Environmental Management System

Rix's Creek Mine

WATER MANAGEMENT PLAN

Doc No:	Water Management Plan
Doc Owner:	Environment Manager – Rix's Creek Pty Ltd
Approval:	Group Environmental Manager – The Bloomfield Group
Signed:	C Knight
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Revision	Issue Date	Description	Originator	Reviewed	Approved
1.1	18/01/2018	Draft for client review	Matt Thompson	Damien Janssen	Garry Bailey
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2.1	18/04/2018	Final with minor revisions	Matt Thompson	Damien Janssen	Chris Knight
2.2	18/04/2018	Minor revisions and updated plans	Chris Quinn	Chris Knight	Chris Knight
2.3	02/11/2018	Addressing NRAR comments	Damien Janssen	Chris Quinn	Chris Knight
2.4	17/05/2019	Greater Ravensworth Area Water Transfer Scheme	Chris Knight	Chris Quinn	Chris Knight
2.5	18/08/2020	Updated for SSD 6300 and DA 49/94 IEA RTR	K Blaikie Hansen Bailey Paul Ryall AGE	D Munro Hansen Bailey	Chris Knight
2.6	20/01/2021	Update in response to DPIE request for information. + Update in response to Auditors recommendation RCS, RCN IEA.(2020).	Chris Knight	Chris Quinn	Chris Knight
2.7	10/03/2021	Update in response to RFI from DPIE	Chris Quinn	Chris Knight	Chris Knight
2.8	17/5/2021	Update Following RCN Mod 9 and 2020 Annual Review	Chris Knight	Chris Quinn	Chris Knight

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1 Introduction

Rix's Creek Mine (RCM) is an open cut coal mine owned and operated by The Bloomfield Group (Bloomfield). RCM comprises the original Rix's Creek Mine, now known as Rix's Creek South (RCS) and the former Integra Open Cut Project Mine now known as Rix's Creek North (RCN).

RCM is located approximately 5 to 10 km north-west of Singleton both east and west of the New England Highway (NEH) (**Figure 1**).

This Water Management Plan (WMP) forms part of a series of Environmental Management Plans for RCM and is the primary tool that will be utilised to manage water around RCM.

1.1 Background

Approved operations within RCM are shown on **Figure 2** and **Figure 3** and include:

- For the Rix's Creek South Mine: North Pit, Pit 2 and Pit 3 (also known as West Pit), rail loadout infrastructure (approved but not constructed) and CHPP; and,
- For the Rix's Creek North Mine: the North Open Cut, South Pit, the Extended South Pit (Western Extension), CHPP and the rail loadout infrastructure.

Relevant infrastructure associated with RCM includes open cut pits and mobile plant, CHPP, rail loading infrastructure, tailings dams and associated clean, dirty, mine and contaminated water storage facilities.

The entire site is known collectively as the Rix's Creek Mine; however, as the two mines have separate development approvals and licences, it is necessary to refer to the two parts of RCM separately.

Rix's Creek Mine is registered with the Hunter River Salinity Trading Scheme, however is a non-discharge site and does not hold any credits under the scheme. Excess saline Mine water is pumped, as required, to Integra Underground, where it is further pumped into the Greater Ravensworth Area Water Sharing Scheme (GRAWSS) as authorised under EPL 3391 and in accordance with RCN MP 08_0102 Schedule 3 Condition 35 Table 13 to "*Maximise water sharing with other mines in the region.*"

1.1.1 RCN

Operations at RCN commenced in 1991 as the Camberwell Coal Project. The original North and South pits have been completed and backfilled, with the areas being mostly rehabilitated. Mining in the Falbrook Pit was approved in 2008 under Development Approval (DA) 06_0073, and extension of the Camberwell Pit was approved in 2010 under Project Approval (PA) 08_0102, which consolidated all previous approvals.

PA 08_0102 was granted on 26 November 2010 has been modified on nine occasions, allows mining operations to 31 December 2035 for the following:

- Falbrook Pit (previously known as North Open Cut) and associated overburden emplacement areas (OEA). Falbrook Pit is located between the RCN tailings storage facilities and a major mine water storage dam (Possum Skin Dam);
- Camberwell Pit (previously known as South Pit) and associated OEAs;
- RCN Coal Handling and Processing Plant (CHPP) which can also be used to wash coal from RCS and stockpiles;
- Rail loop and rail loadout facilities; and
- Associated maintenance and administration buildings.

RCN was purchased by Bloomfield in 2015. Prior to the purchase, the open cut operation was in care and maintenance, with no mining operations taking place on the site. Bloomfield recommenced operations in the Camberwell Pit in 2016. The Falbrook Pit is currently utilised for temporary water storage.

1.1.2 RCS

Operations at RCS commenced in 1990. Mining has been completed in the original Pit 1 and Pit 2 areas on the east side of the New England Highway (NEH), which have been mostly backfilled and rehabilitated. RCS received approval for SSD 6300 on 12 October 2019 which allows expansion of the West Pit north away from Singleton.

RCS is approved under SSD 3600 until 12 October 2040 for the following operations:

- West Pit (previously known as Pit 3) and associated OEAs;
- RCS CHPP which can also be used to wash coal from RCN;
- Tailings Storage Facility;
- Train loading facility located on the RCN rail loop and clean coal stockpiles; and
- Associated maintenance and administration buildings.

Figure 1
Locality

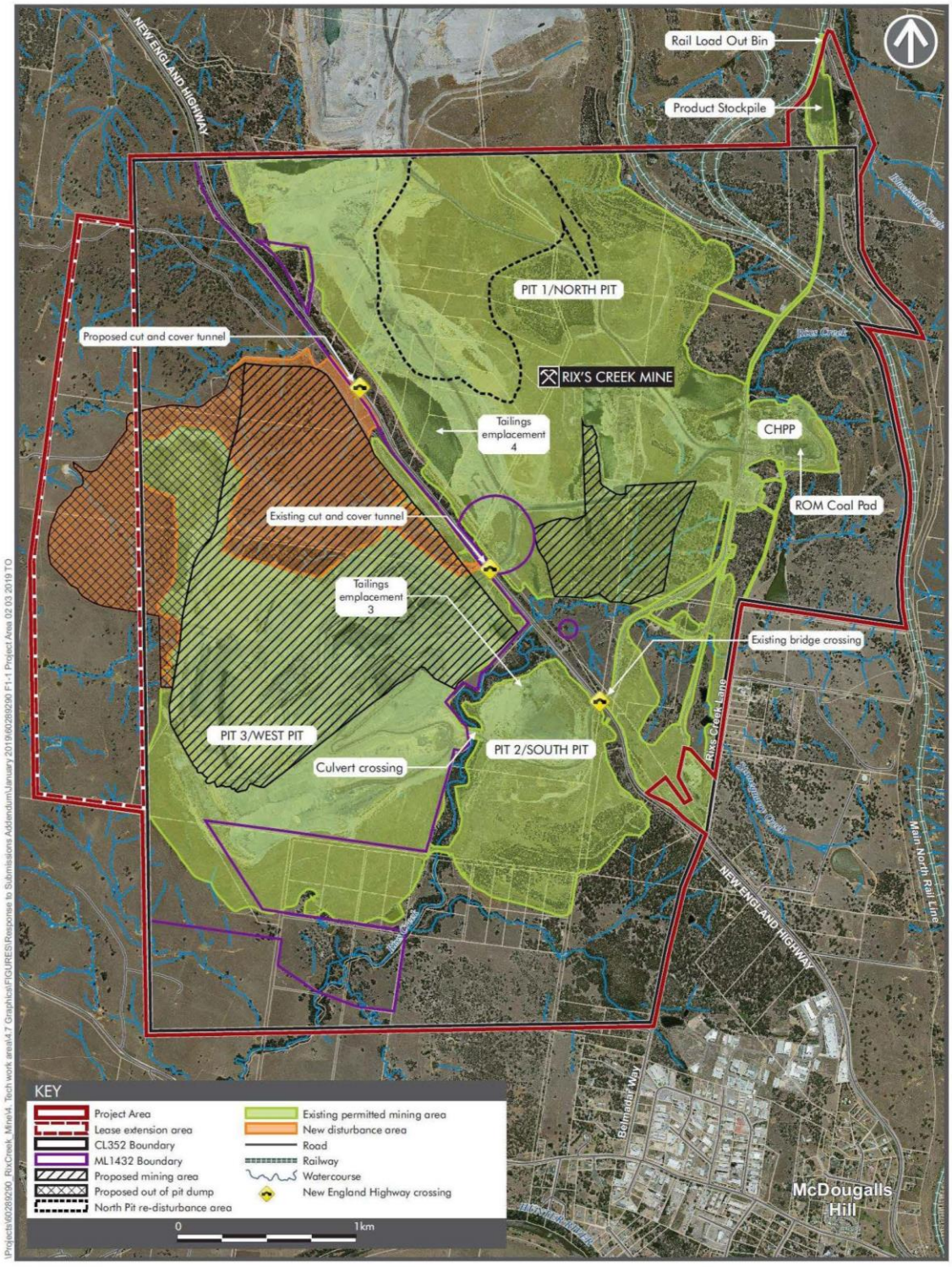

Figure 2
Conceptual Approved Rix's Creek South Mine

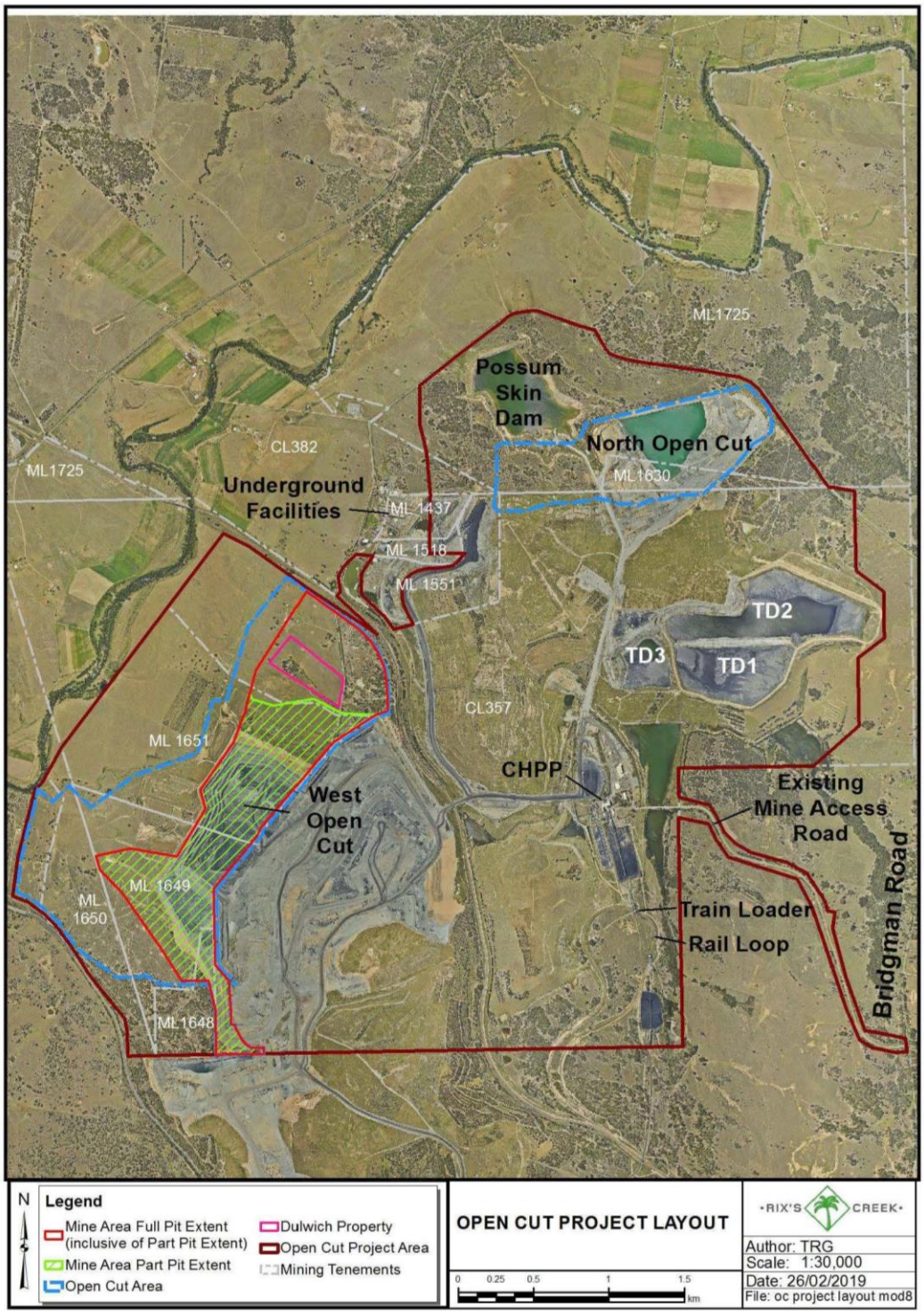

Figure 3
Conceptual Approved Rix's Creek North Mine

1.1.3 Water Management at RCM

With the acquisition of RCN and associated infrastructure, including all dirty and clean water management infrastructure, water management across both the RCN and RCS areas have been integrated. This WMP ensures statutory compliance to particular approvals for relevant areas, while also enabling flexibility in water management outcomes by enabling the movement of water between the northern and southern areas to better utilise water resources and optimise operational activities.

1.2 Local Setting

RCM is located in the Hunter Valley region of New South Wales (NSW), northwest of Singleton and southeast of Camberwell (see **Figure 1**).

The area surrounding RCM typically comprises various open cut and underground coal mining operations, agricultural operations, industrial and commercial activities and a mix of rural residences and urban residential areas.

The majority of land to the north-west of RCM is owned by Mount Owen and Ashton mines. The highest density of private residences is located to the south-east and an industrial precinct is located to the south of RCM. The private residences are more sparsely located in areas to the west, north and northeast.

1.3 Document Structure

The WMP is structured as follows:

Section 2: Outlines the statutory requirements applicable to the WMP.

Section 3: Details the Stakeholder Consultation undertaken for this WMP.

Section 4: Outlines the water management system and water balance.

Section 5: Outlines the surface water management plan.

Section 6: Describes the surface water management measures.

Section 7: Outlines the groundwater management plan.

Section 8: Describes the groundwater management measures

Section 9: Describes the management and reporting of incidents, complaints and non-compliances.

Section 10: Provides details for the review and improvement of the WMP.

Section 11: Provides a summary of responsibilities relevant to this WMP.

Section 12: Provides the references cited in the WMP.

2 Statutory Requirements

RCM has a Water Management System (WMS), which includes a mine dewatering scheme, water storages, sediment dams, tailings storage facilities, pumps and pipeline infrastructure, drains and earthen bunding around stockpiles, hardstand areas, haul roads and refuelling areas. The way in which this WMS is operated is guided by the approved WMP, which integrates both statutory and operational requirements of water management.

The following comprises a summary of statutory requirements and functions relevant to this WMP:

- Satisfy regulatory requirements, including meeting required performance criteria;
- Divert clean water around mining operations to minimise capture of upslope runoff and separate clean water runoff from mining activities;
- Segregate mine impacted water and runoff from undisturbed and revegetated areas with better water quality to minimise the volume of mine impacted water that requires reuse;
- Reuse mine impacted water within the WMS to reduce reliance on raw/clean water; and
- Avoid adverse effects on downstream waterways (including hydraulic and water quality impacts).

2.1 Development Consent Conditions

The specific requirements under PA 08_0102 and SSD 6300 for water management and the WMP and where each condition is addressed in this plan are provided in **Appendix A**.

Schedule 5 Condition 3 of PA 08_0102 allows existing approved management plans to remain in place until an updated version is approved.

The WMP is inclusive of the following:

- Site Water Balance;
- Erosion and Sediment Control Plan;
- Surface Water Management Plan;
- Groundwater Management Plan;
- Salt Balance (SSD 6300); and
- Surface Water and Groundwater Response Plan (PA 08_0102).

Under Schedule 3 Condition 35 of PA 08_0102 and Condition B39 of SSD 6300, Bloomfield is required to comply with the performance measures detailed in Table 13 of PA 08_0102 and Table 4 of SSD 6300. These performance measures are presented in **Appendix B**.

Condition B40 of SSD 6300 states that:

> "*The performance measures in Table 4 do not apply to water management structures constructed under previous consents.*"

2.2 Development Consent Commitments

Appendix C (Table C1 and Table C2) lists the water management commitments made in the *Environmental Assessment Integra Open Cut Project* (URS, 2009) (Integra EA) (and subsequent SEEs) and the *Rix's Creek Continuation of Mining Environmental Impact Statement* (AECOM, 2015) (RCS EIS) and indicates where each is addressed in this WMP.

2.3 Environmental Protection Licence

The *Protection of the Environment Operations Act 1997* (POEO Act) is the principal piece of legislation governing water management in NSW. The POEO Act requires an Environmental Protection Licence (EPL) be held for mining operations such as the Rix's Creek Mine.

Bloomfield operates under EPL 3391. Conditions P1, L1, M2, R4 and R5 of the EPL detail the water management requirements (as at April 2020), and all activities at RCM are conducted in accordance with these requirements.

A copy of EPL 3391 can be found on the Bloomfield public website:

(https://www.bloomcoll.com.au/sustainability/environmental-management/rixs-creek-assessments/environment-protection-licence).

2.4 Water Licencing

Bloomfield holds licences under the *Water Act 1912* and the *Water Management Act 2000* for the operation of extraction and monitoring bores relevant to the site. Water licences applicable to mine dewatering of the open cut operations, surface water extraction and groundwater monitoring are summarised in **Appendix D**.

Bloomfield will ensure that relevant licences are obtained, renewed or upgraded as required throughout the life of the site to ensure compliance with the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* and the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*..

2.5 Plan Objectives & Performance Criteria

The primary objective of the WMP and their associated performance criteria are presented in **Table** 1.

Table 1
RCM Planned Objectives, Performance Criteria & Performance Measures

WMP Objectives	Performance Criteria and Measures
Compliance with legislative requirements	• No unlicensed discharges from RCM • Compliance with all conditions of the Water Licences • Compliance with the EPL discharge conditions
Support procedures to manage and monitor surface and groundwater associated with the site	• All relevant surface and groundwater quality criteria are achieved • Disturbed areas are rehabilitated and revegetated as soon as practicable and become a source of clean runoff • Surface and groundwater monitoring program undertaken to meet EPL requirements • Monitoring program results comply with EPL limits • Minimise unlicensed discharges from RCM • All water management facilities are in locations that minimise impacts to the natural ecosystems • Management measures, including regular inspections, are implemented to prevent the accidental discharge of process water, disturbed area runoff or contaminated water • Monitoring is conducted to confirm the WMS is operating as designed and meets target criteria, licence conditions and commitments made during the approval process
Encourage water reuse and recycling on site	• Maximum use is made of process water for dust suppression and other mining-related purposes • Process water is preferentially sourced from the poorest water sources within the project area. Saline water will be used preferentially to sediment-laden water • The reliability of the water supply for coal processing and other site mine-related purposes is maximised • Process water can be transferred between key process water storages
Provide management mechanisms to minimise the potential for surface water on the site to cause offsite impacts and ensure clean water is diverted about active mining areas where possible	• Clean water within the mine site is diverted away from disturbed land or is directed to flow to Glennie's Creek or Rix's Creek, wherever practicable • A facility is provided to export excess water, when available, to other mining operations

WMP Objectives	Performance Criteria and Measures
	• Any impacts on the availability of surface water or groundwater to surrounding residents, landholders or the environment are minimised • Management measures, including regular site inspections, are implemented to prevent the accidental discharge of process water, disturbed area runoff or contaminated water •
Provide management mechanisms to minimise the potential for the Rix's Creek Mine operations to impact upon the hydraulic and chemical properties of the groundwater in the coal measures and alluvium in the vicinity of the operational pits	• Any impacts on the availability of surface water or groundwater to surrounding residents, landholders or the environment are minimised • Management measures, including regular site inspections and monitoring is conducted to confirm the WMS is operating as designed and meets target criteria, licence conditions and commitments made during the approval process
Ensure clean water is diverted away from the mining area wherever possible	• Erosion and sedimentation from all active and rehabilitated areas of the site is minimised • Areas producing potentially contaminated water such as hardstand, refuelling, lubricating or workshop areas are to be separated from other catchments, resultant drainage collected and treated, if required, before re-use on site
Ensure sediment-laden water is captured and transferred back within the mine water system or if it exceeds the capacity of the system, is treated to meet the required criteria prior to releasing	• Total on site containment of process water is sufficient to contain an average recurrence interval (ARI) rainfall event of 1 in 100 years (ARI100)
Ensure that water captured within the mine water management system (stormwater runoff and groundwater) or water transferred into this system is managed efficiently and appropriately	• Water conveyance infrastructure (such as diversion drains for disturbed area runoff) designed to accommodate a 20-year ARI rainfall event

3 Stakeholder Consultation

3.1 Department of Planning, Industry and Environment

3.1.1 SSD 6300 Conditional Requirements

Condition B41(c) of SSD 6300 requires Bloomfield to submit the WMP to the Secretary of DPIE (Planning Secretary) for approval within six months of commencing development.

The final WMP was submitted to DPIE for approval on 18/8/2020.

A copy of regulatory correspondence is provided in **Appendix E**.

3.1.2 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires approval of the WMP by DPIE.

3.2 DPIE Water

3.2.1 SSD 6300 Conditional Requirements

In accordance with Sch.2 Condition B41 (b) of SSD 6300 the draft WMP was provided to DPIE Water on 10 July 2020 for consultation and comment via the Major Projects Portal. In its response dated 13 July 2020, DPIE Water requested that the plan be sent to Natural Resource Access Regulator (NRAR) for comment. TBG requested consultation by NRAR through the Major Projects Portal on 10 July 2020.

At the date of submission of this Plan to DPIE, NRAR have not provided a response on the Plan. A copy of this correspondence is provide in **Appendix E.**

3.2.2 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires endorsement of the WMP by DPIE Water. Correspondence sent on 18/9/2018 requested review and approval of the Rix's Creek WMP. At this stage no response has been received from this agency. A copy of this correspondence is included in **Appendix E**.

3.3 Environment Protection Authority

3.3.1 SSD 6300 Conditional Requirements

In accordance with Sch.2 Condition B41 (b) the draft WMP was provided to the Environmental Protection Authority (EPA) on 10 July 2020 for consultation and comment via the Major Project Portal. In its response dated 24 July EPA noted that while they encourage the development of Environmental Management Plans they do not offer comments in relation to the plans. A copy of this correspondence is provided in **Appendix E.**

3.3.2 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires consultation during preparation of the WMP with NSW EPA. Correspondence was sent on 18/9/2018 requesting review and comment of the Rix's Creek WMP. At this stage no response has been received from this agency. A copy of this correspondence is included in Appendix E.

3.4 Resources Regulator – (previously DRG)

3.4.1 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires consultation during preparation of the WMP with the Resources Regulator. Correspondence was sent on 18/9/2018 requesting review and comment on the Rix's Creek WMP. At this stage no response has been received from this agency. A copy of this correspondence is included in Appendix E.

3.5 DPIE Biodiversity Conservation Division (previously OEH)

3.5.1 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires consultation during preparation of the WMP with the DPIE Biodiversity Conservation Division. Correspondence sent on 18/9/2018 requested review and comment on the Rix's Creek WMP. At this stage no response has been received from this agency. A copy of this correspondence is included in Appendix E.

3.6 Singleton Shire Council

3.6.1 PA 08_0102 Conditional Requirements

Schedule 3, Condition 36 of PA 08_0102 requires consultation during preparation of the WMP with Singleton Shire Council. Correspondence sent on 18/9/2018 requested review and comment on the Rix's Creek WMP. At this stage no response has been received from this agency. A copy of this correspondence is included in Appendix E.

4 Operational Water Management

4.1 Mine Water Management System

The WMS is a network of infrastructure (i.e. dams, pipelines, contours) to control the movement of water around the site and prevent unscheduled release off site. The RCM WMS (as of 2020) is depicted conceptually on **Figure 4** and shown on **Figure 5**. Future changes to the site water management system will be updated (if required) in the WMP as discussed in **Section 10.4**. Water is managed according to type. Water type is determined by catchment area, quality and use.

The main types of water managed at RCM include:

- Runoff water;
- Saline water;
- Licensed water extraction; and
- Imported Fresh Water (when required).

The goals of the mine water management system are to:

- Divert natural catchment runoff around the mine site where practical.
- Maintain site workability by the capture and storage of pit seepage and disturbed area runoff.
- Maximise the usage of stored mine water for process water supply in the CHPP; for dust minimisation on haul roads, trafficable areas and stockpiles.
- Maximise the usage of surplus water and re-cycling across all operations.
- Minimisation of river make-up water during dry and drought periods by: reducing losses to evaporation; harvesting water from licenced diversions on the mine site; forming agreements to import surplus mine water from neighbouring operations.

4.1.1 Runoff Water

Runoff water varies in quality depending on the characteristics of the catchment area. Runoff water is captured or diverted away from the mine water system dependent on quality, climatic conditions and production requirements. Runoff water can be split into four types based of catchments:

- Undisturbed Catchment;
- Unconsolidated/ Disturbed Mine spoil:
- Rehabilitated Mine Spoil; and
- Active & Saline Mining Catchment Areas.

The management of runoff water is discussed in **Section 4.2**.

