NARRABRI MINE

SITE WATER BALANCE

	NARRABRI MINE ENVIRONMENTAL MANAGEMENT SYSTEM	Document owner:	Environmental Superintendent
		Document approver:	Manager HSE
		Revision period:	Annually
		Revision:	0A
		Last revision date:	29 November 2022

WHC_PLN_NAR_ SITE WATER BALANCE

Prepared by:

Title	Name	Signature	Date
Senior Environmental Manager	S. van der Meulen Onward Consulting		29 November 2022
Director	Mark Vile Onward Consulting		29 November 2022

Onward document number:
NCO-003K-0A-PLN

Table of contents

Tables

Figures

1. Introduction

1.1 Background

The Narrabri Mine is an existing underground coal mining operation situated in the Gunnedah Coalfield, approximately 25 kilometres (**km**) southeast of Narrabri and approximately 60 km northwest of Gunnedah, within the Narrabri Shire Council (**NSC**) Local Government Area, in New South Wales (**NSW**). It is operated by Narrabri Coal Operations Pty Ltd (**NCOPL**), on behalf of the Narrabri Mine Joint Venture[1], which consists of two Whitehaven Coal Limited's (**WHC**) wholly owned subsidiaries, and other joint-venture partners.

The Narrabri Underground Mine Stage 3 Extension Project (**Stage 3**) involves a southern extension to the previously approved Stage 2 mining area (approximately 609 ha of additional surface development footprint) to gain access to additional areas of coal reserves within Mining Lease Application (**MLA**) 1 and 2, an increase in the mine life to 2044, and the development of supporting surface infrastructure[2].

1.2 Purpose and scope

This Site Water Balance (**SWB** or **Plan**) has been developed in accordance with the Stage 3 Extension Project State Significant Development (**SSD**) 10269 Conditions of Consent (**CoC**) B36(e)(i), the requirements of the NSW Water Group within the Department of Planning and Environment (**DPE Water**) and the Environment Protection Authority (**EPA**).

As required by CoC B38, NCOPL will implement the SWB as approved by the Planning Secretary. In accordance with CoC B37, NCOPL will not commence construction until this SWB is approved by the Planning Secretary.

This SWB forms Attachment 1 of the Narrabri Mine Water Management Plan (**WMP**), developed in accordance with CoC B35 to CoC B38.

1.3 Objectives

The objectives of this Site Water Balance are to:

- detail the predicted annual inflows to and outflows from the site;
- describe the measures to be implemented to ensure compliance with the water management performance measures in accordance with CoC B34;
- provide detail on the water sources and security of water supply for the life of mine (including authorised entitlements and licences);
- provide the water storage capacity;
- include detail on the water use and management on the site;
- include a program to regularly review modelling of the likelihood of uncontrolled discharges from the site;
- describe the process for annual revision of the Site Water Balance; and

[1] For full details on the joint venture ownership, refer to the introduction of the Environmental Management Strategy.

[2] For full detail on the background of the Narrabri Mine, refer to the overarching WMP.

- describe the measures to be implemented to ensure compliance with the water management performance measures.

1.4 Regulatory requirements

In accordance with CoC E5(b), Appendix A provides a summary of the relevant regulatory requirements relating to water management water and outlines the section of this document in which each of these conditions and commitments have been addressed.

In accordance with CoC E5(c), Appendix B provides a summary of the relevant commitments or recommendations within the Environmental Impact Statement **(EIS)** and outlines the section of the WMP (including sub-plans) in which each of these commitments have been addressed. These relevant commitments or recommendations include those as amended or added to by the:

- Applicant's Submission Report submitted 31 May 2021;
- Applicant's Amendment Report submitted 31 May 2021; and
- Applicant's final Biodiversity Development Assessment Report dated September 2021.

A detailed overview of the statutory requirements relating to water management is described in section 3 of the WMP.

1.5 Definitions

The terminology used within this SWB are defined in the WMP.

2. Baseline data

2.1 Climate

Long-term meteorological data for the region is available from nearby Bureau of Meteorology (**BoM**) meteorological stations and an on-site weather station. A summary of this data is provided in Table 2-1.

2.1.1 Rainfall and evaporation

Generally, the rainfall records indicate moderate-to-low seasonality, with higher rainfall being recorded in the summer months and lower rainfall in the winter months. The mean and median annual rainfalls at the Narrabri Mine are estimated at 603 millimetres (**mm**) and 597 mm, respectively. The mean monthly rainfalls vary during the year from a low of 35 mm in April to a high of 78 mm in January. The summer average monthly rainfalls (59 mm to 78 mm) are generally higher than the equivalent winter month rainfalls (37 mm to 47 mm).

The mean and median annual potential evaporation is estimated at 1,502 mm and 1,499 mm, respectively. Evaporation varies seasonally, with high evaporation rates occurring in the months between October and March. The potential evaporation rate during the summer months is greater (up to almost 3 to 4 times) than the evaporation rate during the winter months. In addition, average potential evaporation exceeds average rainfall for all months of the year.

2.1.2 Temperature

The data from the Narrabri West Post Office (Station 053030) indicates that temperatures in the vicinity of Narrabri Mine are warmest from December to February and coolest from June to August. Average daily temperatures are highest in January (average daily maximum of 33.8°C) and lowest in July (average daily minimum of 3.7°C).

2.1.3 Humidity

Relative humidity records from the Narrabri West Post Office (Station 053030) generally exhibit a uniform seasonal pattern for the period of record (1962 - 2002). The lowest morning (9.00 am) monthly average relative humidity was recorded in October (57 per cent) and the highest recorded in June (84%). The lowest afternoon (3.00 pm) monthly average relative humidity was recorded in October and December (37%) and the highest recorded in June (52%).

Table 2-1 Relevant meteorological data in the vicinity of Narrabri Mine

Period of record	Average monthly rainfall (mm)			Average monthly evaporation (mm)	Average daily temperature (°C)				Average monthly relative humidity (%)	
	Narrabri West Post Office (053030)	Boggabri Post Office (055007)	Narrabri Mine	SILO Data Drill[1]	Narrabri West Post Office (053030)		Narrabri Mine		Narrabri West Post Office (053030)	
	1891 - 2018	1884 - May 2020	2008-2020	1889-2020	1962-2002		2008-2020		1962-2002	
					Min	Max	Min	Max	9am	3pm
January	82.9	71.5	63.8	200	19.3	33.8	20.7	34.7	61	38
February	61.1	63.5	59.5	166	19.1	33.2	19.1	32.7	65	40
March	60.0	46.6	58.1	152	16.4	31.2	16.9	30.1	64	39
April	38.1	33.4	26.6	105	11.9	27.3	12.6	26.1	66	42
May	46.7	41.2	42.2	74	8.3	22.5	8.0	21.6	78	49
June	49.0	43.5	52.3	53	5.2	18.7	6.1	17.6	84	52
July	45.2	40.5	30.2	58	3.7	18.0	4.3	17.4	82	50
August	39.9	37.7	39.1	77	4.6	19.8	4.5	19.4	73	42
September	40.8	37.9	43.7	106	7.6	23.4	7.9	23.4	65	39
October	51.4	49.8	44.8	148	11.7	27.1	12.0	27.4	57	37
November	60.3	59.4	78.7	174	14.8	30.1	16.1	31.1	59	39
December	75.7	62.2	66.8	199	17.7	33.0	18.5	32.9	59	37
Annual average monthly	**54.3**	**48.9**	**50.5**	**126**	**11.7**	**26.5**	**12.2**	**26.2**	**68**	**42**
Annual average total	**651.1**	**587.2**	**605.8**	**1,502**	**-**	**-**	**-**	**-**	**-**	**-**

Source: Rainfall and evaporation data extracted from Appendix C of the Stage 3 EIS. Temperature and humidity data sourced from Narrabri West Post Office (BoM 2022)

[1] Scientific Information for Landowners. SILO is a database of Australian climate data from 1889 to the present. It provides daily meteorological datasets for a range of climate variables in ready-to-use formats suitable for biophysical modelling, research and climate applications.

3. Implementation and management

3.1 Water management system

3.1.1 Water management system objectives

The proposed water management strategy for the Narrabri Mine is based on targeted management of water from different sources based on anticipated water quality. Water categories on the site are outlined in Table 3-1.

Table 3-1 Water categories

Water Category	Description
External	Raw water imported to the Narrabri Mine from the Namoi River or the Namoi Bore.
Clean	Surface runoff from the Narrabri Mine site areas where water quality is unaffected by mining operations. Clean water includes runoff from undisturbed areas and any fully rehabilitated areas.
Permeate	Water treated by the reverse osmosis (**RO**) or microfiltration (**MF**) plants, suitable for use in the underground workings or controlled release to the Namoi River in accordance with environmental protection licence under the POEO Act (**EPL**) 12789.
Dirty water	Surface runoff water from Narrabri Mine site areas that are disturbed by mining operations. This runoff may contain silt and sediment, but does not contain other pollutants (e.g. chemicals, hydrocarbons). This water can be released from site in accordance with EPL 12789, if required.
Mine water	Water pumped from the underground workings and surface water from Narrabri Mine site areas affected by mining operations which has potentially been in contact with coal and other pollutants (e.g. chemicals and hydrocarbons). Mine water areas include sumps, coal stockpile areas, service ponds and fuel storage areas and is managed to avoid its discharge from the Narrabri Mine.
Brine	Water with elevated concentrations of total dissolved solids (**TDS**), a waste by-product or concentrate produced by the mine's water treatment plants.

The objectives of the Narrabri Mine water management system are to ensure:

- clean water runoff from undisturbed catchment areas is diverted away from the mining area, where practicable;
- dirty water is re-used in the water management system or released into the receiving environment if water quality meets EPL requirements;
- mine water (including water that accumulates within, or drains from, active mining areas, coal reject emplacement areas and Coal Handling Preparation Plant [**CHPP**] infrastructure areas) and groundwater collected within the underground is contained and reused on-site or licensed discharge to the Namoi River following appropriate treatment;
- no discharge of mine water or brine water off-site; and
- on-site water demands are satisfied whilst minimising external water requirements.

3.1.2 Water management system configuration

The current and forecast site catchment areas, land use and water management infrastructure within the Pit Top Area is shown in Figure 3-1.

Figure 3-2 shows a schematic representation of the water circuit for the Narrabri Mine water management system.

3.1.3 Water management system infrastructure

The current and forecast site catchment areas, land use and water management infrastructure within the Pit Top Area is shown in Figure 3-1. NCOPL will utilise the water storages within the Pit Top Area to capture dirty and mine water runoff as well as mine water pumped from the underground workings. Water contained in mine water dams is transferred to the water treatment facilities for treatment and/or re-used on-site (e.g. CHPP operations, washdown and/or dust suppression).

The permeate water and brine produced from the water treatment facilities is stored in the permeate and brine dams, respectively, prior to re-use. The permeate water is used in underground mining operations or transferred to the Namoi River for controlled release.

Brine is stored in the brine dams at the Pit Top Area and may be used for dust suppression on coal stockpiles. Evaporator spray systems are installed on the brine dam (Dam B2) to increase evaporation of brine in order to remove excess water from the site water management system. A seawater RO module is currently installed as an additional control measure to concentrate brine to reduce brine water inventory. Additional evaporator spray systems and increased water treatment plant capacity may be commissioned in the future as part of adaptive management of the mine water management system.

