



Site Water Management Plan

March 2022

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	March 2009	Umwelt	Adrian Moodie
	April 2013	Gary Mulhearn	Gary Mulhearn
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	April 2017	Gary Mulhearn	Gary Mulhearn
	July 2018	Carly McCormack	Carly McCormack
	March 2022	HEC, IEMA	Julie McNaughton
CIRCULATION	Organisation		
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TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background	1
1.2	Purpose and Scope	1
2	STAKEHOLDER CONSULTATION	4
2.1	Pre 2021 Consultation	4
2.2	2021 Consultation	4
3	BASELINE DATA	4
3.1	Groundwater Quality Records	4
3.2	Groundwater Verification Programme	5
3.3	Additional Baseline Data	5
4	STATUTORY REQUIREMENTS	7
4.1	Water Licences and Approvals	7
5	WATER IMPACT ASSESSMENT CRITERIA	8
6	OVERVIEW OF SITE WATER MANAGEMENT	10
6.1	Site Water Balance	10
6.2	Water Sources	10
6.3	Water Use Onsite	11
6.4	Site Water Use and Management	11
6.4.1	Underground Mine Water Management System	14
6.4.2	Coal Handling and Preparation Plant Water Management System	23
6.4.3	Surface Water Storage and Pumping System	29
6.4.4	Pit Top Water Management	34
6.4.5	Offsite Water Transfers or Discharges	35
6.5	Water Management Initiatives	35
6.5.1	Underground	35
6.5.2	Ancillary On-Site Use	35
6.5.3	Offsite Use	35
6.6	Reporting Procedures	35
7	EROSION AND SEDIMENT CONTROL	36
7.1	Overview	36
7.2	Site Activities and Potential for Soil Erosion	36
7.2.1	Surface Activities	37
7.2.2	Longwall Mining and Subsidence	39
7.2.3	Reject Emplacement Areas	39
7.3	Maintenance of Erosion and Sediment Controls	42
8	MONITORING	42
8.1	Surface Water Monitoring Program	42
8.1.1	Onsite Monitoring Requirements	42
8.1.2	Surface Water Monitoring Locations and Frequency	42

8.1.3	CHPP Real time Monitoring System	45
8.1.4	Other Monitoring	45
8.2	Groundwater Monitoring Program	48
8.2.1	Groundwater Monitoring Locations and Frequency	48
8.2.2	Groundwater Quality	48
8.2.3	Groundwater Pumping and Operational Water	49
8.2.4	Groundwater Inflows and Water Levels in Underground Workings	49
8.2.5	Shallow (Porous Rock) and Alluvial Aquifers	50
8.2.6	Privately Owned Bores	51
8.2.7	Groundwater Dependent Ecosystems (River-flat Eucalypt Forest EEC)	51
8.2.8	Groundwater Quality Monitoring Methodology	52
8.3	Monitoring Program Summary	53
9	SURFACE AND GROUNDWATER RESPONSE PLAN	58
9.1	Water Quality Exceedance	58
9.2	Unlicensed Discharge	58
9.3	Loss of Surface Water Flows in Farm Dams	58
9.4	Adverse Impacts on Groundwater Dependent Ecosystems or Riparian Vegetation	58
10	CONTINGENCY PLAN FOR UNPREDICTED IMPACTS	63
11	CONTINUAL IMPROVEMENT AND CLOSURE PLANNING	63
12	COMPLAINTS, INCIDENTS AND REPORTING	64
12.1	Community Complaints and Independent Review	64
12.2	Incident Reporting	64
12.3	Information Dissemination	64
12.3.1	Advice to Black Creek Water Users	65
12.4	Annual Review	65
13	DOCUMENT REVIEW AND REVISION	65
14	REFERENCES	66

TABLES

Table 3-1 - Indicative Recent Groundwater Quality Results	5
Table 3-2 CHPP Water Quality Summaries, 2016 - 2022	6
Table 3-3 Quorrobolong water quality summaries, 2016 - 2021	6
Table 4-1 water licences	7
Table 5-1 - EPL Water Discharge Criteria	9
Table 8-1 - EPL Surface Water Monitoring Points	43
Table 8-2 - Water Sampling, Pressure and Flow Monitoring	49
Table 8-3 - Groundwater Monitoring Methodology	52
Table 8-4 - Monitoring Program Summary	54
Table 9-1 - Surface and Groundwater Response Plan - Triggers, Actions and Responsibilities	60

FIGURES

Figure 1 - Site Layout.....	3
Figure 2 - Water Management Schematic	13
Figure 3 - Incidental Groundwater Infrastructure Locations and Indicative Water Inflow Sources.....	15
Figure 4 - Underground Water Levels.....	20
Figure 5 - Example of CITECT Monitoring System Showing Surface Dams, 16 c/t Pumps and No. 2 Shaft Pumps	22
Figure 6 - CHPP Surface Water Management	24
Figure 7 - Austar Pit Top Surface Water Management.....	30
Figure 8 - Kalingo Dam	31
Figure 9 - Kitchener SIS Surface Water Management.....	32
Figure 10 - Aberdare Extended Water Management	41
Figure 11 - Environmental Monitoring Network.....	44

APPENDICES

Appendix A	Approval Requirements
Appendix B	Management Plan Approval

1 INTRODUCTION

1.1 Background

Austar Coal Mine Pty Ltd (Austar), a subsidiary of Yancoal Australia Limited (Yancoal), owns the Austar Coal Mine, an underground coal mine located approximately 10 kilometres southwest of Cessnock in the Lower Hunter Valley in NSW (refer to **Figure 1**). The Austar Coal Mine incorporates the former Pelton, Ellalong, Cessnock No. 1 (Kalingo) and Bellbird South Collieries and includes coal extraction, handling, processing and rail and road transport facilities (refer to **Figure 1**).

Extensive mining has been undertaken within the Austar Coal Mine since 1916. Historical mining was predominantly via bord and pillar mining and more recently via conventional longwall mining and longwall top coal caving (LTCC) methods. Mining within the Bellbird South areas (Southland, Stage 1, Stage 2 and LWB1-B7, refer to **Figure 1**) was approved by the Minister for Urban Affairs and Planning in 1996 under DA 29/95, while mining of Stage 3 was approved by the Minister for Planning in 2009 under Project Approval 08_0111. Longwall mining commenced in the Ellalong Colliery area in 1983 and has subsequently progressed into the Bellbird South and the Stage 3 areas.

Most recently, mining commenced in the Bellbird South LWB1-B7 mining area in 2016 under DA 29/95 (as modified) and was completed in February 2020. Longwall panels B1 and B7 have not been extracted. Austar mining areas are shown in **Figure 1**.

On 30 March 2020, the Austar Coal Mine transitioned to care and maintenance, with cessation of mining and coal processing activities. On 26 February 2021, a decision was made by the Yancoal board to transition the Austar Coal Mine from care and maintenance to closure. Nevertheless, active water management, mine ventilation and mine inertisation remain key activities and this revision of the Site Water Management Plan (SWMP) has been prepared to document water management and monitoring activities whilst the site is in closure.

Detailed mine closure planning for the site has commenced and will include surface water and groundwater assessments. The SWMP will be updated following completion of these assessments and will align with the activities identified in the approved Mining Operations Plan (MOP), such as decommissioning water management infrastructure. (Note on 2 July 2022 the MOP will transition to a Rehabilitation Management Plan).

