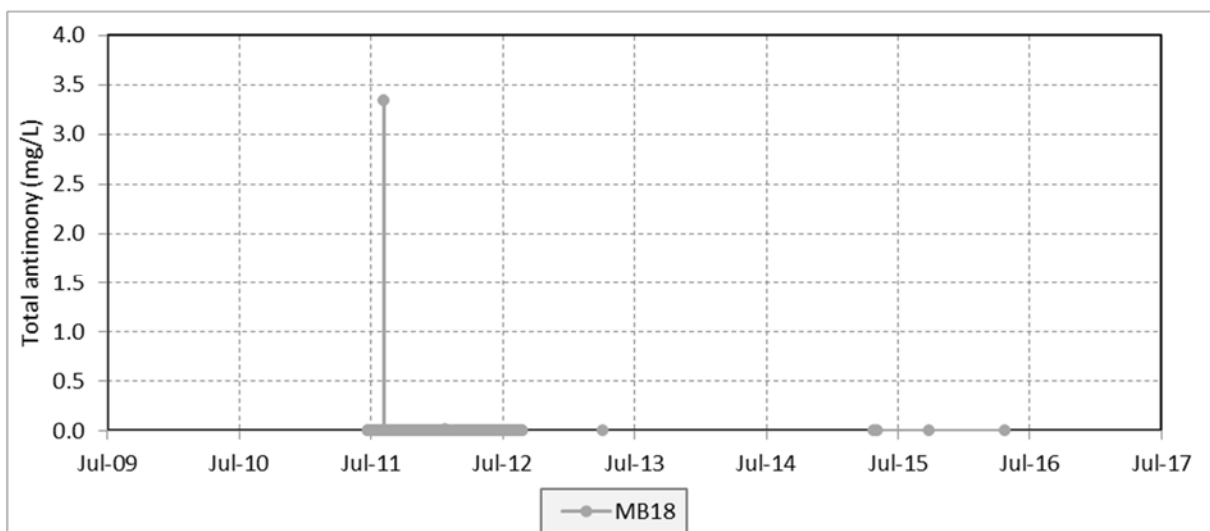


Figure C-123 Total antimony monitored in groundwater

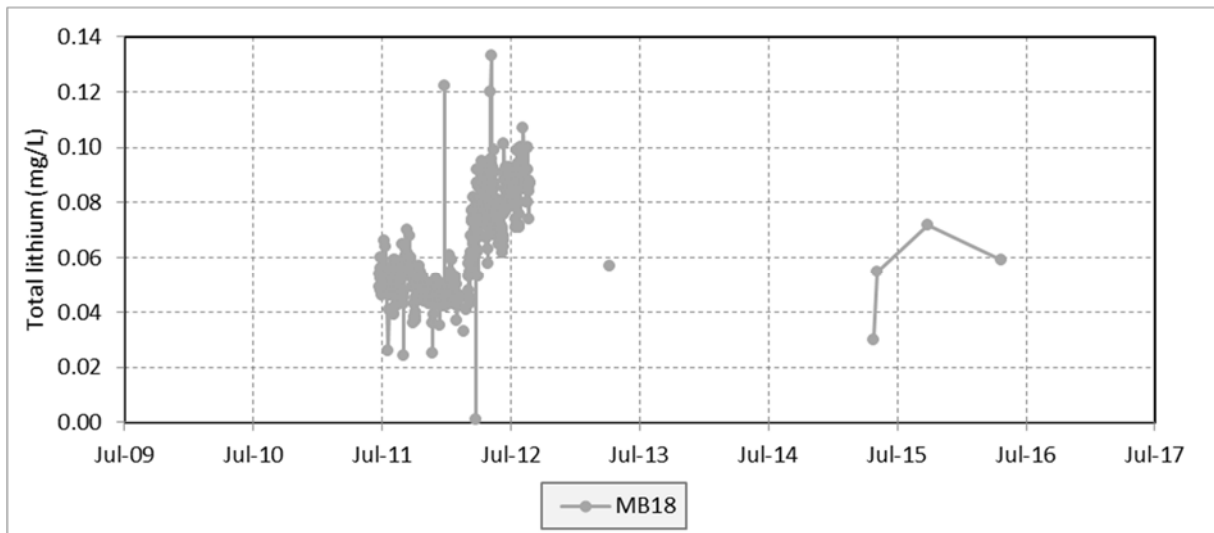


Figure C-124 Total lithium monitored in groundwater

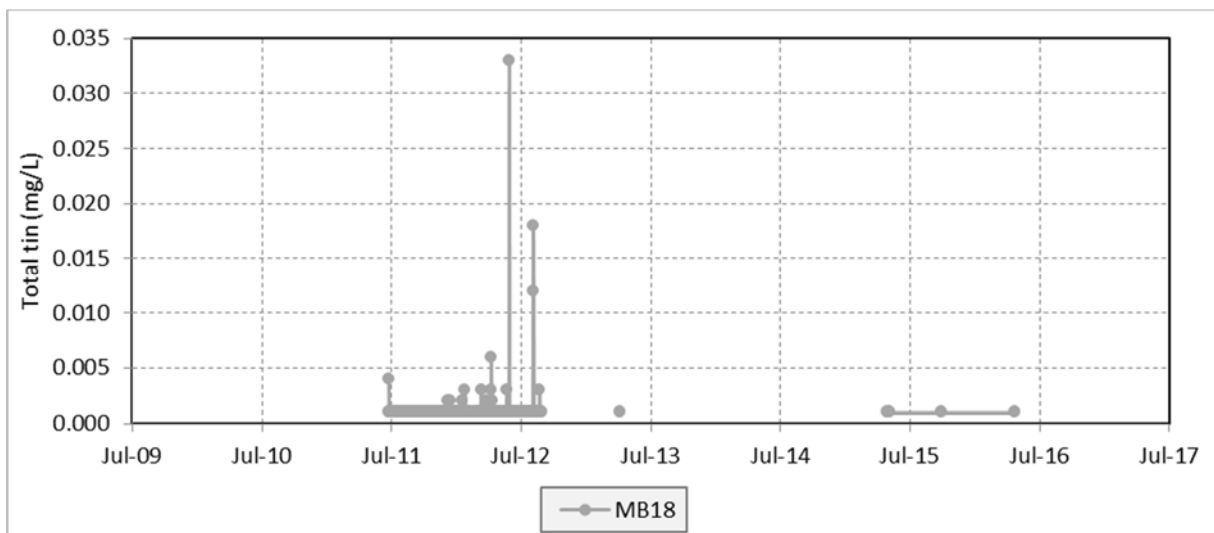


Figure C-125 Total tin monitored in groundwater

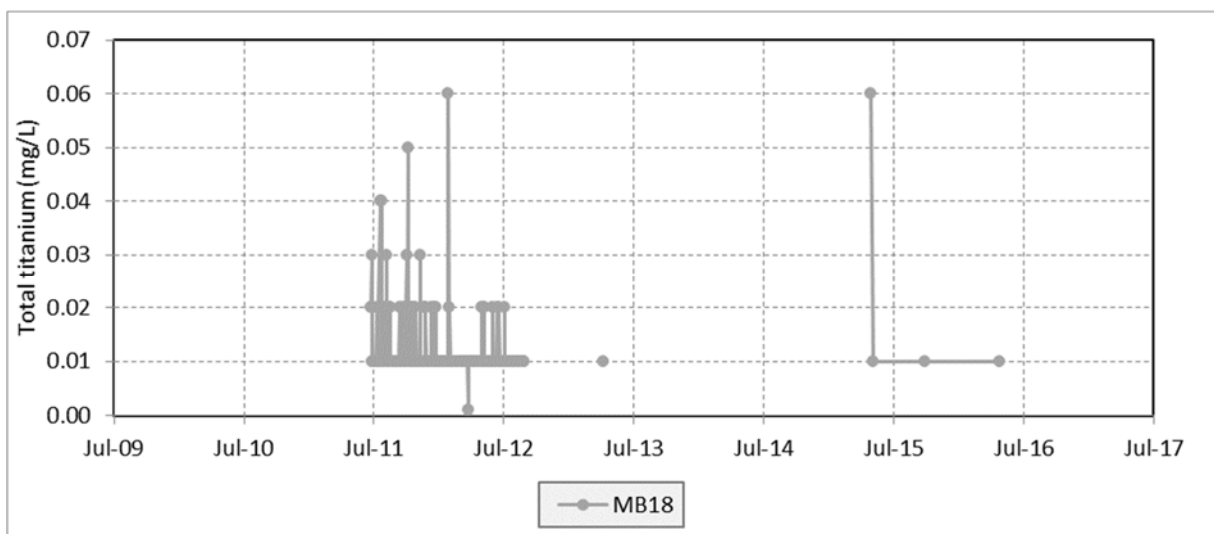


Figure C-126 Total titanium monitored in groundwater

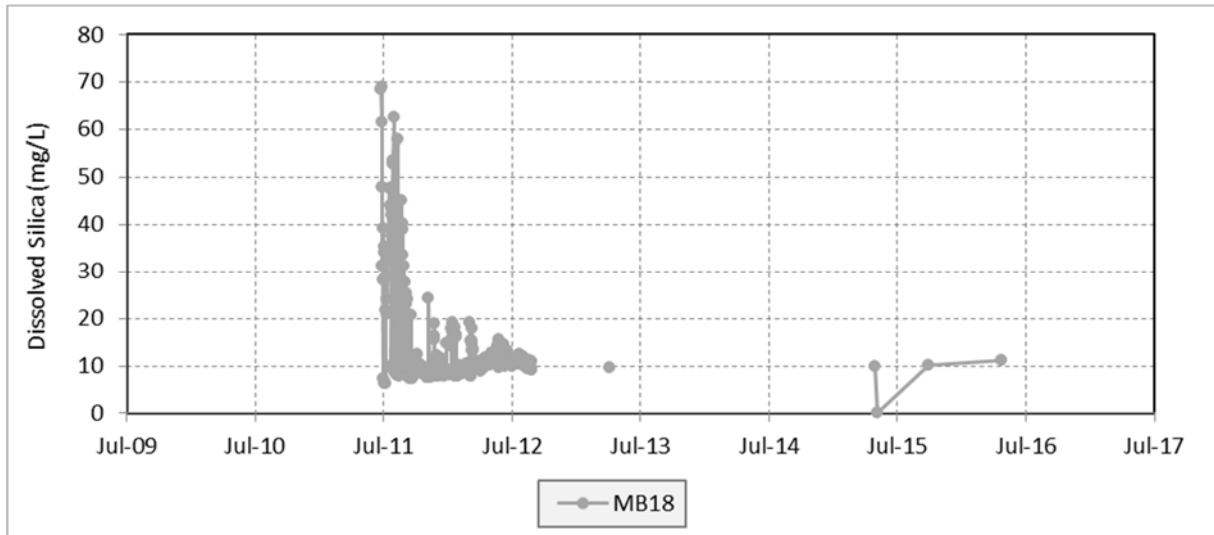


Figure C-127 Dissolved silica monitored in groundwater

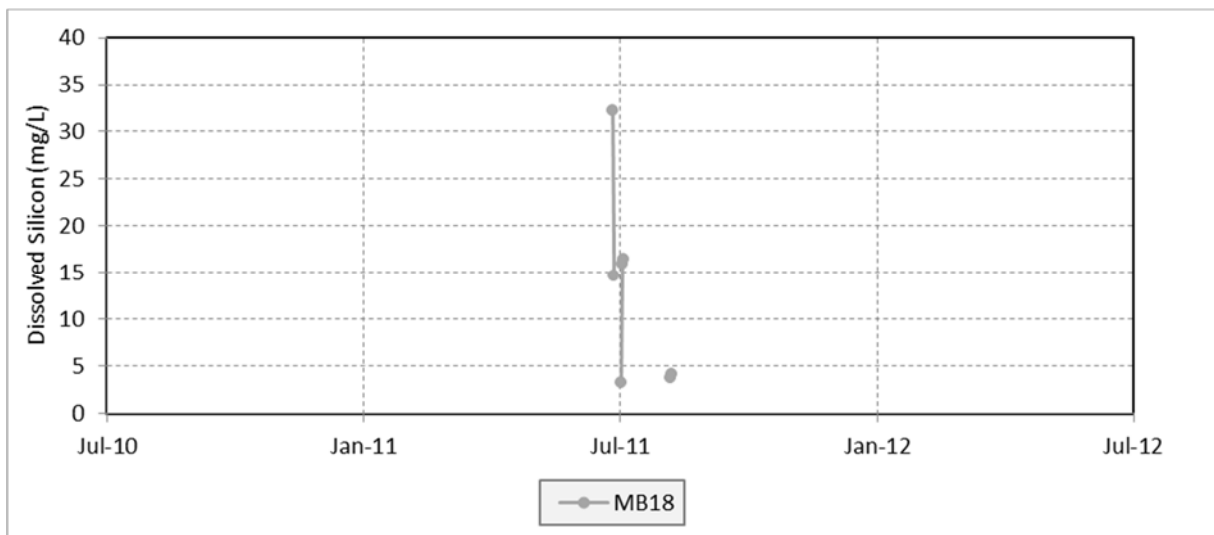


Figure C-128 Dissolved silicon monitored in groundwater

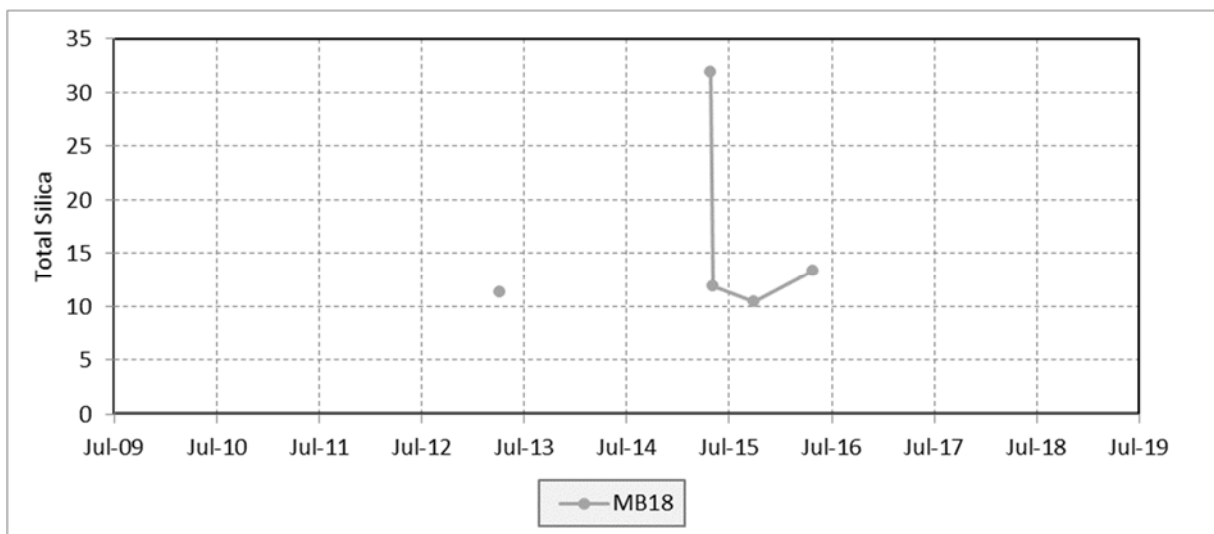


Figure C-129 Total silica monitored in groundwater

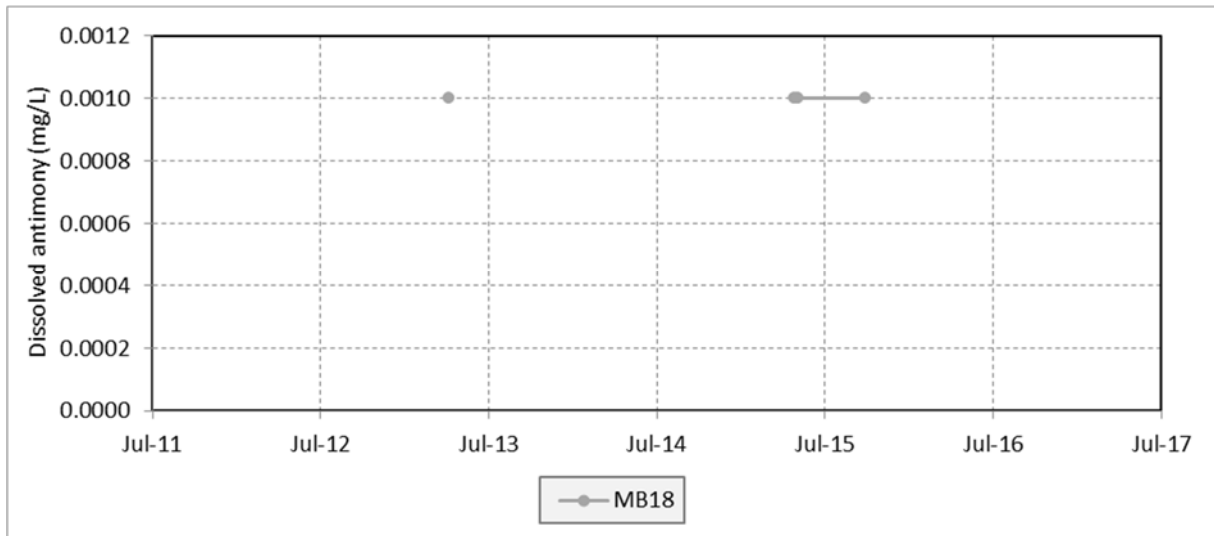


Figure C-130 Dissolved antimony monitored in groundwater

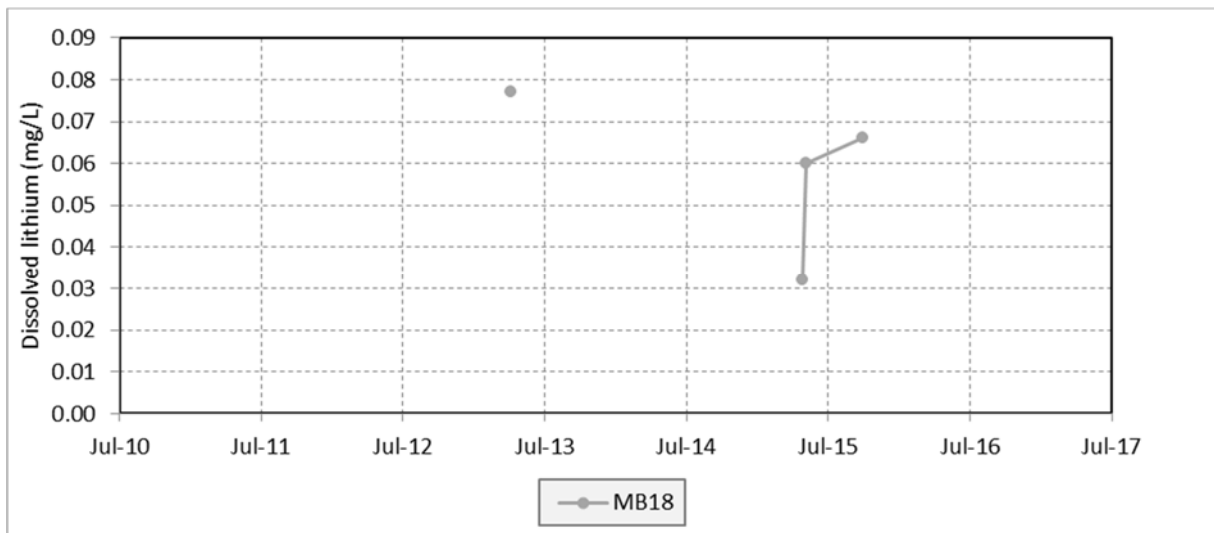


Figure C-131 Dissolved lithium monitored in groundwater

Appendix D

Inspection Forms