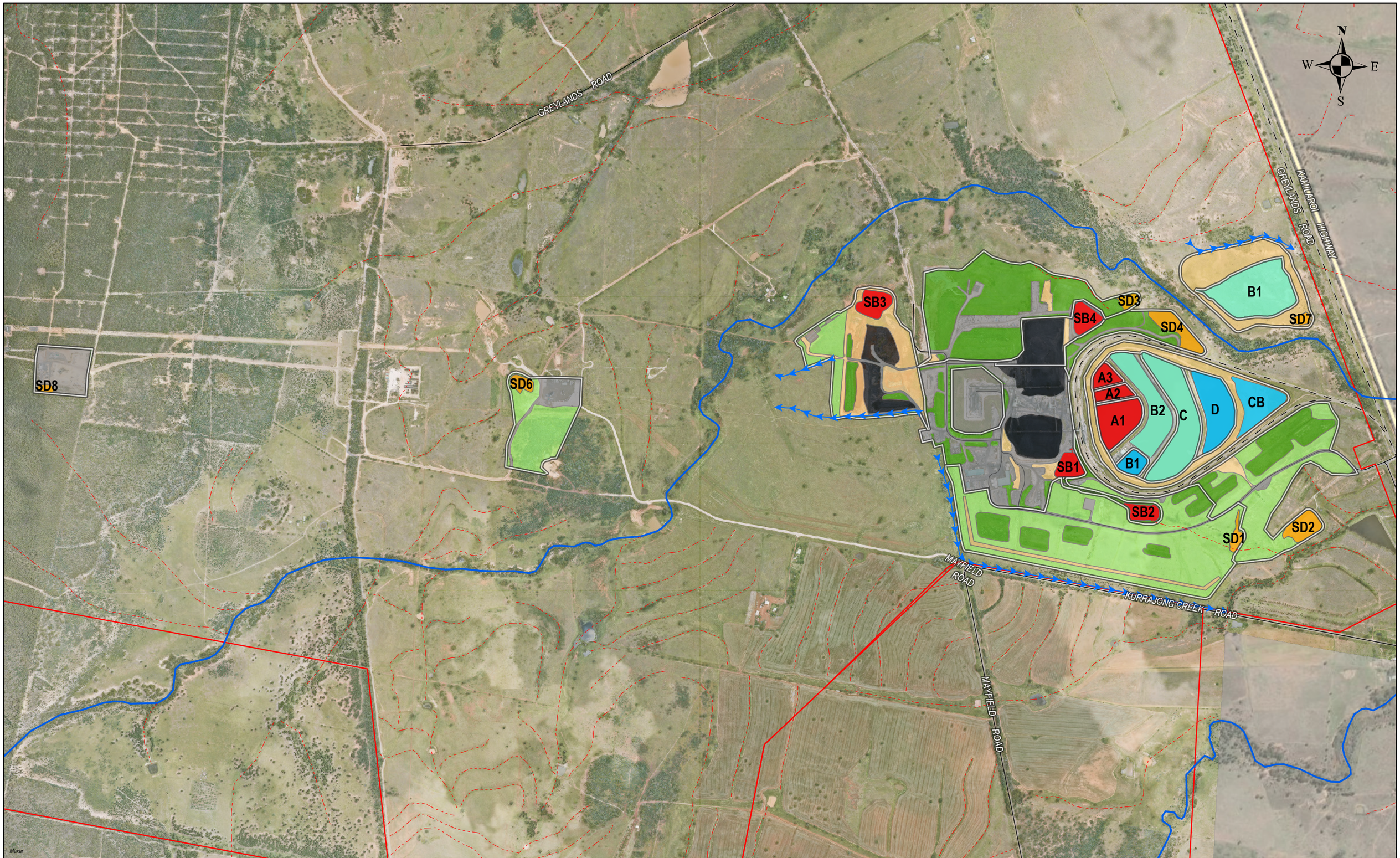
The Pit Top Area, mine water and brine dams have been designed to contain and re-use water on-site. This involves operating the dams with a maximum operating level to provide freeboard for storm runoff storage.

External water is used to supplement mining operations water demands and to supply a separate water treatment facility used to produce potable water. If required, potable water can also be transported via truck to the Narrabri Mine by a licensed contractor to supplement the potable water supply from the water treatment facility.

Water storages

The NCO site water management system includes storages for management of the on-site water types described in Table 3-1.

Details of the site water storages and operating rules are provided in Table 3-2.



Paper size A3

Scale: 1:15,000

150 0 150 300 450 600 750

Metres

Spatial Reference
Name: GDA 1994 MGA Zone 55
Datum: GDA 1994
Projection: Transverse Mercator

Legend

Roads
- Primary road
- Local road

Railways
- Railway - Tamworth

Hydrolines
- Minor streams
- Non-minor streams
- clean water drain

Existing Water Management System

Dam Type
- Brine Water
- Dirty Water
- Mine Water
- Raw Water

Catchments
- Narrabri Catchment

LandUse
- Coal/ Rejects
- Hardstand
- Disturbed Cleared
- Disturbed Veg
- Natural
- Rehab
- Narrabri mine lease

WHITEHAVEN COAL PTY LTD

Figure 3-1: NARRABRI WATER MANAGEMENT SYSTEM

DISCLAIMER

This map is a representation of the information currently held by Whitehaven Coal at the time of publication. The data depicted has been sourced from both internal and multiple external parties. While every effort has been made to ensure the accuracy of this map, Whitehaven Coal accepts no responsibility for any errors or omissions.

Date Exported: 18/07/2022 4:24 PM

Path: C:\Local_Copy\5. WHC GIS Projects_WHITEHAVEN COAL WATER_WHITEHAVEN COAL WATER MANAGEMENT SYSTEM - NARRABRI\WATER MANAGEMENT SYSTEM - NARRABRI.aprx

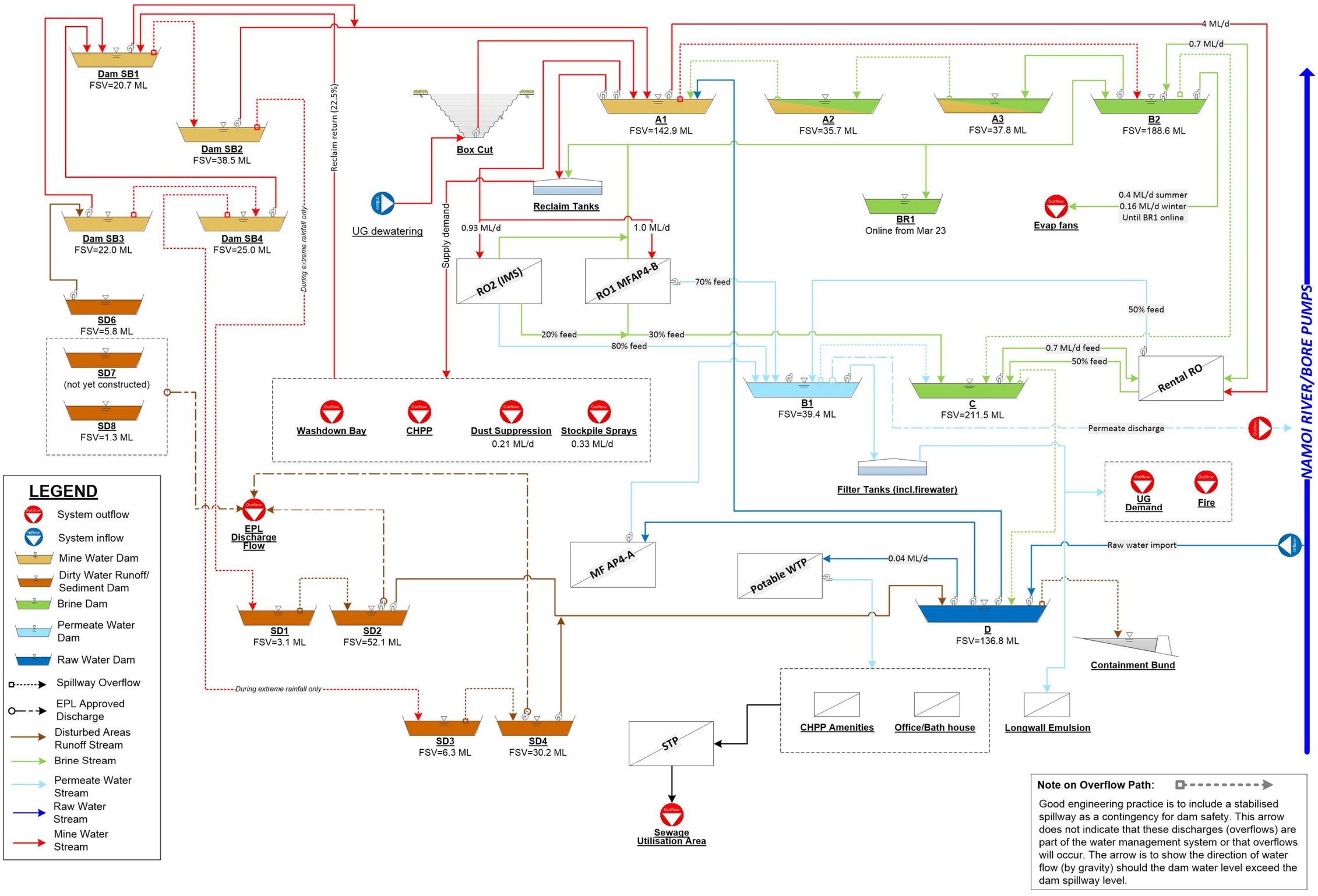


Figure 3-2 Narrabri Mine site water management schematic

Table 3-2 Water storage and transfers at the Narrabri Mine and operating rules

Water management system element	Storage capacity (ML)	Spills to	Operation
A1	142.9	B2	Operated as a mine water storage. Receives Box Cut and storage basin (**SB**) dam dewatering up to maximum operating volume (**MOV**).
A2	35.7	A1	Operated as a mine water storage. Does not receive active inflows above MOV. If needed, excess brine is diluted with mine water and stored for short periods.
A3	37.8	A2	Operated as a mine water storage. Does not receive active inflows above MOV. If needed, excess brine is diluted with mine water and stored for short periods.
B1	39.4	C	Permeate water storage. Receives RO permeate up to MOV.
B2	188.6	C	Brine water storage. Receives RO brine up to MOV.
C	211.5	D	Brine water storage. Receives excess RO brine from B2 up to MOV.
D	136.8	Containment Bund	Raw water storage. Receives excess RO permeate from B1 up to MOV.
Containment Bund	40.1	Offsite	Emergency excess raw water storage. Operated empty.
SB1	20.7	SB2	Pit top runoff dam. Dewatered to A dams when MOV exceeded.
SB2	38.5	SD1	Pit top runoff dam. Dewatered to A dams when MOV exceeded.
SB3	22.0	Offsite	Rejects Emplacement Area runoff dam. Dewatered to A dams via SB1 when MOV exceeded.
SB4	25.0	SD3	Pit top runoff dam. Dewatered to A dams via SB1 when MOV exceeded.
SD1	3.1	SD2	Dirty water storage, managed in accordance with EPL 12789.
SD2	52.1	Offsite	Dirty water storage, managed in accordance with EPL 12789.
SD3	6.3	SD4	Dirty water storage, managed in accordance with EPL 12789.
SD4	30.2	Offsite	Dirty water storage, managed in accordance with EPL 12789.
SD6	5.8	Offsite	Dirty water storage, managed in accordance with EPL 12789.
SD8	1.3	Offsite	Dirty water storage, managed in accordance with EPL 12789.
BR1	470	Offsite	New brine dam to be commissioned by March 2023. Receives RO brine up to 400 ML MOV. Receives brine once B2 and C are full to their respective MOVs

Additional approved mine water and brine dams

An additional approved water management storage dam (i.e. the Southern Mine Water Storage; see location in Figure 1-2 in the WMP) will be required directly south of Longwall 210 to store water from mine dewatering activities. A pipeline between the Southern Mine Water Storage area and the Pit Top Area will be installed to facilitate transfer of water. The pipeline/s will be installed within services corridors and other cleared areas.