The 2021 review of most Austar environmental management plans has resulted in significant restructure of the documents to improve readability and provide more consistency between plans. Changes to actual content have been limited to any amendments required to reflect the closed status of the site and to align content with the requirements of PA 08_0111 and DA 29/95.

1.2 Purpose and Scope

This SWMP outlines the management measures to be implemented during closure at the Austar Mining Complex to minimise the potential for water related impacts on the local community and the environment.

The purpose of the SWMP is to:

- Consolidate and address the relevant conditions of the Project Approval, Development Consent and Environment Protection Licence (EPL) to manage water at the Austar Mine Complex.
- Define the structures, strategies and procedures to be implemented to ensure that the Austar Mine Complex does not result in unacceptable impacts on surface and groundwater systems, groundwater dependent ecosystems and downstream water users during closure;
- Define a program to monitor and report on the impacts and environmental performance of the Austar Mine Complex, and the effectiveness of any management measures; and
- Define a protocol for managing and reporting any incidents, complaints, non-compliances with statutory requirements and exceedances of the impact assessment criteria and/or performance criteria.
- Describe the process for responding to any incidents, complaints or non-compliances; and
- Describe the review, reporting and continual improvement process.

The SWMP has been prepared in accordance with the relevant conditions of PA 08_0111, DA 29/95 and EPL 416 (refer to **Appendix A** for details of conditions).

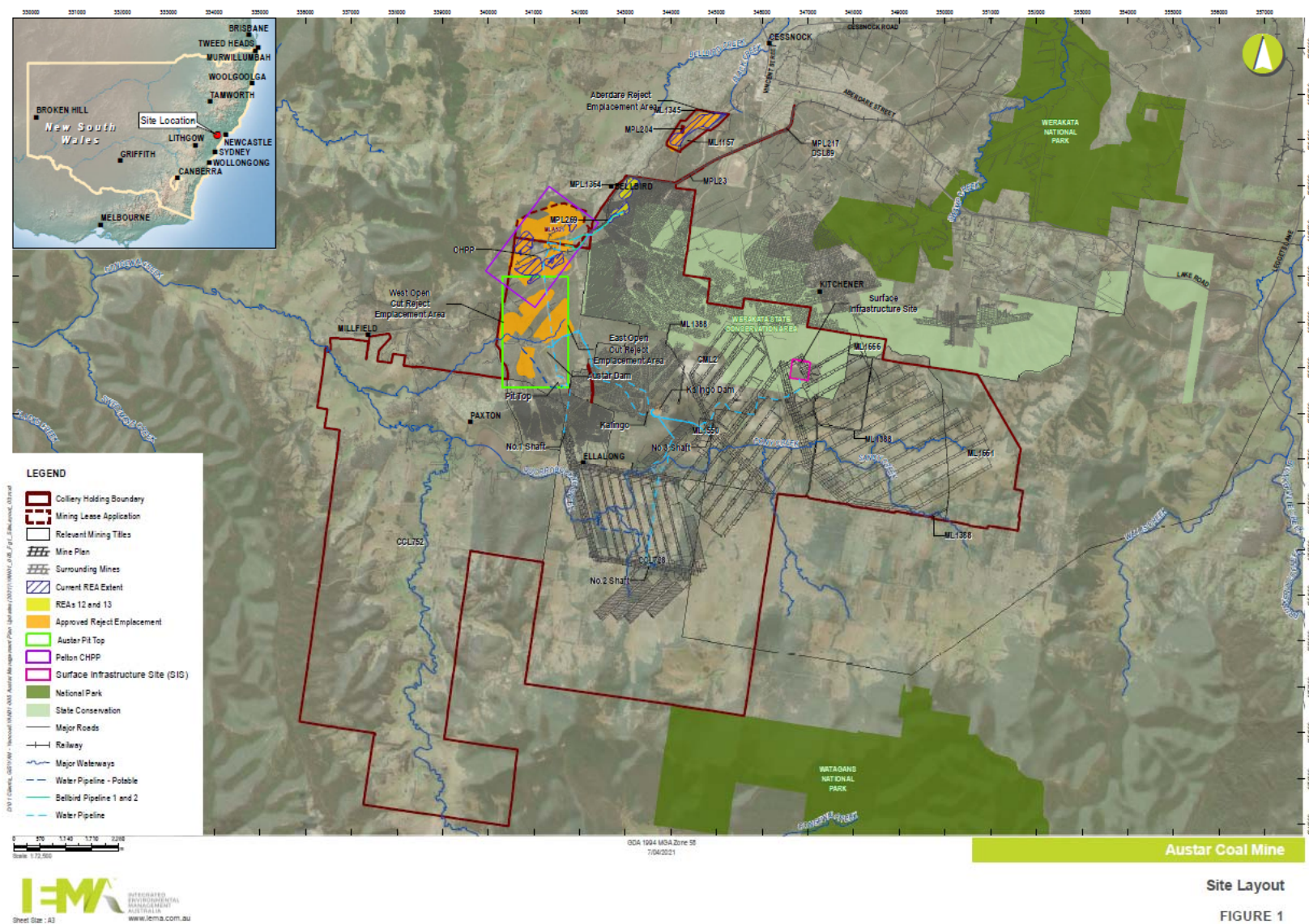


FIGURE 1 - SITE LAYOUT

2 STAKEHOLDER CONSULTATION

2.1 Pre 2021 Consultation

Consultation with government agencies occurred during environmental assessment preparation for the Bellbird South LWB4-B7 area (2017), Bellbird South LWB1-B3 area (2015-2016), Bellbird South Stage 2 Extension Project (Longwall A5a, 2010), the Stage 3 Project (2008) and the modifications to the Stage 3 Project (2010, 2012, 2013). Relevantly for the SWMP, predicted impacts and management strategies within the Bellbird South and Stage 3 underground mining areas have been discussed with the NSW Department of Planning and Environment (DPE), Division of Resources and Geoscience (DRG), DPE – Water in NSW (including the Natural Resource Access Regulator [NRAR]) and the EPA. Austar also reports performance against the SWMP in Annual Reviews.

Extensive correspondence was undertaken with DPIE and NRAR during the development of the Austar Coal Mine Groundwater Review and Assessment Report – February 2019 (Austar Coal Mine, 2019) and the Review of 2019 Groundwater Monitoring Results (AGE, 2020). The development of these reports was an iterative process involving ongoing input from the Department of Planning and Environment, DoI-Water and NRAR.

Relevant agencies were also consulted during previous updates of the SWMP.

2.2 2021 Consultation

In accordance with the requirements of PA 08_0111 and DA 29/95, the EPA, DPIE – Water and the NSW Resources Regulator have been consulted in relation to this update of the SWMP.

The management plan approval letter is provided in **Appendix B**.

3 BASELINE DATA

3.1 Groundwater Quality Records

A detailed understanding of the water quality has been determined from regular sampling undertaken over several years. Indicative water quality is summarised in **Table 3-1**. Whilst there is some variation between various underground workings, the results of regular testing has found the mine water quality is generally very saline, has low pH and is high in iron.