EWP008 – Newstan Weekly Environmental Inspection



Undertaken by: _____

Date: / /20

<u>Hydrocarbon Storage Area</u>			
Level in Diesel Tank Bund	High	Medium	Low
Battery Disposal Required?	Yes	No	
Any spills outside of bunded area?	Yes	No	
General housekeeping	Good	Requires Attention	
<u>General Pit Top</u>			
Stone dust spill	Yes	No	
Oil Drums in unbunded areas?	Yes	No	
Is there any leaking machinery on the pit top	Yes	No	
<u>Separator – Diesel Bay</u>			
Level in Collection Sump	High	Medium	Low
Pump Operating	Yes	No	
Level in Waste Oil Tank	High	Medium	Low
<u>Drive in Sump, Wash Down Bay</u>			
Sediment Level in Sump	High	Medium	Low
<u>M&M Collection Sump</u>			
Waste Oil tank level	High	Medium	Low

Any spills in Transformer sumps	Yes	No
<u>Separator – Compressor House</u>		
Level in Collection Sump	High	Medium
Pump Operating	Yes	No
Level in Waste Oil Tank	High	Medium
<u>Separator – Northern Hardstand</u>		
Level in Collection Sump	High	Medium
Pump Operating	Yes	No
Level in Waste Oil Tank	High	Medium
<u>Northern Hardstand area (Storage area between drifts).</u>		
Level in surrounding drain	High	Medium
Any leaking machinery?	Yes	No
Any oil drums left in unbunded areas?	Yes	No
Any spills on surface	Yes	No
<u>Inspection Point I: Waste Bunkers</u>		
Condition	Good	Requires attention
Oil cans in General Waste Bunker?	Yes	No
<u>Conveyor Drift</u>		
Oil Level in Waste oil tank	High	Medium
Conveyor Drift sump Level	High	Medium
Compressor Bund	High	Medium
<u>LDP001</u>		
Does the LDP001 V-Notch weir require cleaning?	Yes	No

<u>CHP Stockpile Perimeter Drain</u>			
Does the perimeter drain require cleaning?	Yes		No
<u>Haul Road Drive in Sumps</u>			
North Sump Level	High	Medium	Low
South Sump Level	High	Medium	Low
<u>Way-Bridge Sumps</u>			
North Sump Level	High	Medium	Low
South Sump Level	High	Medium	Low
Washery Sump Level	High	Medium	Low