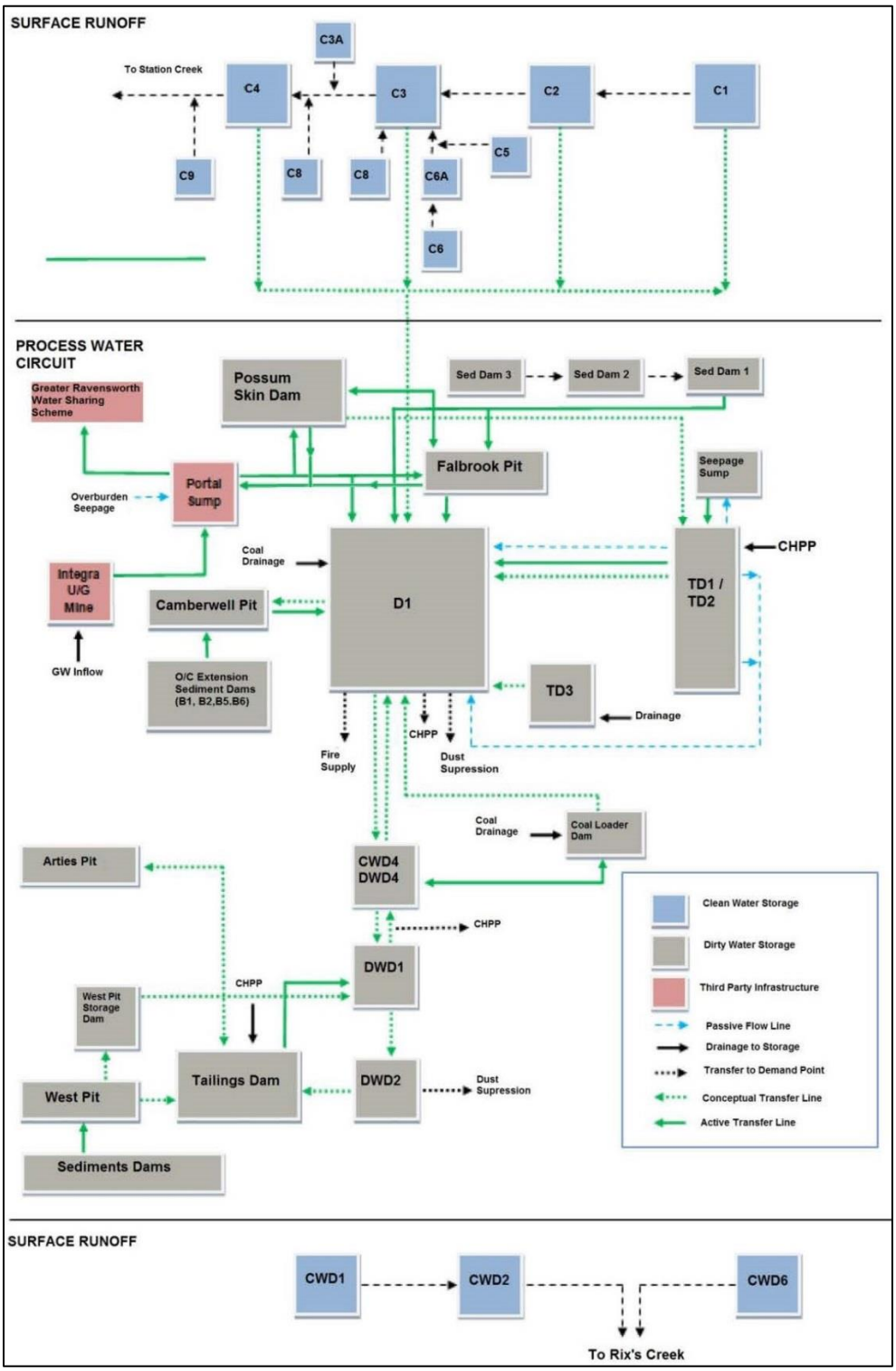

Figure 4
Conceptual Schematic of the RCM Water Management System

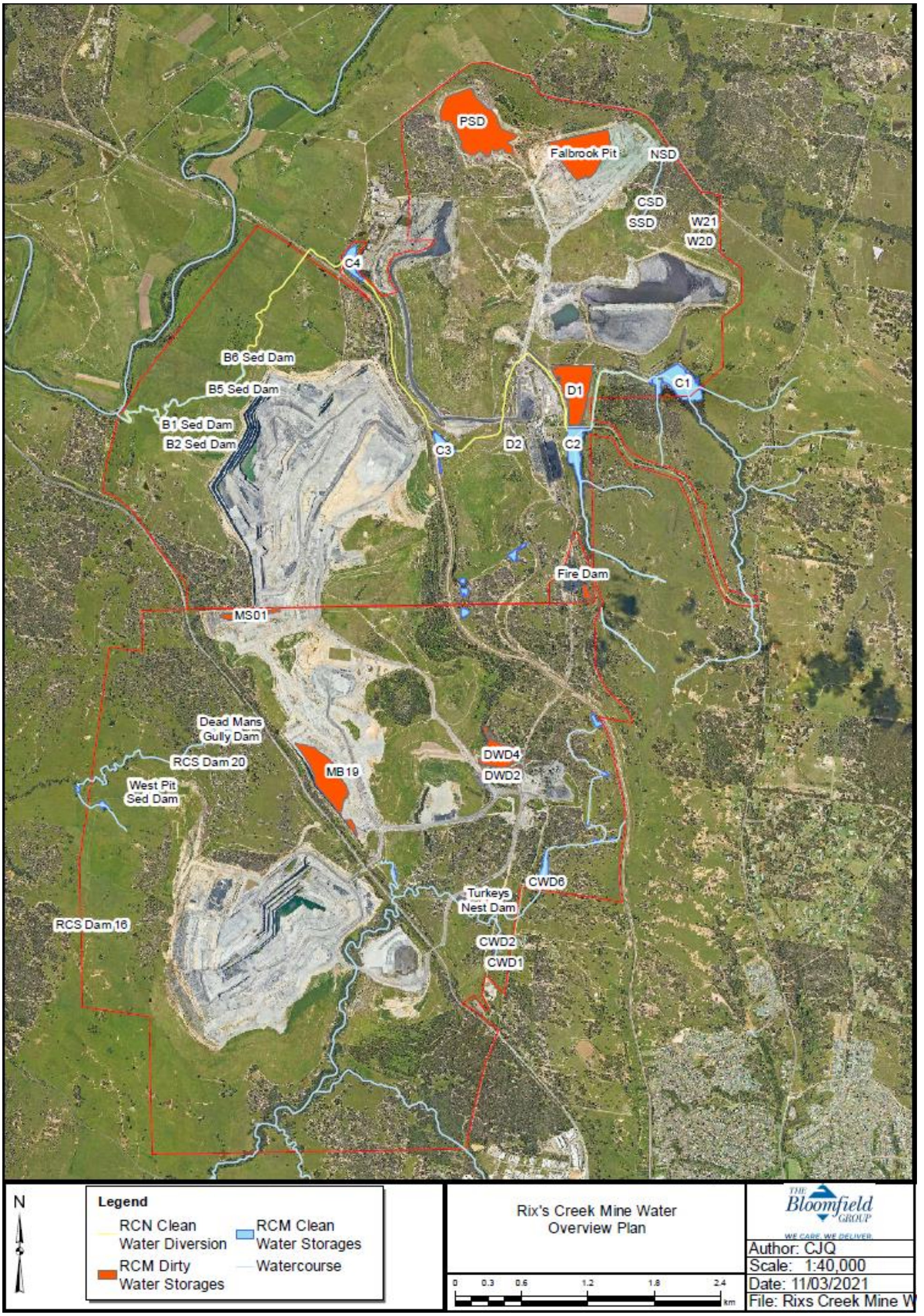

Figure 5
RCM Water Management System

4.1.2 Saline Water

Water used in production on site is predominantly saline due to interaction with high salinity components within coal seams, saline mine spoils and during coal preparation. Saline water cannot be released from site and must be used during processing or stored. The Department of Planning and Environment requires saline water to be stored in facilities which have the capacity to contain runoff from rainfall events up to 1:100 ARI 24-hour duration storm.

There are three main sources of saline water managed at RCM:

- Mine Water (a combination of rainfall runoff, groundwater, spoils and tailings dam seepage)
- CHPP Water Supply
- Tailings Water

RCM does not maintain licensed discharge points to release excess mine water via the Hunter River Salinity Trading Scheme (HRSTS), although this requirement may change as the RCM mining plan is implemented. If found to be necessary in the future, Bloomfield would seek approval to construct a discharge point to allow release of saline mine water and purchase required credits under the HRSTS.

Currently RCM are approved to transfer saline water to Integra and into Glencore's Greater Ravensworth Area Water Sharing Scheme (GRAWSS).

4.1.3 Licenced Water Extraction

At times additional water may be extracted from one of the RCM licenced extraction bores if adequate local supply is not available onsite.

4.1.4 Imported Fresh Water

Currently town water is supplied for bath house and shower /toilet facilities at RCM.

4.1.5 Stream and Riparian Vegetation Health

Rix's Creek

Stone quarry Gully and Rixs Creek are essentially ephemeral streams. Rixs Creek extends from the Hunter River upstream to the New England Highway. Water monitoring data indicates Rixs Creek does not flow for around 8 months of the year, i.e. "No Flow" records are reported about 2/3 of the time in monthly water quality data collected since 1999. No statistical analysis was done of the time distribution of flows, but there is an indication that no apparent seasonality to the data that would justify describing these streams as intermittent.

The stream bed is characterised by reaches of grey silty loam alternating with near horizontal layers of sandstone or jumbled boulders. One section of sandstone bed extended for 350 metres. There are regular nick points in the rock channel, with shelf drops ranging in from 0.2 metres to 0.8 metres, however there are no sills that provide ponding.
The banks consist of mainly grey silty clays with sand and a loamy texture. Except for the diversion below the highway, the stream banks and floodplains are densely wooded (mainly casuarina regrowth) and well vegetated, with trunk diameters regularly exceeding 100 mm. There is evidence of bank vegetation

encouraging deposition at the bank toe, allowing colonising vegetation to encroach further into the channel, especially in the sections constrained by the rock bed.

By managing the dirty water system and diverting clean water run off-site, the Rix's Creek Mine operations significantly reduces the risk of sediment laden spill and mine water spills into the surrounding waterways, and ensures that no adverse effects of downstream water quality within the Glennies Creek or Station Creek are likely to occur.

Glennies Creek

Glennies Creek is a sixth order, Schedule 3 Stream (DIPNR, 2005). Glennies Creek has a permanent, regulated flow however smaller upstream tributaries are ephemeral. Station Creek is an ephemeral stream that links into Glennies Creek. The stream bed is characterised as partially grassed sections made up of predominately loamy textured soils.

In accordance with PA 08_0102 Bloomfield have committed to undertake riparian rehabilitation along Glennies Creek and Station Creek which will include:

- Rubbish removal, complimentary planting, weed control, habitat enhancement and exclusion of grazing stock from riparian areas; and
- A monitoring and management programme to identify and manage noxious weed infestations.

Bloomfield will conduct annual inspections of Rixs Creek and will implement erosion controls/remediation as required, including the exclusion of grazing stock.

4.2 Surface Water Management

4.2.1 Water Categories

Bloomfield categorises water into four types to effectively manage water across RCN and RCS and to mitigate any potential for environmental harm to occur. Each type of water requires different management measures to minimise the risk of contamination of downstream drainage systems. A description of the water quality and potential sources for the four categories of water are summarised in **Table 2**. Water quality is monitored as described in **Section 5.2**.

Table 2
Water Categories & Target Criteria

Water Category	Description	Target Criteria
Clean Water	Runoff from undisturbed or rehabilitated areas where vegetation is fully established and where the water quality is suitable for release/discharge. Also - raw water imported under licence.	Release, where practicable, to downstream environment, in accordance with the POEO Act.
Dirty Water	Runoff from disturbed areas, such as active overburden emplacement areas or overburden emplacement areas where vegetation is not fully established. These areas have the potential for elevated suspended solids (sediment-laden water) but typically have lower salinity.	Managed in line with the Blue Book (Managing Urban Stormwater: Soils and Construction Volume 1 and Volume 2E), and in accordance with the POEO Act
Saline/Mine Water	Runoff from disturbed areas such as mining pits and haul roads. As a result, mine water is typically of higher salinity levels (due to existing resident groundwater quality) than other surface water; these combined i.e. sediment laden water and saline water are collectively known as mine water.	Contained and used during coal processing. Kept separate of clean and dirty water.
Contaminated Water	Water exposed to coal or used in coal processing and runoff within Mining Infrastructure Areas. Mine water includes water associated with groundwater inflows into open cut pits. This water may be highly saline and/or contain pollutants such as hydrocarbons.	Contained for all events. Nil discharge.

4.2.2 Clean Water Management & Drainage

The WMS for clean water includes a series of diversion and catch drains and clean water dams around the perimeter of the operation to capture and maximise diversion of upstream catchment runoff away from active mining areas, as shown in **Figure 5**.

4.2.3 Dirty Water Management

Dirty water will be managed using a series of catch drains and sediment basins located to capture and manage runoff from disturbed areas as shown in **Figure 5**. This will store dirty water separately and limit the potential for sediment laden and contaminated water to mix with other water sources. This will continue to adapt as mining progresses and the disturbed landform develops.

Sediment dams may be dewatered to receiving waters after a rainfall event greater than 50 mm where TSS concentrations and EC are less than the nominated water quality objectives set in **Section 6.2.1**.

4.2.4 Mine Site Surface Water Catchments

Figure 5 shows the surface water management dams. In the RCN area, the eastern portion of the Falbrook Pit area intercepts runoff from the Reedy Creek catchment. Several diversion banks with excavated channels are used to divert clean catchment runoff around or through areas disturbed by mining operations.

In the RCS area, the West Pit is surrounded by natural landforms that slope inwards towards the active mining area which directs any runoff over disturbed areas to flow back towards the pit. Clean water diversion structures have been installed to divert clean water away from active pits in average rainfall conditions.

The catchment areas and diversion structures are progressively changing with the ongoing excavation of approved mining areas and are adapted and maintained to enable the outcomes described above.

The mine water catchments are categorised as:

- **Undisturbed** – areas unaffected by mining operations;
- **Disturbed/Compacted** – these areas include haul roads, hardstand, surface facilities, maintenance and active mining areas within open cut pits and hence will generate much larger volumes of runoff relative to undisturbed catchments;
- **Rehabilitated** – areas covered by overburden material which has been regraded, topsoiled and revegetated; and
- **Spoil** – areas covered by active overburden emplacements.

4.2.5 Surface Water Storages

Ensuring sufficient storage capacity for water provides a buffer against drought and flood interruptions to the business and mitigates unlicensed discharge of polluted water offsite.

Surplus mine water at RCM is stored primarily within the various major dams, sumps, and available pit voids across the mining operations. In addition to the main water storages for mine water there are also smaller dams across the operations that provide buffer storage for production and ancillary demands, as well as acting as sedimentation control.

Clean runoff water is collected across RCM and is stored separate from any dirty water, where sediment is collected prior to creek discharge.

The locations, type and functions of the main water storages in the site are given in **Table 3**, whilst **Table 4** provides details about the entire site's water storages in terms of the type of water stored, the catchment area served by the storage, the maximum surface area and the storage's spill capacity.

Table 3
Main Surface Water Storage Facilities

Name	Location	Description	Function
Rix's Creek North			
Mine Water Dams			
Possum Skin Dam	To the northwest of the Falbrook Pit	• Large dam (evaporative)	• Store mine water for evaporation or use • Provide water for dust suppression • Receive pump out water from dewatering locations
D1	Just east of the northern CHPP	• Primary storage dam for mine water	• Supplies northern CHPP • Used for dust suppression • Future water transfer connection point with the RCS area
Possum Skin Dam Seepage Pond	North of Possum Skin Dam	• Concrete tank	• Return seepage water back to mine when required
Tailings Storage Facilities	North of D1 Dam	• 3 cells of a tailings storage facility	• Receive and store tailings • Return decant water into water circuit • Store small volumes of water when tailings dust control required
Dirty Water Dams			
Sediment Dams 1, 2 and 3	Eastern end of the Falbrook Pit	• Small sediment dams	• Collect disturbed area surface runoff
B1, B2, B5 and B6	West of the Extended Camberwell Pit (Western Extension)	• Small sediment dams	• Collect sediment runoff from stripped areas and topsoil stockpiles

Name	Location	Description	Function
Clean Water Dams			
Small-medium Farm Dams	Throughout RCN area	• Small earthen wall dams on minor drainage lines	• Collect surface runoff • Independent – not part of Mine Water Management System
Rix's Creek South			
Mine Water Dams			
North Pit Storage/Old North	West of CWD4	• Primary storage dam for mine water	• Central repository for mine water • Supplies CHPP • Used for dust suppression
West Pit Storage	North of the RCS area Tailings Dam	• Primary storage dam for mine water	• Central repository for mine water • Supplies CHPP • Used for dust suppression
Tailings Storage Facility	just south of the New England Highway	• Primary storage facility for all tailing runoff from southern CHPP	• Receive and store tailings • Return decant water into water circuit • Store small volumes of water when tailings dust control required
DWD1	East of the southern CHPP	• Dirty water dam 1	• Overflow collection point for excess water from the tailings storage facility • Supplies southern CHPP • Used for dust suppression
DWD2	Between the southern CHPP and southern Tailings Storage Facility	• Dirty water dam 2	• Used for dust suppression • Excess flows into tailing storage facility

Name	Location	Description	Function
DWD4	Northwest of the southern CHPP	• Dirty water dam 4	• Collection point for coal loader seepage dam excess • Supplies southern CHPP • Future water transfer connection point with the RCN area • Overflow directed to DWD1
Rail Loader	Central to the Rix's Creek Mine, on the eastern side of the operations	• Rail loader tunnel water runoff	• Excess water is collected and divided between CWD4 and DWD4 based on water quality
Dirty Water Dams			
Out of Pit Dump Sediment Dam	Located to the North of the Out of Pit Dump in West Pit	• Earthen dams	• Pumped back to mine water system when required.
Clean Water Dams			
CWD1	East of the southern Tailings Dam	• Site 4 - Clean water dam 1	• Water storage dam • Spills into to Rix's Creek
CWD2	East of the southern Tailings Dam and north of CWD1	• Site 5 – Clean Water Dam 2	• Water storage dam • Spills into to Rix's Creek
CWD6	South of the southern CHPP	• Site 7 – Clean Water Dam 6	• Water storage dam • Spills into to Rix's Creek
Small to medium Farm Dams	Throughout RCS Area	• Small earthen dams	• Collect surface runoff • Independent – not part of Mine Water Management System

Table 4
Water Storages & Associated Catchment Areas

Storage	Type of Water Stored	Total Catchment Area (ha)	Max. Surface Area (ha)	Capacity of Spill Level (ML)
Rix's Creek North				
C1	Clean	624	6.0	243
C2	Clean	215	2.3	173
C3	Clean	180	2.0	97
C3A	Clean	58	1.0	25[(a)]
C4	Clean	25	2.2	90
TD1	Saline	31	23.9	205
TD2	Saline	53	28.9	1,000
D1	Saline	89	11.0	440
D2	Saline	36	0.9	39
Possum Skin Dam	Saline	138	32.7	1560
Northern Sediment Dam	Sediment-laden	9	1.3	15.6
Central Sediment Dam	Sediment-laden	5	1.5	26.8
Southern Sediment Dam 3	Sediment-laden	5	1.5	9.7
Sediment Dam B1	Sediment-laden	41	0.59	>10.5
Sediment Dam B2	Sediment-laden	3.5	0.19	>1.2
Sediment Dam B5	Sediment-laden	19	0.29	>6.1
Sediment Dam B6	Sediment-laden	22	0.43	>7.0

Storage	Type of Water Stored	Total Catchment Area (ha)	Max. Surface Area (ha)	Capacity of Spill Level (ML)
Rix's Creek South				
CWD1	Clean	-	N/A	10 [(a)]
CWD2	Clean	-	N/A	10 [(a)]
CWD6	Clean	-	N/A	110 [(a)]
Dead Man's Gully Dam	Clean	-	N/A	20 [(a)]
MB19	Saline	31.84	N/A	2500 [(a)]
MS01	Saline	23.6	N/A	2200 [(a)]
Turkey's Nest Dam	Saline	-	N/A	28 [(a)]
DWD2	Saline	-	N/A	16 [(a)]
DWD4 (was CWD4)	Saline	137.54	N/A	335 [(a)]
Rail Loader (Fire Dam)	Saline	-	N/A	38 [(a)]
RCS Dam 16			N/A	10 [(a)]
RCS Dam 17			N/A	10 [(a)]
RCS Dam 20			N/A	10 [(a)]
West Pit Sediment Dam	Sediment-laden	-	N/A	10 [(a)]

[(a)] *Estimate only*

4.2.6 Flooding

A review of potential flooding impacts was undertaken by JP Environmental (JP Environmental, 2016) and Section 6.7.5 of the *Revised Response to Submissions* (AECOM, 2017) (RRTS) summarises this report.

The report found that flooding in the Hunter River would not impact on the operation of RCS, however additional controls would be required to manage the impacts of flooding from Rix's Creek.

Bloomfield have constructed a continuous embankment between Rixs Creek and the Pit 2 tailings dam to 71 m AHD. This provides the required protection of the West Pit open cut and Pit 2 tailings dam (AECOM, 2017).

4.3 Water Balance at Rix's Creek Mine

Principal water requirements are:

- Make-up water for the coal preparation plants;
- Dust suppression on mining roads, coal conveyors and stockpile areas;
- Machinery washing;
- Fire-fighting; and
- Potable supplies for bathing and other domestic uses.

Water requirements for mine dust suppression and the CHPPs are normally met by mine water harvested from mining operations.

All potable water supplies are sourced from the Singleton Shire Council potable supply.

4.3.1 Operational Mode

The main source of water supply for RCM (CHPPs and dust suppression) is surface water from the pumped inflows from the Open Cut pits.

RCM has three other potential sources of water supply:

- Pumped inflows from various sediment dams;
- Pumped flows from the clean water diversion system; and
- Licensed extraction from Glennie's Creek (RCN) and production bore 20BL170864 (RCS).

A static water balance was calculated in review of the 2016 calendar year, providing information on inputs and outputs for both the Northern and Southern areas. The results are shown in Table 6 and Table 7 below.

Clean water use is minimised by reusing water stored onsite as the priority water source. The history of operation of the mines over recent years has shown that sufficient water is normally available within the mine water system without the need to access clean water supplies. Bloomfield will continue to investigate options to maintain the water balance, such as the recent installation of solid bowl centrifuges at the CHPP which improve water removal from tailings.

Most water demand on site is used for dust suppression and processing coal at the northern and southern CHPPs. In annual average terms, the estimated net CHPP demand is approximately 4.1 megalitres per day (ML/d) or 1505 ML/a for RCN and approximately 4.8 ML/d, or 1744 ML/a for RCS. The estimated dust suppression water demand for the Open Cut operations is approximately 145 ML/a for RCN and 611 ML/a for RCS.

Table 5, **Table 6**, **Table 8** and **Table 9** provide estimates of the annualised inflows to and outflows from the mine water management system based on the site data, (including daily rainfall runoff data).

The overall site water balance will vary from year to year depending on coal production rates and climatic conditions.

4.3.1.1 Water Balance for RCN

In 2016, evaporation losses from at the various water storage facilities across the Rix's Creek North area total to 1,355 ML. The major evaporative losses occurred at:

- The tailings storage facilities, approximately 441 ML;
- The Possum Skin Dam, approximately 487 ML;
- The in-pit voids, approximately 213 ML; and
- Dirty Water Dams 1 & 3; approximately 209 ML.

There was an estimated 100 ML of groundwater inflow into the open cut voids during the reporting period.

Seepage from rehabilitated emplacements and spoil dumps into the Underground Portal Storage was estimated at 511 ML. The volume pumped from the Integra Portal Sump is a combination of runoff and groundwater seepage from RCN, and runoff and underground dewatering volumes associated with Glencore's footprint and operations. Glencore have finalised the construction of a pipeline to transfer water from the Integra Portal Sump to the neighbouring Mt Owen Operations into Glencore's Greater Ravensworth Area Water Sharing Scheme (GRAWSS) (Mod 7 of Project Approval 08_0101). Bloomfield stores all underground and seepage water volumes which Glencore re-draws and transfers into the GRAWSS.

The RCN CHPP was not operational during 2016 and has undergone repairs to be operational in 2017. All the coal extracted from RCN operations during 2016 was washed at the RCS CHPP with fine reject being stored in Tailings Dam 4 at RCS – on that basis, the water usage and entrainment losses were lower than a "typical" year within the RCN area. The result of this operational hiatus is an above average accumulation of water - ~1,200 ML over the year.

The 2017 period coincided with rainfall significantly below the long-term average rainfall in the Hunter Valley. The RCM rain gauge recorded an annual rain fall of 560 mm, compared to 698 mm long term average rainfall in the Hunter Valley. In 2017, evaporation from site process water dams at RCN totalled 1,450 ML. The major evaporation occurred at the Tailings Dam facilities and Possum Skin Dam, with the in-pit voids and Dirty Water Dams also contributing based on their surface area.

There was an estimated 100 ML of groundwater inflow into the open cut voids during the reporting period.

The groundwater inflow and seepage from rehabilitated emplacements and spoil dumps into the Underground Portal Storage was estimated at 805 ML. This estimate is based on water balance assessment work undertaken jointly by Bloomfield and Glencore throughout 2017.

The RCN CHPP returned to operational mode in May 2017 and has been processing coal since that time.

Approximately 17 ML of potable water was sourced from the Singleton town water supply in 2017 for RCM operations.

Overall, the RCN area accumulated 832 ML, mostly in the Falbrook pit, through a combination of water directed from the Portal and the Camberwell Pit.

Table 5
2016 Static Water Balance – RCN

Water Balance Component	2016 (ML)
Inputs	
Imported Fresh Water	0
Imported Potable	10
Groundwater & Spoil Seepage to Portal	511
Groundwater Seepage to Open Cuts	100
Underground Dewatering	0
Rainfall Runoff – into Dirty Water System	2,165
Recycled to CHPP from Tails & Storage (not included in total)	**0**
Water from ROM Coal	0
Total Inputs	**2,783**
Outputs	
Groundwater Seepage Out	0
Dust Suppression – Water Carts	145
Exported to Other Mines – Dirty Water	0
Evaporation Fans & Sprays	0
Evaporation – Mine Water & Tailings Dams	1,350
Entrained in Process Waste	0
Water in Product Coal	**0**
Potable Usage	**10**
Total Outputs	**1,505**
Estimated Change in Pit Storage (increased)	**1,278**

Table 6
2017 Static Water Balance – RCN

Water Balance Component	2017 (ML)
Inputs	
Imported Fresh Water	0
Imported Potable	7
Groundwater & Spoil Seepage to Portal	805
Groundwater Seepage to Open Cuts	100
Underground Dewatering	0
Rainfall Runoff – into Dirty Water System	1,963
Recycled to CHPP from Tails & Storage (not included in total)	**(220)**
Water from ROM Coal	92
Total Inputs	**2,967**
Outputs	
Groundwater Seepage Out	0
Dust Suppression – Water Carts	198
Exported to Other Mines – Dirty Water	0
Evaporation Fans & Sprays	0
Evaporation – Mine Water & Tailings Dams	1,450
Entrained in Process Waste	389
Water in Product Coal	**91**
Potable Usage	**7**
Total Outputs	**2,035**
Estimated Change in Pit Storage (increased)	**832**

In terms of groundwater contributions in RCN against total allocations, **Table 7** outlines the current forecast. These values will be scrutinised and validated as part of the annual water balance review. Within the RCN operations, in is anticipated that the underlying and deeper dewatering operations associated with the Integra Underground will continue to intercept and depressurise much of the regional basement groundwater, with RCN dewatering of Camberwell and Falbrook Pits being contributed from a more local zone of influence (upper coal seams not being intercepted by the underground workings).

In terms of key water balance components, it is noted that groundwater seepage to open cuts is only a few percent of the overall contribution, with rainfall (and associated runoff) contributions being the key water balance driver for the RCN site.