NCOPL may progressively construct brine dams (BR2 to BR5) within the approved brine storage area located in the area to the north of BR1, which is currently under construction (Figure 3-1). The need for additional brine

storages and timing of commissioning will be assessed against the actual groundwater inflows and site water system performance over the life of mine.

Drains and pipelines

The water management system includes ancillary infrastructure to enable the transfer of water including sumps, drains, tanks, pumps, pipelines and associated power supply. Minor augmentations and extensions to this infrastructure will be progressively implemented.

Clean water management system

NCOPL will divert clean water where possible and practical around disturbed areas on the site. Clean water captured for use on the site will comply with the *Water Management Act 2000* (**WM Act**). This includes:

- the construction of clean and dirty water drains/banks or other drainage structures to divert sediment laden water from working areas to sediment controls and ensures separation of clean water from dirty water; and
- diversion of clean water catchment areas around area of disturbance that could generate dirty or contaminated water.

Table 3-2 details the operating rules for water storages and transfers to ensure dams are maintained below their MOV to prevent unauthorised spills to clean water catchments.

3.1.4 Treatment

Three RO plants are used to reduce the mine water and brine inventories on site during the operational period:

- RO1: 1 ML/d feed rate from A1 at 70% efficiency;
- RO2: 0.93 ML/d feed rate from A1 at 80% efficiency; and
- Seawater RO (interim measure): 0.7 ML/d feed rate from B2 or C at 50% efficiency.

The RO1 and RO2 modules are operated according to the following principles:

- The A series dam inventories are above the combined MOV, until the combined inventory drops to below 80% of the combined MOV; and
- The Brine dam inventories are less than the 80% of the combined Brine MOV.

The seawater module is operated according to the following principles:

- when the feed dam TDS concentration is less than 37,500 mg/L; and
- when the receiving dam inventory is less than the MOV.

The seawater module would be decommissioned once the BR1 Dam is commissioned in March 2023.

3.1.5 Potable water

Potable water may be transported to site by a licensed contractor as required to supplement the potable water supply from the water treatment facility.

3.1.6 Measures to minimise clean and potable water use

The beneficial use options assessment for brine, treated water, and mine water will be reviewed and revised in accordance with section 3.1.1 of the Surface Water Management Plan (**SWMP**) (Attachment 3 of the WMP). The scope of the assessment includes options for beneficial reuse of permeate/filtered water onsite and sharing with other water users. The beneficial use of brine, treated water, and mine water will facilitate the minimisation of clean and potable water use.

3.2 Water demands

The modelled water demands from the mine water management system include:

- Mine surface demands:
  - Run of Mine **(ROM)**/product stockpile sprays;
  - Dust suppression;
  - CHPP and washdown (Pit Top area demands);
- Underground permeate water demands:
  - Underground water demand;
  - Longwall emulsion and vent humidity loss;
- Fire water use; and
- Potable water use.

3.2.1 Mine demands

Mine water demand (CHPP, wash bay, stockpile sprays and surface water dust suppression) was assessed based on flow meter records from the mine site. At present the mine monitoring can track mine water demand for surface dust suppression and stockpile sprays separately (dust suppression demand determined by subtraction from flowmeter records) but cannot separate mine water demand between the CHPP and wash bay.

A percentage of the mine demand (CHPP, washdown and stockpile spray) returns to the water management system via SB1. Based on recorded data and calibration of the site water balance model it appears that 22.5% of the total mine demand is recycled into the site water management system via SB1.

Stockpile sprays

A demand of 0.33 megalitres per day (**ML/day**) was adopted for the ROM and product coal stockpile sprays based on the available Narrabri Mine site data.

Haul road dust suppression

Haul road dust suppression rates of 0.21 ML/day was adopted based on available Narrabri Mine site data.

Pit Top Area demands

A Pit Top Area runoff demand (CHPP and washdown) of 0.039 kilolitres per run-of-mine (**kL/ROM**) tonne was adopted based on available Narrabri Mine site data. The Pit Top Area water would be sourced from Dam A1.

This estimated consumption rate has been applied to the forecast ROM tonnages, and the resulting forecast Pit Top Area runoff demand is provided in Table 3-3.

Table 3-3 Annual pit top area and underground permeate demands

Year	ROM tonnage (Mtpa)	Gross Pit Top Area usage (ML/yr)	Gross underground permeate water use (ML/yr)
FY23	6.04	236	387
FY24	7.32	285	468
FY25	8.43	329	540
FY26	8.48	331	543
FY27	9.69	378	620

3.2.2 Underground permeate water use

A fraction of the underground permeate demand returns to the boxcut sump via underground dewatering, and is calculated as follows:

- Underground demand return = [underground permeate water demand + longwall emulsion] – [increase in coal moisture + vent humidity extraction];
- If the above result returns a negative number (i.e. losses exceed inflows) then there is no underground demand return for that day;
- The increase in coal moisture is based on an increase of 2% by mass from in-situ to ROM; and
- The vent humidity extraction is assumed to be 133 ML/yr (0.37 ML/day) based on calculations by NCO personnel.

There is a flowmeter recording the amount of permeate water that is gravity fed into the underground, and also a flowmeter that records the amount of water that is dewatered from the underground mine to the Box Cut sump. By using the above calculation and the flowmeter records, the volume of groundwater extracted from the underground mine can be estimated by subtraction.

Underground demand

An underground permeate water demand of 0.064 kL/ROM tonne was adopted based on recorded underground permeate water use and ROM coal production. This estimated consumption rate has been applied to the forecast ROM tonnages, and the resulting forecast underground permeate water usage is provided in Table 3-3.

Longwall emulsion and vent humidity loss

A constant longwall emulsion demand of 6.33 ML/yr (0.0175 ML/day) was adopted in the model, based on advice from NCO personnel.

A constant vent humidity loss of 133 ML/yr (0.37 ML/day) has been adopted in the water balance model.

3.2.3 Fire water use

A fire water demand of 1.747 kilolitres per day (**kL/day**) has been adopted for this assessment.

3.2.4 Potable water use

A potable water demand of 40 kL/day has been adopted for this assessment.

3.2.5 Evaporation fan losses

Four evaporation fans are operated on the B2 brine dam until the new BR1 brine dam is commissioned in March 2023. The fans have been modelled based on the following assumptions:

- 18 litres per second (**L/s**) combined feed rate;
- 8 hr per day operation; and
- 50% efficiency in summer months, 20% efficiency in winter months.

3.3 Water sources and security

Water inflows for the site include:

- direct rainfall on water surface of storages;
- catchment runoff from disturbed areas;
- groundwater inflows to underground;
- supplementary licensed extraction from the Namoi River and/or Namoi River alluvium (external water); and
- potable water transported to site by a licensed contractor, as required.

NCOPL will continue the use of the site water treatment facilities to treat water for supply to underground mining operations, site potable water requirements and licensed discharge to the Namoi River. The capacity of the water treatment facilities will be reviewed as part of the periodic review of the site water balance (section 6) and the capacity of the water treatment facilities may be adjusted as necessary.

Water will be preferentially sourced from groundwater inflows to underground workings and catchment runoff and infiltration. Supplementary water supply required over the life of mine will be sourced from the Namoi River and/or Namoi River alluvium in accordance with allocations in water licence entitlements (Table 3-4).

3.3.1 Water licensing

NCOPL will ensure sufficient water entitlements are held in a Water Access Licence (**WAL**) to account for the maximum predicted take for each water source, including the associated WAL dealings prior to take occurring.

Water sharing plans (**WSP**) relevant to the Narrabri Mine are:

- *WSP for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020;*
- *WSP for the NSW Great Artesian Basin Groundwater Sources 2020;*
- *WSP for the Namoi Alluvial Groundwater Sources 2020;*
- *WSP for the Upper Namoi and Lower Namoi Regulated River Water Sources 2016;* and
- *WSP for the Namoi and Peel Unregulated Rivers Water Sources 2012.*

Details of the current WALs held by NCOPL for the Narrabri Mine are summarised in Table 3-4. The predicted annual volumes required to be licensed over the life of mine and post-mining, based on groundwater modelling and site water balance modelling, are also summarised in Table 3-4.

NCOPL holds sufficient licences to cover the predicted licensing requirements, with the exception of the following water sources:

- Gunnedah Oxley Basin Murray Darling Basin (**MDB**) Groundwater Source regulated by the *WSP for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2020*; and
- Lower Namoi Groundwater Source regulated by the *WSP for the Namoi Alluvial Groundwater Sources 2020*.

Licensing requirements for the *WSP for the Namoi and Peel Unregulated Rivers Water Sources 2012* (Eulah Creek Water Source) relating to subsidence induced water take is outlined in section 3.3 of the SWMP (Attachment 3 of the WMP).

For the predicted licensing requirements in the Lower Namoi Groundwater Source, NCOPL will seek and obtain the appropriate entitlements on the open market in accordance with the appropriate trading rules of the *WSP for the Namoi Alluvial Groundwater Sources Order 2020*. Based on recent water trading statistics, there is sufficient market depth in the Lower Namoi Groundwater Source to accommodate the very small allocation required.

To address the identified shortfall in the *Gunnedah-Oxley Basin MDB Groundwater Source*, allocation would be transferred from other Whitehaven operations to meet the operational requirements (refer to section 3.1.1 in the Groundwater Management Plan (**GWMP**) [Attachment 4 of the WMP]). Based on recent water trading statistics, there is sufficient market depth in Gunnedah Oxley MDB Groundwater Source in the event NCOPL is not able to obtain sufficient entitlements from other WHC operations.

Additional entitlements for the Gunnedah Oxley Basin MDB Groundwater Source may also be obtained via the controlled allocation order process. Under section 65 of the WM Act, the Minister for Water can make a controlled allocation order to make new entitlements available in water sources with unassigned water. Controlled allocation orders relevant to the Gunnedah Oxley Basin MDB Groundwater Source have been made in 2013, 2014, 2017 and 2020. There is approximately 181,528 megalitre per year (**ML/year**) of unassigned water in the Gunnedah Oxley Basin MDB Groundwater Source.

At the end of mining, relevant entitlements will be surrendered to account for groundwater take post-mining in accordance with the Aquifer Interference Policy (**AIP**).