<u>Levees adjacent Weighbridge Dam</u>			
Do the integrity of the Levees look stable?	Yes		No
<u>Sewerage and Grey Water</u>			
Are there any leaks around tanks?	Yes		No
Does everything seem to be in working order?	Yes		No
<u>Water Tank (End of month only)</u>			
Valve Condition	Good		Requires Attention
<u>Sewage Maturation Point (End of month only)</u>			
Does the maturation Pond appear to be in working order?	Good		Requires Attention
Is maintenance work required?	Yes		No
Level in Pond	High	Medium	Low
Is the sludge level visible?	High	Medium	Low
<u>Weed & Pest Management</u>			
Area(s) Inspected			

Is any eradication required?	Yes	No
Details:		
<u>Comments / Actions Required</u>		

<u>Comments / Actions Required</u>

EWP-013 SUBSIDENCE INSPECTION

Purpose

The purpose of this procedure is to detect and monitor surface cracking and sink holes due to subsidence. This procedure incorporates the requirements of the following documents for environmental impact and public safety:

- Awaba Colliery Water Management Plan, Section 6.3.3 Watercourse Stability;
- Awaba Colliery Sinkhole Management Plan, Section 4.1 Inspections;
- Newstan Complex Mining Operations Plan Trigger Action Response Plan, Element 6 Mine Subsidence; and
- Newstan Colliery Water Management Plan Section, Section 4.1 Inspections.

Location

Attachment 1 – Plans (AW2248 and NS3402) identify existing sinkholes and subsidence cracks at Awaba Colliery and the Newstan Colliery Extension Lease Area, including a predicted area of potential sinkholes using depth of cover (less than 30m) and drainage lines.

Frequency

Inspections are undertaken:

- Frequently following rehabilitation; and
- Quarterly triggered by a pulse work order.

Resources

- Appropriate PPE;
- First Aid Kit;
- Appropriate water supplies;
- Mobile telephone;
- Plan AW2248; and
- Danger/No Road Tape.