TABLE 3-1 - INDICATIVE RECENT GROUNDWATER QUALITY RESULTS

Location	pH	EC $\mu\text{S/cm}$	Total Iron mg/L
#2 Shaft Pump (Ellalong Goaf)	6.2	18,000	436
West Pelton Goaf	7.0	9,980	39
East Pelton Goaf	4.9	19,050	917
Longwall 13	3.2	18,050	690
SL2 Goaf	5.4	18,900	886
Water pumped into the mine from the CHPP as RO brine	5.6	37,600	0
Alluvial Groundwater Bores AQD1073A, WBH1 to WBH3	5.6-7.0	3,000–7,600	-
Porous Rock Aquifer NER1010	7.7-10.3	155-1,650	-
Porous Rock Aquifer MB01	7.5-7.8	7,600	-
Porous Rock Aquifer MB02	9.6-10.4	10,000-12,000	-
Alluvial groundwater bore MB03a	6.5-7	11,000-15,500	-

3.2 Groundwater Verification Programme

In 2018, AGECE (2018) conducted a review of the groundwater impacts of the development. The report indicated that the reported groundwater inflow to Bellbird South LWB1-B7 of 0.16 ML/day was below that predicted by Connell Wagner (2007). AGECE (2018) also concluded that “...the groundwater impact assessments undertaken to date for the development, and SWMP and Longwall Extraction Plan and associated Water Management Plan as approved for the development, are generally fit for purpose to manage groundwater issues for the development described by DA29/95 MOD6 and MOD7 for current and future mining. Further, there has been no material departure identified from the groundwater predictions in the DA29/95 MOD6 EA or the MOD7 EA.

Following departmental review of the AGECE report, Austar committed to an increased groundwater quality monitoring regime for one year, to inform any changes to the TARP or Management Plans if necessary. The Review of Groundwater Monitoring Results (AGECE, April 2020) recommended a review of the groundwater monitoring program upon recommencement of mining operations and conducting annual laboratory sampling of basic parameters and major ions, which has been incorporated into the SWMP.

The AGECE (2018) report is available on the Austar website.

3.3 Additional Baseline Data

Additional baseline data, including surface water quality, surface drainage and flood modelling, and predicted impacts is available in Bellbird South and Stage 2 EAs and Stage 3 EAs and will be considered during detailed mine closure planning. Mining commenced at Pelton Colliery (the site of the CHPP) in 1916. Infrastructure on the site pre-dates current environmental and planning legislation, and historic

surface water quality results may not be relevant or reflect current standards of environmental management. Pre-mining data is not available for most water quality monitoring sites. Table 3-2 and Table 3-3 provides average, mean, maximum, minimum and standard deviation of water quality samples gathered from 2016 to 2021 at the CHPP and Quorrobolong water quality monitoring sites.

TABLE 3-2 CHPP WATER QUALITY SUMMARIES, 2016 - 2022

	SW1 - Emergency Dam Spillway			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	0	0	0	0
Average	0.0	0.0	0.0	0.0
Standard Deviation	0.0	0.0	0.0	0.0
Minimum	0	0	0	0
Maximum	0	0	0	0
	SW2 - Pinch Bridge			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	54	54	17	44
Average	6.8	376.3	9.7	0.4
Standard Deviation	0.4	139.0	7.8	0.7
Minimum	5.61	114	2	0.038
Maximum	7.68	697	28	3.83
	SW4 - Downstream Boundary			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	51	51	22	50
Average	6.8	488.7	12.8	0.5
Standard Deviation	0.4	208.1	16.3	0.6
Minimum	6.08	219	1	0.08
Maximum	7.6	1400	65	3.04
	SW5 - Upstream Boundary			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	27	27	22	27
Average	7.4	2477.4	22.6	2.5
Standard Deviation	0.2	3352.4	32.1	5.4
Minimum	6.91	179	4	0.08
Maximum	7.78	9870	120	26.7
	SW6 - WTP Discharge			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	57	57	17	22
Average	7.2	335.4	5.7	0.1
Standard Deviation	0.3	135.5	2.1	0.0
Minimum	6.29	120	2	0.008
Maximum	8.42	667	12	0.18

TABLE 3-3 QUORROBOLONG WATER QUALITY SUMMARIES, 2016 - 2021

	SW Q1 - Quorrobolong Creek (Sandy Creek Rd)			
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	29	29	22	29
Average	7.4	1529.4	45.0	5.9

Standard Deviation	0.4	568.6	87.1	12.0
Minimum	6.59	612	1	0.452
Maximum	8.28	2560	388	63
SW Q2 - Quorrobolong Creek Upstream				
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	33	33	33	33
Average	7.0	1566.1	17.0	5.0
Standard Deviation	0.6	729.3	31.5	3.9
Minimum	5.45	130	1	0.87
Maximum	7.93	3170	191	16
SW Q3 - Quorrobolong Creek Downstream				
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	25	25	21	25
Average	7.2	1414.1	11.5	3.0
Standard Deviation	0.4	710.3	8.5	2.1
Minimum	6.45	186	4	0.449
Maximum	7.82	2780	41	10.7
SW C1 - Cony Creek				
	pH	EC (µS/cm)	TSS (mg/L)	Fe (mg/L)
Count	58	58	55	58
Average	7.1	1776.2	30.4	2.8
Standard Deviation	0.8	906.6	78.5	2.5
Minimum	3.78	342	3	0.48
Maximum	8.2	3710	599	13.9

4 STATUTORY REQUIREMENTS

Relevant conditions from PA 08_0111 and DA 29/95, EPL 416, PA 08_0111 Statement of Commitments and where these are addressed in this Plan are provided in **Appendix A**.

4.1 Water Licences and Approvals

Austar currently holds water licences for a number of monitoring and dewatering bores across the operation. A consolidated list of water licences identifying all water licences and approvals, the work they are assigned to, entitlements and purposes are detailed in Table 4-1 water licencesTable 4-1.

TABLE 4-1 WATER LICENCES

Licence Held	Licence Number	Validity of Licence	Purpose of Licence	Entitlements / Water Source
Bore Licence Certificate	20BL171361	17 May 2007 - Perpetuity	Monitoring Bore (AQD1077)	N/A
Bore Licence Certificate	20BL172524	20 July 2010 - Perpetuity	Monitoring Bore (NER1010)	N/A
Bore Licence Certificate	20BL172852	7 June 2011 - Perpetuity	Monitoring Bore (WBH1, WBH2, WBH3)	N/A

Licence Held	Licence Number	Validity of Licence	Purpose of Licence	Entitlements / Water Source
Bore Licence Certificate	20BL173843	1 Oct 2014 - Perpetuity	Monitoring Bore (BB1, BB2, BB3)	N/A
Bore Licence Certificate	20BL173878	8 Dec 2014 - Perpetuity	Monitoring Bore (MB01)	N/A
Bore Licence Certificate	20BL173891	19 Mar 2015 - Perpetuity	Monitoring Bore (MB02)	N/A
Exempt Monitoring Bore	N/A	N/A	Monitoring Bore (MB03A, MB04)	N/A
Water Access Licence / Associated Works	WAL19181 / Works Approval 20WA210299	Continuing	Unregulated River Water Licence	10 shares Hunter Unregulated and Alluvial Water Sources - Upper Wollombi Water Source - Congewai Creek Management Zone.
Water Access Licence / Associated Works	WAL41504 / 20WA219699	Continuing	Aquifer - Industrial dewatering 16CT pump station No 2 Shaft Borehole	770ML Sydney Basin – North Coast Groundwater Source. North Coast Fractured and Porous Rock Groundwater Sources 2016.