Table 3-4 Water licensing summary for the Narrabri Mine

Water Sharing Plan	Water source (Management Zone)	Licence category	WAL number	Nominated works	Allocation (Unit Shares)	Entitlement (Unit Shares) held by NCOPL	Peak volume requiring licensing during mining (ML/year[1])	Peak volume requiring licensing post-mining (ML/year[1])	Estimated year to exceed entitlement
Groundwater									
NSW Murray-Darling Basin Porous Rock Groundwater Sources Order 2020	Gunnedah Oxley Basin MDB Groundwater Source	Aquifer	WAL 29549	90WA822539	818	1,221	2,310	2,310	2023
			WAL 43017[2]	- [2]	403				
NSW Great Artesian Basin Groundwater Sources 2020	GAB Southern Recharge Groundwater Source	Aquifer	WAL 15922	90WA822539	248	248	42	88	NA
Namoi Alluvial Groundwater Sources Order 2020	Upper Namoi Zone 5 Groundwater Source	Aquifer	WAL 12833	90WA812891	67	260	10	64	NA
			WAL 20131		150				
			WAL 12822		43				
	Lower Namoi Groundwater Source	Aquifer	-	-	Nil	Nil	0	1	> 2149
Surface water									
Upper Namoi and Lower Namoi Regulated Water Sources 2016	Lower Namoi Regulated River Water Source	Regulated River (High Security)	WAL 6762	90CA802130	20	20	44	193	NA
		Regulated River (General Security)	WAL 2671		48	658			
			WAL 2728		10				
			WAL 20152		600				

Note:

[1] Licensing requirement for groundwater includes direct pit inflows and induced leakage.

[2] NCOPL purchased 403 units of the Gunnedah Oxley Basin Groundwater Source and have submitted an application to assign nominated works to the WAL.

3.3.2 Groundwater inflows

Table 3-5 presents the adopted groundwater inflows to the mining pit, based on groundwater model predictions from the site groundwater model and adjusted for the purpose of site water balance forecasting. The adjustment is based on recorded data of groundwater extracted from the underground, which has historically indicated actual inflows are significantly lower than predicted. The groundwater model inflows are therefore considered conservative. The water balance model has used scaled back inflows which are less than the predicted inflows, but greater than the actual inflows. Therefore, the water balance model is still applying a conservative estimate to groundwater inflows and accounting for the potential increase in inflows over time. NCOPL will continue to license groundwater inflows as predicted in the groundwater model.

Table 3-5 Adopted groundwater inflows

Year	Groundwater inflow (ML/yr)
2022	668
2023	703
2024	754
2025	810
2026	883
2027	972

3.3.3 Catchment runoff

Rainfall runoff model

The Australian Water Balance Model (**AWBM**) (Boughton, 2004) was used to estimate daily runoff from daily rainfall. The AWBM is a saturated overland flow model which allows for variable source areas of surface runoff. The AWBM uses a group of connected conceptual storages (three surface water storages and one ground water storage) to represent a catchment. Water in the conceptual storages is replenished by rainfall and is reduced by evapotranspiration. Simulated surface runoff occurs when the storages fill and overflow.

The AWBM model uses daily rainfalls and estimates of catchment evapotranspiration to calculate daily values of runoff using a daily balance of soil moisture. The model has a baseflow component which simulates the recharge and discharge of a shallow subsurface store. Runoff depth calculated by the AWBM model is converted into runoff volume by multiplying by the contributing catchment area. The model parameters define the storage depths, the proportion of the catchment draining to each of the storages, and the rate of flux between them.

Catchment runoff was modelled using the AWBM rainfall-runoff model. Catchments across the site have been characterised into the following land use types:

- natural (undisturbed catchments, fully rehabilitated spoil and pre-strip areas).
- compacted (haul roads, pit floor, mine infrastructure).
- spoil (unrehabilitated overburden emplacement areas).

Catchment areas

Figure 3-1 shows the adopted catchments and land use. Catchment areas for each storage are shown in Table 3-6.

Table 3-6 Adopted catchment areas

Dam	Catchment area (ha)	Dam	Catchment area (ha)
A1	3.7	SB4	6.3
A2	1.1	SD1	43.3
A3	1.1	SD2	22.1
B1	1.1	SD3	25.1
B2	4.7	SD4	6.1
C	7.3	SD6	7.6
D	4.2	SD7	2.0
Containment bund	10.6	SD8	2.0
SB1	29.1	Box Cut	6.0
SB2	1.9	BR1	8.5
SB3	19.9		

3.3.4 External supplementary water supply

Make-up water demands will be met via licensed surface water extraction from the Namoi River and/or the Namoi alluvial production bore. Water will be extracted from NCOPL's existing alluvial bore located adjacent to the Namoi River during periods when supply from the underground mining area is insufficient to meet the mine's water demands, and sufficient allocation from the Namoi River (i.e. utilising NCOPL's existing Namoi River pump) is unavailable. NCOPL's bore is located within the Upper Namoi Zone 5 Groundwater Source (within the *WSP for the Namoi Alluvial Groundwater Sources Order 2020*).

External supplementary water from the Namoi River and/or the Namoi alluvial production bore will be extracted in accordance with the licensed entitlements allocated under the relevant WALs held by NCOPL (Table 3-4) and the rules prescribed in the WSP.

3.4 Discharge

Licensed discharge points and limits are outlined in section 4 of the SWMP (Attachment 3 of the WMP).

3.4.1 Mine water releases

In accordance with EPL requirements, no releases of mine water were simulated as part of the water balance. No overflow or release of mine water has ever occurred from the mine.

3.4.2 Dirty water releases

Controlled discharge from sediment dams to the receiving environment can occur from SD2, SD4, SD7 and SD8 if rainfall exceeds the design standard, in accordance with Condition L2.5 of EPL 12789.

3.4.3 Permeate water releases

Permeate produced by the water treatment plant that is surplus to requirements may be discharged to the Namoi River as required in accordance with Condition P1.3 of EPL 12789 as described in the SWMP (Attachment 3 of the WMP). The pipeline used for the transfer of water from the Namoi River to the mine will be modified to allow for water transfer in the opposite direction. Any discharge to the Namoi River will be directly from the RO plants, or from Dam B1 in accordance with the SWMP (Attachment 3 of the WMP).

The maximum discharge rate and volume to the river will limited by the capacity of the pipeline. Leak detection will be installed on the pipeline and discharge will be through a diffuser. An auto shut-off valve will be connected through remote process control linked to in-line pH and EC monitoring probes.

3.5 Water balance

The Goldsim water balance model was used to undertake a forecast simulation of the NCO site water balance under varying climatic conditions over the five-year period FY23 to FY27. The model simulates all major components of the water management system on a daily time step. The simulated inflows and outflows included in the model are provided in Table 3-7.

Climatic conditions were represented by extracting five-year periods of rainfall from the historical rainfall record which goes back to 1889. Each five-year climate sequence represented by the model is referred to as a “realisation”. The first realisation used recorded rainfall data from 1889 to 1894. The second realisation used data from 1890 to 1895, and so on. The historical rainfall record (1889 to 2022) provides 129 realisations.

Table 3-7 Simulated inflows and outflows to the mine water management system

Inflows	Outflows
Direct rainfall on water surface of storages	Evaporation from water surface of storages
Catchment runoff	Stockpile sprays
Groundwater inflows to underground	Dust suppression demand
External water supply	Pit Top area usage
Mine water return	Underground demand
Underground permeate water demand	Longwall emulsion and vent humidity loss
	Evaporation fan losses
	Permeate water-controlled release
	Fire water and potable demands
	Offsite release from storages

The Goldsim model was used to assess the performance of the proposed water management system, including:

- A dams combined inventory;
- Brine dam inventory;
- SB dam combined inventory;
- Box Cut inundation risk; and
- the overall water balance within the water management system.

Figure 3-2 shows the conceptualisation of the mine water management system adopted for the water balance model. Whilst the coal process water circuit was not explicitly modelled, the estimated net water demand from the CHPP was included in the model.

It is important to note that there is inherent uncertainty with respect to some components of the water balance (e.g. catchment yield/rainfall runoff, mining area groundwater inflows). Best estimates of these parameters have been adopted and these estimates will continue to be checked and refined against on-site observations as operations progress.

Long term daily rainfall and evaporation data for NCO was obtained from the SILO database (https://www.longpaddock.qld.gov.au/silo/) for the period January 1889 to December 2021 (133 years). Average monthly rainfall and evaporation are shown in Figure 3-3. Morton's lake evaporation was adopted to represent evaporation for the simulation of the site water balance.

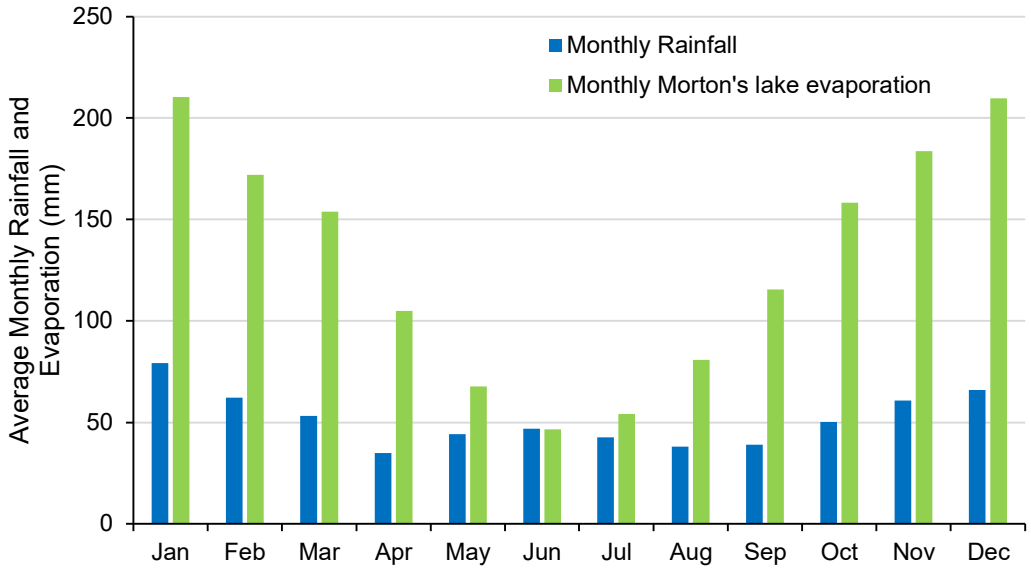


Figure 3-3 Average monthly rainfall and evaporation from SILO Database

3.5.1 Forecast simulation results interpretation

In interpreting the results of a forecast simulation, it should be noted that the results provide a statistical analysis of the water management system's performance over the 5-year forecast period, based on 129 realisations with different climatic sequences.

The model results are presented as a probability of exceedance. For example, the 10th percentile represents 10% probability of exceedance and the 90th percentile results represent 90% probability of exceedance. There is an 80% chance that the result will lie between the 10th and 90th percentile traces.

Whether a percentile trace corresponds to wet or dry conditions depend upon the parameter being considered. For site water storage, where the risk is that available capacity will be exceeded, the lower percentiles correspond to wet conditions. For example, there is only a small chance that the 1 percentile storage volume will be exceeded, which would generally correspond to very wet conditions.

For external site water supply volumes, where the risk is that insufficient water will be available, there is only a small chance that more than the 1 percentile water supply volume would be required. This would generally correspond to very dry climatic conditions.