Procedure

Subsidence Inspections					
	JOB STEPS		HAZARDS & RISKS		CONTROLS
1	Notify Newstan Control Room - you are completing the subsidence inspection	1.1	Unknown location in an emergency situation	1.1.1	Verbally notify subsidence inspection is being undertaken
				1.1.2	Provide map location of where inspection will be undertaken and time of return
				1.1.3	Carry mobile phone
2	Travelling to subsidence inspection area	2.1	Vehicle collision	2.1.1	Drive slowly and to the conditions
				2.1.2	Engage in 4WD in wet conditions
				2.1.3	Avoid any obstacles
		2.2	Road subsidence	2.2.1	Vigilant of road conditions
				2.2.2	Carry Danger/No Road tape
				2.2.3	Install Danger/No Road tape to demarcate restricted access
2	Inspection of creek lines	2.1	Slips, trips, falls (including unidentified cracks or holes)	2.1.1	Eyes on path
				2.1.2	Avoid any obstacles
				2.1.3	If cracking identified place flagging tape around crack and GPS location
				2.1.4	Carry first aid kit on person
				2.1.5	Plan of inspection area
		2.2	Bites / Stings	2.2.1	Carry first aid kit on person
				2.2.2	Wear enclosed footwear and long pants
		2.3	Bushfires	2.3.1	Inspection date to change if bushfires are in the area
				2.3.2	RFS Fires Near Me App
		2.4	Weather exposure	2.4.1	Carry adequate water
				2.4.2	Apply and carry adequate sunscreen
		2.5	Public safety risk	2.5.1	Carry Danger/No Road tape
				2.5.2	Install Danger/No Road tape to demarcate restricted access
3	Travelling - from subsidence inspection area	3.1	Vehicle collision	3.1.1	Drive slowly and to the conditions
				3.1.2	Engage in 4WD in wet conditions
				3.1.3	Avoid any obstacles
4	Notify Newstan Control Room - you have returned to site	4.2	Unknown returned to site	4.2.1	Verbally notify of return
5	Report of new subsidence locations	5.1	Areas not communicated to Mine Manager	5.1.1	Complete Incident Report Form
		5.2	Areas not communicated to Mine Surveyor	5.1.1	Provide GPS location and photographs to Mine Surveyor
		5.3	Improper external reporting	5.2.1	Notify Resources Regulator in accordance with Awaba Colliery Sinkhole Rehabilitation Plan, Section 7.3 Reporting including: locality, dimensions, features

Subsidence Inspection Checklist		
Date		
Name/s		
24 Hour Rainfall		
Monthly Rainfall		
Site Name - AW2248 Location		
Previous Inspection Date and Actions		
Rehabilitated Sinkholes		
Inspection Item	Checked Y/N	Comments
Evidence of further subsidence		
Erosion or sedimentation		
Integrity of graded banks, diversion drains, waterways		
Vegetated cover (description, ground cover %)		
Natural regeneration of native species		
Weed species present		
General stability		
Other		
Actions		

New Surface Cracking or Sinkholes		
Inspection Item	Checked Y/N	Comments
Description		
Step change in Bed		
Damage to drainage channels		
Ponding, including out-of-channel		
Other		
Actions		
Tracks Inspection		
Inspection Item	Checked Y/N	Comments
Identification of subsidence signage		
Surface Cracking		
Step change in track surface		
Other		
Actions		

Audit & Review

This Procedure will be reviewed every 3 years.

Review

Were there any hazards associated with the task that were not identified by the procedure?

Can the procedure be improved or does it need review/updating?

YES	NO

Comments

Aspect	Normal	Stage 1	Stage 2	Notifications
Surface subsidence associated with the Awaba mine void.	Subsidence levels are within predictions (90-135 mm subsidence).	Trigger: Subsidence levels more than 1.5 times greater than predicted values (>202 mm subsidence) Action: Undertake visual monitoring of watercourses to identify any instabilities that may have formed. If an instability is identified: - Investigate the factors contributing to the instability, which may include advice from technical specialists. - Undertake additional monitoring (e.g. watercourse stability, water quality, aquatic ecology) where relevant. - Implement corrective actions as required as soon as practicable to stabilise the surface and/or watercourses based on the outcomes of the investigation. Prioritise actions based on the risk to the environment and likelihood of further impact. - Review WMP and related procedures to prevent reoccurrence.	Trigger: Total plug failure (2.5 m subsidence) Action: - Immediate inspection of area as soon as practicable following failure event (Environment and Community Coordinator is also to inspect for impacts to watercourses, ecology (threatened flora and fauna) and archaeology) - The location of the hazard areas is to be mapped to suitable accuracy - Initiate remedial works process as soon as practicable - A suitably qualified surface water specialist will undertake an assessment of any potential issues to creeks and make recommendations to remediate the affected area; - A suitably qualified ecologist will undertake an assessment of any potential impact to downstream GDEs and other potential impacts to threatened flora and fauna by the proposed remedial works; - A suitably qualified archaeologist will undertake an assessment of	Stage 1: Notify Environment and Community Coordinator/Mine Manager immediately. Stage 2: Report to management and principal subsidence engineer immediately. Notify relevant agencies in accordance with PIRMP requirements or if material harm has occurred.

Aspect	Normal	Stage 1	Stage 2	Notifications
			any potential Aboriginal heritage aspects for the proposed works. • Remediation works are to be carried out to Awaba Colliery environmental standards and in accordance with the specific recommendations of specialist ecology and archaeology reports • Report to Principal Subsidence Engineer and implement any further recommendations.	