The forecast annual groundwater extraction volumes outlined in **Table 7** below are based on a projection of currently intercepted groundwater seepage combined with an assessment of the planned mining sequence and mining advance rate below water table to inform the likely flows to be encountered throughout the life of mine.

Given the groundwater inflow volumes are in the order of 2-3% of total pit water inflows, with rainfall runoff being the dominating influence, the groundwater inflow is not considered to be a significant volume of water and is below the accuracy of the current water balance.

Table 7
Forecast Groundwater Extraction (versus Annual Licence Allocations)

Issued By	Number	Expiry, renewal or anniversary date		Comment
	Number	**Category**	**Volume**	**Purpose**
Natural Resource Access Regulator	WAL41500	Mining	100(ML/yr)	Open Cut (dewatering groundwater) Hard Rock
	WAL41555	Mining	100(ML/yr)	Open Cut (dewatering groundwater) Hard Rock
	WAL 40777	Mining	305(ML/yr)	Open Cut (dewatering groundwater) Hard Rock
	20BL170864	Mining	100(ML/yr)	1 x Bore (dewatering groundwater

Year	RCN Allocation (ML/a)	RCN Forecast (ML/a)	RCS Allocation (ML/a)[b]	RCS Forecast (ML/a)[a]
2018	200	100	100	283
2019	200	100	100	275
2020	200	150	305	251
2021	200	150	305	305
2022	200	200	305	270
2023	200	200	305	238
2024	200	250	305	205
2025	200	250	305	157
2026	200	200	305	153
2027	200	200	305	185
2028	200	150	305	165
2029	200	150	305	153
2030	200	100	305	148
2031	200	100	305	143
2032	200	100	305	137
2033	200	80	305	135
2034	200	80	305	132
2035	200	80	305	131

[a] *sourced from Rix's Creek Continuation of Mining Project Groundwater Impact Assessment (RPS, 2014). RCS Continuation of Mining Project commenced 24 Feb 2020.*
[b] *Additional 205ML licence granted by NRAR 6/2/2021*

4.3.1.2 Water Balance for RCS

Evaporation from RCS process water dams totalled 430 ML in 2016. The major evaporation occurred at:

- The Process Water Dams, approximately 236 ML;
- The Arties Pit Void, approximately 32 ML; and
- The southern Tailings Storage Facility 162 ML.

There was an estimated 47 ML of groundwater inflow into the open cut voids at Rix's Creek South during the reporting period.

In addition, approximately 20 ML of potable water was sourced from the Singleton town water supply in 2016 for the entire RCM.

In 2016 the strategy was to manage water levels in the open cut at RCS operations by pumping water to the southern CHPP for re-use, to surface water storage dams and disused pit voids to maximise evaporation. Water is pumped to the CHPP water supply dams and to the Arties Pit void from West Pit open cut operations. The RCS area ended the year with a minor accumulation of ~250 ML of water.

Table 8
2016 Static Water Balance – RCS

Water Balance Component	2016 (ML)
Inputs	
Imported Fresh Water	-
Imported Potable	10
Groundwater Seepage to Open Cuts	47
Underground Dewatering	0
Rainfall Runoff – into Dirty Water System	1,749
Recycled to CHPP from Tails & Storage (not included in total)	(646)
Water from ROM Coal	**187**
Total Inputs	1,919
Outputs	
Groundwater Seepage Out	0
Dust Suppression – Water Carts	611
Exported to Other Mines – Dirty Water	0
Evaporation Fans & Sprays	0
Evaporation – Mine Water & Tailings Dams	427
Entrained in Process Waste	572
Water in Product Coal	**124**
Potable Usage	**10**
Total Outputs	**1,744**
Estimated Change in Pit Storage (increased)	**249**

Table 9
2017 Static Water Balance – RCS

Water Balance Component	2017 (ML)
Inputs	
Imported Fresh Water	0
Imported Potable	10
Groundwater Seepage to Open Cuts	50
Underground Dewatering	0
Rainfall Runoff – into Dirty Water System	1,586
Recycled to CHPP from Tails & Storage (not included in total)	**(470)**
Water from ROM Coal	292
Total Inputs	**1,938**
Outputs	
Groundwater Seepage Out	0
Dust Suppression – Water Carts	410
Exported to Other Mines – Dirty Water	0
Evaporation Fans & Sprays	0
Evaporation – Mine Water & Tailings Dams	427
Entrained in Process Waste	928
Water in Product Coal	**147**
Potable Usage	**10**
Total Outputs	**1,922**
Estimated Change in Pit Storage (increased)	**16**

In terms of groundwater contributions in RCS against total allocations, **Table 7** outlines the current forecast. These values will be scrutinised and validated as part of the annual water balance review. Within the RCS operations, in is anticipated that ongoing dewatering of West Pit will continue to contribute only minor groundwater seepage volumes, with mining in this pit already well progressed to target depths.

In terms of key water balance components, it is noted that groundwater seepage to open cut is only a few percent of the overall contribution, with rainfall (and associated runoff) contributions being the key water balance driver for the RCS site.

4.3.2 Security of Supply

As discussed in Section 3.4.1, water is supplied to RCM from rainfall and catchment runoff captured in surface storages, and can be extracted from Glennies Creek under licence. The site water balance model results predict that RCM will have a water surplus which is stored on site in surface water storages. The risk of a shortfall of water to meet the daily operational requirements at RCM is low. In the event that extended dry periods or drought lead to a water shortage, RCM may either reduce production to a level to suit water availability or additional water may be sourced from external sources, including additional water allocations or from other mining operations. Any additional water sources would be obtained in accordance with any relevant approvals and licences.

4.3.3 Other Water Balance Considerations

The above water balance assessments have been undertaken independently to meet licensing and reporting requirements – however, this WMP seeks to enable flexibility to move water between the northern and southern mining areas to enable optimised water management across the whole mining complex.

In accordance with Schedule 3 Condition 35 Table 13 of PA 08_0102 and Condition B39 Table 4 of SSD 6300, Bloomfield have investigated the opportunity to *"maximise water sharing with other mines in the region"* by providing water into the Greater Ravensworth Water Sharing Scheme (GRAWSS). Bloomfield has finalised discussions with Glencore and have contractually agreed to provide water into the GRAWSS to export surplus water to other users in the area. Input into the scheme will reduce regional water abstraction and improve local storage capacity at RCM. This will involve water volumes greater than the currently stored Integra water as noted in Section 4.3.1.1.

RCM have installed the required infrastructure to record all water transfers into the GRAWSS which will form part of the Water Accounting Framework reporting and Annual Review (AR) reporting requirements. Monthly sampling of water transferred into the scheme will be analysed for pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS).

As required under Condition B41(e) of SSD 6300, Bloomfield will utilise existing data from nearby mines if available and where relevant and practicable to inform other water balance considerations. This data will be used to assess and build on existing monitoring programs if relevant and practicable.

A comprehensive monitoring program is in place to manage and monitor surface water during active mining operations and is detailed in **Section 5.2.**

Annual reporting of the RCM site water balance will be completed as detailed in **Section 10.1**.

4.4 Site Salt Balance

4.4.1 Saline material

Section 15 of the RCS EIS notes that water is likely to have a high salt content if it has come into contact with coal. This could include water that has come into contact with:

- ROM coal;
- Product coal;
- Coarse coal rejects; and
- Tailings.

Saline material has the potential to generate saline water while it is exposed to the surface. Saline material will be managed though storage and emplacement such that the saline water that is generated is contained in the WMS or pumped to Integra into the GRAWSS . The details of the management of the different source of saline material are summarised in **Table 10**.

Table 10
Management of Saline Material

Source	Management
In Situ and ROM Coal	Coal prior to extraction contained entirely within the active mining area. Coal stored in stockpiles that are constructed such that runoff is contained in the water management system before being processed in the CHPP.
Product Coal	Stored in stockpiles that are constructed such that runoff is contained in the water management system before being exported off site.
Coarse coal rejects	Emplaced in overburden emplacement areas that are constructed such that runoff is contained in the water management system before being rehabilitated.
Tailings	Emplaced in tailings dams that are constructed such that runoff is contained in the water management system.
Overburden and interburden	Emplaced in overburden emplacement areas that are constructed such that runoff is contained in the water management system before being rehabilitated.

4.4.2 Saline Water

The sources of saline water at RCM are:

- Runoff from saline material. In addition to the salt released by weathering of the saline material, salt also accumulates by deposition from rainfall in soil. The salt on the surface of the soil or material is dissolved by rainfall and enters the WMS dissolved in runoff;

- Groundwater inflows from predominantly saline coal seam aquifers into open cut pits; and
- Groundwater extracted from water bores under licence.

As salt lost via evaporation is negligible, salt will typically concentrate in the water stored and used at RCM. Once dissolved, the salt remains in solution as it is transferred through the WMS.

Salt passes through the CHPP in solution and either remains with the product or coarse reject material. Salt also remains with the solid bowl centrifuge product at RCS or is pumped as tailings slurry in proportion to the water volumes. Salt dissolved in the tailings slurry is either retained in the tailings or transferred in solution with decant water in proportion to the water volumes. Salt dissolved in water used for dust suppression accumulates on the haul roads as the water evaporates. This salt is redissolved when runoff occurs and re-enters the WMS.

The main Mine Water Dams at RCS are shown in **Table 11** along with representative EC values. Typical EC has been defined for these dams based on values provided in the *Surface Water Study for Rixs Creek Continuation of Mining* (JP Environmental, 2014).

Section 4.2.4 outlines the management of saline water.

Table 11
Typical EC of RCS Mine Water Dams compared to Groundwater

Mine Water Dam	Typical electrical conductivity (µS/cm)
DWD 1	5,344
DWD 2	5,940
DWD 4	4,702
Groundwater	2,200 – 19,200

EC within the dams is predicted to remain steady as shown in **Figure 6**. The management of mine water will remain as described in **Section 4.2**, and median salinity is expected to remain stable. Monitoring of these locations will continue as discussed in **Section 5.2** with the results reported in the Annual Review (**Section 10.1**).

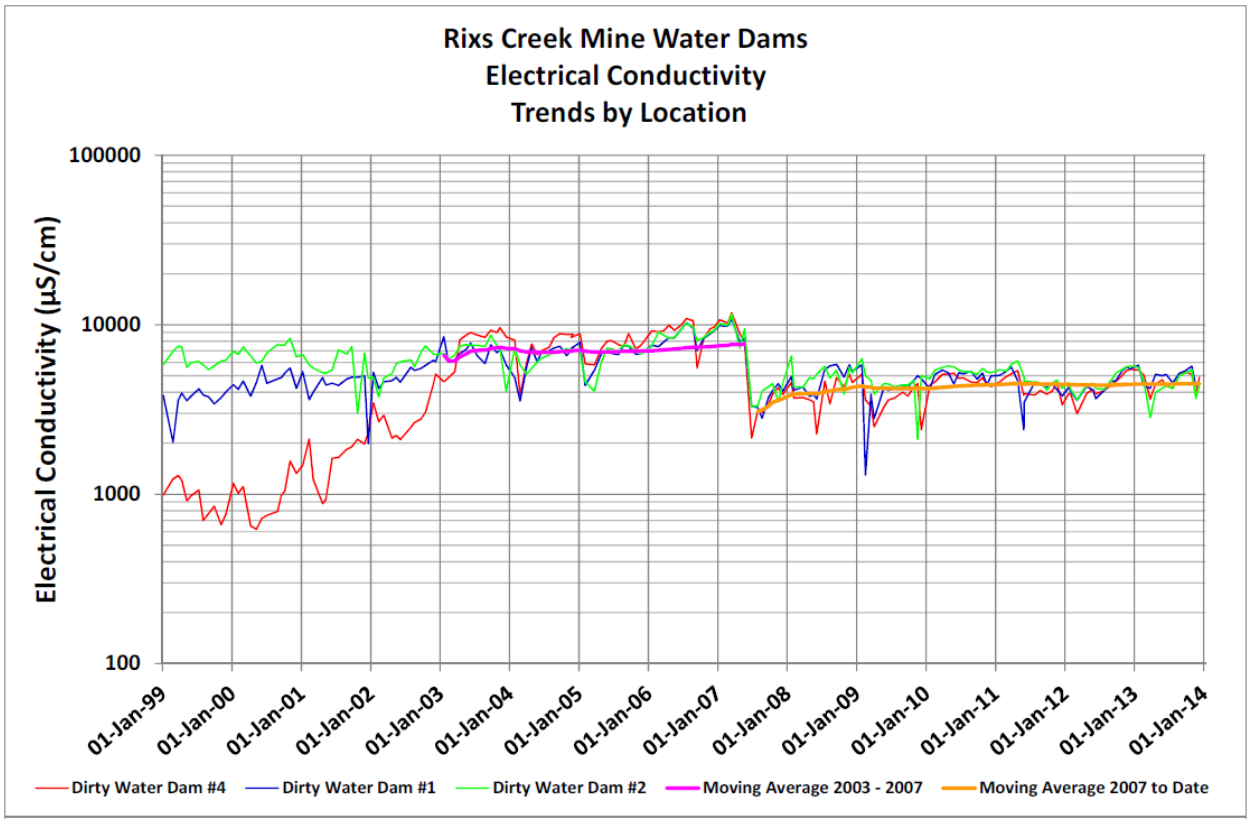

Figure 6
EC trends in Mine Water dams

4.4.3 RCS Final Void

The *Rix's Creek Continuation of Mining Project Groundwater Impact Assessment* (RPS, 2014) (GIA) modelled the potential long-term salinity within the final void.

Inflows to the void comprise:

- Rainfall recharge to the surface of the lake;
- Exchange of groundwater from the backfill to the void

Outflows from the void comprise:

- Evaporation from the lake surface;
- Exchange of groundwater to the backfill from the void.

Table 12 presents the assumed salt concentration of inflows to the void as well as other relevant assumptions.

Table 12
Model Parameters for Salt Balance

Component	Concentration	Comment
Inflows		
Rainfall	10 mg/L	
Groundwater from Backfill	7,370 mg/L (maximum salinity of BH01 is 11,000 µS/cm)	Assumed to be 'fresh' groundwater rather than recycled from the void.
Outflows (to Integra)	8,000 µS/cm	Water
Evaporation	0 mg/L	
Groundwater to Backfill	Variable as dependent on concentration of the pit lake at the time.	Assumed to be constantly mixed and therefore homogenous at all times. Assumed not to re-enter the void.

4.4.3.1 Model Results

The water balance components were combined with the assumed concentrations in **Table 13** to derive the long-term salinity in the void.

Table 13
Salt Mass Balance Results

SP	Time (years)[a]	Concentration (mg/L)	Recharge (m3/d)	Pit Inflow (m3/d)	Evaporation (m3/d)	Pit Outflow (m3/d)
1	1 month	7,454	3,428	1,874	6,715	31,802
2	2 months	7,416	7,166	3,017	5,617	14,141
3	3 months	7519	580	3057	4388	7729
4	4 months	7583	548	2975	2955	4971
6	6 months	7580	1560	2631	1243	2589
12	1	7537	725	1776	4366	830
24	2	7552	208	1050	3565	259

SP	Time (years)[a]	Concentration (mg/L)	Recharge (m3/d)	Pit Inflow (m3/d)	Evaporation (m3/d)	Pit Outflow (m3/d)
32	10	7144	1272	449	2149	88
42	20	6411	3021	409	2377	213
52	50	6370	2515	346	2466	153
62	100	6893	2515	331	2602	137
72	200	8876	2515	336	2696	125
84	500	14181	2515	339	2730	120
94	1000	18467	2515	339	2733	120
NA[b]	2000	20473	2515	339	2733	120
NA[b]	5000	20753	2515	339	2733	120

a Time elapsed from end of mining in 2037
b Water balance components assumed to be steady state after SP94

From **Table 13**, evaporation exceeds recharge in the water balance and inflow to the pit from backfill/hard-rock exceeds outflow. The long-term salinity of the lake formed in the void is 20,750 mg/L, equivalent to an EC of 31,000 µS/cm.

Modelling indicates that the void operates as a groundwater sink since groundwater inflow exceeds outflow and groundwater flux is minor compared to recharge and evaporation components.

The groundwater contribution from hard-rock (HSU Zone 1 in Figure 8.29 in the GIA) to the Hunter River Alluvium is predicted to be 244 m^3/d at the end of the recovery simulation. This demonstrates a minimal groundwater contribution to the Hunter River alluvium.

Although there is a small groundwater outflow from the pit, the long-term impact to off-site groundwater quality is considered minimal.

5 Surface Water Management Plan

5.1 Overview

To ensure that surface water management is occurring consistently with the objectives of this WMP, a monitoring program has been developed for RCM. The Surface Water Monitoring Program has been set up to provide parameters, sampling frequency, monitoring period and reporting requirements.

The WMS at RCM has been designed with the primary objectives of:

- Minimising impacts (if any) on the surface water catchments;
- Segregation of uncontaminated, clean water runoff, from contaminated-mine water on site; and
- Priority use of and safe disposal on site of contaminated water.

A comprehensive monitoring program is in place to manage and monitor surface water during active mining operations and is detailed in **Section 5.2.**

5.2 Surface Water Monitoring Program

Surface water monitoring is conducted during normal mining operations at the locations identified in **Figure 7**. The surface water sites included in the monitoring program are:

- Streams and rivers near the site that have the potential to be impacted by RCM;
- Locations along the site's clean water diversion channel which runs through the Open Cut operations at RCN;
- Significant site water storages and areas that pose potential environmental and operational risks; and
- Pipelines, flows and levels of storages to enable water transfers and water balances to be completed.

For RCM, the Environmental Protection Licence (EPL 3391) requires the monitoring of selected surface waters and water storage dams for pH, EC, TSS and Total Dissolved Solids (TDS). Grab samples are collected at the following sites once a month (minimum of four weeks).

Within RCN, the following surface water sampling locations have been identified:

- W3 - Martins Creek, where it enters the site;
- W6 - Blackwattle Creek, where it enters the site; and
- W1 - Station Creek, where it leaves the mine site.

Within RCS, the following surface water sampling locations have been identified:

- Site 1 - Railway Underpass, as the Creek enters the site;
- Site 2 - New England Highway Bridge, at the mid-point through the mine site;

- Site 10 – Below Operation, on Rix's Creek below the operation;
- Site 3 - Maison Dieu Road Bridge, after the Creek has left the site;
- Site 4-Clean Water Dam 1 - (CWD 1);
- Site 5-Clean Water Dam 2 - (CWD 2); and
- Site 7-Clean Water Dam 6 - (CWD 6).

The following sites require faecal coliforms and pH, on a monthly basis during discharge:

- Northern CHPP Sewerage Treatment Plant (STP) to Discharge area; and
- Southern STP to Discharge area.

The water samples are analysed by laboratories that are accredited through the National Association of Testing Authorities, Australia (NATA).

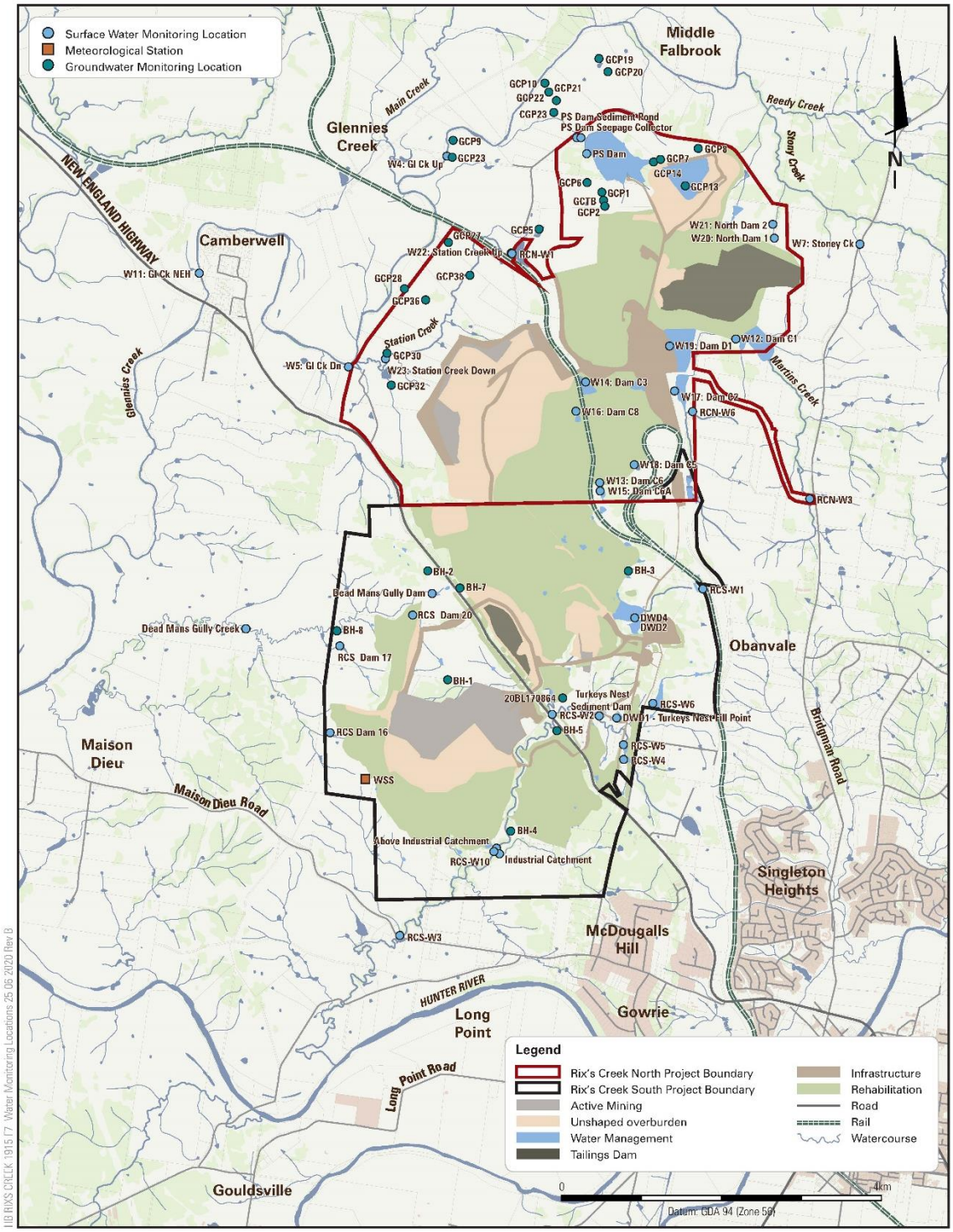

Figure 7
RCM Water Monitoring Locations

Table 14 lists the water quality parameters monitored and **Table 15** and **Table 16** identify the requirements for each monitoring location. The volumes of water inflow, storage, transfer and use within the WMS will be monitored using a series of flow meters and water level gauges at strategic locations, as shown in **Table 15**.

Table 14
Water Monitoring Suites

Suite	Analytes
1	Field Meter or laboratory analysis for electrical conductivity and pH
3	(Suite 1) + TDS, Na, K, Ca, Mg, F, Cl, SO4, HCO3, NO3, Total N, Total P, Cu, Pb, Zn, Ni, Fe, Mn, As, Se, Cd, Cr (Totals)
7	(Suite 1) + TSS, TDS
8	(Suite 1) + Comprehensive suite: Al, As, B, Ba, Be, Ca, $CaCO^3$, Total Cl, Cd, Co, CO^3, Cu, F, Fe (Soluble), HCO^3, Hg, K, Li, Mg, Mn, Na, NH^3, Ni, NO^2, NO^3, OH, P, Rb, Sb, Se, Si, SO4 (or S), Sr, Zn + TSS, TDS

Table 15
Mine Water & Dam Monitoring – Frequency, Analytes and Method

Site	Site ID	Monitoring Suite (see Table 9)	Monitoring Frequency	Method
Rix's Creek North				
Dam C4	W10	Suite 7	Monthly	Grab sample
Dam C1	W12	Suite 7	Monthly	Grab sample
Dam C6	W13	Suite 7	Monthly	Grab sample
Dam C3	W14	Suite 7	Monthly	Grab sample
Dam C6A	W15	Suite 7	Monthly	Grab sample
Dam C8	W16	Suite 7	Monthly	Grab sample
Dam C2	W17	Suite 7	Monthly	Grab sample
Dam C5	W18	Suite 7	Monthly	Grab sample
Dam D1	W19	Suite 7	Monthly	Grab sample
North Dam 1 (seepage catch dam)	W20	Suite 7	Monthly	Grab sample
North Dam 2	W21	Suite 7	Monthly	Grab sample
Possum Skin Dam	GCSW03	Water level +Suite 3	Monthly	Staff gauge + grab sample
Possum Skin Dam Seepage Collector	GCSW04	Water level +Suite 3	Monthly	Visual level check for pump out + grab sample
Possum Skin Dam Sediment Pond	GCSW05	Water level + Suite 3	Monthly	Staff gauge + grab sample
Sediment Dam 1	SD1	Water level +Suite 7	Monthly	Staff gauge + grab sample

Site	Site ID	Monitoring Suite (see Table 9)	Monitoring Frequency	Method
Sediment Dam 2	SD2	Water level + Suite 7	Monthly	Staff gauge + grab sample
Sediment Dam 3	SD3	Water level + Suite 7	Monthly	Staff gauge + grab sample
Sediment Dam B1	SD4	Water level + Suite 7	Monthly	Staff gauge + grab sample
Sediment Dam B2	SD5	Water level + Suite 7	Monthly	Staff gauge + grab sample
Sediment Dam B5	SD6	Water level + Suite 7	Monthly	Staff gauge + grab sample
Sediment Dam B6	SD7	Water level + Suite 7	Monthly	Staff gauge + grab sample
Rix's Creek South				
Site 1 – Rail Underpass	Site 1	Suite 1 Monthly, Suite 8 Annually	Monthly	Grab sample
Site 2 – New England Hwy	Site 2	Suite 1 Monthly, Suite 8 Annually	Monthly	Grab sample
Site 3 – Maison Dieu Bridge	Site 3	Suite 1 Monthly, Suite 8 Annually	Monthly	Grab sample
Site 10 – Below Operation	Site 10	Suite 1 Monthly, Suite 8 Annually	Monthly	Grab sample
Maison Dieu Industrial Estate Catchment Branch	-	Suite 8	Annual	Grab sample
Above Junction with Industrial Estate Catchment	-	Suite 8	Annual	Grab sample
Site 4 – Clean Water Dam 1 (CWD1)	Site 4	Suite 1	Annually	Grab sample

Site	Site ID	Monitoring Suite (see Table 9)	Monitoring Frequency	Method
	Site 4	Suite 8	Monthly	Grab sample
Site 5 – Clean Water Dam 2 (CWD2)	Site 5	Suite 1	Annually	Grab sample
	Site 5	Suite 8	Monthly	Grab sample
Site 6 – Clean Water Dam 6 (CWD6)	Site 6	Suite 1	Annually	Grab sample
	Site 6	Suite 8	Monthly	Grab sample
Dirty Water Dam 1	-	Suite 8	Annual	Grab sample
Dirty Water Dam 2	-	Suite 8	Annual	Grab sample
Dirty Water Dam 4 (DWD4)	-	Suite 8	Annual	Grab sample
West Pit Catchment	-	Suite 8	Annual	Grab sample
Sediment Dam Pit 3 – East	-	Suite 8	Annual	Grab sample
Sediment Dam Pit 3 – West	-	Suite 8	Annual	Grab sample
Rail Loader Tunnel Water	-	Suite 8	Annual	Grab sample

Table 16
Stream Monitoring – Frequency, Analytes and Method

Site	Type of Monitoring	Sampling Method	Frequency	Site Description
Rix's Creek North				

Site	Type of Monitoring	Sampling Method	Frequency	Site Description
DWE Stn 210044 (GC1)	Electrical Conductivity and Flow	Water level logger / EC meter from NSW Office of Water website	Daily	Middle Falbrook Rd Bridge
GC1	Suite 7	Grab sample	Monthly	Middle Falbrook Rd Bridge
GC2 / GCSW08	Suite 7	Grab sample	Monthly	Nobles Crossing
SC1 (W1)	Suite 7	Grab sample	Quarterly	Station Creek
SC2	Suite 7	Grab sample	Quarterly	Station Creek
SC3 (W23)	Suite 7	Grab sample	Quarterly	Station Creek
W3	Suite 7	Grab sample	Monthly	Martins Creek
W5	Suite 7	Grab sample	Monthly	Glennie's Creek
W6	Suite 7	Grab sample	Monthly	Blackwattle Creek
W7	Suite 7	Grab sample	Monthly	Stony Creek
Rix's Creek South				
Site 1 – Rail Underpass	Suite 1 Monthly, Suite 8 Annually	Grab sample	Monthly	Rix's Creek
Site 2 – New England Hwy	Suite 1 Monthly, Suite 8 Annually	Grab sample	Monthly	Rix's Creek
Site 3 – Maison Dieu Bridge	Suite 1 Monthly, Suite 8 Annually	Grab sample	Monthly	Rix's Creek
Site 10 – Below Operation	Suite 1 Monthly, Suite 8 Annually	Grab sample	Monthly	Rix's Creek
Maison Dieu Industrial Estate Catchment Branch	Suite 8	Grab sample	Annual	Rix's Creek
Above Junction with Industrial Estate Catchment	Suite 8	Grab sample	Annual	Rix's Creek

5.2.1 Rix's Creek Surface Water Performance

Surface water results and trends are analysed annually by specialist consultants. Recent results have shown no issues, breached trigger levels or reportable events. The water performance is summarised in the ARs.