The *Water Management Act 2000* sets out additional approval requirements for certain water uses, works or activities. Additional approvals are not required for development approved under MP 08_0111 in accordance with Section 4.41 of the EP&A Act. The *Water Management (General) Regulation 2018* sets out the exemptions. These include (but are not limited to):

- clause 39(1)(c) of the *Water Management (General) Regulation 2018* exempts water monitoring bores required by a development consent from requiring a Water Supply Work Approval under section 90(2) of the *Water Management Act 2000*; and
- clause 42/42A, and clause 18 (Schedule 4, Part 2) of the *Water Management (General) Regulation 2018* exempts activities carried out in accordance with a mining lease under the *Mining Act 1992* from requiring a Controlled Activity Approval under section 91(2) of the *Water Management Act 2000*.
- clause 42/42A, and clause 33 (Schedule 4, Part 2) of the *Water Management (General) Regulation 2018* exempts activities carried out to maintain lawful structures constructed within waterfront land from requiring a Controlled Activity Approval under section 91(2) of the *Water Management Act 2000*.

Austar will ensure it secures all necessary approvals under the *Water Management Act 2000*.

5 WATER IMPACT ASSESSMENT CRITERIA

Discharge water quality and quantity criteria as specified in EPL 416 are provided in **Table 5-1**.

TABLE 5-1 - EPL WATER DISCHARGE CRITERIA

Licence Number	Condition																														
L1	Pollution of Waters																														
L1.1	Except as expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operation Act 1997.																														
L1.2	Discharge from Point 1 is permitted only when discharge occurs solely as a result of rainfall at the premises exceeding: a) a total of 168 millimetres over any consecutive five day period; or b) 48 millimetres in less than any consecutive 12 hour period.																														
L2	Concentration Limits																														
L2.1	For each monitoring/discharge point or utilisation area specified in the table/s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table.																														
L2.2	Where a pH quality limit is specified in the table the specified percentage of samples must be within the specified ranges.																														
L2.3	To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table/s.																														
L2.4	<div>Water and/or Land Concentration Limits</div> <div>Point 1</div> <table><tr><th>Pollutant</th><th>Units of Measure</th><th>50 percentile concentration limit</th><th>90 percentile concentration limit</th><th>3DGM concentration Limit</th><th>100 percentile concentration limit</th></tr><tr><td>Iron</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>1</td></tr><tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5-8.5</td></tr><tr><td>Total dissolved solids</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>6000</td></tr><tr><td>Total suspended solids</td><td>Milligrams per litre</td><td></td><td></td><td></td><td>50</td></tr></table> <div>Point 6</div>	Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration Limit	100 percentile concentration limit	Iron	Milligrams per litre				1	pH	pH				6.5-8.5	Total dissolved solids	Milligrams per litre				6000	Total suspended solids	Milligrams per litre				50
Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration Limit	100 percentile concentration limit																										
Iron	Milligrams per litre				1																										
pH	pH				6.5-8.5																										
Total dissolved solids	Milligrams per litre				6000																										
Total suspended solids	Milligrams per litre				50																										

Licence Number	Condition														
	Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration Limit	100 percentile concentration limit									
	Conductivity	Microsiemens per centimetre				600									
	Iron	Milligrams per litre				1									
	pH	pH				6.5-8.5									
	Total suspended solids	Milligrams per litre				50									
L3	Volume and Mass Limits														
L3.1	<p>For each discharge point or utilisation area specified below (by a point number), the volume/mass of:</p> <p>(a) liquids discharged to water; or</p> <p>(b) solids or liquids applied to the area;</p> <p>must not exceed the volume/mass limit specified for that discharge point or area.</p> <table><tr><th>Point</th><th>Unit of Measure</th><th>Volume/Mass Limit</th></tr><tr><td>1</td><td>Kilolitres per day</td><td>2000</td></tr><tr><td>6</td><td>Measure 1</td><td>5000</td></tr></table> <p>Note: For the purpose of this condition ‘Measure 1’ means KL/day measured as an annual average.</p>						Point	Unit of Measure	Volume/Mass Limit	1	Kilolitres per day	2000	6	Measure 1	5000
Point	Unit of Measure	Volume/Mass Limit													
1	Kilolitres per day	2000													
6	Measure 1	5000													

Note: 3DGM Means the three day geometric mean, which is calculated by multiplying the results of the analysis of three samples collected on consecutive days and then taking the cubed root of that amount. Where one or more of the samples is zero or below the detection limit for the analysis, then 1 or the detection limit respectively should be used in place of those samples

6 OVERVIEW OF SITE WATER MANAGEMENT

6.1 Site Water Balance

Despite the site no longer being operational, water management continues to be an integral component of the safe management and maintenance of the site. The information provided in the following sections remains relevant while the mine is in a closure planning phase.

A site water balance applicable for the closed site will be prepared during detailed mine closure planning once surface water and groundwater assessments have been completed. The site water balance will address the requirements of PA 08_0111 and DA 29/95.

6.2 Water Sources

Water is sourced from the following resources:

- Recycled, treated mine water – mine water stored in underground and above ground water storages is treated through the reverse osmosis (RO) plant and reused on site.
- Groundwater take – groundwater inflows to the mine are harvested under water access licence WAL41504 / 20AL217003, treated using the RO plant and used on site

- Potable water – potable water is provided by Hunter Water for human use onsite and may be used as make up water in operations as required.
- Stormwater runoff in operational areas is collected, treated and used as required. Stormwater take is limited where possible by diverting away from operational areas.

6.3 Water Use Onsite

During closure, water is used for maintenance activities, dust suppression, cleaning and other incidental uses. Water is used underground and in all surface facilities and use is minimised as much as possible to core requirements.

6.4 Site Water Use and Management

The factors that influence the site water balance at Austar are complex and variable. There are a number of geographically separated interrelated systems that are managed as a whole to ensure that the needs of the mine are addressed whilst also meeting EPL requirements. **Figure 2** provides a schematic representation of the components of the water management system.

A database of recorded water transfers is maintained that allows calculation of groundwater inflow estimates on a monthly basis as well as short-term water balance forecasting. The water database is updated on a monthly basis.

Surface and underground water storage areas can act as buffers such that individual systems can operate independently of each other.

The three major components or systems referred to in this document are:

1. Underground Mine Water Management System;
2. Pelton CHPP Site Water Management System; and
3. Surface Water Storage and Management System, which includes:
 - a. CHPP Area Surface Water Management system;
 - b. Austar Pit Top Site;
 - c. Kalingo Dam; and
 - d. Kitchener Surface Infrastructure Site (SIS).

Water treatment onsite at the CHPP includes pH adjustment (lime plant), flocculation and settlement of suspended sediments in addition to the RO plant.

Site preferentially uses treated water from the RO plant. Supply of minor volumes of town water (sourced from Hunter Water) are used for human contact purposes, supply to the lime plant and vehicle washbay, as well as a back-up supply for water normally sourced from RO plant permeate (refer **Figure 2**).

Discharge of treated water (RO plant permeate) occurs to Bellbird Creek in accordance with EPL416 conditions. In addition, wet weather discharge is permitted under specific rainfall conditions as part of EPL416 from the Emergency Overflow Dam at the CHPP Area.