It is important to note that a percentile trace shows the likelihood of a particular value on each day and does not represent continuous results from a single model realisation. For example, the 50th percentile trace does not represent the model time series for median climatic conditions.

Overall water balance

Water balance results from the 129 modelled realisations are presented in Table 3-8, for median climatic conditions. The results are the average of realisations and will include wet and dry periods distributed throughout the forecast period.

Rainfall yield for each year is affected by the variation in climatic conditions within the adopted climate sequence. It should be recognised that the following components of the water balance are subject to climatic variability:

- rainfall runoff;
- evaporation (including the enhanced evaporation from the evaporation fans, until the BR1 dam is commissioned in March 2023);
- imported water requirement; and
- site releases/spills.

Hence, actual values of these components of the water balance will vary from year to year and may be outside the range of simulated results.

The results show that, for a median climatic year:

- The average annual external water demand supplied from external licensed sources is approximately 61 ML/year and a peak demand of up to 150 ML/yr. The mine has sufficient licenses to account for the peak demand.
- Evaporation from dam water surfaces ranges between approximately 464 ML/year and 515 ML/year.
- Combined runoff and direct rainfall contribute between 368 ML/year and 482 ML/year.

Table 3-8 Annual water balance – all realisations (median climatic conditions)

Year	Annual water balance (ML/period)				
	FY23	FY24	FY25	FY26	FY27
Water inputs					
Direct rainfall + catchment runoff	368	417	482	425	460
External water supply	0	29	61	55	37
Underground inflow (groundwater inflow + mine water return)	773	867	975	1,088	1,171
Total inputs	**1,140**	**1,313**	**1,518**	**1,568**	**1,668**
Water outputs					
Evaporation (incl enhanced fan evaporation)	492	464	485	483	515
Total net mine water demand	301	336	374	407	409
Total net permeate water demand	314	387	469	539	543
Total net potable water demand	15	15	15	15	15
Total controlled permeate water release	69	7	2	0	2
Offsite release	4	34	65	91	34
Total outputs	**1,195**	**1,243**	**1,409**	**1,535**	**1,518**
Change in stored volume	**-54**	**70**	**109**	**33**	**150**

A Dams combined inventory

Figure 3-4 shows the forecast A series dam inventory for the reporting period. The following summary of results is provided:

- A1 would be the only mine water storage until the BR1 brine dam is commissioned in March 2023.
- The RO treatment rate would need to be upgraded before FY27, to account for the increasing groundwater inflows into the underground. For the purposes of this assessment, it is assumed that the RO2 feed rate would be increased by 50% to manage the system.
- For median (50%ile) climatic conditions and drier, the A series dam inventory would generally fluctuate around 80% of their MOV.
- The A series dam would reach their combined full storage volume (**FSV**) during 10%ile wet climatic conditions and spill to B2.

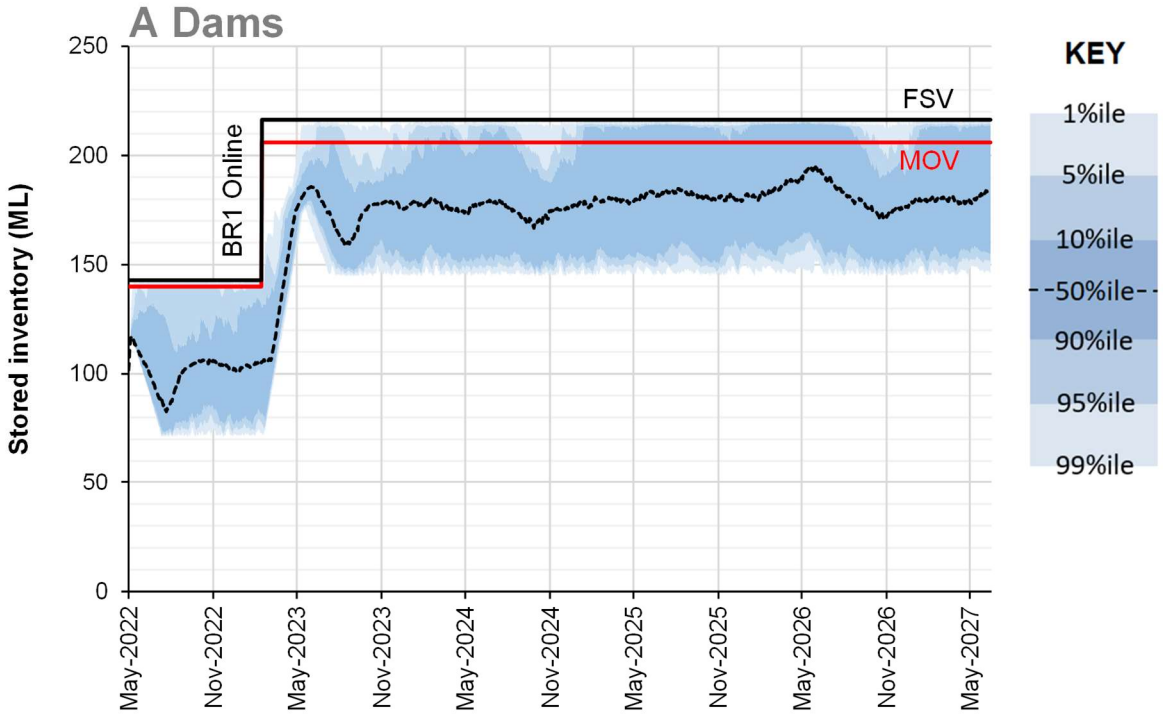


Figure 3-4 Forecast A Dams combined inventory

Brine Dam inventory

Figure 3-5 shows the forecast brine dam inventory for the reporting period. The following summary of results is provided:

- At the start of the simulation B2 and C are the principal brine water storages. After March 2023 BR1 will be operated as brine water once construction is complete.
- If needed, excess brine is diluted with Mine water and stored in A2 and A3 for short periods until the brine squeeze can reduce brine inventories.
- The combined brine water inventory would progressively decrease while the Seawater RO is online, until it is decommissioned in March 2023. Beyond this point, the brine inventory would steadily increase.
- BR1 will be commissioned by March 2023, to provide additional brine storage.
- During extreme wet climatic conditions, BR1 would store up to 400 ML by the end of 2026, which suggests that a new brine dam (i.e. BR2) may be required by 2027. The requirement for an additional brine dam will be re-assessed on an annual basis.

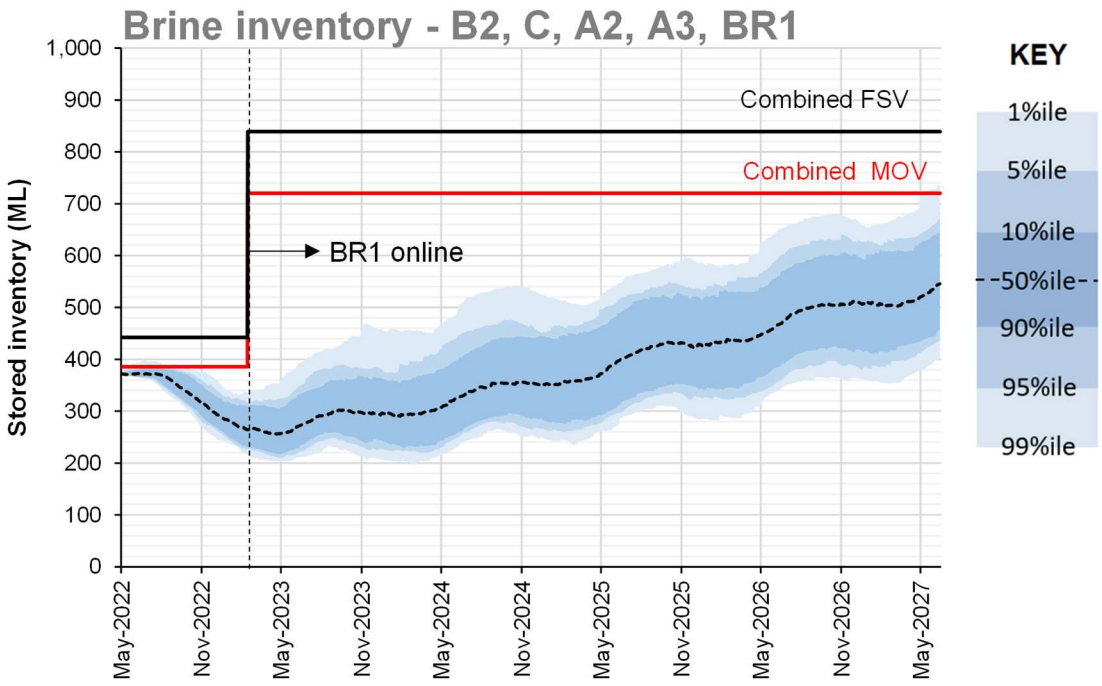


Figure 3-5 Forecast Brine Dam inventory

SB Dam combined inventory

Figure 3-6 shows the combined SB Dam inventory over the simulation, showing that the combined inventory would remain below the combined FSV and there are no forecast spills from the dam up to the 1% AEP.

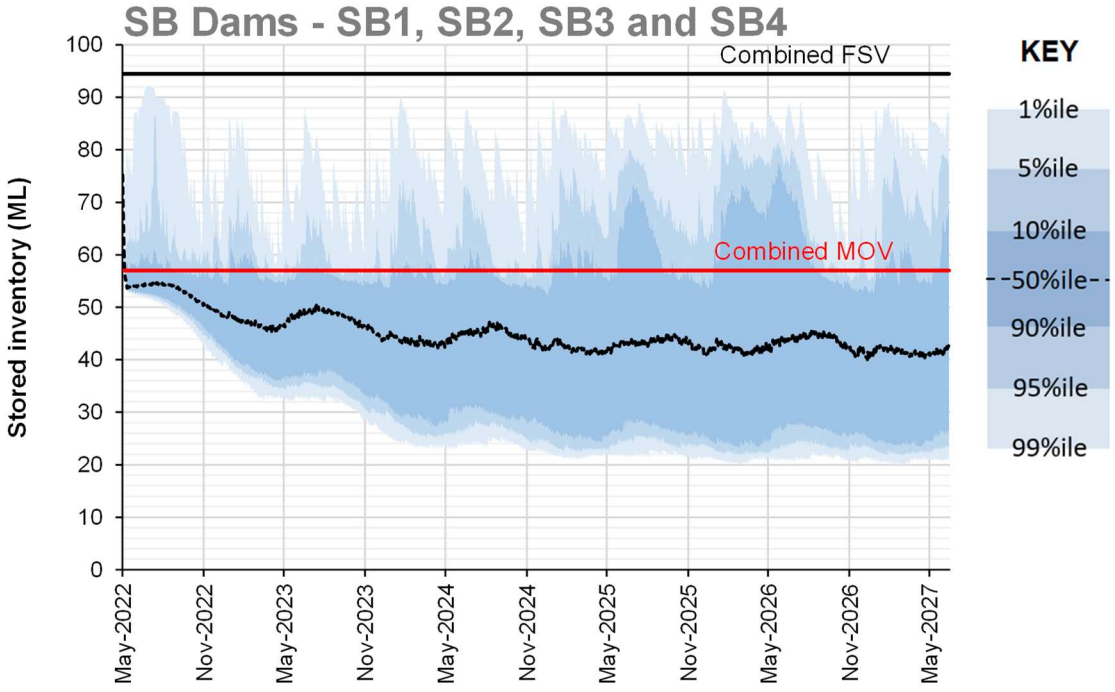


Figure 3-6 Forecast SB Dam combined inventory

Box Cut inundation risk

Figure 3-7 shows the Box Cut inundation risk, showing that the Box Cut may be inundated by up to 20 ML during extreme wet climatic conditions at the start of the simulation. This occurs due to the limited available capacity in the brine dams. There is no further modelled Box Cut inundation risk after BR1 is commissioned in March 2023.