6 Surface Water Management Measures

The measures to manage surface water at RCM have been divided into those measures which aim to prevent water management incidents in the first place (i.e. Preventative Measures); and those measures which aim to minimise environmental damage in the event of a trigger or incident occurring (i.e. Corrective Measures).

6.1 Preventative Measures

6.1.1 Design & Operational Safeguards

The integrated surface water management system incorporates the design and operational safeguards set out in **Table 17**.

Table 17
Surface Water – Preventative Measures

Timing / Trigger	Measure	Responsibility

These design and operational safeguards are already in place.	**Rix's Creek North**
	• Retention and evaporation of mine water in the following dams:
	  ◦ Dam D1
	  ◦ Tailings Storage Facilities TD1, TD2 (now combined into a large single storage) and TD3
	  ◦ Possum Skin Dam
	  ◦ Falbrook Open Cut pit as temporary water storage
	• Use of mine water for:
	  ◦ Processing coal at the northern CHPP, dust suppression and other mine-related activities at the Open Cut mining areas
	• Where practicable, maintenance of the water within Portal Sump at a target RL agreed with Integra (Glencore) to provide adequate storage and thereby prevent flooding of the Integra underground operations in the event of a major rainfall event.
	• No open cut mining operations will take place within 150 metres of the Glennies Creek alluvial aquifer or Station Creek alluvial aquifer without the prior written approval of the Secretary.
		Mining Engineering Manager

Timing / Trigger	Measure	Responsibility

	Rix's Creek South
	• Retention and evaporation of mine water in the following dams:
	  ◦ Tailings Storage Facilities
	  ◦ Dirty Water Dams 1 & 2 (DWD1 & DWD2)
	  ◦ West Pit Storage Dam
	  ◦ Arties Pit Storage Dam
	• Use of mine water for:
	  ◦ Processing coal at the southern CHPP, dust suppression and other mine-related activities at the Open Cut mining areas.
	RCM
	• Continue and extend existing WMS as required throughout operations.
	• Manage sediment dam water with TSS exceeding the water quality objectives through:
	  ◦ Flocculation
	  ◦ Movement of water to dirty water storage with available capacity; or
	  ◦ Pump into the mine water management system.	

These design and operational safeguards are already in place.	**Rix's Creek North** • Diversion of clean water from the upper reaches of Martin's and Blackwattle Creeks to Station Creek and then Glennie's Creek via a clean water channel through the site • Use of mine water for: ◦ Export to other nearby mines, as demand and arrangements allow (eg. GRAWSS) • When possible, maintenance of Possum Skin Dam near the maximum operating level of 88.8m RL to maximise evaporation. **Rix's Creek South** • Retention and evaporation of mine water in the following dams: DWD1, DWD2, Tailings Storage Facility, West Pit Storage Dam, Arties Pit Storage Dam.	Environmental Advisor/ Environmental Officer

Timing / Trigger	Measure	Responsibility
	• Runoff from undisturbed areas is directed away from mining operations through diversion banks and channels. • The construction and management of suitable dams and diversion banks to divert clean runoff water from entering mine workings (and associated mine water management). • Priority is given to the use of contaminated water in mine operations. Contaminated water is used in the coal beneficiation process and for dust suppression via water carts for haul road watering and spraying coal stockpiles. • Tailings from the coal beneficiation process are directed to the emplacement area and water decanted off the tailing's dam surface is recycled through the coal handling and preparation plant. • Within five days of a rainfall event greater than 50mm, all sediment dams (in disturbed areas) will be inspected. Where necessary, dams will be dewatered to provide free storage capacity of at least the settling zone volume. • Sediment dams may be dewatered to receiving waters after a rainfall event greater than 50mm where TSS concentrations and EC are less than the nominated water quality objectives set in **Section 6.2**. • Continue and extend existing Water Management System as required throughout operations. • Ensure diverted clean water is diverted to stable disposal areas prior to being discharged into surrounding water courses	
Additional design and operational safeguards to be implemented across all sites.	**Rix's Creek North and South** • Utilise mining voids as temporary storage voids if water storage dams nearing or at capacity. • Ensure adequate pumping capacity (i.e. pumps, polypipe) available to meet site requirements. • Implement duty roster to ensure coverage of monitoring program, inspections and general management of surface water infrastructure and ensure timely response to unplanned events. • Raise any concerns found during the inspections with the Environmental Advisor and assist in investigations.	Pumping Coordinator

See **Figure** 4 for the schematic representation of the integrated water management system for RCM.

6.1.2 Erosion & Sediment Control Plan

Erosion and sedimentation control is an integral part of the water management across the entire site. Erosion control on reshaped and rehabilitation areas is achieved by having the minimum delay in time and area between the active mining operation and establishing rehabilitation. Revegetation of rehabilitation areas is undertaken as soon as an area becomes available with the aim to establishing a minimum of 70% ground cover, the level required to adequately control soil erosion and sediment mobilisation. Accompanied by this is the use of sediment detention basins in front of the operation, along haulage roads and on drainage lines flowing from establishing rehabilitation areas.

Mining operations that have the potential to cause erosion or generate sediment and impact the surrounding catchment areas are:

- Continued mining operations and construction activities at RCM;
- Clearing or disturbance of land for mining or other activities;
- Construction of operational sediment control measures within RCM;
- Construction of overburden and emplacement areas and haul routes within RCM;
- Placement of overburden and topsoil;
- Vehicle and equipment movements;
- Coal stockpiles and coal handling equipment areas; and
- Mine site rehabilitation.

Erosion and sedimentation impacts which may result from mining operations include:

- Increased runoff volumes and velocities from the removal of vegetation, land disturbance and the introduction of impervious surfaces on hardstand areas;
- Increased potential for sedimentation to occur from increased erosion and runoff associated with open cut mining, stockpiling of material and the construction of surface facilities, access roads/tracks and exploration drilling;
- Potential for increased scouring during the construction of surface facilities adjacent to watercourses; and
- Potential decline in water quality and degradation of local amenities through sediment transport to nearby watercourses.

Clean water diversions are also constructed at RCN and RCS operational areas as required to enable mining progression in line with the requirements of the WMP. Shortly after the drains are constructed using a D6 dozer, the drains are cross ripped, and application of pasture mix is sown to promote grass cover to reduce sediment and erosion issues. In West Pit operations, the out of pit dump was rehabilitated using pasture species as outlined in the *Mining Operations Plan* (Bloomfield, 2019) (MOP), with the aim of improving the water quality entering the sediment dams.

Prior to any disturbance activities being undertaken by the site, a Permit to Disturb is required to be completed. The purpose of the Permit to Disturb is to identify and address any potential environmental, community, infrastructure or safety hazards associated with the proposed works. As part of completing the

Permit to Disturb, an Erosion and Sediment Control Plan (ESCP) is required to be developed if required. The ESCP should be developed and implemented in conjunction with the WMP to ensure that the objectives of the ESCP are met. Surface water quality monitoring is included in the WMP. The erosion and sediment control inspections are conducted on a monthly basis. Actions from these inspections are recorded and remediation or improvements works undertaken as required.

Erosion and sediment control activities are to be undertaken in accordance with the guidelines from:

- Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volumes 2A - Installation of Services, 2C- Unsealed Roads, and 2E - Mines and Quarries (DECC, 2008) (the Blue Book).

6.1.3 Flood Management

Monitoring of rainfall and storm events will occur though weather forecast and warnings information for potential flooding. Regular inspections of floodways and structures will be conducted to prepare for severe weather.

Dam walls and other flood management structures will be inspected for damage, overtopping, structural damage, slips, slumps or movement that may compromise the integrity of the structure. Spillways will be inspected for damage or flow obstructions. If there is severe damage to the integrity of flood management structures, the damage will be mitigated or repaired.

Routine inspections of water structures, including dams, diversion drains and erosion and sediment control structures, as well as inspections following significant rainfall events (greater than 50 mm in 24 hours), will be conducted by RCM personnel. Water structures are inspected to assess the capacity, structural integrity and effectiveness and advise on any maintenance requirements.

6.2 Corrective Measures

The corrective measures outlined here are effectively the "Surface Water Response Plan" prepared as a condition of the project approvals. The steps are presented in **Table 18**, indicating the measurements required, who is responsible for documentation and data collection and when it is to be implemented. Each category is described in further details in Sections **6.2.1** - **6.2.4**.

Table 18
Surface Water – Corrective Measures

Timing / Trigger	Measure	Responsibility	Reference
Surface water quality trigger activated	• Sample and analyse discharge water and assess against relevant guidelines	Environmental Manager (or delegate)	6.2.1

Timing / Trigger	Measure	Responsibility	Reference
Storm water flow exceeds drain or dam design capacity	• Increase the capacity of the drain or dam to accommodate the observed flow in accordance with the Blue Book.	Mining Engineering Manager / CHPP Manager (or delegate) or Environmental Manager (or delegate)	6.2.2
A discharge of sediment laden water occurs	• Assess the cause(s) of the discharge and take appropriate measures to correct any deficiencies in the design or operation of the system	Environmental Manager (or delegate)	6.2.3.1
A discharge of saline water occurs	• Assess the cause(s) of the discharge and take appropriate measures to correct any deficiencies in the design or operation of the system	Environmental Manager (or delegate)	6.2.3.2
Inflows to sediment containment dam exceed design capacity	• Allow the dams to passive flow via their spillways in accordance with the design requirements in the Blue Book.	Mining Engineering Manager / CHPP Manager (or delegate) or Environmental Manager (or delegate)	6.2.3.3
Disturbed catchments have been observed that require rehabilitation	• Restore the affected areas following preparation of a post mining rehabilitation plan	Mining Engineering Manager (or delegate) or Environmental Manager (or delegate)	6.2.4
Changes to the Catchment areas/yields occur in comparison with the pre-mining regime	• Restore pre-mining runoff characteristics in the natural water courses	Environmental Manager (or delegate)	-
Surface cracking and injury to people, stock or native animals occur	• Remediate the affected areas	Mining Engineering Manager (or delegate) or Environmental Manager (or delegate)	-

Timing / Trigger	Measure	Responsibility	Reference
There are observed adverse effects on overland surface drainage and ponding	• Carry out additional work if required	Mining Engineering Manager (or delegate) or Environmental Manager (or delegate)	-

Adverse impacts on stream bed and bank stability / erosion are observed	• Remediate, as follows, if required:
	  • Grade back unstable unconsolidated banks to their angle of repose and revegetate
	  • Apply the appropriate revegetation technique to subsidence cracks
	  • Revegetate denuded areas
	  • Rectify subsidence effects on fencing and deny cattle access
		Environmental Manager (or delegate)	-

Water Supply for other users	• Assess the cause(s) of the water supply deficiency and take appropriate measures to correct any deficiencies of the system.	Mining Engineering Manager (or delegate) or Environmental Manager (or delegate)	6.2.5
Post mining water pollution from rehabilitated area	• Assess the cause(s) of the event and take appropriate measures to correct any deficiencies in the design or operation of the system	Mining Engineering Manager (or delegate) or Environmental Manager (or delegate)	6.2.3.1

6.2.1 Surface Water Quality Trigger Activated

In the event of a mine water storage area reaching its Blue Book Dam Design capacities, the target criteria for water leaving site would be based on the Environmental Protection Authority (EPA) guidelines and 100th percentile limit stipulated in the ANZECC (2000) limit for irrigation guidelines.

If a discharge event occurs, water sampling and analysis will be undertaken at affected locations, including downstream monitoring points. All samples will undergo water analysis for a range of parameters. These parameters will be plotted against past events, EPA guidelines and the ANZECC (2000) limit for irrigation guidelines.

The same samples will also undergo analysis to establish the concentration and frequency of pollutants. This analysis will be assessed to ensure compliance with DPI Water / EPA requirements.

6.2.2 Stormwater Flow and Dam Design Capacity

Dirty water dams and dirty water catchment structures will be designed installed and maintained to avoid unlicensed or uncontrolled discharge of mine water. All new storages will be designed to contain the 100 year ARI storm event and minimise permeability

6.2.3 **Following a significant rainfall event, defined as an event of greater than 50 mm, data will be reviewed to determine from the magnitude of the rainfall event if the flow associated with a drain, or out of a dam, exceeds its design capacity. If the magnitude of the event is less than the design capacity (i.e. the drain or dam should have contained the event), the capacity of the drain or dam will be increased to accommodate the observed flow. If a dirty water dam storage is within 1m of spilling, water will be pumped from this dam to a suitable alternative storage, if available. All pumped inflows to dirty water storages will cease when the storage water level reaches a defined maximum operating level.** Discharge Events

RCM is a non-discharge site meaning that mine water or sediment laden water must be retained within the RCM water storage system, other than discharge through the GRAWSS. Events outside the normal operation of the water storage system that exceed the design capacity of dams constructed in accordance with the Blue Book will be addressed as per the detail in **Section 6.2.3**.

6.2.3.1 Accidental Discharge with High Total Suspended Solids

If water with a high TSS level is discharged from site, (other than through the GRAWSS), the effect of the discharge on Glennies or Rixs Creek will be assessed to determine the magnitude/volume of the event and the likely significance of the discharge in terms of pollutant load. Sampling and analysis will be undertaken at affected locations and downstream monitoring points to determine any potential environmental impact. The assessment will make recommendations as to appropriate measures to correct any deficiencies in the design or operation of the system.

These incidents will be reported to the EPA, Department of Planning, Industry and Environment (DPIE), and Resources Regulator (RR) as described in **Section 9.1**.

6.2.3.2 Accidental Discharge of Saline Water

If saline water is discharged from site, (other than through the GRAWSS), the effect of the discharge on Glennies and Rixs Creek will be assessed to determine the magnitude of the event and the likely significance of the discharge in terms of pollutant load. The assessment will make recommendations on appropriate measures to correct any deficiencies in the design or operation of the system.

These incidents will be reported to the EPA, DPIE, and RR as described in **Section 9.1**.

6.2.3.3 Sediment Dam Inflows Exceed Design Capacity

If storm runoff exceeds the design operating capacity of sediment dams, the dams will discharge via their spillways into Reedy Creek (Falbrook Open Cut) or Station Creek (Camberwell Pit and Western Extension at RCN; or into Rixs Creek in the RCS area.

The spillways are designed to minimise the risk of scouring embankments and loss of the storage. In addition, applicable erosion and sediment controls have been installed and will be maintained downstream of these spillways to help reduce any potential environmental impacts should an overflow event occur.

These incidents will be reported to the EPA, DPE, and RR as described in **Section 9.1**.

6.2.4 Restoration of Disturbed Catchments

Mine operational impacts which necessitate the need to rehabilitate any land surface, stream bed or bank, modify stream flow or improve water, will be undertaken following preparation of a post mining rehabilitation plan that addresses the relevant issues.

Following the completion of mining, site rehabilitation will entail re-shaping, soil application and vegetation, with the completed mining areas in the pit and associated catchments being revegetated primarily with endemic local species to restore the run-off and water quality characteristics of these areas or water sources.

Overburden emplacement areas will be rehabilitated progressively to minimise mine footprint, and the associated volumes of mine water run-off, and to restore the flow and quality of run-off from these catchments.

In accordance with PA 08_0102 Bloomfield have committed to undertake riparian rehabilitation along Glennies Creek and Station Creek which will include:

- Rubbish removal, complimentary planting, weed control, habitat enhancement and exclusion of grazing stock from riparian areas; and
- A monitoring and management programme to identify and manage noxious weed infestations.

Bloomfield will conduct annual inspections of Rixs Creek and will implement erosion controls/remediation as required, including the exclusion of grazing stock.

6.2.5 Water Supply for other Water Users

The surface water assessment conducted for the Environmental Assessment (PSM, 2007) and for the Western Extension of the Camberwell Pit (WRM Water and Environment, 2009) did not anticipate any observable loss of flow in Glennies Creek, Station Creek, and no ameliorative actions are currently proposed. In the southern area, Rixs Creek is likewise not anticipated to be influenced by mine water management operations.

If any observable loss of flow in Glennies Creek is identified, then a qualified hydrologist will be commissioned to assess whether the loss of flow is due to operations at RCM.

If the loss of flow is due to RCM operations, then the hydrologist will develop a strategy to minimise any adverse impacts to downstream water users.

7 Groundwater Management Plan

7.1 Overview

The groundwater monitoring program has been implemented to monitor for potential groundwater impacts and to provide data that enables comparison of the actual impacts of RCM with those predicted in the current groundwater model. Monitoring locations for potential impacts were selected to facilitate the observation of any significant changes in the groundwater regime across the project area – the Permian basement and the creek alluvial system.

The monitoring network was designed to comply with the DPIE Water guidelines to:

- Permit the collecting of a sufficient and reliable level of data such that any interpretation based on that data should accurately represent the condition of the natural resource at the time of sampling;
- Provide a mechanism for monitoring the impact of mining developments on the groundwater system and to relate it to the predictions made during the environmental impact assessment process; such as:
  - Tailings emplacement area – groundwater pollution;
  - Spoils and emplacement – contribution of salt to surface water and groundwater;
  - Surface water bodies – these may locally control groundwater levels in surrounding spoil and Permian strata; and
  - Waste dumps & CHPPs – surface water runoff and associated water quality issues.
- Initiate any required remediation and restoration program where there is degradation of the groundwater regime beyond the trigger levels identified in the approvals as part of the development application.

The overall aim of the monitoring program is to develop and expand a baseline set of water level and quality data for RCM against which any future perceived, or actual groundwater impacts of the mine can be independently assessed. The currently implemented groundwater monitoring program consists of the following:

- Groundwater levels monitored via a network of VWPs, open standpipe piezometers and production bores;
- Piezometers monitor water levels in both the regolith, alluvium and coal seams;
- Hydrogeological conditions in the shallow and deep groundwater systems adjacent to the working seam are monitored by multi-level piezometers (nested installations);
- The Singleton STP weather station provides climatic data;
- Field water chemistry is recorded (EC, pH, TDS and Temperature);
- Piezometer water levels and field chemistry are recorded on a bi-monthly basis; and
- All piezometers are sampled annually for a standard chemistry suite undertaken by a laboratory.

The monitoring network currently includes a combination of standpipe piezometers (monitoring bores), production bores and vibrating wire piezometers. The bore details are summarized in **Table 19** and the objectives of the monitoring program are outlined in **Table 20**.

Table 19
Groundwater Monitoring Program Network

Bore ID	License	Easting	Northing	Screened Interval (mbgl)	Stick Up (m)	Surface Elevation (mAHD)	Total Depth (mbgl)
Rix's Creek North							
Creek Alluvium							
GCP09	(20BL171708)	323259	6407315	4.5-9	0.71	69.8	9
GCP10	(20BL171708)	324414	6408030	Unknown	0.7	74.9	11.5
GCP19	(20BL171708)	325086	6408333	8.5 - 12	0.63	77.5	12
GCP20	(20BL171708)	325201	6408179	5.2-8.2	0.67	82	8.2
GCP21	(20BL171721)	324466	6407916	6 to 11	0.82	76	11
GCP22	(20BL171721)	324558	6407814	8.5-12	0.7	75	12
CGP23	(20BL171721)	324535	6407659	4.6 - 8	1.01	75	8
GCP28	(20BL171722)	322651	6405459	6.7 to 12.0	0.8	69.5	12
GCP30	(20BL171720)	322438	6404649	5.5 to 12.0	0.94	67.5	12
Coal Measures							
GCP1	(20BL169631)	325124	6406664	Unknown	0.34	96.01	108
GCP2	(20BL169631)	325160	6406490	Unknown	0.61	105.4	105
GCP5	(20BL169631)	324337	6406203	Unknown	0.54	80.3	108
GCP6	(20BL169631)	324941	6406785	Unknown	0.38	102.9	126
GCP7	(20BL169628)	325864	6407071	60 – 72 & 96 - 102	0.1	93.0	120

Bore ID	License	Easting	Northing	Screened Interval (mbgl)	Stick Up (m)	Surface Elevation (mAHD)	Total Depth (mbgl)
GCP8	(20BL169630)	326332	6407214	Unknown	0.44	105.1	120
GCP13	(20BL169628)	326169	6406745	Unknown	0.15	105.3	66
GCP14	(20BL169628)	325774	6407042	Unknown	0.66	90.9	123
GCTB	(20BL169631)	325149	6406572	Unknown	0.2	102.6	90
GCP27	(20BL171881)	323197	6406037	36.5 to 37.5	1.11	70	27.5
GCP32	(20BL171880)	322491	6404250	49.0 to 55.0	0.66	70.5	55.55
GCP36	(20BL171722)	322915	6405320	14.5 to 16.0	0.85	70.5	16
GCP38 (VWP)	(20BL171878)	323468	6405626	17.0-24.3	0.98	71	24.3
GCP24		323241	6407107	46-48	0.6	71.25	48
GW67291		326264	6408139		0.2		90
Rix's Creek South							
Creek Alluvium							
BH-8	-	321803	6401175	5 to 14	0.8	85.446	20
BH-4	-	323982	6398666	7 to 10	0.74	N/A	10
Coal Measures							
BH-3	-	325457	6401923	5 to 8	0.97	N/A	11
BH-5	-	324562	6399924	63 to 66	1.04	76.469	66.5
BH-7	-	323345	6401709	150.5 to 198.5	0.72	100.86	200.5
20BL170864	-	324633	6400335	N/A	0.3	N/A	~70
DDH223	VWP	321684	6409694	N/A	N/A	N/A	N/A

Table 20
Groundwater Monitoring Plan

Timing / Trigger	Measure	Responsibility
Monitoring activities will be undertaken in accordance with the frequency / timing indicated in this WMP.	The groundwater monitoring program specifically provides for the collection of information relating to: • Provide detailed baseline data of groundwater levels, yield and water quality in the region • Impacts on groundwater levels on neighbouring properties and any beneficial groundwater users • Impacts on the groundwater dependent ecosystems associated with the alluvial aquifers of Glennie's Creek, Station Creek, and Rix's Creek. • Groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts The current operational groundwater monitoring programs will continue with ongoing review and possible modification of the program as further data are obtained and interpreted	Environment Manager (or delegate)

7.2 Groundwater Monitoring Program

7.2.1 Monitoring Water Levels

As part of the water management at RCM, an extensive monitoring program has been implemented to detect any impacts from mining (and associated dewatering) on the groundwater regime, and from any nearby groundwater users (including third party mining operators). The broad monitoring program incorporates both shallow and deep groundwater monitoring locations monitoring the water levels in the Creek Alluvial deposits and the Permian Coal Measures around both the RCN and RCS areas. The monitoring locations are shown in **Figure 7**, and listed in **Table 19**. **Table 21** outlines the method and frequency of water level measurement requirements based on the water management plan.

The monitoring site selection was based on:

- Previous assessments of the local environment;
- The current and proposed mining operations;
- Mine rehabilitation plans; and
- The existing groundwater users in the area.

Piezometers, production bores and VWPs included in the operational groundwater monitoring program include the Foybrook Formation basement coal measures as well as the Glennies Creek, Station Creek,

and Rixs Creek alluvium groups. As RCM continues to develop and evolve, there may be requirements from time to time to replace, remove or add piezometers to enable the monitoring network to achieve its stated objectives – such alterations would be documented in future revisions to the WMP over time.

Table 21
Groundwater Level Monitoring – Method and Frequency

Monitoring Site	Sampling Method	Frequency	Units
Rix's Creek North			
All bores	Dip meter	Bi-monthly	mbgl
Rix's Creek South			
BH3 – BH5, BH7 – BH8	Dip meter	Bi-monthly	mgbl
DDH223	Vibrating wire piezometer array	Twice daily / annual download	Pressure (m head)
20BL170864	Dip meter	Bi-monthly	mgbl

Note:

* mbgl = metres below ground level
* Missing bore numbers are either not drilled or not used (GCP03, 4, 17, 33, 40) or have been removed / destroyed
* Where they are now required, any new bores will be installed by suitably licenced drillers after obtaining the relevant licence from DPI Water
* Bi-monthly is every two months

7.2.2 Rix's Creek Mine Water Level Performance

Groundwater results and trends are analysed annually by specialist consultants. Recent results have shown no exceedances of groundwater trigger levels or reportable events. Water level performance is summarised in the ARs.