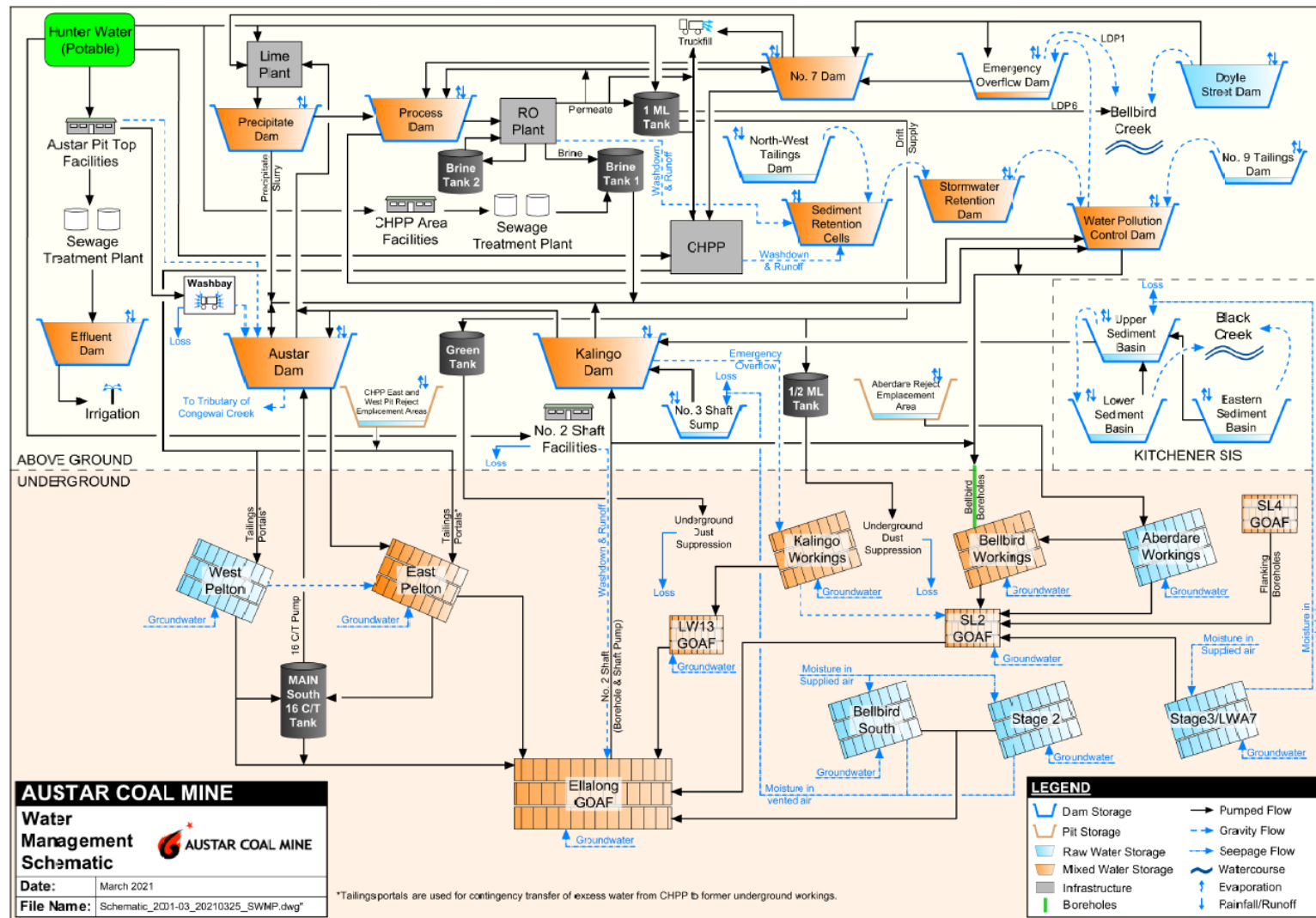


FIGURE 2 - WATER MANAGEMENT SCHEMATIC

6.4.1 Underground Mine Water Management System

The mine has a complex groundwater management system that is heavily influenced by inflow from surrounding historic mine workings. These include the Pelton (East and West), Kalingo, Bellbird and Aberdare workings as indicated on **Figure 2**.

6.4.1.1 Inflow Sources

Inflow water sources into the mine workings can be described as:

- Natural strata inflow of groundwater;
- Water piped underground used for underground maintenance operations (such as dust control) – no longer an input under closure;
- Water from high rainfall periods that enter old mine workings via surface cracks and subsidence;
- Surface water from mine affected areas at the CHPP and other infrastructure areas which is pumped underground into the old mine workings;
- Pit top runoff which is captured and can be sent to underground workings; and
- Brine from the RO plant pumped underground into the old mine workings.

All major inflow sources have been identified and systems put in place to measure the cumulative volumes. Measurements are generally recorded on a monthly basis and results logged in a database that allows analysis of long term trends and inflows. The main sources of inflow are shown on **Figure 3**.

Water levels are also monitored for the old workings of the Bellbird, Kalingo and Aberdare Central Collieries.

6.4.1.2 Underground Water Storages

East Pelton

The old workings of Pelton located adjacent to the East of the Main South Headings and North of 1 East Headings (labelled '2' on **Figure 3**) are connected to Austar Coal Mine workings. Connecting boreholes are periodically monitored and opened and closed to control the level of water in these workings. Water is removed from this area via 2 of the dewatering boreholes and is returned to the surface water management system via a pumping station at 16 cut through (c/t) (labelled '3' on **Figure 3**). Alternatively, water can be siphoned into the Ellalong goaf (see **Figure 3**). Inflow water through the strata from East Pelton into the Austar workings is controlled by a siphon from the Blue Panel Dam (labelled '2D' on **Figure 3**) and air pumps from the 1 East belt and travelling road areas, with the water flowing to Ellalong Goaf.