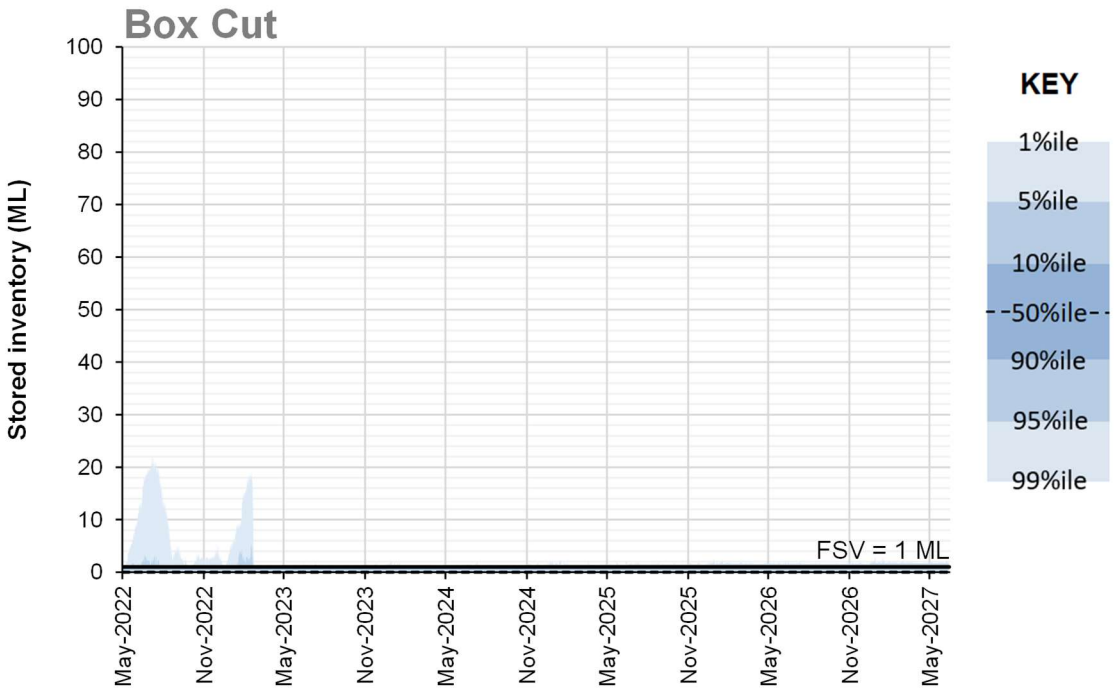


Figure 3-7 Forecast SB Dam combined inventory

Permeate and raw water combined inventory

Figure 3-8 shows the combined Permeate and Raw water dam inventory (including B1, D and the Containment Bund) across the simulation period. It shows that the combined inventory will be maintained below the combined MOV for the majority of climatic conditions, due to the ability to release permeate to the Namoi River.

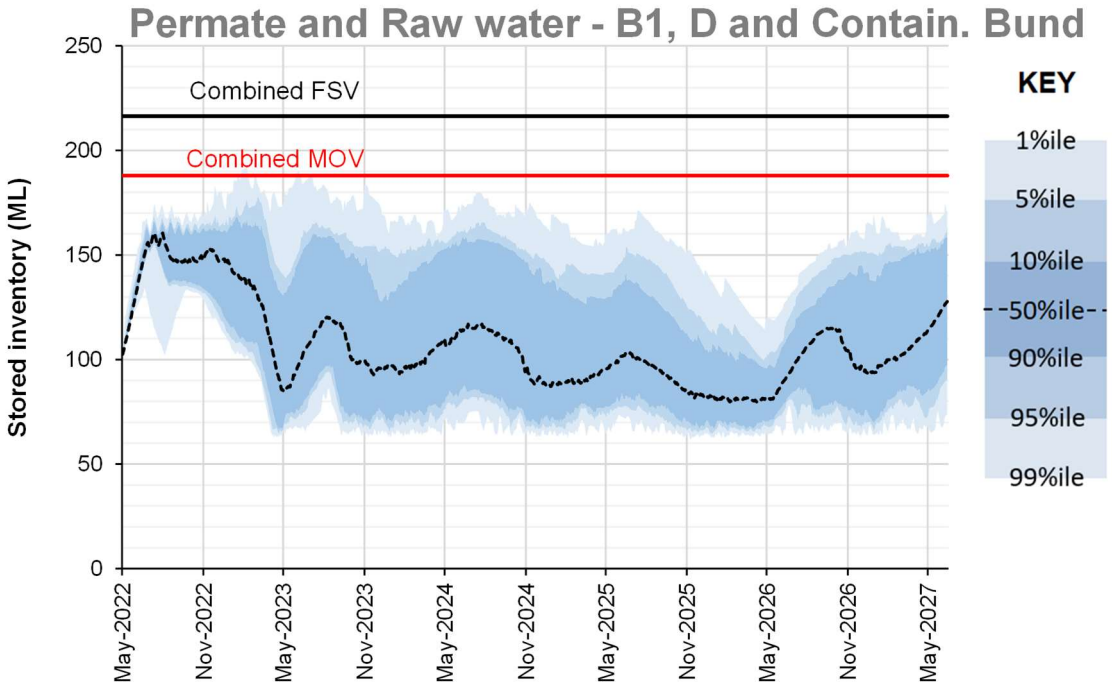


Figure 3-8 Forecast permeate and raw water inventory

Figure 3-9 shows the annual volumes of the permeate releases to the Namoi River. It shows that the requirement for permeate release would be highest in the first year of the simulation (up to 130 ML), after which it reduces significantly. The reduction corresponds with the increased production rates and permeate water demands.

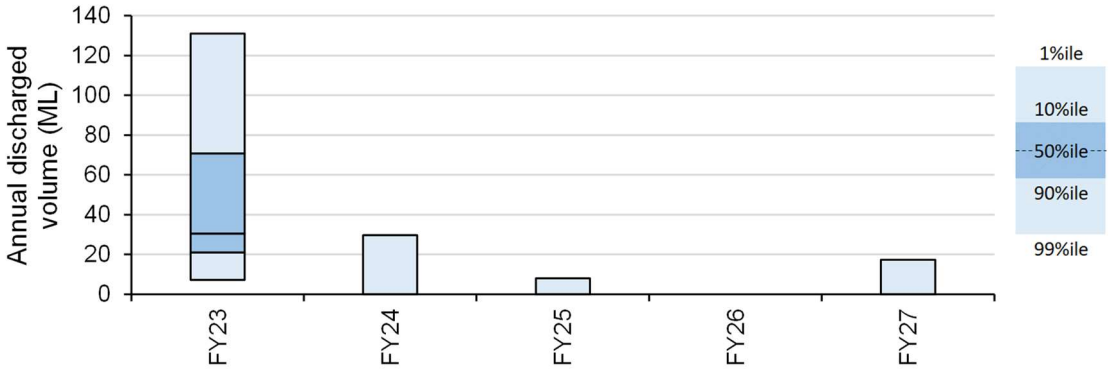


Figure 3-9 Forecast annual permeate release volumes to the Namoi River

External water requirements

Figure 3-10 shows the forecast annual (July-June) external water requirements from the Namoi River. It shows that during extreme dry conditions, up to 140 ML may be required in FY26.

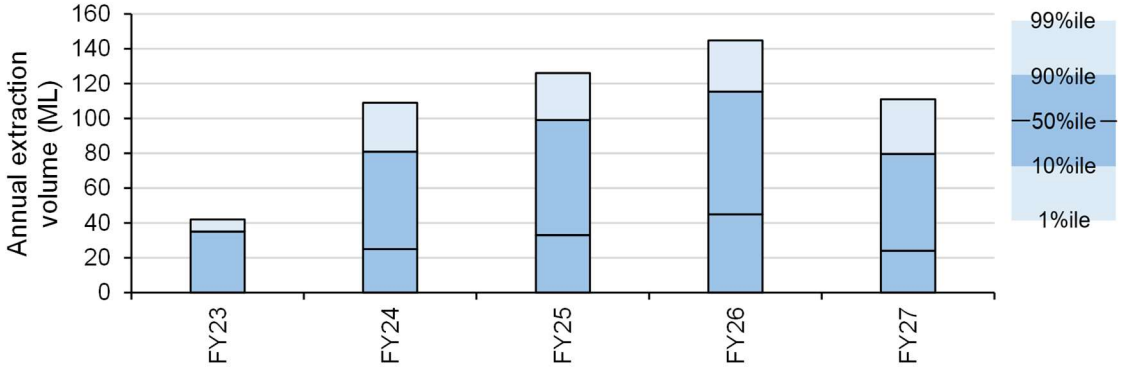


Figure 3-10 Forecast external water requirements

Offsite uncontrolled spills

The water balance model results show that there were no spills from A1, A2, A3, B2 or C to the receiving environment for any of the climatic conditions assessed.

The SB dams would be sufficiently managed during operations as to prevent uncontrolled spills to the receiving environment.

3.5.2 Adaptive management

The model results presented above represent the application of the adopted water management system rules over the mine life, regardless of climatic conditions. In reality, there are numerous options for adaptive management of the water management system to accommodate climatic conditions. For example, when excess water is available on site, NCOPL may increase the application of water for dust suppression or share excess water with other users in accordance with approvals requirements. These alternative management approaches will be used to reduce the risks top operations associated with climatic variability.

4. Site water balance monitoring program

4.1 Water storages and volumes

Storage levels (and volumes) at each water storage will be monitored in accordance with the SWMP (Attachment 3 of the WMP). Flowmeters will be used to record the transfer of water around the mine site, with mine water pumped from the underground working monitored in accordance with the GWMP (Attachment 4 of the WMP).

An analysis of the likelihood of uncontrolled discharges from the site will be conducted annually as part of the comparison of the actual behaviour of the site water management system to the predicted outcomes of the site water balance modelling (section 6).