Appendix E

Trigger action response plan

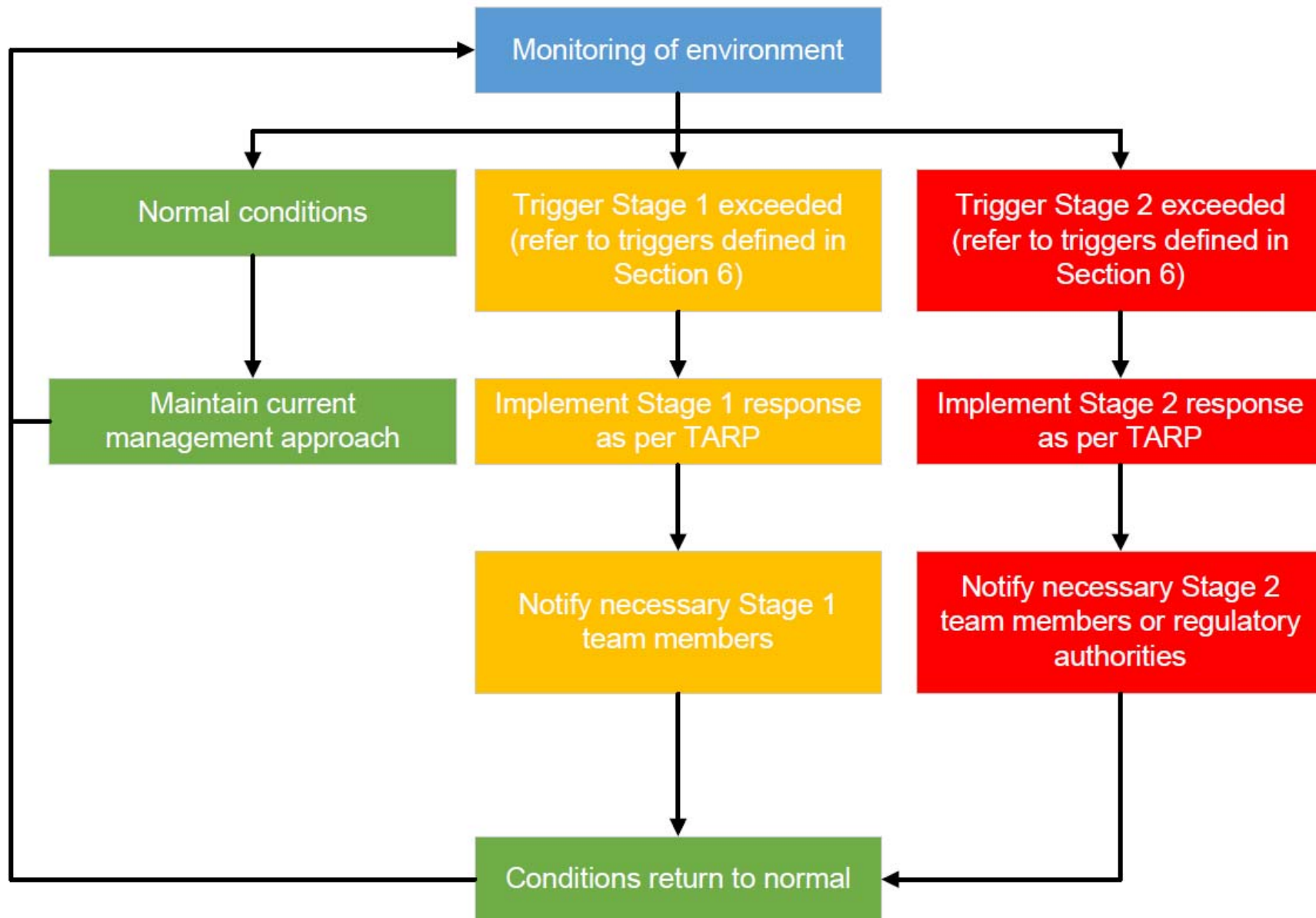


Table E-1 Trigger Action Response Plan

Aspect	Normal	Stage 1	Stage 2	Notifications
Groundwater level	Depth to groundwater is less than groundwater level triggers specified in Table 6-2.	Trigger: Depth to groundwater exceeds the groundwater level triggers specified in Table 6-2 at one or more monitoring locations. Action: Undertake investigation to determine if the change in groundwater level is due to mining-related activity.	Trigger: Investigation into Stage 1 trigger identifies that trigger exceedance is due to mining-related activity and is outside predictions from the groundwater model and impact assessment. Community complaint to Centennial Newstan regarding groundwater levels Action: Verify if monitoring results are consistent with hydrogeological modelling predictions and consider recalibration of the model. If impacts in any identified GDEs are unacceptable, then mitigation measures will be considered. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial Newstan. Where monitoring indicates any adverse impacts due to mining, implement remediation strategy to the satisfaction of DPIEW	Stage 1: Notify Environment and Community Coordinator/Mine Manager. Stage 2: Notify DPIE, DPIEW and any potentially affected landholders as soon as practicable.