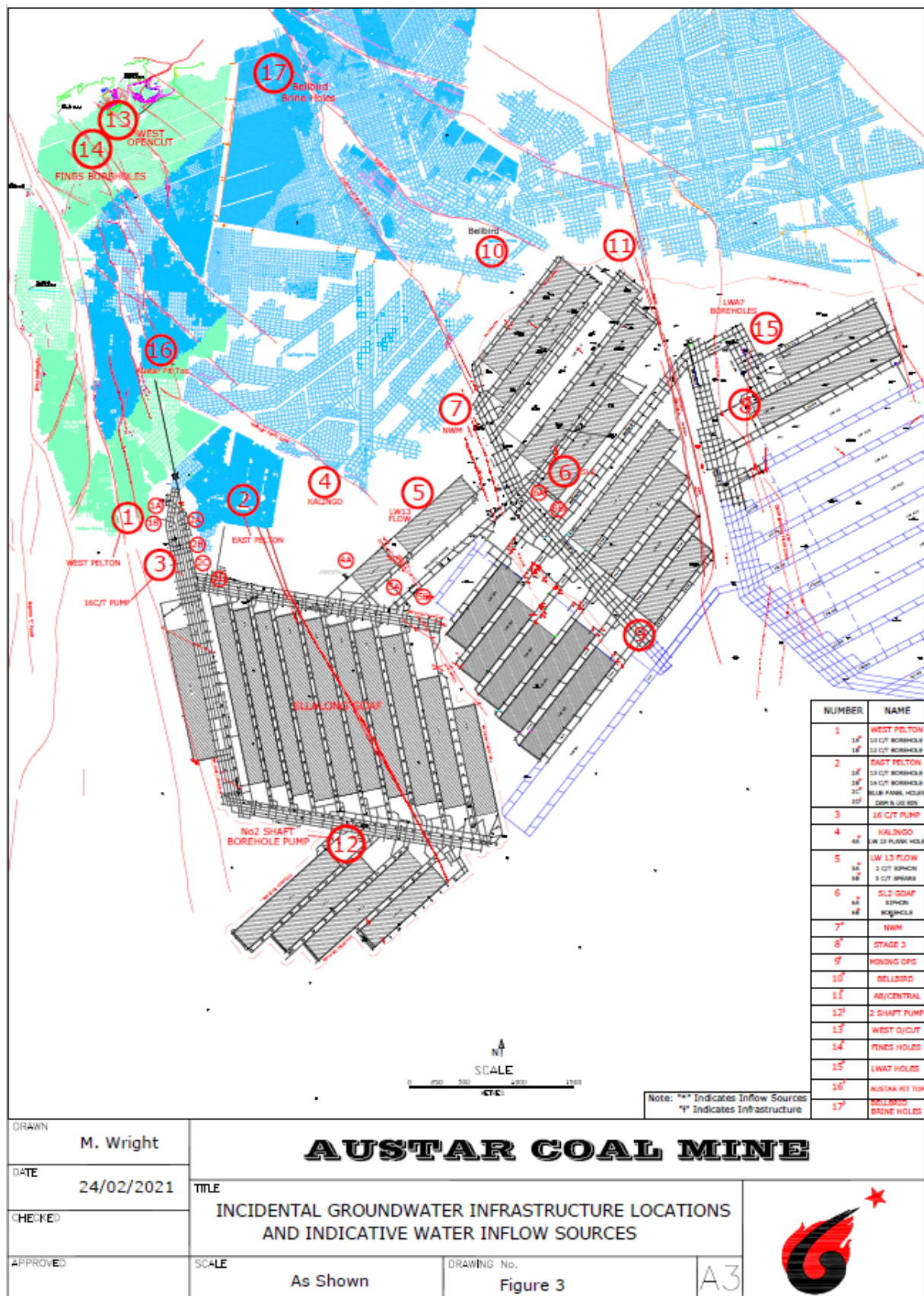


FIGURE 3 - INCIDENTAL GROUNDWATER INFRASTRUCTURE LOCATIONS AND INDICATIVE WATER INFLOW SOURCES

The combined East and West Pelton goaf has a maximum capacity of 475ML. Due to the seam contours, when fully drained from the existing dewatering holes down dip sections of East Pelton goaf still contains around 58ML of water. The goaf capacity is constrained by the allowable head of water on the seals to Austar workings. Pressure readings are taken on a monthly basis.

Inflow sources are predominantly from mine affected runoff from the CHPP East Open Cut Reject Emplacement Area (REA).

West Pelton

The old workings of Pelton located to the west of the main South Headings (labelled '1' on **Figure 3**) are connected to Austar Coal Mine workings via 2 dewatering boreholes (labelled '1A' and '1B' on **Figure 3**). These are regularly monitored and may be opened and closed to control the level of water in these workings. The boreholes allow drainage from these workings to the Ellalong goaf area. This water can also be directed to the 16c/t pump station and removed from the mine.

The West Pelton goaf has a working capacity of 42ML, with water flowing to East Pelton when the volume exceeds this capacity. Pressure readings on the barrier pillar to the Austar workings are taken on a monthly basis.

Inflow sources are typically from mine affected runoff from the CHPP West Open Cut REA. Notwithstanding the above boreholes, it is likely that water would seep from this area along the mine floor down the Main South Headings to the Ellalong goaf area.

Ellalong Goaf (2 East Panel, Longwalls 1-12)

The old workings of Ellalong are utilised as the main underground water storage reservoir for the mine. These workings have a capacity of 3,000ML which is constrained by the level (270 mAHd) where the water would flow into the Bellbird mains, blocking access to Bellbird South and Stage 3 workings. Water from the Bellbird South, Stage 2 and Stage 3 areas is pumped into Ellalong Goaf (refer **Figure 3**). Water is removed via a pump within Number 2 shaft and an adjacent borehole pump providing a combined pumping system capable of approximately 7ML/day. The quantity of water removed is monitored continuously via CITECT (refer to **Section 6.4.1.5**). In addition, the water level in the shaft is monitored by CITECT, and also by dipping the No. 2 shaft.

Longwall 13

Longwall 13 was mined in 1997. Water from this area is currently managed via a siphon that transfers water to the Ellalong Goaf (see **Figure 3**). Monitoring of the siphon is undertaken regularly. Inflow to LW13 occurs from the old flooded workings of the neighbouring Kalingo Colliery. When it is running, flow from the siphon is measured regularly which allows the inflow rate to be calculated. The head of water in Kalingo Colliery is measured by dipping the shaft near the Kalingo dam. The water levels for Kalingo Colliery are recorded in a database maintained by the Austar Coal Mine surveyor.

Kalingo workings

The old workings of Kalingo are to the west of Longwall 13, with no direct connection to the mine. Water levels indicate that the void is full. Water would seep to LW13, or to SL2 goaf.

SL2 Panel

The sealed SL2 goaf is currently partially flooded and drains via a pipe from where it is pumped to the Ellalong goaf (see **Figure 3**). This draining borehole is monitored regularly and maintains the water level in this sealed goaf. Monitoring indicates a daily water inflow of less than 2ML. The estimated capacity of the SL2 goaf is 165ML which is restricted by the need to prevent the water from accumulating behind goaf seals. Water flow into this area is predominantly from the old flooded workings of the neighbouring Bellbird and Aberdare Central Collieries. There are three in-seam flanking boreholes adjacent to these workings from SL4 panel that contribute to the water inflow into the SL2 panel. These flanking boreholes are unable to be isolated to prevent this inflow as this area was sealed following the Southland 2004 spontaneous combustion event.

Bellbird/Aberdare Central

The head of water in Aberdare Central Colliery is measured by dipping a shaft near the Kitchener Surface Infrastructure Site. A monitoring bore has been established into the Bellbird workings to enable water levels in these workings to be monitored. A second monitoring hole into Bellbird has also been established further east to monitor the effect of pumping into these old workings on the eastern side of some geological anomalies.

Water levels in the Bellbird/Aberdare Central Colliery areas indicate a recharge response to significant high rainfall events, partly due to surface water ingress into shallow historical workings and related sinkholes. It is estimated that prior to a large storm event in June 2007 (the 'Pasha Bulker' event – 254 mm recorded in 3 days), water levels in the old Bellbird/Aberdare Central workings were approximately -86 mAHD with the workings having a storage capacity of approximately 9,000 ML above this level. During the June 2007 storm event, a sinkhole formed on Black Creek permitting surface water to enter underground workings. As a result of the June 2007 storm event, the water level in these workings rose to approximately -36 mAHD. By January 2009 the water level in these workings had fallen to approximately -30 mAHD. Further water level response to rainfall events have been observed notably for the April 2015 rainfall event (229 mm recorded in 3 days).

6.4.1.3 Seam to Surface Pumping

Austar has two licenced pumping locations that deliver mine water to the surface water management system:

No 16 Cut Through (East Pelton and West Pelton)

The 16 c/t Main South Pump Station (shown on **Figure 2** and labelled as '3' on **Figure 3**) was designed and installed to pump mine water inflow from the old Pelton (East and West) Mine workings. The pump station pumps the water to the surface to Austar Dam via a rising main installed in the drift. As the mine moves to closure, this pump will be removed from service and this pumping location decommissioned.