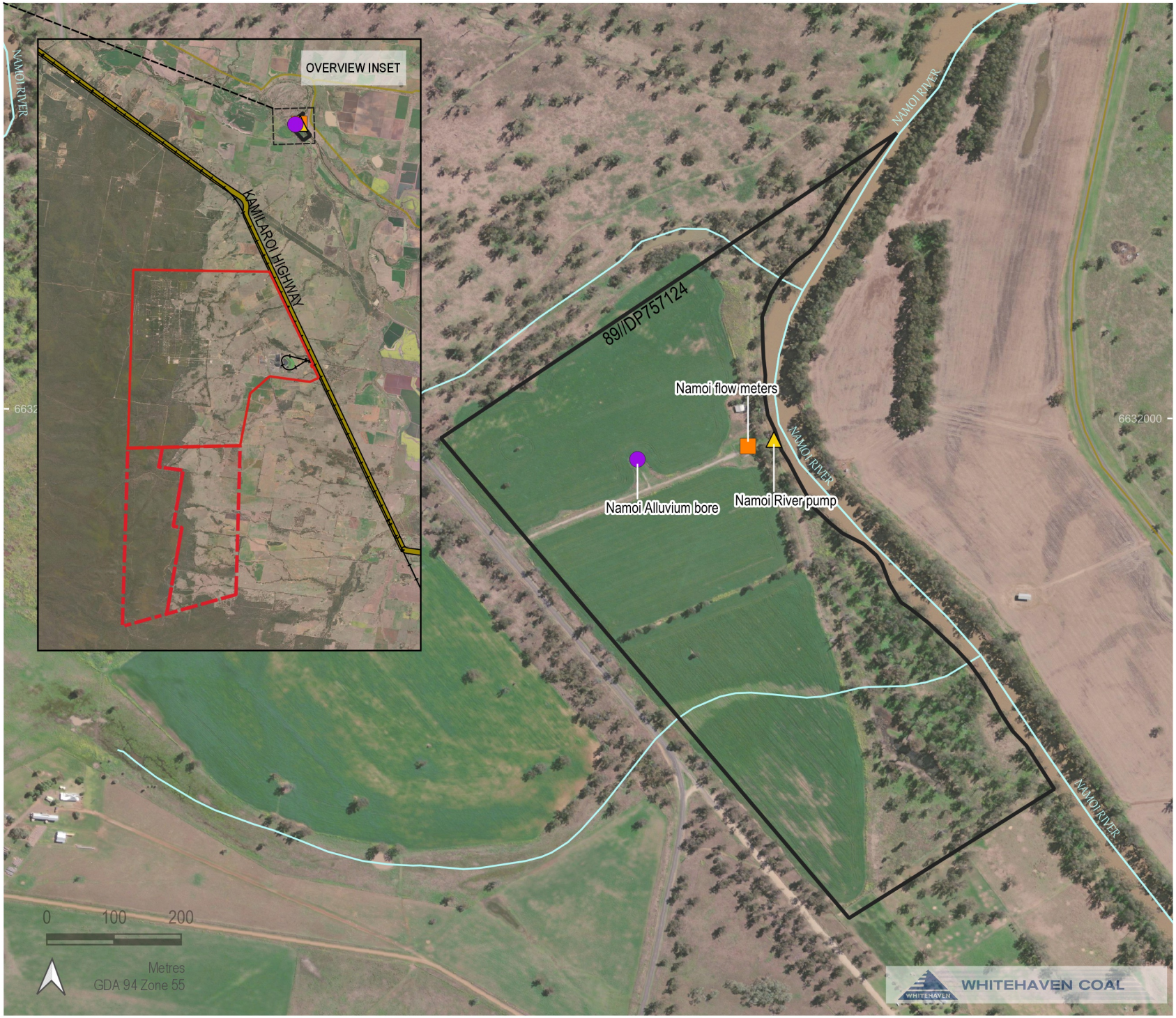
4.2 Water take

The quantity of water captured, intercepted or extracted from the Narrabri Mine will be determined using a range of methods including measurement, simulation and estimation. NCOPL will continue collecting and metering all inflows and outflows and to use the water balance model to calculate the groundwater take. Flow meters required for water take (under a WAL) will meet the requirements of the relevant water supply work approval.

NCOPL will record the metered quantities of water pumped to the Narrabri Mine via the pipeline from the Namoi River pump station and alluvial production bore. Flow meters required for water take under work approvals are located on the property 'Broadwater' Lot 89 DP 757124 and are shown in Figure 4-1. These flowmeters meet the requirements of the NSW Metering Policy.

The approach for monitoring surface water take associated with water losses from surface cracking and ponding in watercourses is outlined in section 4.4.1 of the SWMP (Attachment 3 of the WMP).

The forecast quantity of surface water and groundwater water take will be reviewed against the water licence entitlements described in section 3.3.1 to determine if contingency measures will be required to reduce water take or if additional water licences will be required (refer to the Trigger Action Response Plan [**TARP**] in section 5).



LEGEND

- ML1609
- MLA 1
- MLA2
- Lot 89 DP 757124
- Namoi flow meters
- Namoi Alluvium bore
- Namoi River pump
- Highway
- RoadSegment
- Railway
- Watercourse

ONWARD CONSULTING

NARRABRI MINE

FIGURE 4-1

Location of Metering Points for Licensed Water Take

4.3 Meteorological monitoring

Meteorological monitoring is undertaken at the on-site weather station (W1) to provide data to support environmental monitoring and design work. The following parameters will continue to be monitored at W1:

- rainfall;
- temperature at 2 metres (**m**);
- temperature at 10 m;
- sigma theta;
- total solar radiation;
- wind direction at 10 m;
- wind speed at 10 m; and
- relative humidity.

5. Trigger Action Response Plan

The TARP presented in Table 5-1 includes triggers to respond to any exceedances of the site water balance related criteria and performance measures.

Table 5-1 Site water balance TARP

Method	Status	Trigger	Action	Response
Mine water and brine inventory				
To ensure long term behavior of the mine water management system is within predicted forecast tolerances. To ensure that additional brine storages and water treatment plant upgrades can be implemented as required. **Sites**: • Dams SB1, SB2, SB3, SB4, A1, A2, A3, B2, BR1 & C **Parameter**: • Total stored mine water volume in SB1, SB2, SB3, SB4, A1, A2 and A3. • Total stored brine volume in A2, A3, B2, C and BR1. **Analysis:** • Compare total mine water volume and total brine volume with forecast water balance results in the Site Water Balance. **Frequency:** • Annual	**Normal**	Total stored volume of mine water or total stored volume of brine is below the predicted 10th percentile (wet climatic conditions) forecast inventories in the Site Water Balance.	None required.	Continue routine monitoring of stored water volume.
	Level 1	Total stored volume of mine water or total stored volume of brine exceeds the predicted 10th percentile (wet climatic conditions) forecast inventories in the Site Water Balance (but remains below the predicted 5th percentile).	Engage hydrologist to confirm calibration of water balance model to identify the reason for inventory exceedance.	Use recalibrated water balance model to undertake forecast modelling to confirm or revise the proposed timing of site water management system upgrades.
	Level 2	Total stored volume of mine water or total stored volume of brine exceeds the predicted 5th percentile (wet climatic conditions) forecast inventories in the Site Water Balance or exceeds the MOV.	Revise site water balance model to inform and develop a contingency plan to reduce inventories as required.	Implement contingency plan to reduce water level in storages to provide less than the MOV. This may involve increasing dust suppression / stockpile spray use, transferring water between storages, or treating additional water in the water treatment plant
Water take				
To ensure sufficient water entitlement is available for the operation of the Narrabri Mine and water is extracted in accordance with the relevant WALs held by NCOPL and the rules prescribed in the WSP. **Sites**: • Underground workings • Namoi River pump and alluvial production bore **Parameter**:	**Normal**	Forecast water take indicates sufficient water entitlement (licensed take) is available for the modelled operational scenario.	None required.	Continue routine water balance forecast modelling and monitoring of water take.

Method	Status	Trigger	Action	Response
• Total passive intake of aquifer water (modelled predictions). • Total metered quantities of water pumped to the Narrabri Mine via the pipeline from the Namoi River pump station and alluvial production bore. **Analysis:** • Water balance forecast modelling. • Review actual and forecast water take against the water licence entitlements. **Frequency:** • Annual	**Level 1**	Forecast water take indicates insufficient water entitlement (licensed take) is available for the modelled operational scenario.	Conduct preliminary quality assurance of water balance scenario modelling inputs and outputs to confirm prediction. Revise modelled operational scenario as required.	Transfer additional entitlements from other Whitehaven operations (where feasible) or obtain additional allocation on the open market in accordance with the appropriate trading rules of the relevant WSP.
	Level 2	Trend in actual water take indicates risk of exceeding allocation during the water year (reporting period).	Identify measures to further maximise water use reduction, water recycling and beneficial reuse options for mine water and dirty water to ensure sufficient water supply is made available to meet demand.	• Implement measures to further maximise water use reduction, water recycling and beneficial reuse options for mine water and dirty water to ensure sufficient water supply is made available to meet demand. • Transfer additional entitlements from other Whitehaven operations (where feasible) or obtain additional allocation on the open market in accordance with the appropriate trading rules of the relevant WSP.

6. Reporting, evaluation and review

Results of the site water balance model will be reviewed against the impact assessment criteria in this plan on an annual basis. NCOPL will use this information to review and determine if improvements are required.

All internal and external reporting and periodic review of this Plan will be undertaken in accordance with section 7 of the WMP. The revision status of this Plan is indicated in section 8.

The site water balance model will be revisited on an annual basis to compare the actual behaviour of the Narrabri Mine site water management system to the predicted outcomes of the site water balance modelling. The review will include:

- validation of the calibration parameters of the water balance model to ensure that the model adequately simulates observed conditions on site;
- an analysis of the likelihood of uncontrolled discharges from the site for the following year; and
- a site water balance for each calendar year.

Surface water and groundwater inflows, outflows and storage volumes data obtained as part of the SWMP (Attachment 3 of the WMP) and GWMP (Attachment 4 of the WMP) will be used to inform the validation/calibration of the site water balance model.

Annual inflow and outflow volumes will be reviewed prior to secondary extraction and will be detailed in the relevant Extraction Plan.

The Annual Review will report on the water captured, intercepted or extracted from the site (direct and indirect) in the previous water year (1 July – 30 June), including water taken under each water licence. The report will include:

- water licence number;
- WSP, source and management zone (as applicable);
- entitlement;
- passive take/inflows;
- active pumping (if applicable); and
- total take.

7. References

Boughton (2004). *The Australian water balance model, Environmental Modelling and Software*. Vol. 19, pp. 943-956.

Bureau of Meteorology (BoM) (2022). *Summary Statistics Narrabri West Post Office*. Available at http://www.bom.gov.au/climate/averages/tables/cw_053030.shtml

NSW Department of Primary Industries – Office of Water (2012). *Aquifer Interference Policy*.

NSW Independent Planning Commission (April 2022). *Development Consent SSD 10269, Narrabri Underground Mine Stage 3 Extension Project.*

Resource Strategies Pty Ltd (October 2020). *Narrabri Underground Mine Stage 3 Extension Project – Environmental Impact Statement.* Prepared for Narrabri Coal Operations Pty Ltd.

8. Review history

Revision	Comments	Author	Authorised by	Date
0A	Approved by Department of Planning and Environment on 14 September 2023	Onward Consulting	Manager HSE	29 November 2022

Department of Planning and Environment

Our ref: SSD-10269-PA-21

Brent Baker
Manager HSE
Narrabri Coal Operations Pty Ltd
10 Kurrajong Creek Road
Baan Baa, NSW, 2390

14/09/2023

Subject: Narrabri Coal Stage 3 – Site Water Balance

Dear Mr. Baker

I refer to your submission, requesting review and approval of the Site Water Balance for the Narrabri Coal Stage 3 project. I also acknowledge your response to the Department's review comments and request for additional information.