7.2.3 Monitoring Groundwater Quality

Table 19 presents the combined monitoring bore network for RCM. The bores and parameters are to be monitored while mining operations are occurring. The units and frequency of monitoring for the groundwater quality monitoring program for all open standpipe piezometers is to be bi-monthly for EC, pH, TDS and Temperature and annually for a full suite as noted in **Table 22**.

Groundwater samples will be collected annually from selected piezometers and analysed at a NATA accredited laboratory for major ions and selected metals. Monitoring will continue for three years following cessation of mining or longer if required by EPA, DPIE and DPIE Water.

The frequency of monitoring will be reassessed after mining of specific areas is complete as it may be viable, depending on results, to reduce the sampling frequency.

7.2.3.1 RCN

Groundwater monitoring sites have been identified ranging from piezometers, production / regional bores and VWP installations to provide adequate monitoring coverage to produce a viable Groundwater Monitoring and Response Plan.

Baseline monitoring data has been reviewed back to September 2009, with monthly monitoring of field water quality parameters including: EC, TDS and pH. Quarterly sampling has been undertaken regularly since 2012. The historical comprehensive laboratory analysis suite of parameters including:

- Physical properties (EC and pH);
- Major cations, anions and selected Total Metals (Na, K, Ca, Mg, F, Cl, SO4, HCO3, NO3, Cu, Pb, Zn, Ni, Fe, Mn, As, Se, Cd, Cr)

7.2.3.2 RCS

Groundwater monitoring sites have been identified ranging from piezometers, production bores and VWP installations to enable the development of a suitable Groundwater Monitoring and Response Plan. In May 2010, five standpipe piezometer monitoring bores were installed (BH-1 to BH-5) and along with an existing production bore (20BL170864), with a further two bores BH-7 and BH-8 installed in 2015.

Baseline monitoring commenced in May 2010, with regular monthly monitoring of field water quality parameters including: EC, TDS and pH. Quarterly sampling was undertaken for historical comprehensive laboratory analysis of a broader suite of parameters including:

- Physical properties (EC, TDS, and pH);
- Major cations and anions (Ca, Mg, Na, K, Cl, SO4, HCO^3 and CO^3); and
- Selected Total Metals.

Table 22
Groundwater Quality Monitoring – Method and Frequency

Monitoring Site	Water Quality Parameters	Sampling Method	Frequency
GCP6, 8, 10, 21, 22, GCP7, 14, 19, 20, 23, TB, 30, GCP27, 28, 32, BH3 – BH5, BH7 - BH8, 20BL170864,	EC, pH, TDS, Temperature	Pumped or bailed sample	Bi-monthly
GCP6, 8, 10, 21, 22, GCP7, 14, 23, TB, 30, 32, GCP27, 28, 32, BH3 – BH5, BH7 - BH8, 20BL170864	(EC, pH) + TDS, Na, K, Ca, Mg, F, Cl, SO4, HCO3, NO3, Total N, Total P, hardness, Cu, Pb, Zn, Ni, Fe, Mn, As, Se, Cd (Totals)	Pumped or bailed sample	Annually

7.2.4 Rix's Creek Mine Water Quality Performance

7.2.4.1 RCN

Results from 2016 reporting period showed pH remained at relatively constant levels throughout the reporting period at all GC series piezometers (neutral to slightly alkaline range). EC was consistently low at the Glennies Creek alluvial bore GC09 (307-445 µS/cm).

The pH and salinity in the Glennies Creek alluvial open standpipe piezometers has not shown any significant trends since they were installed in 2007, except for a reducing salinity profile in GCP29 (bore no longer serviceable), and GCP30 between mid-2009 and early 2011.

The pH and salinity in the basement open standpipe piezometers in the vicinity of the Camberwell Pit has not shown any significant trends since they were installed after mid-2007.

The pH and salinity in the alluvial open standpipe piezometers in the vicinity of the Falbrook Open Cut Pit has not shown any significant trends since they were installed in 2012. Likewise, the pH and salinity in the Falbrook Open Cut basement open standpipe piezometers have not shown any significant trends since they were installed in 2012, excepting a rise then fall in salinity in GCP14 and a reduction in salinity at GCP02.

7.2.4.2 RCS

Results from 2016 annual water review showed pH remained at relatively constant levels throughout the reporting period at all BH series piezometers (neutral to slightly alkaline range). Groundwater EC (mS) throughout the period of monitoring have also returned stable results. This is all consistent with the historical groundwater EC ranges.

The average salinity values of the groundwater sampled from the screened bore in the coal seam (BH5) ranged between 4,680 to 6,140 mg/L showing high levels of salinity. BH7 was also sampled and recorded 7,250 mg/L in May 2016, although the bore appeared to be dry during other sampling events during 2016. The salinity values within the regolith (BH3 and BH4) are also high ranging from 5,720 to 20,400 mg/, but are consistent with field water quality parameters observed in the region over time.

Since monitoring commenced in 2012, salinity levels are shown to remain consistent (yet distinct) in the coal seams and the regolith/alluvium. This indicates limited connectivity (and mixing) between the two aquifer zones, and no negative water quality trends are being driven from mining operations in the area. This is consistent with the hydrogeological conceptualisation which underpins the groundwater baseline study and impact assessment work, and continues to be validated by the ongoing monitoring analysis.

8 Groundwater Management Measures

As with surface water management, measures to manage groundwater at RCM have been divided into those measures which aim to prevent groundwater management incidents in the first place (i.e. Preventative Measures); and those measures which aim to minimise environmental damage in the event of a trigger or incident occurring (i.e. Corrective Measures).

8.1 Preventative Measures

8.1.1 Open Cut Groundwater Inflows

The approach to the management of groundwater inflows into open cuts is outlined in **Table 23**.

Table 23
Groundwater – Preventative Measures

Timing / Trigger	Measure	Responsibility
Ongoing	• Groundwater seepage will be estimated by measuring the total volume of water pumped into and out of each pit using flow meters • The annual groundwater seepage volume for each pit will be determined from the measured pit inflow and outflow volumes, after allowing for annual rainfall within each pits' catchment area and for evaporation • The estimated groundwater inflow in the open cut pits will be reported annually in the AR • Impacts on the groundwater supply of nearby landowners. • Impacts on nearby creeks and any groundwater dependent ecosystems and riparian vegetation will be reported	Environment Manager (or delegate)

8.2 Corrective Measures

The corrective measures which follow effectively constitute the "Groundwater Monitoring and Response Plan" required under Schedule 3 Condition 36(g) of PA 08_0102 and Condition B41(f)(v) of SSD 6300. The measures are presented in **Table 24**, indicating the measures required, who is responsible for implementing the measure and when it is to be implemented. Explanatory notes for each action follow the table.

Table 24
Groundwater – Corrective Measures

Timing / Trigger	Measure	Responsibility	Reference
Groundwater level trigger activated	• Investigate the causes for the unpredicted changes to groundwater levels and take appropriate actions	Environmental Manager (or delegate)	**8.2.1**
Groundwater quality trigger activated	• Investigate the causes for the unpredicted changes to groundwater quality and take appropriate actions	Environmental Manager (or delegate)	**8.2.2**
Departures from groundwater model validation and calibration experienced	• A suitably qualified and experienced hydrogeologist assess the cause(s) of departures and take appropriate actions (if required)	Environmental Manager (or delegate)	**8.2.3**
Adverse impacts on yield of well GW67291 or other private bores/wells	• A suitably qualified and experienced hydrogeologist assess the cause(s) of departures and take appropriate actions	Environmental Manager (or delegate)	**8.2.4**
A reduction in the standing water level within a private bore/well which exceeds the identified trigger because of mining	• Bloomfield to enter negotiations with affected landowner(s) to explore options (including to provide compensatory water supply)	Environmental Manager (or delegate)	**8.2.5**
A loss of flow in Glennies, Station or Main Creeks	• A suitably qualified and experienced hydrogeologist investigate the cause(s) of loss of flow and develop a strategy to minimise any adverse impacts if loss of flow due to open cut operations at Rix's Creek Mine	Environmental Manager (or delegate)	**8.2.6**

Timing / Trigger	Measure	Responsibility	Reference
Stream flow monitoring within Glennies, Station, or Main Creeks indicates significant adverse departure from previously monitored stream flows	• Determine if equivalent offset to the stream flow loss is required	Environmental Manager (or delegate)	**8.2.7**

8.2.1 Groundwater Level Trigger Activated

A groundwater level trigger will be activated if the groundwater level in a piezometer or well within the Quaternary alluvium falls by greater than 15% of the saturated aquifer thickness. Where the historic water level exceeds the 15% alluvium thickness level, the actual measured variation range will take precedent, as shown in **Table 25**. To activate the trigger, the reduction in water level will also need to be at a level that is deeper than the historical ranges of natural variability measured in the overall monitoring data set.

Ongoing monitoring will continue to identify whether increasing and declining trends in the data are associated with climatic/streamflow trends, or the more local influences of drawdown. **Appendix G** shows the historical data and associated hydrographs which inform and track this level trigger. To date, the trends in the alluvium hydrographs shows a correlation with rainfall events (and associated streamflow influences), and not with dewatering drawdown.

The trigger level will undergo adaptive management, if necessary, against updated benchmark data as the monitoring program continues.

As required under Condition B41(v), groundwater level triggers for the hardrock piezometers have been developed using statistical analysis of monitoring data. These trigger levels are presented in **Table 26**. The trigger levels will be reviewed every three years with the review of the groundwater model required under Condition B41(v).

If the monitoring results show an exceedance of the adopted water level trigger values for two consecutive readings, the response actions listed below will be initiated. An action plan will be prepared to reflect these actions:

- Once an exceedance is detected the circumstances of the event will be immediately investigated including a review of relevant monitoring data, meteorological conditions, etc;
- The exceedance will be reported as outlined in **Section 9.1**;
- An assessment will be made to determine the reason for the exceedance, the potential magnitude of the impact, and inform the level of future risk;
- If assessed as being caused by the mining operation, and it is further assessed to be likely to cause an adverse impact on an existing use for surface water, then an appropriate preventative and/or remedial strategy will be prepared for discussion with relevant authorities which may comprise:
  - Additional monitoring including assessment of ecological aspects;

- Modification of mine water management procedures;
- Modification of mine water management facilities; or
- (If appropriate) change to Operations.

- A response/mitigation plan will be implemented to the satisfaction of the relevant authorities;
- If it is found that downstream water users have been adversely impacted, the landholder(s) will be consulted regarding the provision of an alternative water supply or some other appropriate agreement negotiated between the parties.

Table 25
Groundwater Level Reduction – Saturated Alluvium Thickness Trigger

Bore ID	Screened Interval (mbgl)	Total Depth (m)	15% of Alluvial Thickness	Historical Water Level Variability (m)	Trigger Value
Rix's Creek North					
GCP10	Unknown	11.5	1.73	0.4	1.73
GCP21	6 to 11	11	1.65	1.04	1.04
GCP23	4.6 – 8	8	1.20	0.62	1.20
GCP26	7.0 - 11.0	11	1.65	0.88	1.65
GCP28	6.7 – 12.0	12	1.80	0.4	1.80
GCP30	5.5 – 12.0	12	1.80	2.03	2.03
Rix's Creek South					
BH4	7–10	10	1.5	2.33	2.33
BH8	5-14	20	3	0.14	3

Table 26
RCS Groundwater Level Reduction – Hardrock Trigger

Bore ID	Target Formation	Trigger drawdown value (m)
BH3	Colluvium	1.3
BH5	Coal	5.7
BH7	Coal	4.6

Source: Rix's Creek South – Groundwater Trigger Value Derivation (AGE, 2020)

8.2.2 Groundwater Quality Trigger Activated

Groundwater monitoring has shown that the groundwater quality in both the coal measures and alluvial aquifers, except for groundwater immediately adjacent to Glennies Creek (i.e. GCP9 and GCP10), exceeds the criteria shown in **Table 27** and **Table 28**.

Trigger levels (**Table 29**) are set so that a variation of greater than 15% from the average 2002 to 2016 baseline EC value or 0.5 pH deviation from baseline range conditions will trigger further investigation. In the event of a trigger activation, the causes will be investigated, and appropriate actions determined and undertaken.

Table 27
Groundwater Quality Criteria – Major Ions & Nutrients

Type	pH	TDS (mg/L)	EC (uS/cm)	F (mg/L)	SO_4 (mg/L)	NO_3 (mg N/L)	Hardness as $CaCO_3$ (mg/L)
Irrigation	6 – 8.5	0	0	2	0	25 – 125	>60 – 350
Livestock	-	<4000 / 5000	6100/7700	2	-	-	-

Table 28
Groundwater Quality Criteria – Metals (mg/L)

Type	Cu	Pb	Zn	Ni	Fe	Mn	As	Se	Cd	Cr
Irrigation	5	5	5	2	10	10	2.0	0.05	0.05	1
Livestock	1 / 0.4	0.1	20	1	-	-	0.5	0.02	0.01	1

Table 29
Groundwater Quality Trigger Levels

Parameter	Trigger Level
Electrical Conductivity (EC)	>15% variation from the average 2003-2016 baseline data
pH	>pH 0.5 variation from the average 2003-2016 baseline data

8.2.3 Groundwater Model Validation and Calibration Departures

The current version of the numerical groundwater model (2017) is an update to the previous version of the model adopted initially for the RCS operations, and then utilised for impact assessment for the Rix's Creek Continuation Project (the Project). Since Bloomfield acquired the open cut operations formerly associated with the Integra mining operations, there was a need to integrate these pits further into the latest version of the groundwater model – for calibration and prediction purposes.

If groundwater level monitoring data within RCM alluvial and basement piezometers suite indicates a significant adverse departure from the anticipated drawdowns, and these departures may be directly related to dewatering of the Falbrook Pit, or Camberwell Pit, then a suitably qualified and experienced hydrogeologist will be required to assess the cause of the departure.

If the departure from the groundwater prediction can be directly related to the unanticipated adverse drawdowns in the Glennies Creek, Station Creek, or Main Creek alluvium or the Permian Coal Measures basement lithologies (Foybrook Formation) due to dewatering of the open cut pits, then a groundwater model validation and calibration program to site specific conditions may be required, after discussion and agreement with DPIE Water.

8.2.4 Adverse Impact on Groundwater Users

At present there is one active registered groundwater extraction point (well GW67291) within the potential drawdown area for the Falbrook Open Cut pit (modelled by AGE Pty Ltd, 2006 on behalf of Integra Operations); and the Western Extension of the Camberwell Pit (modelled by Geoterra, 2009 on behalf of Integra Operations).

In the event of any reported adverse impacts on the yield of the subject water supply well or any private bores or wells that may be developed in the future within the RCM water footprint, the cause will be investigated by a suitably qualified and experienced hydrogeologist. If the impacts can be directly related to the mine following assessment of the available monitoring data, either the affected bore or well will be deepened or an alternative water source will be provided.

8.2.5 Compensatory Groundwater Supply

The RCS EIS predicted that there were no identified groundwater users within the predicted extent of groundwater drawdown which could be potentially impacted by the Project.

If monitoring identifies a reduction in the standing water level within a private bore or well which exceeds the identified trigger and it is established to be a consequence of mining, Bloomfield will enter into

negotiations with the affected landowner(s) with the intent of formulating an agreement which provides for one or a combination of:

- Re-establishment of saturated thickness (alluvial aquifer) or standing water level (basement aquifer) in the affected bore(s) through bore deepening;
- Establishment of additional bores to provide the yield at least equivalent to the effected bore prior to being affected by mining;
- Provision of access to alternative sources of water; and/or
- Compensation to reflect increased water extraction costs – e.g. due to lowering pumps or installation of additional or alternative pumping equipment.

The compensatory water supply measures will provide an alternative long-term supply of water that is equivalent to the loss attributed to RCM.

If Bloomfield and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer to the Secretary for resolution. If Bloomfield is unable to provide an alternative long-term supply of water, then Bloomfield shall provide alternative compensation to the satisfaction of the Secretary.

8.2.6 Loss of Flow in Glennies, Station or Main Creeks

The surface water assessment conducted for the Environmental Assessment (PSM, 2007) and for the Western Extension of the Camberwell Pit (WRM Water and Environment, 2009) did not anticipate any observable loss of flow in Glennies Creek, Station Creek, and no ameliorative actions are currently proposed. In the southern area, Rixs Creek is likewise not anticipated to be influenced by mine water management operations.

If any observable loss of flow in Glennies Creek is identified, then a qualified hydrologist will be commissioned to assess whether the loss of flow is due to operations at RCM.

If the loss of flow is due to RCM operations, then the hydrologist will develop a strategy to minimise any adverse impacts.

8.2.7 Stream Baseflow Offsets

If stream flow monitoring at nominated locations within RCM indicates a significant adverse departure from previously monitored stream flows, and those departures may potentially be related to RCM influences, then an independent, qualified hydrologist will be requested to assess the causes of the departure.

If the effect can be directly related to unanticipated adverse drawdown in the Quaternary stream alluvium or basement lithologies due to mining operations within RCM dewatering operations, then an equivalent offset to the stream flow loss may be required, after discussion and agreement with DPIE Water.

Stream baseflow offsets may be provided via the retirement of adequate water entitlements to account for the loss attributable to the project.

RCM is not required to provide additional baseflow offsets where such offsets have already been provided under previous consents or approvals for the operation.

Groundwater modelling indicates no impact to the Glennies Creek alluvium as a result of continued mining operations. Nevertheless, to provide early warning of any potential losses from the Glennies Creek alluvium, RCM will use the two Office of Environment and Heritage (OEH) streamflow gauging stations located upstream and downstream of the operation and will assess the changes in baseflow contribution based on the long term historical data available for those two stations. In addition, groundwater monitoring bores installed in the alluvium will provide early warning of any potential changes in groundwater levels and therefore changes to flow. The review of groundwater monitoring data will occur quarterly and reported in the AR.

8.2.8 Groundwater Dependent Ecosystem Impacted

Mining operations are not predicted to impact on the Groundwater Dependent Ecosystem (GDE) located at some reaches of Glennies Creek and hence there is no monitoring program proposed for the GDEs during mining operations as RCM is a nil discharge site. Shallow monitoring bores are installed in the Glennies Creek alluvium and will provide data, allowing for early detection of altered baseflow contribution to the creek and provide information on any potential impact from seepage from water storages on the alluvium.

9 Compliance Protocol

9.1 Compliance Reporting

Condition E7 of SSD 6300 and Schedule 5 Condition 8 of PA 08_0102 require Bloomfield to immediately report any incidents to DPIE and any other relevant agencies. An incident is defined as:

> "*An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance*."

An incident report includes:

- Identification of the development (including development application number and name);
- Location and nature of the incident

Bloomfield are required to report any non-compliances to DPIE in writing within seven (7) days of becoming aware of the non-compliance under Condition E8 of SSD 6300 and Schedule 5 Condition 9 of PA 08_0102. A non-compliance is defined as:

> "*An occurrence, set of circumstances or development that is a breach of this consent.*"

A non-compliance report includes:

- Identification of the development (including development application number and name);
- Set out the condition of this approval that the development is non-compliant with;
- The way in which it does not comply and the reasons for the non-compliance (if known)
- What actions have been, or will be, undertaken to address the non-compliance.

If an affected landowner considers the Rix's Creek Mine is exceeding the relevant criteria, they may request from the Planning Secretary an independent review of impacts that would include monitoring and identifying measures to be implemented to ensure compliance.

Condition R4.1 of EPL 3391 requires Bloomfield to notify the EPA by phone immediately after becoming aware of any contravention or potential contravention of Section 120 of the POEO Act. Written details of the notification must be provided to the EPA Director Hunter within seven days of the note of the notification.

9.2 Complaints Handling

RCM has a 24-hour telephone hotline (02 4930 2665) for the members of the public to lodge complaints and concerns or to raise issues associated with the operations. This service aims to promptly and effectively address community concerns and environmental matters.

The hotline number is advertised on the Bloomfield Group web site (https://www.bloomcoll.com.au/) and members of the community are encouraged to contact the hotline if they need to highlight any environmental issues or seek information regarding environmental aspects associated with RCM.

In addition, a member of the community can contact an RCM Environmental Advisor or Manager in person, by phone, e-mail or letter. Any person that is likely to be in a position to receive concerns is trained to deal with complaints in a professional, private and effective manner.

All complaints received are recorded in accordance with the *Privacy Act 1988* and lodged in the complaint register. The complaint register is only viewable by environmental personnel and is protected to prevent others viewing recorded information. All complainants are questioned if they would like their complaint and details recorded. Information which may be recorded includes:

- Date and time the complaint was lodged;
- The method by which the complaint was made;
- Personal details provided by the complainant;
- Nature of the complaint;
- Action taken or if no action was taken, the reason why; and
- Follow up contact with the complainant following investigation.

All anonymous complaints will be received, investigated and actioned (if required). However, if no details are provided Bloomfield will not be able to provide feedback to the complainant. The outcome of the complaint will be recorded in the register.

Only generalised, non-personal information is published in the monthly complaint register on the Company website. No personal details such as name, address, phone number are published or any other information which may allow the complainant to be identified. A summary of complaints also will be reported in the EPL Annual Return and AR and presented at the CCC meetings.

The complaint record will be kept for at least four years after the complaint was made.

10 Reporting & Review

10.1 Annual Reporting

By the end of March each year, Bloomfield will provide an Annual Review required under Schedule 5 Condition 10 of PA 08_0102 and Condition E9 of SSD 6300 to the Planning Secretary. The Annual Review will

- Describe the development over the previous calendar year and that proposed for the next calendar year;
- Report on actual versus proposed surface disturbance;
- Summarise the environmental performance of RCM for the previous calendar year, including compliance with relevant criteria;
- Include the presentation and analysis of the results of monitoring, including any relevant trends;
- Discuss any non-compliances, incidents, complaints and any management actions implemented at RCM over the reporting period;
- Identify any discrepancies between the predicted and actual impact of the development and analyse the potential cause of any significant discrepancy; and
- Include a description of what measures will be implemented over the coming year to improve the environmental performance of the development.

The AR will be made publicly available through placement on Bloomfield's website http://www.bloomcoll.com.au/ and will be provided to the CCC.

The AR will outline trends in surface water and groundwater quantity and quality and standing groundwater levels and quality in both alluvial and basement aquifers.

The assessment of trends will not only consider the trigger levels identified in this report, but also any natural variations that occur. The report will include:

- Raw water monitoring data and groundwater extraction data;
- A basic statistical analysis (mean, minimum, maximum and. standard deviation) of the results for the parameters measured in creeks, dams, bores, piezometers or wells;
- An interpretation of the water quality results and trends in water quality and water levels at surface and groundwater monitoring points supported by graphs and plots (versus ANZECC Guidelines as appropriate);
- An interpretation and review of the results in relation to trigger criteria and predictions made in the original Environmental Assessments;
- A review of RCM water balance assumptions in the light of the actual measured inflows and outflows and provide an interpretation of RCM water balances compared to Mine Water Access Licences

The water monitoring and review detail will be prepared by a qualified hydrogeologist. Any groundwater modelling required as part of this review will be conducted consistent with the conditions of consent.

Where monitoring identifies any elevated results that may impact on other water users, Bloomfield will notify these water users as soon as practicable, as required under Condition B41(f)(iv).

10.2 Monthly Reporting

Surface water monitoring results will be reported monthly on the public website as required by the EPL and Schedule 5, Condition 13 of PA 08_0102 and Condition E14 of SSD 6300.

10.3 Auditing

Under Condition E10 of SSD 6300 and Schedule 5 Condition 11 of PA 08_0102, an independent environmental audit of the RCN and RCS operations will be conducted every three years and the results reported to the Secretary DPIE and made available on the website. This audit will consider water monitoring results and Bloomfield's responses.

Actions and recommendations are communicated to senior management and actioned as necessary. Any relevant findings are considered in the planning processes as part of the Environmental Management System.

Internal audits of this management plan will be undertaken by specialists periodically as determined by the Environment Manager, or in response to significant environmental incidents for which a systems failure has been determined as a contributor to the incident.

10.4 Management Plan Review

Schedule 5, Condition 5 of PA 08_0102 (as modified) and Condition E5 of SSD 6300 require that, within three months of the submission of the following documents, Bloomfield will review, and if necessary, revise the WMP in consultation with the EPA to the satisfaction of the Planning Secretary:

- Annual Review in accordance with Schedule 5, Condition 10 and Condition E9;
- Incident report under Schedule 5, Condition 8 and Condition E7;
- Audit report under Schedule 5, Condition 11 and Condition E10; or
- Modification to the conditions of PA 08_0102 or SSD 6300 (unless the conditions require otherwise).

When a review leads to revision in the WMP, then within six weeks of the review decision, unless the Secretary agrees otherwise, the revised WMP will be submitted to the Secretary for approval.

The purpose of the review is to ensure that the WMP remains suitable, adequate and effective. The monitoring data will be reviewed as it is collected and at strategic milestones in the mine life, including AR

reporting periods. The WMP will be modified as required to reflect changes to the mine plans, monitoring results or in response to stakeholder comments.

11 Roles & Responsibilities

The roles and responsibilities of staff at RCM in respect of this WMP are presented in **Table 30**.

Table 30
Roles & Responsibilities

Role	Responsibilities	Section
Mining Engineering Manager	• Ensure adequate resources are available to enable to implementation of this WMP;	6.1
	• Maintain accountability for the overall environmental performance of the operations, including the procedures and outcomes of this WMP;	6.1
	• Respond to any unplanned events that may potentially result in, or cause, negative environmental impacts as required.	6.2, 8.2
	• Ensure reportable incidents are investigated and reported to the Environment Manager;	9
	• Ensure inspections are undertaken in accordance with the WMP;	6.1
	• Check that persons conducting the inspection are appropriately trained, understand their obligations and the specific requirements of this WMP.	6.1
CHPP Manager	• Ensure dam and drain capacities around the CHPPs are sufficient to accommodate observed flows in accordance with the Blue Book	6.2
Environment Manager or delegate	• Authorise the WMP and future amendments;	10.4
	• Ensure inductions and training relevant to the WMP is implemented.	6.1
	• Act as the interface for environmental matters between government authorities, private industry, contractors, community groups and the wider community;	9
	• Promptly notify the relevant regulatory agencies of any incidences or non-compliances;	9.1
	• Manage complaints as required in **Section 9.2**;	9.2
	• Investigate the causes of any discharges and take appropriate measures to correct any deficiencies;	6.2, 8.2
	• Check that persons conducting the inspection are appropriately trained, understand their obligations and the specific requirements of this WMP;	6.1

Role	Responsibilities	Section
	• Maintain an environmental monitoring program to gauge the effects of RCM mining operations on surface water and groundwater systems;	5.2, 7.2
	• Conduct required monitoring to the standard and frequency outlined in this WMP and as per requirements of the EPL, Project Approval and associated water licence requirements	5.2, 7.2
	• Develop an Annual Review report detailing the results of key performance indicators developed for each monitoring location;	10.1
	• Review and assess the monitoring results and inspection checklists;	6.2, 8.2
	• Commission specialist input as required under this WMP to undertake specialised monitoring, interpretation and reporting functions;	6.2, 8.2
	• Manage the Permit to Disturb process;	6.1.2
	• Implement rehabilitation of disturbed catchments;	6.2
	• Remediate adverse impacts on surface drainage and creek lines;	6.2
	• Negotiate and provide compensatory water supply when required;	8.2.5
	• Report monitoring results monthly.	10.2
Pumping Coordinator	• Maintain a high level of understanding of the WMP;	6.1.1
	• Review and ensure implementation of the WMP;	6.1.1
	• Inform the relevant, Mining Engineering Manager and Environmental Manager / or delegate of unexpected or serious environmental impact issues;	6.1.1 6.2.2
	• Ensure dam capacities are reviewed regularly and prior to/during rainfall events to prevent discharges;	6.1.1
	• Respond to any unplanned events that may potentially result in, or cause, negative environmental impacts.	6.1.1
	• Ensure inspections are undertaken in accordance with the WMP.	
All Personnel □	• Adhere to the requirements of the WMP; and	9.1

Role	Responsibilities	Section
	• Report any events that may potentially result in, or cause, negative environmental impacts immediately to your Supervisor.	