Aspect	Normal	Stage 1	Stage 2	Notifications
Groundwater quality	Groundwater quality within or below values specified in Table 6-3.	Trigger: Groundwater quality is outside or above the values specified in Table 6-3 for at least one parameter for two consecutive sampling events. Action: Undertake investigation to determine if the change in groundwater quality is due to mining-related activity.	Trigger: Investigation into Stage 1 trigger identifies that trigger exceedance is due to mining-related activity. Community complaint to Centennial Newstan regarding groundwater quality. Action: If environmental impacts are unacceptable and/or if the beneficial use of the groundwater changes, remediation options will be considered. Loss of water supply to any adjacent landholder due to mining-related activities will need to be replaced by Centennial Newstan. Where monitoring indicates any adverse impacts due to mining, implement remediation strategy to the satisfaction of DPIEW	Stage 1: Notify Environment and Community Coordinator/Mine Manager. Stage 2: Notify DPIE, DPIEW and any potentially affected landholders as soon as practicable.
Underground water level/ LDP017 discharge	FUS water level is below 4.4 m AHD No discharges from LDP017	Trigger: FUS water level reaches 4.4 m AHD Action: Investigate storage operation and dewatering procedures. Undertake dewatering of relevant storages to areas where capacity exists. Training for staff.	Trigger: Discharge occurs from LDP017. Action: Investigate storage operation and dewatering procedures. Undertake dewatering of relevant storages to areas where capacity exists. Training for staff.	Stage 1: Notify Environment and Community Coordinator/Mine Manager as soon as practicable. Stage 2: Notify relevant agencies if material harm has occurred. Notify DPIEW if exceedance of limit occurs.
Underground water level	FUS water level is above 27 m bgl (or -4	Trigger: FUS water level is below 27 m bgl (or -4 m AHD).	Trigger: Clean water plant experiences operational difficulties to water quality.	Stage 1 and 2: Notify Environment and

Aspect	Normal	Stage 1	Stage 2	Notifications
	m AHD)	Action: Ensure Fassi bore pumps have stopped.	Action: Investigate storage operation and dewatering procedures.	Community Coordinator/Mine Manager as soon as practicable.
Surface water quality	Water quality sat surface water monitoring locations is within trigger values provided in Table 6-1	Trigger: Water quality is outside trigger values provided in Table 6-1 or not consistent with historical baseline for at least one parameter for two consecutive sampling events. Action: Review recent monitoring results and any relevant operational data (e.g. operational activities, meteorological data) and identify any potentially contributing factors. Investigate the source of the exceedance and develop corrective/preventative actions based on the outcomes of the investigation.	Trigger: Investigation into Stage 1 trigger identifies that trigger exceedance is due to operational activity. Community complaint to Centennial Newstan regarding surface water quality. Action: Determine if an incident has potentially occurred. Increase monitoring frequency and undertake additional monitoring where relevant. Implement corrective/preventative actions, in consultation with relevant agencies, based on the outcomes of the investigation and/or additional monitoring. Prioritise actions based on the risk to the environment and likelihood of further impact. Review the WMP and related procedures to prevent reoccurrence.	Stage 1: Notify Environment and Community Coordinator/Mine Manager as soon as practicable. Stage 2: Notify relevant agencies if material harm has occurred. Notify DPIEW as soon as practicable if Stage 2 exceedance is found to be mining-related.
Aquatic Ecology	ANZG (2018) weight of evidence approach indicates no significant effects attributable to the project.	Trigger: Weight of evidence assessment indicates possible adverse effects associated with mining-related activity. Action: Undertake further investigation to determine if the effects are the result of mining activities and the significance of	Trigger: Weight of evidence assessment and/or investigation into stage 1 trigger indicates significant adverse effects associated with mining-related activity. Action: If the effects on aquatic ecology are unacceptable remediation options, including grouting of subsidence fractures, will be considered.	Stage 1: Notify Environment and Community Coordinator/Mine Manager. Stage 2: Notify DPIE, DPIEW as soon as practicable.

Aspect	Normal	Stage 1	Stage 2	Notifications
		the effects.		
Watercourse instabilities	Watercourse monitoring indicates no areas of instabilities.	Trigger: Watercourse monitoring indicates one or more areas of instabilities in watercourses. Action: Review historical monitoring records. Investigate the factors contributing to the instability, which may include advice from technical specialists. Implement corrective actions as required as soon as practicable to stabilise the surface and/or watercourses based on the outcomes of the investigation. Increase monitoring frequency and undertake additional monitoring where relevant.	Trigger: Watercourse monitoring indicates one or more areas of instabilities in watercourses causing sediment loads to migrate and or impact to riparian vegetation. Action: Immediately isolate areas of instability and implement remediation measures to stabilise surface and/or watercourse. Investigate the factors contributing to the instability, which may include advice from technical specialists. Implement corrective/preventative actions based on the outcomes of the investigation and/or additional monitoring. Prioritise actions based on the risk to the environment and likelihood of further impact. Increase monitoring frequency and undertake additional monitoring where relevant. Review the WMP and related procedures to prevent reoccurrence. Where monitoring indicates any adverse impacts due to mining, implement remediation strategy to the satisfaction of DPIEW	Stage 1: Notify Environment and Community Coordinator/Mine Manager as soon as practicable. Stage 2: Notify relevant agencies if material harm has occurred. Notify DPIE as soon as practicable if Stage 2 exceedance is found to be mining-related.