Number 2 Shaft (Ellalong)

The old Ellalong Colliery workings (Longwalls 1 to 12) within Austar mine are utilised as the main underground water storage reservoir for the mine. Two large diameter, multistage pumps operating at the Number 2 shaft site (shown on **Figure 2** and labelled as '12' on **Figure 3**) transfer water from

these underground workings to Kalingo Dam via vertical rising mains and connecting polyethylene pipelines. Mine water may be diverted from this pipeline to the Bellbird Boreholes.

This system has the capacity to pump up to approximately 7 ML/Day. This enables water levels in the Ellalong goaf to be lowered during normal operations and reduced more rapidly after major inflow events.

6.4.1.4 Incidental Groundwater Interception

An important natural groundwater resource in the Newcastle/Cessnock area is found in the alluvial sediments, which cover low-lying areas and, in the Austar mine area, include Quorrobolong Creek and its tributaries Sandy and Cony Creeks (AGEC, 2018). These aquifers are not predicted to have been affected by the Austar mining activities due to the depth of cover (Dundon Consulting, 2017). The low permeability of the Branxton formation ($\sim 2.32 \times 10^{-10}$ m/s) and the marine depositional environment generally provides water-bearing zones of poor water quality and low yield. Finally, the Greta Coal Measures (GCM) also have very low permeabilities ($<10^{-8}$ m/s) and it was concluded that “the importance of the coal seams within the GCM as an aquifer is generally minimal due to the poor quality groundwater as well as limited yield potential” (AGEC, 2018). An assessment of the interception of the natural groundwater resources was undertaken for the Bellbird South and Stage 3 mine plans. Inflows were predicted to reach a maximum 2.5 ML/day during Stage 3 mining which was to include 13 longwalls, however only two of these have been mined. Groundwater inflow to Bellbird South LWB1-B7 was assessed as 0.16 ML/day (AGEC, 2018).

The comprehensive water inflow database held at the mine has allowed assessments to be made regarding the magnitude of groundwater inflows.

Recent water inflow database assessment indicates a groundwater interception volume of 582 ML for the year ending 30 June 2019 which equates to an average rate of 1.6 ML/day for the year. The current water licences allow for incidental groundwater interception of up to 2.1 ML/day.

Monitoring data from underground inflow sources are used to assess compliance with the groundwater licence on an annual basis and is reported in the Annual Review.

The measured water percolating through the up dip coal barriers that is intercepted, captured and then pumped / recirculated back to other storage areas has been determined from the following.

Measured water Inflow from Kalingo Mine

Measured water Inflow from Kalingo Mine:

- LW13 Flankhole = <0.03 ML/day; and
- LW13 Siphon = negligible.

The total average measured water inflow from Kalingo Mine is 0.3 ML/day. Water from Kalingo would also present to SL2 goaf, however these contributions are unable to be measured. The water level in the Kalingo shaft is relatively constant and is at the same level as the highest mine workings in Kalingo. This indicates that the old Kalingo mine workings are essentially full. The water level in the Bellbird mine, located to the north east above the Kalingo mine workings is approximately 100m higher than

the water level in the Kalingo workings. Since the water level does not rise in the Kalingo shaft, the migration of water across the barriers is now in equilibrium with the rate of water transfer into the Austar mine workings. The workings at Kalingo are deep at greater than 250m. These are first workings only with no secondary extraction and as such there is no potential for fracturing through to the surface.

Measured water Inflow from Aberdare Central Mine:

The total average measured water inflow from the SL2 Goaf Siphon is 2 ML/day. This is understood to comprise water ingress from in-seam drill holes from SL3 and SL4 panels and the barrier (this area has been sealed off).

Recorded underground water levels in the Aberdare Central Mine are plotted in **Figure 4**.

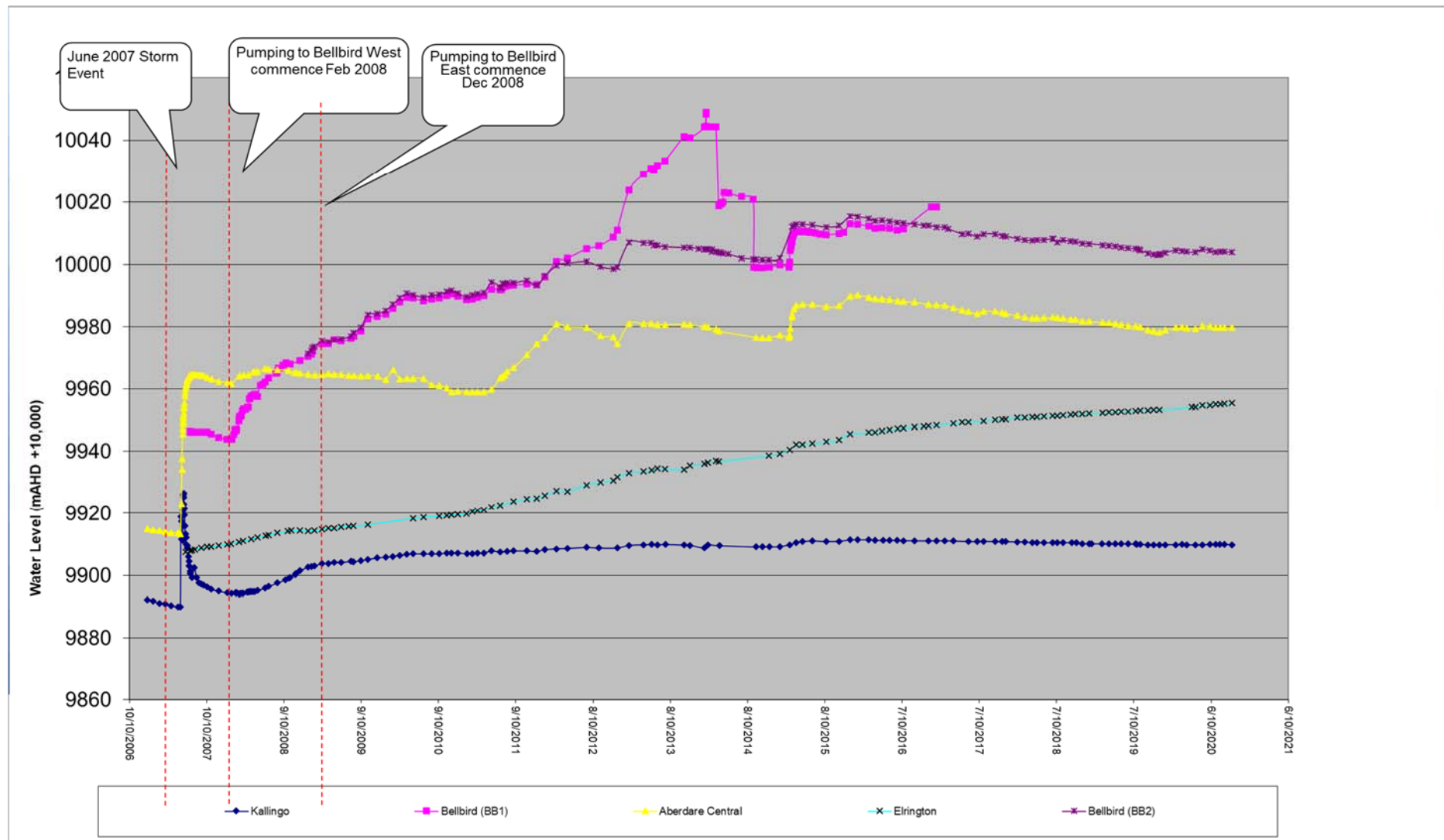


FIGURE 4 - UNDERGROUND WATER LEVELS

From **Figure 4** it can be seen that the water level in Aberdare Central shaft fell at a rate of approximately 4 metres per year up until the June 2007 rainfall event, when a sink hole that formed adjacent to Black Creek delivered approximately 2.5 GL to 3 GL of surface runoff to the underground workings with a major jump in water level of about 50 m immediately following.