12 References

AECOM, "Rix's Creek Continuation of Mining Environmental Impact Statement". 2015

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Appendix A - Development Consent Conditions

Table A1

PA 08_0102 Consent Conditions

Ref	Legal Requirement	Section
Schedule 3 Condition 29	The Applicant must obtain all necessary water licences for the project under the Water Act 1912 or the Water Management Act 2000.	**2.4**
Schedule 3 Condition 30	The Applicant must ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations to match its available water supply, to the satisfaction of the Secretary.	**4.3**
Schedule 3 Condition 31	The Applicant must offset the loss of any baseflow to the surrounding watercourses and/or associated creeks caused by the project to the satisfaction of the Secretary. *Notes:* *• This condition does not apply in the case of losses of baseflow which are negligible.* *• Offsets should be provided via the retirement of adequate water entitlements to account for the loss attributable to the project.* *• The Applicant is not required to provide additional baseflow offsets where such offsets have already been provided under previous consents or approvals for the project. These existing offsets are to be described and evaluated in the Surface and Ground Water Response Plan (see below).*	**8**
Schedule 3 Condition 32	The Applicant must provide compensatory water supply to any landowner of privately-owned land whose water entitlements are impacted (other than an impact that is negligible) as a result of the project, in consultation with DPIE Water, and to the satisfaction of the Secretary. The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent to the loss attributed to the project. Equivalent water supply must be provided (at least on an interim basis) as soon as practicable after the loss being identified. If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.	**8.2.5**

Ref	Legal Requirement	Section
	If the Applicant is unable to provide an alternative long-term supply of water, then the Proponent must provide alternative compensation to the satisfaction of the Secretary.	
Schedule 3 Condition 33	The Applicant must ensure that all surface water discharges from the site comply with the: (a) discharge limits (both volume and quality) set for the project in any EPL; or (b) relevant provisions of the POEO Act or *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*	**6**
Schedule 3 Condition 34	The Applicant must not undertake any open cut mining operations within 150 metres of the Glennies Creek alluvial aquifer or Station Creek alluvial aquifer without the prior written approval of the Secretary. In seeking this approval, the Applicant must consult with DPIE Water and demonstrate to the satisfaction of the Secretary that adequate safeguards have been incorporated into the Surface and Groundwater Response Plan (see below) to minimise, prevent and/or adequately offset groundwater leakage from the alluvial aquifers. *Notes: The alluvial aquifers and 150 metre buffer zones are shown conceptually on the figure in Appendix 6. This condition does not restrict the Applicant's right to construct and use water management works, access tracks, environmental bunds, remediation works and other similar works*	**6.1.1**
Schedule 3 Condition 36	The Applicant must prepare a Water Management Plan for the project to the satisfaction of the Secretary. This plan must:	
	(a) be prepared in consultation with BCD, EPA, the Resources Regulator and Council, and be endorsed by DPIE Water and then submitted to the Secretary for approval;	**Appendix E**
	(b) include detailed performance criteria and describe measures to ensure that the Applicant complies with the Water Management Performance Measures (see Table 13);	**2.5**
	(c) include a Site Water Balance, which must: • include details of: − sources and security of water supply; − water use on site;	**4.3**

Ref	Legal Requirement	Section
	− water management on site; and − any off-site water transfers, and • describe what measures would be implemented to minimise clean water use on site;	
	(d) include an Erosion and Sediment Control Plan, which must:	**6.1**
	• identify activities that could cause soil erosion and generate sediment;	**6.1.2**
	• describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk;	**6.2**
	• describe the location, function and capacity of erosion and sediment control structures and flood management structures; and	**6.1.1**
	• describe what measures would be implemented to maintain the structures over time;	**6.1.1**
	(e) include a Surface Water Management Plan, which must include:	
	• detailed baseline data on surface water flows and quality in creeks and other waterbodies that could potentially be affected by the project;	**6.1.1**
	• surface water and stream health impact assessment criteria including trigger levels for investigating any potentially adverse surface water impacts from the project (for existing creeks and reinstated/rehabilitated creeks);	**6.2.1**
	• a program to monitor and assess: − surface water flows and quality; − impacts on water users; − stream health; and − channel stability.	**5.2**
	(f) Include a Groundwater Management Plan, which must include:	

Ref	Legal Requirement	Section
	• detailed baseline data of groundwater levels, yield and quality in the region, particularly for privately-owned groundwater bores that could be affected by the project;	**Appendix F**
	• groundwater impact assessment criteria including trigger levels for investigating any potentially adverse groundwater water impacts; and	**8.2**
	• a program to monitor and assess:	**7.2**
	− groundwater inflows to the mining operations;	**8.1.1**
	− impacts on regional aquifers;	**7.2.1**
	− impacts on the groundwater supply of potentially affected landowners;	**7.2.1**
	− impacts on the Glennies Creek and Station Creek; and	**7.2**
	− impacts on groundwater dependent ecosystems and riparian vegetation;	**8.2.8**
	(g) a Surface and Groundwater Response Plan, which must include:	
	• a response protocol for any exceedances of the surface water and groundwater assessment criteria, including provisions for independent investigation by a suitable qualified hydrogeologist whose appointment has been approved by the Secretary;	**8.2**
	• measures to offset the loss of any baseflow to watercourses caused by the project;	**8.2.7**
	• measures to compensate landowners of privately-owned land whose water supply is adversely affected by the project; and	**8.2.4**
	• measures to mitigate and/or offset any adverse impacts on groundwater dependent ecosystems or riparian vegetation.	**8.2.8**
	The Applicant must implement the management plan as approved by the Secretary.	

Ref	Legal Requirement	Section
Schedule 5 Condition 2	The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:	
	(a) detailed baseline data;	**Appendix F**
	(b) a description of: • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; and • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	**2** **2** **2.5**
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**5** **7**
	(d) a program to monitor and report on the: • impacts and environmental performance of the project; and • effectiveness of any management measures (see (c) above);	**5.2** **7.2**
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	**6.2.1** **8.2**
	(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	**10**
	(g) a program to regularly review management practices to align with contemporary best practice industry standards;	**10**
	(h) a protocol for managing and reporting any: • incidents; • complaints; • non-compliances with the conditions of this consent and statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and	**9.1** **9** **9.1** **9.1**

Ref	Legal Requirement	Section
	(i) a protocol for periodic review of the plan. *Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	**10**
Schedule 5 Condition 3	**Preparation of Management Plans** Prior to approval of management plans required under Schedule 3, all existing management plans, monitoring programs, strategies, programs, protocols, etc approved as at the date of approval of Modification 6 shall continue to have full force and effect, and may be revised under the requirements of condition 5 below as if subject to the conditions of this consent that applied prior to the approval of Modification 6, or otherwise with the approval of the Secretary.	**2.1**
Schedule 5 Condition 4	**Relationships between Management Plans** With the agreement of the Secretary, the Proponent may combine any strategy, plan or program required by this approval with any similar strategy, plan or program required for Rix's Creek.	**Appendix E**
Schedule 5 Condition 5	**Revision of Strategies, Plans & Programs** Within 3 months of: (a) the submission of an incident report under condition 8 below; (b) the submission of an annual review under condition 10 below; (c) the submission of an audit report under condition 11 below, or (d) any modification of the conditions of this consent (unless the conditions require otherwise), the Applicant must review, and if necessary, revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. The Applicant must notify the Department in writing of any such review being undertaken. Where this review leads to revisions in any such document, then within 6 weeks of the review the revised document must be submitted for the approval of the Secretary. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the project.*	**10.4**
Schedule 5 Condition 8	**Incident Notification** The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an	**9.1**

Ref	Legal Requirement	Section
	incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.	
Schedule 5 Condition 9	**Non-compliance Notification** Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this approval that the development is non-compliant with, the way in which it does not comply and the reasons for the noncompliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	**9.1**

Table A 2

SSD 6300 Consent Conditions

Ref	Legal Requirement	Section
Part B Condition B29	The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of the development to match its available water supply.	**4.3**
Condition B30	The Applicant must report on water extracted from the site each year (direct and indirect) in the Annual Review, including water taken under each water licence. *Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain all necessary water licences for the development, including during rehabilitation and post mine closure.*	**10.1**
Conditions B31 to B35	Prior to commencing mining operations under this consent, the Applicant must notify owners of licensed privately-owned groundwater bores that are predicted to have a drawdown of greater than 2 metres as a result of the development. The Applicant must provide a compensatory water supply to any landowner of privately-owned land whose rightful water supply is adversely and directly impacted (other than an impact that is minor	**8.2.5**

Ref	Legal Requirement	Section
	or negligible) as a result of the development, in consultation with DPIE Water, and to the satisfaction of the Planning Secretary. The compensatory water supply measures must provide an alternative long term supply of water that is equivalent, in quality and volume, to the loss attributable to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable after the loss is identified, unless otherwise agreed with the landowner. If the Applicant and the landowner cannot agree on whether the loss of water is attributed to the development or the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution. If the Applicant is unable to provide an alternative long term supply of water, then the Applicant must provide compensation, to the satisfaction of the Planning Secretary. *Note:* *• The Water Management Plan (see condition B41) is required to include trigger levels for investigating potentially adverse impacts on water supplies.*	
Condition B36	The Applicant must ensure that all surface discharges from the site comply with: (a) discharge limits (both volume and quality) set for the development in any EPL; or (b) relevant provisions of the POEO Act or *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002.*	**6**
Condition B37	The Applicant may receive water from, and transfer water to, neighbouring mines including Rix's Creek North, Integra Underground and/or the Greater Ravensworth Water Access Sharing Scheme.	**4.3.3**
Condition B38	The Applicant may integrate the site water management system with water management for Rix's Creek North.	**This document**
Condition B41	The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:	

Ref	Legal Requirement	Section
	(a) be prepared by a suitably qualified and experienced person/s whose appointment has been endorsed by the Planning Secretary;	**Appendix E**
	(b) be prepared in consultation with DoI and the EPA;	**Appendix E**
	(c) be submitted to the Planning Secretary for approval within six months of commencement of development under this consent;	**Appendix E**
	(d) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4);	**2.5**
	(e) utilise existing data from nearby mines and build on existing monitoring programs, where practicable;	**4.3.3**
	(f) include a: (i) **Site Water Balance** that includes details of: • predicted annual inflows and outflows on the site; • sources and security of water supply for the life of the development (including authorised entitlements and licences); • water storage capacity; • water use and management on the site, including any water transfers or sharing with neighbouring mines; • licensed discharge points and limits; and • reporting procedures, including the annual preparation of an updated site water balance;	**4.3**
	(ii) **Salt Balance** that includes details of: • sources of saline material on the site; • saline material and saline water management on the site; • measures to minimise discharge of saline water from the site; and • reporting procedures, including the annual preparation of an updated salt balance;	**4.4**
	(iii) **Erosion and Sediment Control Plan** that: • is consistent with the requirements of *Managing Urban Stormwater: Soils and Construction - Volume 1: Blue Book*	**6.1.2**

Ref	Legal Requirement	Section
	(Landcom, 2004) and *Volume 2E: Mines and Quarries* (DECC, 2008); • identifies activities that could cause soil erosion, generate sediment or affect flooding; • describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; • describes the location, function, and capacity of permanent erosion and sediment control structures and flood management structures; and • describes what measures would be implemented to maintain (and if necessary decommission) the structures over time;	
	(iv) **Surface Water Management Plan** that includes:	
	• detailed baseline data on surface water flows and quality of watercourses and/or water bodies potentially impacted by the development, including: – stream and riparian vegetation health; – channel stability (geomorphology); and – water supply for other surface water users;	**4.1**
	• a detailed description of the surface water management system;	**6**
	• detailed plans, design objectives and performance criteria for water infrastructure, including: – any approved creek diversions or restoration works associated with the development; – water run-off diversions and catch drains; – water storages and sediment dams; – emplacement areas; and – backfilled pits and any final voids for the development (see also Table 6); and – reinstated drainage networks on rehabilitated areas of the site;	**6**

Ref	Legal Requirement	Section
	• detailed performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts (or trends) associated with the development, for: – downstream surface water flows and quality; – channel stability; – downstream flooding impacts; – stream and riparian vegetation heath; – water supply for other water users; and – post-mining water pollution from rehabilitated areas of the site;	**6.2**
	• a program to regularly monitor: – compliance with the relevant performance measures listed in Table 4 and the performance criteria established above; – controlled and uncontrolled discharges and seepage/leachate from the site; – surface water inflows, outflows and storage volumes to inform the Site Water Balance; and – the effectiveness of the surface water management systems and the measures within the Erosion and Sediment Control Plan;	**5.2**
	• reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results; and	**10.1**
	• a trigger action response plan to respond to any exceedances of the performance measures or performance criteria, and repair, mitigate and/or offset any adverse surface water impacts of the development;	**6.2.1**
	(v) **Groundwater Management Plan**, that includes:	
	• detailed baseline data of groundwater levels, yield and quality for groundwater resources potentially impacted by the development, including groundwater supply for other water users;	**Appendix F**
	• a detailed description of the groundwater management system;	**8**

Ref	Legal Requirement	Section
	• groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts associated with the development, on: – regional and local aquifers (alluvial and hardrock); and -Impacts on groundwater supply for other water users; – groundwater supply for other water users such as privately-owned licensed groundwater bores;	**8.2**
	• a program to monitor and evaluate: – compliance with the relevant performance measures listed in Table 4, and the performance criteria established above; – water loss/seepage from water storages into the groundwater system, including from any final void; – groundwater inflows, outflows and storage volumes to inform the Site Water Balance; – the hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development; – the effectiveness of the groundwater management system;	**7.2**
	• reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results;	**10.1**
	• a trigger action response plan to respond to any exceedances of the groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development; and	**8.2**
	• a program to periodically validate the groundwater model for the development, including an independent review of the model every 3 years, and a comparison of monitoring results with modelled predictions; and	**8.2.3**
	(vi) a protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in condition E8.	**10.1**
	A2. The Applicant must implement the Water Management Plan as approved by the Planning Secretary.	

Ref	Legal Requirement	Section
Part E Condition E4	Management plans required under this consent must be prepared in accordance with any relevant guidelines, and include:	
	(a) a summary of relevant background or baseline data;	**Appendix F**
	(b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures/criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	**2** **2** **2.5**
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c)	**Appendix C**
	(d) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	**5** **7**
	(e) a program to monitor and report on the: (i) impacts and environmental performance of the project; and (ii) effectiveness of any management measures (see (c) above);	**5.2** **7.2**
	(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**6.2.1** **8.2**
	(g) a program to investigate and implement ways to improve the environmental performance of the project over time;	**10**
	(h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of any impact assessment criteria or performance measure; (ii) complaint; or (iii) failure to comply with other statutory requirements;	**9.1** **9.2** **9.1**

Ref	Legal Requirement	Section
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	**10.1**
	(j) a protocol for periodic review of the plan. *Note: The Planning Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans*.	**10**
Condition E5	**Revision of Strategies, Plans & Programs** Within 3 months of: (a) the submission of an incident report under condition E7; (b) the submission of an annual review under condition E9; (c) the submission of an Independent Environmental Audit under condition E10, or (d) the modification of the conditions of this consent (unless the conditions require otherwise), The suitability of existing strategies, plans, and programs required under this consent must be reviewed by the Applicant.	**10.4**
Condition E6	If necessary, to either improve the environmental performance of the development or cater for a modification, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary. Where revisions are required, the revised document must be submitted to the Planning Secretary for approval within 6 weeks of the review. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development*.	**10.4**
Condition E7	**Incident Notification** The Applicant must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name) and set out the location and nature of the incident.	**9.1**
Condition E8	**Non-compliance Notification**	**9.1**

Ref	Legal Requirement	Section
	Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the development (including the development application number and name), set out the condition of this approval that the development is non-compliant with, the way in which it does not comply and the reasons for the noncompliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	

Appendix B – Water Management Performance Measures

Under Schedule 3 Condition 35 of PA 08_0102 and Condition B39 of SSD 6300, Bloomfield is required to comply with the performance measures detailed in Table 13 of PA 08_0102 and Table 4 of SSD 6300. These performance measures are presented in **Table B1**.

Table B1
Water Management Performance Measures

Feature	PA 08_0102	SSD 6300
Water Management – General	• Maximise water sharing with the other mines in the region • Minimise the use of clean water on site • Minimise the need for supplementary water from external supplies	• Maintain separation between clean, dirty (i.e. sediment-laden) and mine water • Minimise the use of clean and potable water • Maximise water recycling, reuse and sharing opportunities • Minimise the use of make-up water from external sources • Design, install, operate and maintain water management infrastructure in a proper and efficient manner • Minimise risks to the receiving environment and downstream water users
Alluvial Aquifers	• Negligible environmental consequences to the alluvial aquifer beyond those predicted in the documents referred to in conditions 2 and 3 of Schedule 2, including: o negligible change in groundwater levels; o negligible change in groundwater quality; and o negligible impact to other groundwater users *(Glennies Creek and Station Creek)*	• Negligible impacts to alluvial aquifers beyond those predicted in the document/s listed in condition A2(c), including: - negligible change in groundwater levels; and - negligible impact to other groundwater users; • Maintain appropriate setbacks in accordance with the Aquifer Interference Policy (DPI, 2012)
Erosion and sediment control works	• Design, install and maintain erosion and sediment controls generally in accordance with the series Managing Urban Stormwater: Soils and Construction including Volume 1,	• Design, install and maintain erosion and sediment controls in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom,

Feature	PA 08_0102	SSD 6300
	Volume 2A – Installation of Services and Volume 2C – Unsealed Roads • Design, install and maintain all new infrastructure within 40 m of watercourses generally in accordance with the Guidelines for Controlled Activities on Waterfront Land (DPI 2007), or its latest version • Design, install and maintain creek crossings generally in accordance with the Policy and Guidelines for Fish Friendly Waterway Crossings (NSW Fisheries, 2003) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries 2003), or their latest versions	2004) and 2E Mines and Quarries (DECC, 2008) • Design, install and maintain any new infrastructure within 40 metres of watercourses in accordance with the guidance series for Controlled Activities on Waterfront Land (DPI Water, 2012) • Maintain a 20 metre setback for Pits 2 and 3 from the bank of Rix's Creek • Design, install and maintain any creek crossings in accordance with the Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings (NSW Fisheries, 2003)
Clean water diversions and storage infrastructure	• Design, install and maintain the clean water system to capture and convey the 100 year ARI flood • Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site	• Design, install and maintain the clean water system to capture and convey the 100 year ARI flood event • Maximise, as far as reasonable, the diversion of clean water around disturbed areas on the site, except where clean water is captured for use on the site
Flood protection works		• Design, install and maintain flood levees to protect mining areas from a 100 year ARI flood event and to ensure no increased flooding impacts on roads or privately-owned land
Sediment dams	• Design, install and maintain the dams generally in accordance with the series Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries • Design, install and maintain dams to capture site runoff and minimise any sediment and salt loads from entering nearby watercourses	• Design, install and maintain sediment dams in accordance with the guidance series Managing Urban Stormwater: Soils and Construction – Volume 1 (Landcom, 2004) and 2E Mines and Quarries (DECC, 2008) and the requirements under the POEO Act or Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002

Feature	PA 08_0102	SSD 6300
Mine water storages	• Design, install and maintain mine water storage infrastructure to store a 100 year ARI 72 hour storm event • Design, install and maintain on-site storages (including tailings dams, mine infrastructure dams, groundwater storage and treatment dams) to ensure they are suitably lined to minimise permeability • Ensure adequate freeboard within all pit voids to minimise the risk of discharge to surface waters	• Design, install and maintain mine water storage infrastructure to avoid unlicensed or uncontrolled discharge of mine water • New storages designed to contain the 100 year ARI storm event and minimise permeability
Tailings storages	• Design and maintain tailings storage areas to encapsulate and prevent the movement of tailings seepage/leachate offsite	• Minimise storage of wet tailings and maximise drying and co-disposal of dried tailings within overburden emplacements • Design and maintain tailings storage areas to encapsulate and prevent the release of tailings seepage/leachate
Overburden emplacements	• Design, install and maintain emplacements to encapsulate and prevent migration of tailings, acid forming and potentially acid forming materials, and saline and sodic material • Design, install and maintain emplacements to prevent and/or manage long term saline groundwater seepage	• Design, install and maintain emplacements to encapsulate and prevent migration of acid forming and potentially acid forming materials, and saline and sodic material • Design, install and maintain out-of-pit emplacements to prevent and/or manage long term saline seepage
Chemical and hydrocarbon storage	• Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards	• Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standard
Creek diversions		• Diverted creek lines are hydraulically and geomorphologically stable • Incorporate erosion control measures based on vegetation and engineering revetments

Feature	PA 08_0102	SSD 6300
		• Incorporate water features such as persistent/permanent pools for aquatic habitat • Revegetate with suitable riparian vegetation
Aquatic and riparian ecosystems	• Maintain or improve baseline channel stability • Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures (DECC 2006), or its latest version	• Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c) • Maintain or improve baseline channel stability • Develop site-specific in-stream water quality objectives in accordance with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) and Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006)

Appendix C Environmental Commitments

Table C1 and **Table C2** summarise the Water Management commitments made in the respective environmental assessment which form part of the PA 08_0102 Appendix 9 and SSD 6300 definition of EIS (page 4).

Table C2
PA 08_0102 Water Management Commitments

Item	Mitigation Measure and Commitment	Implementation	Section
Groundwater			
C1	Standing water levels and groundwater quality will be assessed in accordance with Table 7.3, Table 7.4 and Table 7.5.	Continuous during and after operations	**7.2**
C2	All results will be reviewed and updated monitoring and remediation plans will be developed as required in consultation with DoI-L&W, DRG and OEH.	Continuous during and after operations	**10**
C3	If required, contingency measures will be developed to manage any adverse impacts identified by monitoring that may indicate unanticipated effects in the groundwater system's response to mining in the proposed Pit.	Continuous during and after operations	**8.2**
C4	If the impacts of mining on the alluvium and Foybrook Formation groundwater systems are demonstrated to be greater than anticipated, Bloomfield will: • assess the significance of these impacts; • investigate measures to minimise these impacts; and • describe what measures will be implemented to reduce, minimise, mitigate or remediate these impacts in the future to the satisfaction of the Director–General.	Continuous during and after operations	**8.2**
C5	Rehabilitation of groundwater dependent ecosystems will be incorporated as part of the Offset Strategy (refer Commitment E10). Trigger	Continuous during and after operations	**8.2.8**

Item	Mitigation Measure and Commitment	Implementation	Section
	thresholds for the groundwater management response will be identified and included in the Rehabilitation Strategy.		**See Rehabilitation Strategy**
C6	The amount of water pumped into or out of the proposed Pit will be monitored to assess the actual volume of water stored within the pit as well as to assess the groundwater inflows and evaporation effects.	Continuous during operations	**8.1.1**
C7	All new bores will be installed by suitably licensed drillers after obtaining the relevant license from DoI-L&W.	Continuous during and after operations	**7.2.1**
C8	If monitoring results indicate the agreed standard or performance indicators are not being achieved, remedial actions will be implemented as appropriate.	Continuous during and after operations	**8.2**
C9	An annual report will be prepared by a qualified hydrogeologist and include a statistical analysis of the results of the parameters measured, an interpretation of water quality and standing water level changes.	Annually during and after operations	**10**
C10	All relevant monitoring and management activities for each year will be reported in the Annual Review.	Annually	**10**
C11	ICO will adhere to the operating rules of the Hunter Regulated River Water Sharing Plan (HRRWSP) and the Hunter Unregulated River Water Sharing Plan (HURRWSP), thereby ensuring that the operation of the proposed extended Pit will protect Glennies Creek and its associated well connected alluvial water sources.	Continuous during and after operations	**2.4**
C12	Ongoing verification of the EA predictions and contingency measures will be attained by development and adherence to a surface water and groundwater monitoring and management plan (SW&GWMP) that will be prepared, in consultation with DoI-L&W. Cut off thresholds	Continuous during and after operations	**10.1**

Item	Mitigation Measure and Commitment	Implementation	Section
	that relate to potential mining induced depressurisation impacts in the connected Glennies Creek Alluvium will be established and documented in the SW&GWMP.		
C13	During excavation of the western periphery of the pit, geological mapping will be used to assess the potential southerly extension of a fault identified in the drift to Integra Underground and, if identified, its significance. If the fault is present in the pit, it will be investigated to assess whether it can provide a connective hydrological pathway between the pit and the Glennies Creek alluvium through re-activation of the fault. If appropriate, the hydrological significance of the fault will be assessed through incorporating its hydrological properties into the existing FEFLOW groundwater model.	Continuous during operations Surface Water	**Complete- no fault identified in highwall.**
Surface Water			
D1	Construct diversions to direct clean water away from areas of disturbance, to a standard suitable to contain an ARI 50 year rainfall event.	Prior to and progressively during operations.	**6.1.2**
D2	Construct dirty water diversions to collect stormwater runoff from disturbed areas and deliver this water to sedimentation basins.	Prior to and progressively during operations	**6.1.1**
D3	Construct sedimentation basins to treat disturbed area runoff prior to discharge.	Prior to and progressively during operations	**6.1.2**
D4	Continue and extend existing Water Management System.	Continuous during operations	**6.1.1**