I note the Site Water Balance has been prepared in consultation with DPE Water and EPA, and contains the information required by the conditions of approval.

The Department has carefully reviewed the document and is satisfied that it meets the requirements of the relevant conditions in Development Consent (SSD-10269).

Accordingly, as nominee of the Planning Secretary, I approve the Site Water Balance (Rev 0A, dated 29 November 2022).

Please ensure you make the document publicly available on the project website at the earliest convenience.

If you wish to discuss the matter further, please contact Wayne Jones on (02) 6575 34056

Yours sincerely

Stephen O'Donoghue
Director
Resource Assessments
As nominee of the Planning Secretary

Appendix A - Compliance conditions relevant to this Plan

Table A-1 SSD 10269 consent conditions directly relevant to this Plan

Condition	Requirement	Document reference
Obligation to minimise harm to the environment		
A1.	In addition to meeting the specific performance measures and criteria established under this consent, the Applicant must implement all reasonable and feasible measures to prevent, and if prevention is not reasonable and feasible, minimise, any material harm to the environment that may result from the construction and operation of the development, and any rehabilitation required under this consent.	Section 1.3 Section 3 Section 6.2 of the WMP
Evidence of Consultation		
A20.	Where conditions of this consent require consultation with an identified party, the Applicant must: (a) consult with the relevant party prior to submitting the subject document; and (b) provide details to the Department of the consultation undertaken including: (i) the outcome of that consultation, matters resolved and unresolved; and (ii) details of any matters not resolved between the party consulted and the Applicant and how the Applicant has addressed the matters not resolved.	Section 1.4 of WMP
Staging, combining and updating strategies, plans or programs		
A21.	With the approval of the Planning Secretary, the Applicant may:	
	(a) prepare and submit any strategy, plan or program required by this consent on a staged basis (if a clear description is provided as to the specific stage and scope of the development to which the strategy, plan or program applies, the relationship of the stage to any future stages and the trigger for updating the strategy, plan, or program);	No staging of SWB proposed
	(b) combine any strategy, plan or program required by this consent (if a clear relationship is demonstrated between the strategies, plans or programs that are proposed to be combined);	No combining of SWB with another plan proposed
	(c) update any strategy, plan or program required by this consent (to ensure the strategies, plans and programs required under this consent are updated on a regular basis and incorporate additional measures or amendments to improve the environmental performance of the development); and	Section 6
	(d) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required by an adjoining mining consent or approval, in common ownership or management.	No combining of SWB with another plan proposed
Compliance		
A30.	The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development.	Section 2 of the WMP
Applicability of guidelines		
A31.	References in the conditions of this consent to any guideline, protocol, Australian Standard or policy are to such guidelines, protocols, Standards or policies in the form they are in as at the date of inclusion (or later update) in the condition.	Section 3.7 of the WMP
A32.	However, consistent with the conditions of this consent and without altering any limits or criteria in this consent, the Planning Secretary may, in respect of ongoing monitoring and management obligations, agree to or require compliance with an updated or revised version of such a guideline, protocol, Standard or policy, or a replacement of them.	
Water Supply		

Condition	Requirement	Document reference
B25.	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.	Section 3.3
B26.	The Applicant must report on water take at the site each year (whether direct or indirect and whether licensable or exempt) 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.	Section 6.1
Water Discharges		
B33.	The Applicant must ensure that all surface discharges from the site comply with all relevant provisions of the POEO Act, including any discharge limits (both volume and quality) set for the development in any EPL.	Section 3.4
Water Management Performance Measures		
B34.	The Applicant must comply with the performance measures in Table 4. ***Table 4: Water management performance measures*** **Feature** / **Performance measure** Water management – general: • Maintain separation between clean, dirty (i.e. sediment-laden) and mine water management systems; • Minimise the use of clean and potable water on the site; • Maximise water recycling, reuse and sharing opportunities; • Minimise the use of make-up water from external sources; • Design, install, operate and maintain water management systems in a proper and efficient manner; and • Minimise risks to the receiving environment and downstream water users. Mine water discharges: Negligible environmental consequences beyond those predicted in the document/s listed in condition A2(c).	Section 3.1 Section 3.3 Section 3.4 Section 3.5
Water Management Plan		
B36.	This plan must:	
	(a) be prepared by a suitably qualified and experienced person/s;	Section 1.4 of the WMP
	(b) be prepared in consultation with DPIE Water and the EPA;	
	(c) describe the measures to be implemented to ensure that the Applicant complies with the water management performance measures (see Table 4);	Section 3
	(d) build on existing monitoring programs and utilise existing data from nearby mines, where practicable;	Section 4
	(e) include a:	
	(i) **Site Water Balance** that includes details of:	
	• predicted annual inflows to and outflows from the site;	Section 3.2 Section 3.3 Section 3.4 Section 3.5

Condition	Requirement	Document reference
	• sources and security of water supply for the life of the development (including authorised entitlements and licences);	Section 3.3
	• water storage capacity;	Section 3.1.3 Section 4.1
	• water use and management on the site, including any water transfers or sharing with other industries;	Section 3.1.6 Section 3.3.1
	• a program to regularly review modelling of the likelihood of uncontrolled discharges from the site;	Section 4.1 Section 5 Section 6
	• licensed discharge points and limits; and	Section 3.4
	• reporting procedures, including annual revision of the site water balance;	Section 6
Management Plan requirements		
E5.	Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	
	a) summary of relevant background or baseline data;	Section 2
	b) details of:	
	i) the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 1.4
	ii) any relevant limits or performance measures and criteria; and	Section 3.3.1 Section 3.4
	iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	Section 4 Section 5
	c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	Appendix B
	d) a description of the management measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 3
	e) a program to monitor and report on the:	
	i) impacts and environmental performance of the development; and	Section 4
	ii) effectiveness of the management measures set out pursuant to paragraph (d);	
	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;	Section 5
	g) a program to investigate and implement ways to improve the environmental performance of the development over time;	Section 7.6 of the WMP
	h) a protocol for managing and reporting any:	
	i) incident, non-compliance or exceedance of any impact assessment criterion or performance criterion;	Section 6 of WMP

Condition	Requirement	Document reference
	ii) complaint; or	Section 8 of WMP
	iii) failure to comply with other statutory requirements;	Section 6.2 of WMP
	i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	Section 3.7 of the WMP
	j) a protocol for periodic review of the plan.	Section 6
E6.	The Applicant must ensure that management plans prepared for the development are consistent with the conditions of this consent and any EPL issued for the site.	Appendix A Appendix B

Appendix B - Key EIS commitments

Table B-1 Key EIS commitments

Source	Aspect	Details	Reference
EIS Section 6.4.3	Namoi Alluvial Bore	Water would be extracted from NCOPL's existing alluvial bore located adjacent to the Namoi River during periods when required (e.g. when supply from the underground mining area is insufficient to meet the Project water demand, and sufficient allocation from the Namoi River [i.e. utilising NCOPL's existing Namoi River pump] is unavailable.	Section 3.3
EIS Section 6.4.3	Namoi Alluvial Bore	NCOPL's bore is located within the Upper Namoi Zone 5 groundwater source (within the WSP for the Namoi Alluvial Groundwater Sources). Water would be extracted in accordance with the relevant WALs held by NCOPL and the rules prescribed in the WSP.	Section 3.3
EIS Section 6.4.3	Namoi Alluvial Bore	All extraction from the alluvial bore would be conducted in accordance with the licensed entitlements issued by DPIE – Water, and in accordance with the rules in the relevant WSP.	Section 3.3
EIS Section 6.4.4	Groundwater Licensing	Entitlements would be transferred from other Whitehaven operations to cover Project requirements for the Gunnedah Oxley Basin MDB. In the event NCOPL is not able to obtain sufficient entitlements from other Whitehaven operations, there is sufficient market depth in the Gunnedah Oxley Basin MDB Groundwater Source.	Section 3.3 Section 5
EIS Section 6.4.4	Groundwater Licensing	For the predicted licensing requirements in the Lower Namoi Groundwater Source, NCOPL would seek and obtain the appropriate entitlements on the open market in accordance with the appropriate trading rules of the *Water Sharing Plan for the Namoi Alluvial Groundwater Sources 2020*.	Section 3.3 Section 5
EIS Section 6.4.4	Groundwater Licensing	At the completion of the Project, relevant entitlements would be surrendered to account for groundwater take post-mining in accordance with the AIP.	Section 3.3.1
EIS Section 6.5.3	Water Management System	The Project would involve the use of the existing/approved water management infrastructure with minor augmentations and extensions, including the progressive developments of pumps, pipelines, water storages and other water management infrastructure.	Section 3.1
EIS Section 6.5.3	Water Management System	The objectives and design criteria of the Project site water management system would be to: • protect the integrity of local and regional water resources; • separate runoff from undisturbed, rehabilitated and mining-affected areas; • design and manage the system to operate reliably throughout the life of the Project in all seasonal conditions, including both extended wet and dry periods; • provide water for use in mining and CHPP operations that is of sufficient volume and quality, including during periods of extended dry weather; • provide sufficient storage capacity in the system to store, treat and discharge runoff as	Section 3.1.1 Section 3.1 of Attachment 3 of WMP

Source	Aspect	Details	Reference
		required, including during periods of extended wet weather; and • maximise the re-use of water on-site.	
EIS Section 6.5.3	Flow Regime - Changes in Contributing Catchment	Runoff from Project disturbance areas and areas under active rehabilitation would be captured in sediment dams and: • transferred to the Project site water management system for re-use in mine operations; and/or • controlled release via licensed discharge points, in accordance with the requirements of EPL 12789 following rainfall events that exceed sediment dam design capacity.	Section 3.1.1 Section 3.4.2
EIS Section 6.5.3	Surface Water Quality	The controlled release of treated water, which would be undertaken in accordance with EPL 12789, would not adversely impact Namoi River water quality.	Section 3.4.3
EIS Section 6.5.3	Namoi River Surface Water Extraction	Consistent with current practice, water would be preferentially extracted from the Namoi River in accordance with WALs held by NCOPL. When low or no-flow conditions in the Namoi River prevent the extraction of water from the river (or other circumstances such as the Namoi River pump station not being operational), groundwater would be extracted from NCOPL's bore to provide a supplementary water supply, in accordance with WALs held by NCOPL.	Section 3.3.4
EIS Section 6.5.3	Namoi River Surface Water Extraction	Extraction from the Namoi River would be conducted in accordance with the licensed entitlements issued under the *Upper Namoi and Lower Namoi Regulated River Water Sources 2016*.	Section 3.3.1 Section 3.3.4
EIS Section 6.5.4	Water Management Plan – Site Water Balance	Review and progressive refinement of the site water balance would continue annually over the life of the Project to record the status of inflows, storage and consumption (e.g. usage, return water from co-disposal areas, dust suppression and filtered water releases or beneficial re-use) and to optimise water management performance.	Section 6
Submissions Report Section 4.2.1	Other licensing matters	NCOPL would report on water take at the site each year (direct and indirect) in the Annual Review.	Section 6
Submissions Report Section 4.2.1	Other licensing matters	NCOPL would ensure that relevant nomination of work dealing applications for Water Access Licences proposed to account for water take by the Project have been completed prior to the water take occurring.	Section 3.3.1