Item	Mitigation Measure and Commitment	Implementation	Section
D5	Continue the existing Surface Water Monitoring Program and extend to include: • collection of grab samples along ephemeral watercourses such as Station Creek, during or immediately after surface runoff events; • monthly water quality sampling of water storages on the site; and • regular collection of data on water quality, storage water levels (including the Portal Sump)* and pumping volumes between storages.	Continuous during operations * RCM no longer has access to Portal Sump (owned by Integra)	**5.2**
D6	All pumped inflows to dirty water storages will cease when the storage water level reaches a defined Maximum Operating Level.	Continuous during operations	**6.2.2**
D7	If the weather outlook indicates future significant rainfall, water will be pumped out of any dirty water storage (with the potential to discharge offsite) that is within 100 mm of spilling, provided that a suitable alternative storage location is available elsewhere on the site.	Continuous during operations	**6.2.2**
D8	In the event of a dirty water discharge offsite, water samples will be collected at the overflow from the spilling storage and at the surface water sampling locations along Station Creek (for spills within the Station Creek catchment). For a spill from Possum Skin Dam, a sample will be collected at the discharge point and at the point of inflow to Glennies Creek.	Continuous during operations	**6.2.3**
D9	If a spill occurs, an incident report will be prepared which documents the circumstances leading to the spill, the measures taken to prevent the spill, the estimated spill volume and duration, and the measured water quality results. Any spillage will be reported to EPA in accordance with the requirements of the site's Environment Protection Licence.	Continuous during operations	**9.1**

Item	Mitigation Measure and Commitment	Implementation	Section
D10	After construction of drainage works is complete, disturbed areas will be topsoiled and revegetated using a combination of pasture grasses and cover crops to stabilise the ground surface.	During and following operations as appropriate.	**6.1.2**
D11	As part of the rehabilitation activities, above ground landforms will feature drainage provisions designed to effectively capture and divert surface water run-off to stable disposal areas prior to being discharged into surrounding watercourses.	During and following operations as appropriate.	**6.1.1**

Table C2
SSD 6300 Water Management Commitments

	Factor	Management and Mitigation Measures	Section
Hydrology and Water Quality			
26	Surface Water Runoff	Within five days of a rainfall event greater than 50mm, sediment dams (in disturbed areas) will be dewatered to provide free storage capacity of at least the settling zone volume.	**6.1.1** **6.2.2**
27	Surface Water Runoff	Sediment dams may be dewatered to receiving waters after a rainfall event greater than 50mm where TSS concentrations and EC are less than the nominated water quality objectives set in the approved Water Management Plan (WMP) and any EPL.	**6.1.1** **6.2.2**
28	Surface Water Runoff	Where TSS exceeds the water quality objective, water in dams in accordance with the WMP will be: • Flocculated to reduce TSS; and/or • Pumped to another water storage with available capacity; and/or • Pumped into the mine water management system.	**6**
29	Surface Water Runoff	New surface water diversion drains, outlets, contour drains, catch drains and other waterways will be designed to convey peak runoff discharge rates as per conditions of consent.	**6.1.1**
30	Surface Water Runoff	Consistent with the WMP, the following measures will be implemented to manage flooding: • Protect the open cut and the Pit 2 tailings dam (tailings emplacement #3) from inflows due to the 1% AEP Upper Limit flood in Rix's Creek. • Incorporate review of flood protection measures into the design systems of the mine, specifically for Pit 3 along Rix's Creek. The purpose is to ensure containment berms are of adequate height and integrity to withstand the 1% AEP Upper Limit flood in Rix's Creek;	**4.2.6**

	Factor	Management and Mitigation Measures	Section
		• Review the integrity and height of existing berms along the perimeter of Pit 3, upstream of the culvert crossing to Pit 2 tailings dam; and • Ensure that the minimum 35 m floodway width at the culvert crossing to Pit 2 tailings dam is maintained.	
31	Water Quality	Consistent with the WMP, a water management system will be implemented and include: • Diversion of clean runoff from undisturbed catchments away from disturbed areas, wherever possible, using surface drains; • Treatment of dirty (sediment-laden) runoff from overburden emplacements using sediment dams prior to discharge from the site; and • Collection of mine-water runoff from mining areas (including coal stockpiles) within Mine water dams for recycling on site.	**4.2**
32	Off Site Water	Where access to any off-site water is required, the following options are available: • Negotiate water sharing agreements with neighbouring mines to access sources of excess water; and/or • Utilise held unregulated river allocations; and/or • Purchase additional units on the open market; and/or • Approach other Water Allocation Licence holders for a term transfer. If additional water is required, where the above options do not suit, the mine will establish a pump and pipeline on the Hunter River to access the 258 unit general security allocation it currently owns (subject to separate approval).	**4.3.3**
33	Sediment and Erosion	Progressive installation of surface drainage and catchment dams will be carried out to direct surface runoff to sediment dams before the water is released from site in accordance with commitments 26 and 27.	**4.2**

	Factor	Management and Mitigation Measures	Section
34	Final void water	Undertake an assessment of opportunities for the beneficial reuse of void water as part Closure Plan requirements in consultation with DRG.	**See Rehabilitation Strategy**
Groundwater			
35	Groundwater	Site Specific Trigger Values will be developed through statistical analysis of monitoring data. These trigger values will determine whether mining related impacts on groundwater are occurring, and if so, the appropriate management response.	**8.2**
36	Groundwater	An annual review of monitoring data will be undertaken by a hydrogeologist in order to assess the impacts of the Project on the groundwater environment, and to compare observed impacts with those predicted from groundwater impact modelling.	**10.1**
37	Groundwater	Groundwater modelling will be conducted consistent with any conditions of consent.	**10.1**

Appendix D Water Licences

Table D2
RCM Mining Water Licences

WAL	Reference Number	Category	Water Source	Management Zone	Purpose	Entitlement	Nominated Works Approval
Rix's Creek North							
41500	20BL169513	Aquifer	Sydney Basin – North Coast Groundwater Source		Extraction Works	100	20WA219698
	20BL172249				Mining	100	Water Act 1912 licence
Rix's Creek South							
	20BL170863				Mining	100	Water Act 1912 licence
	20BL170864				Mining	100	Water Act 1912 licence

Table D2
RCM Groundwater Monitoring Licences

Licence Number	Date of Issue / Registration	Expiry	Name
Rix's Creek North			
20BL169626	7/03/2005	Perpetuity	GCP24
20BL169628	17/03/2005	Perpetuity	GCP7, GCP13, GCP14,
20BL169630	17/03/2005	Perpetuity	GCP8
20BL169631	17/03/2005	Perpetuity	GCP1, GCP2, GCP5, GCP6 and GCTB
20BL171708	17/08/2007	Perpetuity	GCP9, GCP10, GCP 19 and GCP 20
20BL171720	16/01/2008	Perpetuity	GCP 30
20BL171721	16/01/2008	Perpetuity	GCP 21, GCP 22 and GCP 23
20BL171722	16/01/2008	Perpetuity	GCP 28, ~~GCP29~~ and GCP36
20BL171878	5/06/2008	Perpetuity	GCP38
20BL171880	5/06/2008	Perpetuity	GCP32
20BL171881	5/06/2008	Perpetuity	GCP27
Rix's Creek South			
20BL172457	6/4/2010	Perpetuity	Bore 1
20BL172459	6/4/2010	Perpetuity	Bore 2
20BL172459	6/4/2010	Perpetuity	Bore 3
20BL172460	6/4/2010	Perpetuity	Bore 4

Licence Number	Date of Issue / Registration	Expiry	Name
20BL172461	6/4/2010	Perpetuity	Bore 5
20BL173812	9/9/2014	Perpetuity	Bore 6
20BL173733	7/4/2014	Perpetuity	Bore 7
20BL173734	7/4/2014	Perpetuity	Bore 8

Appendix E – Regulatory Correspondence

Planning, Industry & Environment

Mr Chris Knight
Environment Manager
The Bloomfield Group

PO Box 4
East Maitland, NSW, 2323

18/02/2020

Dear Mr Knight

Rix's Creek South Continuation Project (SSD 6300)
Post Approval Requirements

I refer to your correspondence dated 10 February 2020, requesting the Secretary's approval to combine environmental management plans and strategies and the Community Consultative Committee (CCC) required by Rix's Creek North (MP 08_0102) and Rix's Creek South (DA 49/94) approvals, with those required for the Rix's Creek South Continuation Project (SSD 6300).

I note that Rix's Creek North and Rix's Creek South are now owned and operated by the Bloomfield Group. Consequently, under condition A21(d) the Secretary approves combining the following management plans and strategies required by the relevant conditions of MP 08_0102, DA 49/94 and SSD 6300:

- Environmental Management Strategy;
- Blast Management Plan;
- Water Management Plan;
- Air Quality and Greenhouse Gas Management Plan;
- Noise Management Plan;
- Rehabilitation Management Plan; and
- Bushfire Management Plan.

The Secretary also agrees to combine the CCC required under condition A19 of SSD 6300 with the existing combined CCC operating under the requirements of MP 08_0102 and DA 49/94.

Lastly, I acknowledge that a Bushfire Management Plan has been prepared in accordance with condition B67. I note that this plan does not require approval from the Secretary.

If you wish to discuss the matter further, please contact Melanie Hollis on 8217 2043.

Yours sincerely

Matthew Sprott
A/Director
Resource Assessments (Coal & Quarries)
as nominee of the Planning Secretary

Planning, Industry & Environment

Mr Chris Knight
Environment Manager
The Bloomfield Group
PO Box 4
East Maitland NSW 2323

18/02/2020

Dear Mr Knight

Rix's Creek South Continuation Project (SSD 6300)
Endorsement of Experts – Water Management Plan

I refer to your request for the Secretary's endorsement of suitably qualified persons to prepare a Water Management Plan for the Rix's Creek South Continuation Project (SSD 6300).

The Department has reviewed the nominations and information you have provided and is satisfied that this expert is suitably qualified and experienced. Consequently, I can advise that the Secretary endorses the appointment of Mr Paul Ryall of Australasian Groundwater and Environmental Consultants to prepare the Water Management Plan, assisted by Ms Dianne Munro of Hansen Bailey.

If you wish to discuss the matter further, please contact Melanie Hollis on 8217 2043.

Yours sincerely

Matthew Sprott
A/Director
Resource Assessments (Coal & Quarries)

as nominee of the Planning Secretary

Correspondence for consultation and endorsement of RCM Water Management Plan

Thu 19/04/2018 2:34 PM

Chris Quinn

Rix's Creek Mine Water Management Plan consultation

To 'minres.environment@industry.nsw.gov.au'; EPA RSD Hunter Region Mailbox; 'rog.hcc@environment.nsw.gov.au'; 'ssc@singleton.nsw.gov.au'; 'dan.adams@industry.nsw.gov.au'; 'Natasha Ryan'; 'steve.lewer@environment.nsw.gov.au'

Cc Luke Murray; Garry Bailey (gBailey@bloomcoll.com.au); Christopher Knight; Hannah Bowe

Message 20180418_RCM_Water_Management_MP_V2.2_Final reduced size.pdf

Hello,

In accordance with Rix's Creek North Project Approval (PA08_0102) and Rix's Creek South Development Consent(DA49/94), please find attached the Rix's Creek Mine Water Management Plan for review. Project Approval 08_0102 Schedule 3, Condition 36 (a) states that the Rix's Creek Mine Water Management Plan must be prepared in consultation with OEH, EPA, DRG and Singleton Council.

If you have any questions, comments or inclusions from the review of the Rix's Creek Mine Water Management Plan, please reply to myself via email in the first instance, or contact me via the phone number below.

Kind regards,

Chris Quinn
Environmental Advisor – Rix's Creek Mine
The Bloomfield Group - *Celebrating over 80 years in Business*
PO Box 4, EAST MAITLAND NSW 2323
| Mob: 0427 169 302 | Fax: 02 6571 1066 |
Email: cquinn@rixs.com.au | Website: www.bloomcoll.com.au

Thu 19/04/2018 2:55 PM

Chris Quinn

Rix's Creek Mine Water Management Plan endorsement

To 'fergus.hancock@dpi.nsw.gov.au'

Cc Luke Murray; Garry Bailey (gBailey@bloomcoll.com.au); Christopher Knight; Hannah Bowe

Message 20180418_RCM_Water_Management_MP_V2.2_Final reduced size.pdf

Hello Fergus,

In accordance with Rix's Creek North Project Approval (PA08_0102) and Rix's Creek South Development Consent(DA49/94), please find attached the Rix's Creek Mine Water Management Plan for review. Project Approval 08_0102 Schedule 3, Condition 36 (a) and Development Application 49/94 Schedule 2, condition 15 states that the Rix's Creek Mine Water Management Plan must be endorsed by DPI Water.

If you have any questions, comments or inclusions from the review of the Rix's Creek Mine Water Management Plan, please reply to myself via email in the first instance, or contact me via the phone number below.

Kind regards,

Chris Quinn
Environmental Advisor – Rix's Creek Mine
The Bloomfield Group - *Celebrating over 80 years in Business*
PO Box 4, EAST MAITLAND NSW 2323
| Mob: 0427 169 302 | Fax: 02 6571 1066 |
Email: cquinn@rixs.com.au | Website: www.bloomcoll.com.au

Chris Knight

From: no-reply@majorprojects.planning.nsw.gov.au
Sent: Monday, 13 July 2020 11:14 AM
To: Enviro
Subject: Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan - Response from Water Group

Water Group has responded to your request for advice in relation to the Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan . The response is below and/or attached. Record of this consultation has been automatically saved to the portal.

When you are ready, login to your profile to submit the final document to the Department.

Public Authority Response
Hi,
As this is a post approval request please submit it to nrar.servicedesk@industry.nsw.gov.au
Regards,
Alistair Drew
Project Officer I Assessments
Water | Department of Planning, Industry and Environment

To sign in to your account click here or visit the Major Projects Website.
Please do not reply to this email.

Kind regards

Department of Planning, Industry and Environment

Subscribe to our newsletter

Chris Knight

From:	Chris Knight
Sent:	Monday, 3 August 2020 12:03 PM
To:	'nrar.servicedesk@industry.nsw.gov.au'
Subject:	Consultation- Rix's Creek Mine SSD 6300 Water Management Plan
Attachments:	200709 RCM Water Management Plan.pdf

Hi NRAR,
Just a quick email to follow up on the Rix's Creek Mine Water Management Plan which was submitted for consultation with the Natural Resource Access Regulator via the NSW Major Projects Portal on 10 July 2020.

In accordance with our Project Approval for SSD 6300, Rix's Creek Continuation we are required to submit the Water Management Plan within 6 months of commencement being 24 August 2020.
To allow time for inclusion of any comments or recommendations from the Regulator can you please provide feedback on the above document by 10 August 2020, or sooner if possible please.

If you require anything further please don't hesitate to give me a call.

Best Regards,

THE Bloomfield GROUP
WE CARE. WE DELIVER.

Chris Knight
Environment Manager
E: cknight@bloomcoll.com.au | T: 02 6578 8824 | M: 0403 058 777
W: www.bloomcoll.com.au
PO Box 4, East Maitland, NSW 2323
North: Bridgman Road, South: Rixs Creek Lane, Singleton, NSW 2330 Australia

Chris Knight

From: Chris Knight
Sent: Monday, 10 August 2020 2:59 PM
To: 'Ellie Randall'
Subject: RE: Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan

Hi Ellie,
Thank you for the explanation, very much appreciated.

In regard to timing we will need to submit the Water Management Plan prior to receiving comments due to a specific condition in our approval, (within 6 months from commencement .....) but will note to the post approval team that we will accept your comments and re-submit at a later date addressing any concerns from DPIE Water and NRAR.

Please don't hesitate to give me a call if you have any queries or require any further information.

Thank you and Best Regards,

Chris Knight
Environment Manager
E: cknight@bloomcoll.com.au | T: 02 6578 8824 | M: 0403 058 777
W: www.bloomcoll.com.au
PO Box 4, East Maitland, NSW 2323
North: Bridgman Road, South: Rixs Creek Lane, Singleton, NSW 2330 Australia

WE CARE. WE DELIVER.

From: Ellie Randall [mailto:ellie.randall@dpi.nsw.gov.au]
Sent: Monday, 10 August 2020 2:52 PM
To: Chris Knight <cknight@bloomcoll.com.au>
Subject: Re: Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan

Hi Chris,

There is no ignorance on your behalf, it is a very confusing setup between NRAR and DPIE Water.

For all post approval SSD matters, NRAR provides a combined response with DPIE Water.

The DPIE Water Group does a combined response for NRAR and DPIE Water for pre-approvals only. Hence why when this submission was made for the Water Management Plan to the assessments team that you received this response from Alistair Drew.

Give me a call if you need more clarification.

Kind regards,

Ellie Randall | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 4275 9308 | F: +61 2 4224 9740
E: ellie.randall@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

From: Chris Knight <cknight@bloomcoll.com.au>
Sent: Monday, 10 August 2020 2:43 PM
To: Ellie Randall <ellie.randall@dpi.nsw.gov.au>
Subject: RE: Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan

Hi Ellie,
Thank you for getting back to me.

Just for clarification you note that DPIE water will be reviewing the Plan. On Friday 7 August DPIE water noted on the NSW Major Project Portal that they would not be reviewing the Plan and noted to send to NRAR.

Please accept my ignorance but is it NRAR or DPIE Water that will be reviewing the plan please? Or are both the same entitity?

Water Group (PAE-8406035)

Status	Due Date
Closed	Friday, 7 August 2(

Notes:
Hi,
As this is a post approval request please submit it to nrar.servicedesk@industry.nsw.gov.au
Regards,
Alistair Drew
Project Officer I Assessments
Water | Department of Planning, Industry and Environment

Appreciate any assistance with this.

Best Regards,

Chris Knight
Environment Manager
E: cknight@bloomcoll.com.au | T: 02 6578 8824 | M: 0403 058 777
W: www.bloomcoll.com.au
PO Box 4, East Maitland, NSW 2323
North: Bridgman Road, South: Rixs Creek Lane, Singleton, NSW 2330 Australia
WE CARE. WE DELIVER.

From: Ellie Randall [mailto:ellie.randall@dpi.nsw.gov.au]
Sent: Monday, 10 August 2020 2:27 PM
To: Chris Knight <cknight@bloomcoll.com.au>
Subject: Rix's Creek Coal Mine Extension Rix's Creek Mine Water Management Plan

Hi Chris,

DPIE Water will be reviewing the Rix's Creek Water Management Plan.

The comments will not be available today and will most likely be available at the end of August, beginning of September.

Kind regards,

Ellie Randall | Water Regulation Officer
Natural Resources Access Regulator | Water Regulation (East)
Level 0 | 84 Crown Street | Wollongong NSW 2500
PO Box 53 Wollongong NSW 2520
T: +61 2 *4275 9308* | F: +61 2 *4224 9740*
E: ellie.randall@nrar.nsw.gov.au
W: www.industry.nsw.gov.au

DOC20/556726-6

The Bloomfield Group
Returned via the Major Projects Portal

24 July 2020

Dear Mr Chris Knight

Post Approval Water Management Plan Review
Rix's Creek Mine SSD 6300-PA-24

Thank you for consulting with the Environment Protection Authority (EPA) about the Rix's Creek Mine Water Management Plan Review for the Rix's Creek Mine (RCM) operated by The Bloomfield Group SSD 6300 – PA 8399533, at Rix's Creek Lane, Singleton NSW.

The EPA encourages the development of Environmental Management Plans to ensure that proponents have determined how they will meet their statutory obligations and environmental objectives as specified by any Project and/or the conditions of an environment protection licence. However; the EPA does not review these plans (unless in circumstances deemed necessary) as the role of the EPA is to set conditions for environmental protection and management, not to be directly involved in the development of strategies to comply with such conditions.

The EPA has therefore not reviewed this management plan and offers no comments in relation to it.

If you have any questions about this matter, please contact Genevieve Lorang on 02 4908 6869 or by email to hunter.region@epa.nsw.gov.au

Yours sincerely

JENNY LANGE
A- Unit Head Regulatory Operations
Environment Protection Authority

Phone 131 555
Phone 02 4908 6800
Fax 02 4908 6810
TTY 133 677
ABN 43 692 285 758
PO Box 488G
Newcastle
NSW 2300 Australia
117 Bull Street
Newcastle West
NSW 2302 Australia
www.epa.nsw.gov.au
hunter.region@epa.nsw.gov.au

Planning, Industry & Environment

Chris Knight
Environment Manager
Four Mile Creek Rd
Ashtonfield, NSW, 2323

11/12/2020

Dear Chris Knight

Rix's Creek Coal Extension (SSD-6300-PA-24)
Water Management Plan - Request for Additional Information

I refer to the Water Management Plan submitted to the Department as required under the conditions of Conditions of Consent for the Rix's Creek Coal Extension. After careful consideration, the Department is requesting that you provide additional information.

You are requested to submit a revised document that addresses the RFI attached.
You are requested to provide the information, or notification that the information will not be provided, to the Department by Monday 11 January 2021. 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 Charissa Pillay, who can be contacted on / at Charissa.Pillay@planning.nsw.gov.au.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

Rix's Creek SSD-6300-PA-24
Post Approval Review

Planning, Industry & Environment

Document: Water Management Plan
Revision: Version 2.5 July 2020
Reviewed: Charissa Pillay on "November 2020"

Water Management Plan, Condition B41, Schedule 2	Sufficient (Yes/No/Partial)	Document reference and comment	Action Required	Company Response
The Applicant must prepare a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must:				
(a) Be prepared by a suitably qualified and experienced person/s;	Yes	Appendix E	-	-
(b) Be prepared in consultation with the DPIE Water and the EPA	Yes	Appendix E	-	-
(c) Be submitted to the Planning Secretary for approval within six months of commencing development under this consent;	Yes	Appendix E	-	-
(d) Describe the measures to be implemented to ensure the Applicant complies with the water management performance measures (see Table 4)	Partial	Section 2.5 Table sets out the objectives and performance criteria	What are the measures and how will they be implemented to ensure water is managed in line with the performance measures listed in table 4	Performance measures included in Section Table 1 Section 2.5
(e) Utilise the data from nearby mines and build on existing monitoring programs, where practicable	Partial	Section 4.3.2 considers other water balances	Describe the existing monitoring programs in place	Section 5.2 describes existing monitoring programmes at RCM
(f) Include a: (i) Site Water Balance that includes details of: • Predicted annual inflows to and outflows from the site;	(i)Partial	Section 4.3 and Table 7,8 and 9 provide detail on Site Water Balance	Update the section to include: • security of water supply for the life of the development	Section 4.3.2 security of water supply for life of development

1

Rix's Creek SSD-6300-PA-24
Post Approval Review

Planning, Industry & Environment

Document: Water Management Plan
Revision: Version 2.5 July 2020
Reviewed: Charissa Pillay on "November 2020"

	• Sources and security of water supply for the life of the development (including authorised entitlements and licences); • Water storage capacity; • Water use and management on the site, including any water transfers or sharing with neighbouring mines; • Licensed discharge points and limits; and • Reporting procedures, including the annual preparation of an updated site water balance;			(including authorised entitlements and licences); • Licensed discharge points and limits; and • Reporting procedures,	There are no licenced discharge points at RCM. See Section 1.1 Section 10.1 sets out reporting procedures for Monthly and Annual reporting.
(ii)	Salt Balance that includes details of: • Sources of saline material on the site; • Saline material and saline water management on the site; • Measures to minimise discharge of saline water from the site; and	(ii)Partial	Section 4.4.1, Table 10 Section 4.2.4 discusses Mine Site Surface Water Catchments	(ii)Include a section to discuss measures that will be use to minimise discharge of saline water from site What reporting procedures will be undertaken for salt balance?	See Section 1.1. RCM does not discharge Saline Water into the HRSTS. Section 10.1 sets out reporting procedures for annual reporting

2

Rix's Creek SSD-6300-PA-24
Post Approval Review

Planning, Industry & Environment

Document: Water Management Plan
Revision: Version 2.5 July 2020
Reviewed: Charissa Pillay on "November 2020"

• Reporting procedures, including (iii) Erosion and Sediment Control Plan that: • Is consistent with the requirements of Managing Urban Stormwater: Soils and Construction – Volume 1: Blue Book (Landcom, 2004) and Volume 2E: Mines and Quarries (DECC, 2008); • Identifies activities that could cause soil erosion, generate sediment or affect flooding; • Includes a program to review the adequacy of existing flood protection works; and ensure they comply with the relevant performance measures listed in Table 4; • Describes measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; • Describes the location, function, and capacity of erosion and sediment control structures and flood management structures; and	(iii)No	(iii) section 6.1.2 describes an Erosion and Sedimentation Control Plan. It states the ESCP *is required to be developed if required…*	Revise the plan to include an ESCP to: - Identify the activities that could cause soil erosion and, generate sediment or affect flooding - Program to review the adequacy of existing flood protection works; and ensure they comply with the relevant performance measures listed in Table 4; - Describes the location, function, and capacity of erosion and sediment control structures and flood management structures; and	Section 6.1.2 identification of soil and erosion Section 6.1.3 updated for inspection of flood protection works.

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• Describes what measures would be implemented to maintain (and if necessary, decommission) the structures over time; (iv) Surface Water Management Plan that includes: • Detailed baseline data on surface water flows and quality of watercourses and/or water bodies potentially impacted by the development, including: - Stream and riparian vegetation health; - Channel stability (geomorphology); and - Water supply for other surface water users; • A detailed description of the surface water management system; • Detailed plans, design objectives and performance criteria for water management infrastructure, including: - Any approved creek diversions or restoration works associated with the development; - Water run-off diversions and catch drains	(iv) No Yes Yes	Section 4.1 discusses dirty water and clean water management on the mine Section 5 and section 6 Section 6 and 6.2	Revise section to discuss stream and riparian vegetation health, channel stability and water supply for other users. - -	Covered in 4.15 Water supply with other users 8.25

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Post Approval Review

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- Water storages and sediment dams; - Emplacement areas - Backfilled pits and any final voids for the development (see Table 6); and - Reinstated drainage networks on rehabilitated areas of the site; • Detailed performance criteria, including trigger levels for identifying and investigating any potentially adverse impacts (or trends) associated with the development, for: - Downstream surface water flows and quality - Channel stability; - Downstream flooding impacts - Stream and riparian vegetation health; - Water supply for other water users; and - Post-mining water pollution from rehabilitated areas of the site; • A program to monitor and evaluate:	Partial Partial	Section 6, 6.2 Section 5.2 provides details on a comprehensive monitoring program to	Demonstrate trigger levels for identifying and investigating any potentially adverse impacts (or trends) associated with the development, for: • Water supply for other water users; and • Post-mining water pollution from rehabilitated areas of the site; are included.	Section 6.2 Table 18 update for Trigger level. Section 6.2.5 added section for water supply for other users.

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Rix's Creek SSD-6300-PA-24
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- Compliance with the relevance performance measures listed in Table 4 and the performance criteria in this plan - Controlled and uncontrolled discharges and seepage/leachate from the site; - Impacts on water supply for other water users; - Surface water inflows, outflows and storage volumes, to inform the Site Water Balance; and - The effectives of surface water management system and the measures in the Erosion and Sediment Control Plan;		manage and monitor surface water during active mining operations	Update the plan to demonstrate how the program will monitor and evaluate: Controlled and uncontrolled discharges and seepage/leachate from the site; Impacts on water supply for other water users; The effectives of surface water management system and the measures in the Erosion and Sediment Control Plan;	This is covered in section 6.1 and 6.2 preventative and Corrective actions 8.25 has detailed in compensatory water supply
• Reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results; and	Yes	-	-	
• A trigger action response plan to respond to any exceedances of the performance measures of performance criteria, and repair, mitigate and/or offset any adverse surface water impacts of the development;	Yes	-	-	

6

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(v) Ground Water Management Plan that includes: • Detailed baseline data of groundwater levels, yield and quality for groundwater resources potentially impacted by the development, including groundwater supply for other water users; • A detailed description of the groundwater management system; • Groundwater performance criteria, including trigger levels for identifying and investigating any potentially adverse groundwater impacts associated with the development, on: - Regional and local aquifers (alluvial and hardrock); - Impacts on groundwater supply for other water users; and - Groundwater supply for other water users such as licensed privately-owned groundwater bores; A program to monitor and evaluate: - Compliance with the relevant performance measures listed in Table 4				

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and the performance criteria in this plan; - Water loss/seepage from water storages into the groundwater system, including from any final void; - Groundwater inflows, outflows and storage volumes, to inform the Site Water Balance - The hydrogeological setting of any nearby alluvial aquifers and the likelihood of any indirect impacts from the development; - The effectiveness of the groundwater management system; • Reporting procedures for the results of the monitoring program, including notifying other water users of any elevated results • A trigger action response plan to respond to any exceedances of the groundwater performance criteria, and repair, mitigate and/or offset any adverse groundwater impacts of the development; and				

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• A program to periodically validate the groundwater model for the development, including an independent review of the model every 3 years, and a comparison of monitoring results with modelled predictions; and (vi) A protocol to report on the measures, monitoring results and performance criteria identified above, in the Annual Review referred to in condition E9.				
General Comment			**Action Required**	**Company Response**
1)				
2)				
3)				
Other Agency Comments			**Action Required**	**Company Response**

9

Christopher Knight
Environment Manager
The Bloomfield Group
Four Mile Creek Road
Ashtonfield, NSW 2323

15/03/2021

Dear Mr Knight

Rix's Creek Coal Extension (SSD-6300)
Water Management Plan

I refer to the Water Management Plan which was submitted in accordance with Condition B41c of Schedule 2 of the Condition of Consent for the Rix' Creek Coal Extension (SSD-6300-PA 24).

The Department has carefully reviewed the document and is satisfied that it generally meets the condition.

Accordingly, the Planning Secretary has approved the Water Management Plan (Revision 2.7, dated March 2021). Please ensure that the approved plan is placed on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Charissa Pillay on 0299955944.

Yours sincerely

Matthew Sprott
Director
Resource Assessments (Coal & Quarries)

As nominee of the Planning Secretary

Appendix F Background Information

1. Groundwater

The hydrogeology of the Upper Hunter Valley is dominated by two aquifer groups; alluvial deposits of quaternary age and consolidated sedimentary rocks of Permian age (Coal Measures and interburden).

Neither the coal measures nor creek alluvium are listed as vulnerable aquifers under the Aquifer Risk Assessment Report (DLWC, 1998). However, they are covered, as appropriate, by the generic State Groundwater Policy (DLWC, 1997), Groundwater Quality Protection Policy (DLWC, 1998), the Groundwater Dependent Ecosystem Policy (DLWC, 2002) and the Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources (2009).

1.1. Conceptual Hydrogeological Setting

1.1.1. Alluvial Aquifer

The unconsolidated alluvium is associated with drainage lines and creeks and the regolith comprises clay bound and silt-bound sands and gravels. Within the project area only minor alluvium, associated with Rixs Creek, exists to the south of the mine lease, these deposits generally consist of low permeability clay underlain by marginally higher permeability clayey gravel and clayey sand. At Rixs Creek, alluvial aquifers are typically thin and poorly developed, while being more extensively developed in the north around Glennies Creek; and along the Hunter River to the south.

1.1.2. Permian Coal Measures Aquifer

The Permian Coal Measures consist of a variable sequence of aquitards (predominantly siltstone and sandstone) and low permeability aquifers (coal seams). The permeability of the coal seams is typically 1 to 2 orders of magnitude greater than that of the associated interburden and overburden units, with groundwater flow within the Coal Measures predominantly confined to the cleat fractures in the coal seams. This means the coal seams themselves form the main aquifer within the hard rock system.

Within the Coal Measures, the higher permeability coal seams are the main influence the bulk horizontal hydraulic conductivity, while the lower permeability interburden sandstones, siltstones and shales influence the overall vertical hydraulic conductivity – meaning groundwater prefers to flow along the coal seam beds rather than moving vertically through the lower permeability siltstone/shale units.

Increased permeability can be associated the crests and limbs of the major folds like the Camberwell anticline and Rixs Creek Syncline, and areas of localised bedding flexure. Such deformation may result in enhanced cleating within the coal seams or enhanced fracturing and jointing within adjacent strata. Although it is noted from mining to date at RCM, enhanced permeability and associated groundwater inflows have not been encountered in the operational areas.

The hydrogeological basement lithologies on site are comprised of low permeability siltstones of the basal Saltwater Creek Formation of the Whittingham Coal Measures, and the underlying Mulbring Siltstone of the Maitland Group.

1.1.3. Regional Groundwater Flow

Regional groundwater flow within the Coal Measures is sustained by rainfall recharge to generally elevated areas of regolith and outcropping strata on the fringes of the basin structure. Downward recharge to deeper strata is aided in areas of enhanced jointing and fracturing, particularly dilated joints and bedding planes in the upper weathered horizons. Downwards recharge will typically be limited by reduced fracture connectivity with depth.

Mackie (2009) compiled a regional piezometric surface from reports submitted in support of mining approvals over the period 1993 to 2004. The map typically shows groundwater flow from areas of high ground towards the Hunter River and associated alluvium, and towards major tributary drainages such as Glennies Creek and Wollombi Brook. In the vicinity of Rixs Creek this flow is generally to the west in the vicinity of Deadman's Gully and south to southwest in the vicinity of Rixs Creek. The regional flow regimes are altered around major below water table mining operations where drawdown influences prevail.

It is noted that in areas where mining has not impacted upon the Coal Measures strata, the deep pore pressure regime is observed to be generally stable in time with seasonal movements being commonly less than one metre, even during periods of sustained drought – suggesting that the shallow groundwater and basement groundwater systems are hydraulically isolated from each other for the most part.

Groundwater discharge is typically to the regional drainage and overlying alluvial aquifers of the Hunter River and its tributaries with upwards leakage associated with the sub-cropping of Coal Measures in specific areas. In areas not influenced by mining operations, upwards hydraulic gradients are often identified, and reduced water quality is often associated with areas of leakage of more saline groundwater from the Coal Measures into the overlying alluvial system.

Groundwater levels within the Rix's Creek Syncline are dominated by the groundwater sinks presented by the current RCM open cut mining operation at West Pit and the neighbouring Camberwell Pit to the north, along with the Glencore Integra underground operations further to the northwest. This means that the basement groundwater levels are depressurised compared to original pre-mining conditions and are significantly deeper than the water levels observed with the alluvial aquifer system. Therefore, in this area, the basement groundwater system is not contributing baseflow to the alluvial aquifer and creek system.

1.1.4. Conceptual Hydrogeological Model

The conceptual hydrogeological model for Rix's Creek is relatively simple in that the basin-like structure of the Rix's Creek Syncline acts to isolate the Coal Measures from the broader regional hydrogeological regime, with little groundwater interaction through the bounding low permeability siltstones.

The basin-like structure as defined by the base of the Hebden Seam (and upper surface of the underlying siltstone basement rock of the Saltwater Creek Formation) is depicted on Figure 5 (below).

The limbs of the anticline have a relatively shallow dip on the eastern limb with the western limb dipping at a much steeper angle. The syncline axis also plunges from the north and south. The lowest point the Coal Measures in the synclinal basin is approximately -130mAHD.

Although geologically more complicated on the local scale due to the splitting and merging of multiple minor seams, the aquifer system at Rix's Creek has been simplified and represented by a layer cake style system, with the layer geometry reflecting the synclinal basin structure. Within the layer cake, the major coal seams represent the main aquifers, with the interburden units acting as low permeability aquitards between the aquifers. Within the coal seam aquifers, preferential groundwater flow is along the bedding. Large scale groundwater flow vertically between bedded units is impeded by the low permeability interburden units.

1.1.5. Aquifer Recharge

Rainfall recharge and infiltration will occur on remnant regolith areas, as well as rehabilitated mine areas, and direct rainfall to open cut areas. A degree of enhanced recharge and infiltration will also occur from the Old North Pit water to storage and the deposition of tailings slurry in South Pit (although tailings seepage is anticipated to be a minor contributor to the overall water balance).

The lack of water level response observed at shallow monitoring bores in the creek alluvial system, located within the limit of Coal Measures outcrop, demonstrates the disconnection of the shallow regolith and alluvial aquifers from the deeper groundwater regime. It also shows that the shallow aquifers in these locations are locally reliant on direct rainfall recharge, and that this has not been diminished by the ongoing mining operations.

1.1.6. Mine Site Catchment Hydrology

Run-off from undisturbed areas is directed away from mining operations through diversion banks, which direct run-off into natural watercourses or into a number of clean water dams. Clean water dams overflow into the natural drainage system.

Within the RCS project area Rixs Creek is a losing (influent) stream, and within the RCN project area Reedy Creek, Station Creek and Glennies Creek are losing streams. The elevation of the bottom of the Creek is above groundwater level and therefore the creek does not receive a base flow from the basement aquifer system – that is, there is no direct hydraulic connection between the alluvial system and the Permian Coal Measures aquifer. This is an important concept for RCM, as it limits the potential for basement dewatering operations to impact upon creek alluvial groundwater levels.

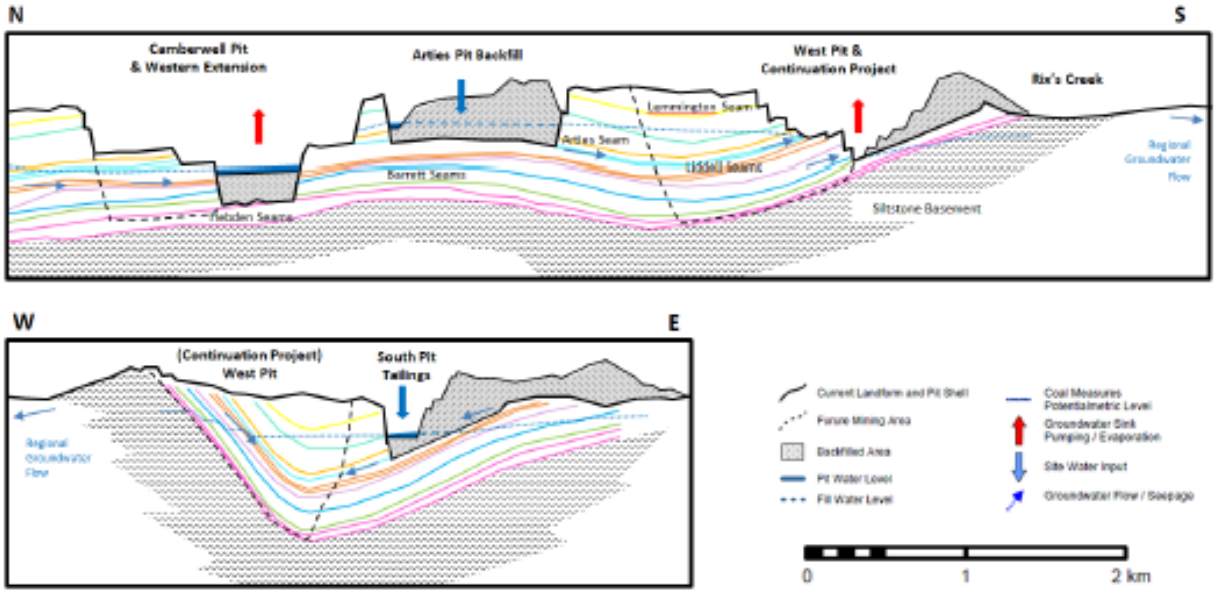


Figure 5: Conceptual Hydrogeological Model of the Rix's Creek Mine Area

1.2. Numerical Groundwater Model

The current version of the numerical groundwater model (2017) is an update to the previous version of the model adopted initially for the RCS operations, and then utilised for impact assessment for the Rix's Creek Continuation Project (the expansion of West Pit). Since the Bloomfield Group acquired the open cut operations formerly associated with the Integra mining operations, there was a need to integrate these pits further into the latest version of the groundwater model – for calibration and prediction purposes.

In terms of upgrades to the model for calibration, the following is noted:

- Extended the calibration period to September 2017, including the addition of all available new observation data and four new observation bores;
- Mining sequences during the intervening period (June 2014 to September 2017) for RCN and RCS mining areas was updated based on actual mining progression; and
- Further work was undertaken to improve calibration through variation of aquifer parameters. Some limited improvement to the calibration was achieved; however, the fit to the observed data is still good.

For the Prediction stage, the following adaptions are noted:

- Modification of the mining sequence predictive model to start in October 2017;

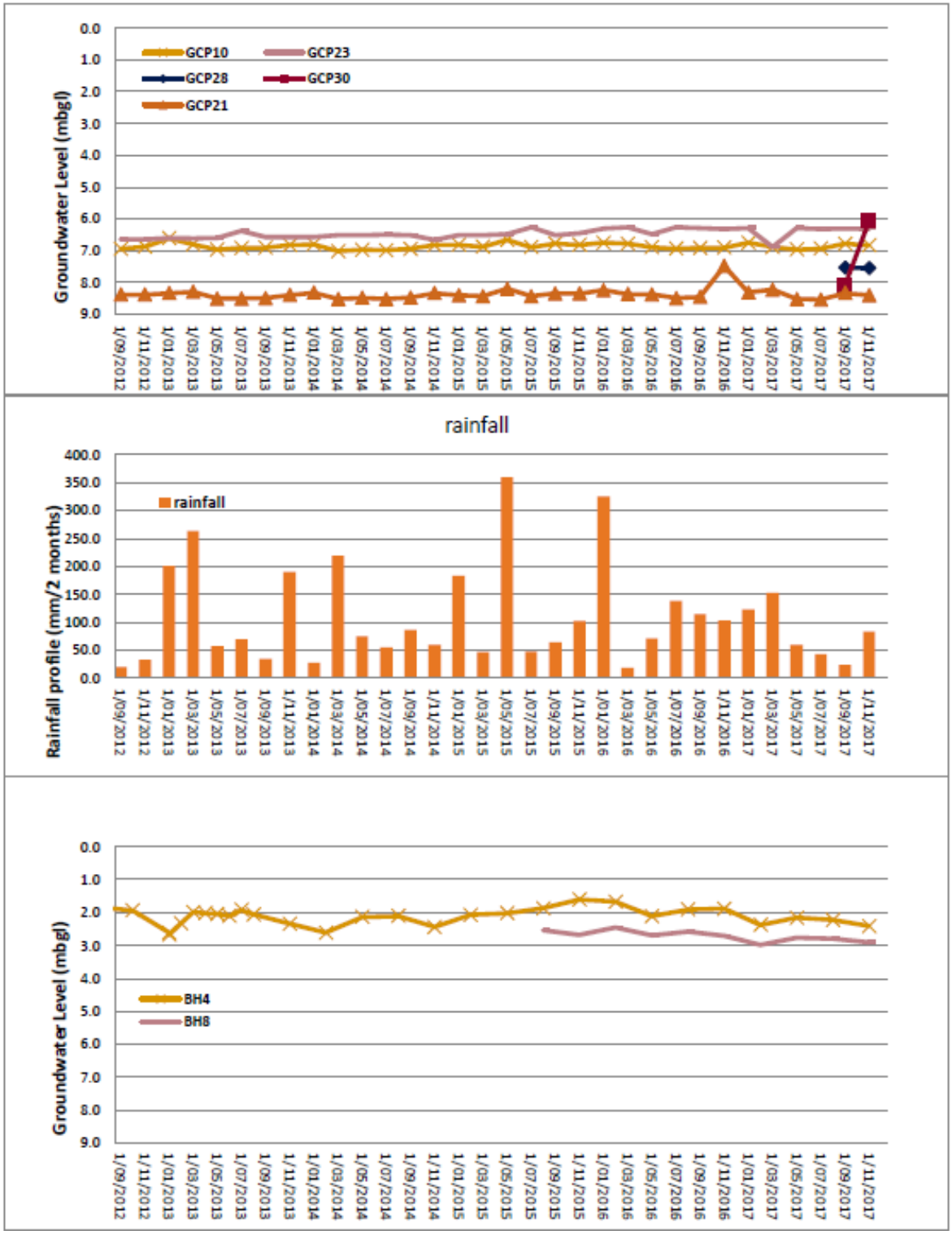
- It is noted that there were significant developments in mining since the 2014 iteration:
    - Arties Pit and South Pit are no longer present in the prediction period, as mining is completed. Aquifer parameters representing infill were added to the prediction model to represent Arties Pit and South Pit.
    - West Pit mining has been modified in the model according to updated plans provided by Bloomfield.
    - Camberwell Pit and Falbrook Pit mining is implemented in the model according to plans provided by Bloomfield.
    - Third party mining activity was updated with the latest publicly available information – including changes to Ashton Underground, Integra Underground, and Glendell Open Cut. Ashton SEOC was removed from the model as no future mining plans were found.

For the Recovery model stage, the following changes are noted:

- The recovery model was updated to reflect the newly provided final landform surface across the Mine area. Four remnant pit voids (and associated backfill) are now simulated in the recovery model – the West Pit and Arties Pit voids which were present in the original recovery model, a void in the Western Extension, and one at the Integra Underground Portal. Evapotranspiration and recharge were updated to simulate pit lakes at these voids
- The salt mass balance for the West Pit void was upgraded with groundwater fluxes from the updated model runs

For the Calibration, Prediction and Recovery models, null cases (without RCM) models were developed to evaluate cumulative mining impacts (i.e. third parties only, versus all operators).

Appendix G - Alluvial Groundwater Trigger Levels


Groundwater Level (mbgl)
GCP10
GCP23
GCP28
GCP30
GCP21
rainfall
Rainfall profile (mm/2 months)
rainfall
Groundwater Level (mbgl)
BH4
BH8

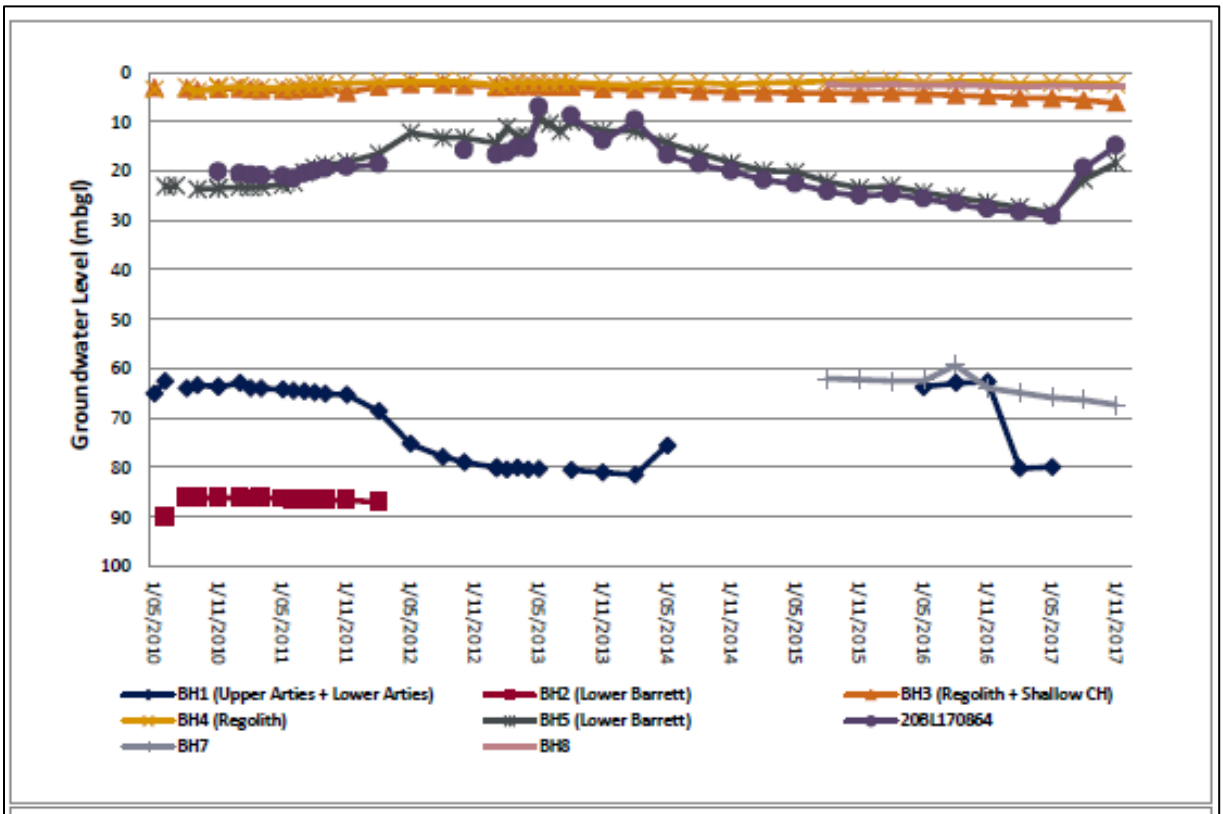
Alluvial Aquifer – hydrogeological interpretation of data

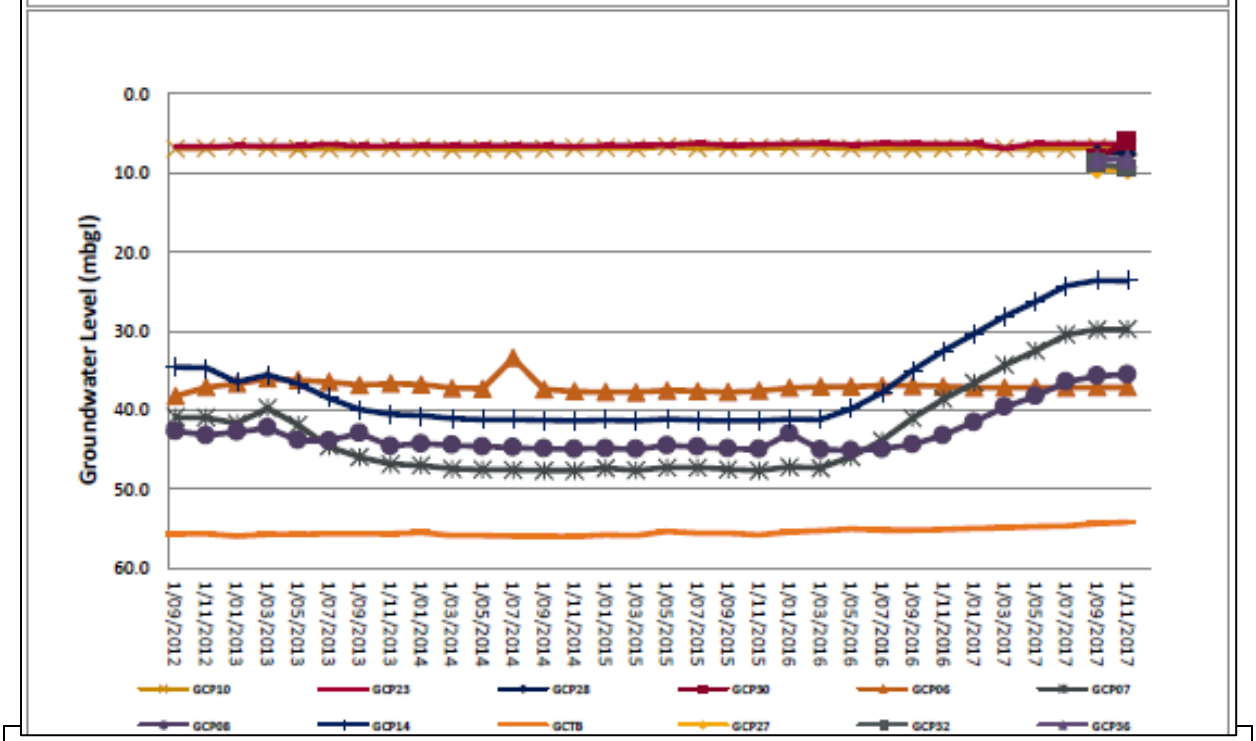
The bore hydrographs presented in the charts above are representing the bores installed and screened in the shallow alluvial aquifer within the project area, specifically:

- Rix's Creek North area – GCP10, GCP21, GCP23, GCP28 and GCP30
- Rix's Creek South area – BH4 and BH8

The historical rainfall chart has also been presented on the same bi-monthly scale to allow analysis and correlation between rainfall (and associated runoff and streamflow events) and the alluvial aquifer water level trends. Based on a dataset from 2010 to the end of 2017, we can observe the following:

- In both the northern and southern areas, the overall trend of the water levels in the alluvial aquifer has been stable – that is, there has not been a long-term declining trend that could be correlated to basement dewatering influences (see hydrographs below which show alluvial monitoring bores maintaining steady water levels over time; while the other hydrographs, from bores screened in various basement units, show a high range of fluctuation due to dewatering (and recovery) influences.
- In both the northern and southern areas, we can observe a correlation between short term water level rises (and a subsequent recession back to baseline levels) and major rainfall (and streamflow) events in the monitoring areas. This includes notable events in early 2013, and early to mid-2015 in particular. The last two years have been more moderate in terms of rainfall events, and the hydrographs have been more stable also.


Groundwater Level (mbgl)
0
10
20
30
40
50
60
70
80
90
100
1/05/2010
1/11/2010
1/05/2011
1/11/2011
1/05/2012
1/11/2012
1/05/2013
1/11/2013
1/05/2014
1/11/2014
1/05/2015
1/11/2015
1/05/2016
1/11/2016
1/05/2017
1/11/2017
BH1 (Upper Arties + Lower Arties)
BH2 (Lower Barrett)
BH3 (Regolith + Shallow CH)
BH4 (Regolith)
BH5 (Lower Barrett)
208L170864
BH7
BH8


Groundwater Level (mbgl)
0.0
10.0
20.0
30.0
40.0
50.0
60.0
1/09/2012
1/11/2012
1/01/2013
1/03/2013
1/05/2013
1/07/2013
1/09/2013
1/11/2013
1/01/2014
1/03/2014
1/05/2014
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1/05/2017
1/07/2017
1/09/2017
1/11/2017
GCP10
GCP23
GCP28
GCP30
GCP06
GCP07
GCP08
GCP14
GCP27
GCP32
GCP36