Following the June 2007 event, the water level declined slowly, interrupted by a much smaller, less steep rise between February and September 2008, which likely reflects increased rainfall during the first half of 2008. Thereafter water levels steadily declined at a rate similar to that following the June 2007 event. In mid-June 2011, water levels in Aberdare Central commenced rising more steeply than at any time other than the June 2007 event. This is interpreted as reflecting overflow of water from the Bellbird workings into the Aberdare Central workings. From April 2012, the Aberdare Central water levels declined slowly apart from short duration increases caused by high rainfall events in January-March 2013, April 2015 and January 2016. The Aberdare Central trend is influenced by siphoning from the SL2 goaf, as that has a direct connection to Aberdare Central via in-seam boreholes (refer **Figure 2**). The rate of siphoning from the SL2 goaf has increased since 2012, resulting in slow drawdown of the Aberdare Central water level.

Groundwater levels in Aberdare Central and inflows to SL2 Goaf will continue to be monitored to assess if the recorded rise in water level in Aberdare Central has a significant influence on inflow rates to Austar Mine.

Anticipated water Inflow from Bellbird Mine.

Mining operations in the vicinity of Bellbird Mine include the A2 longwall panel. The water level in these workings is monitored in the Bellbird monitoring holes. Water flow measurements from the area continue to be collected at 5.5ct North West mains from the water traps installed in these seals. Groundwater levels in Bellbird Mine will continue to be monitored.

6.4.1.5 Monitoring System

The site has a centralised monitoring and communication system (CITECT). The system enables remote control of the major components and communications across the mine site. The real time monitoring system includes a wide range of parameters including water pressure, flow rates and storage levels. An example of the CITECT monitoring system that shows a section of the underground pump out system is shown in **Figure 5**.

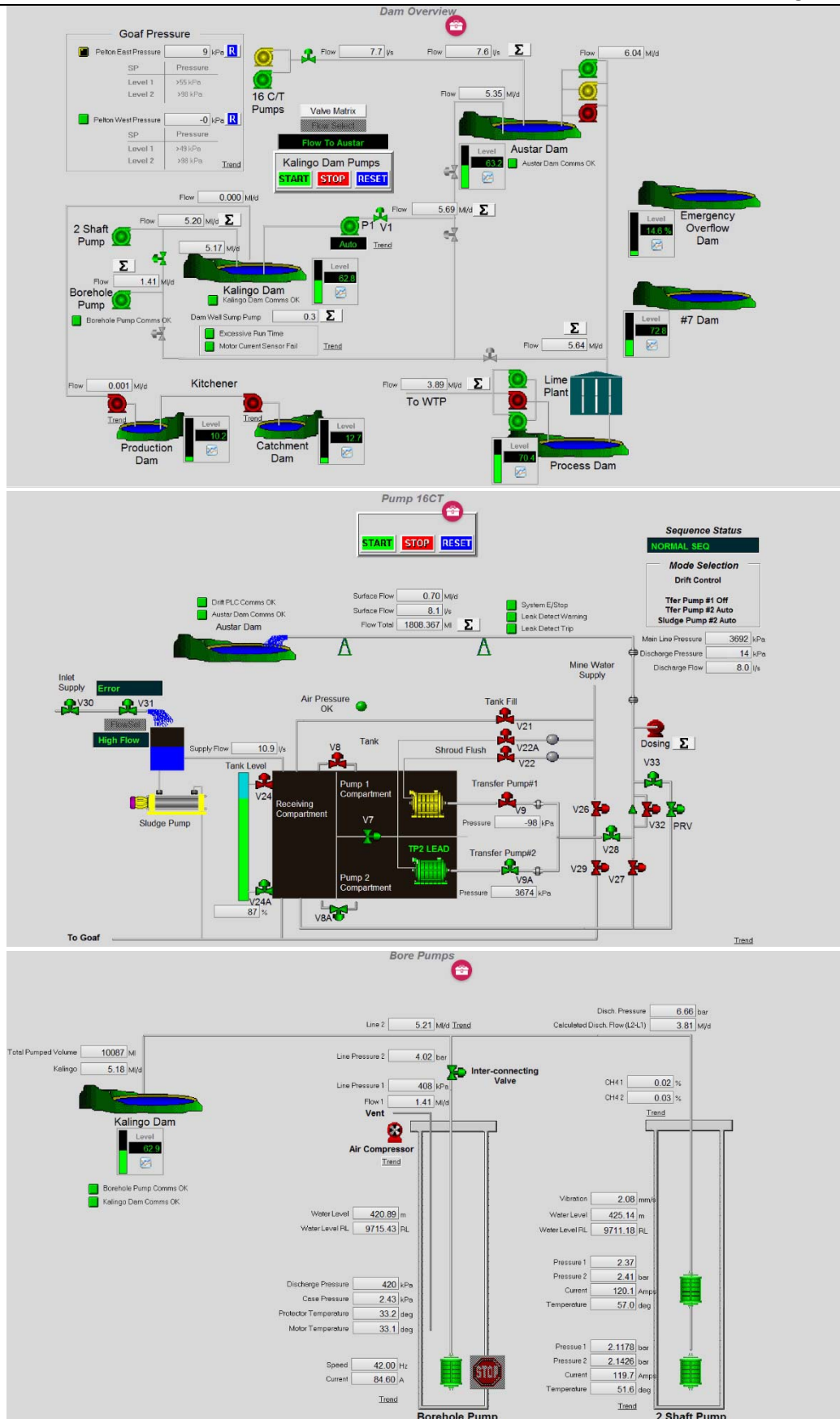


FIGURE 5 - EXAMPLE OF CITECT MONITORING SYSTEM SHOWING SURFACE DAMS, 16 c/t PUMPS AND NO. 2 SHAFT PUMPS

6.4.1.6 Predicted Future Inflows

Recent underground water inflow database assessment has estimated an average inflow rate of 1.6 ML/day. This is unlikely to increase during closure as there is no further longwall mining exposing additional areas for groundwater inflow.

Estimates of groundwater flows and water inflow database assessment by Austar will continue in order to verify predicted inflow volumes. Groundwater interception is reported in the Annual Review.

6.4.2 Coal Handling and Preparation Plant Water Management System

6.4.2.1 Overview

Figure 2 includes a schematic overview of the water management system at the CHPP. The major storages and surface water controls at the CHPP are shown on **Figure 6**.

The two operational water management systems at the CHPP during closure are:

- RO Plant water treatment system; and
- Stormwater runoff and management system.

Water from these systems can be discharged back into the old underground mine workings at Pelton and Bellbird where settling of sediment occurs prior to the water percolating through coal barriers where it reports to the underground water storages. The location of water pipelines at the CHPP which transfer water to the Bellbird workings are shown in **Figure 6**.

Permeate from the RO plant was used to provide supply to operations. Potable water is supplied from Hunter Water for drinking, bathing and backup operations supply. Any excess permeate that is unable to be utilised on site is discharged into Bellbird Creek in accordance with the conditions of EPL 416 which permits up to an annual average of 5ML/day to be discharged.

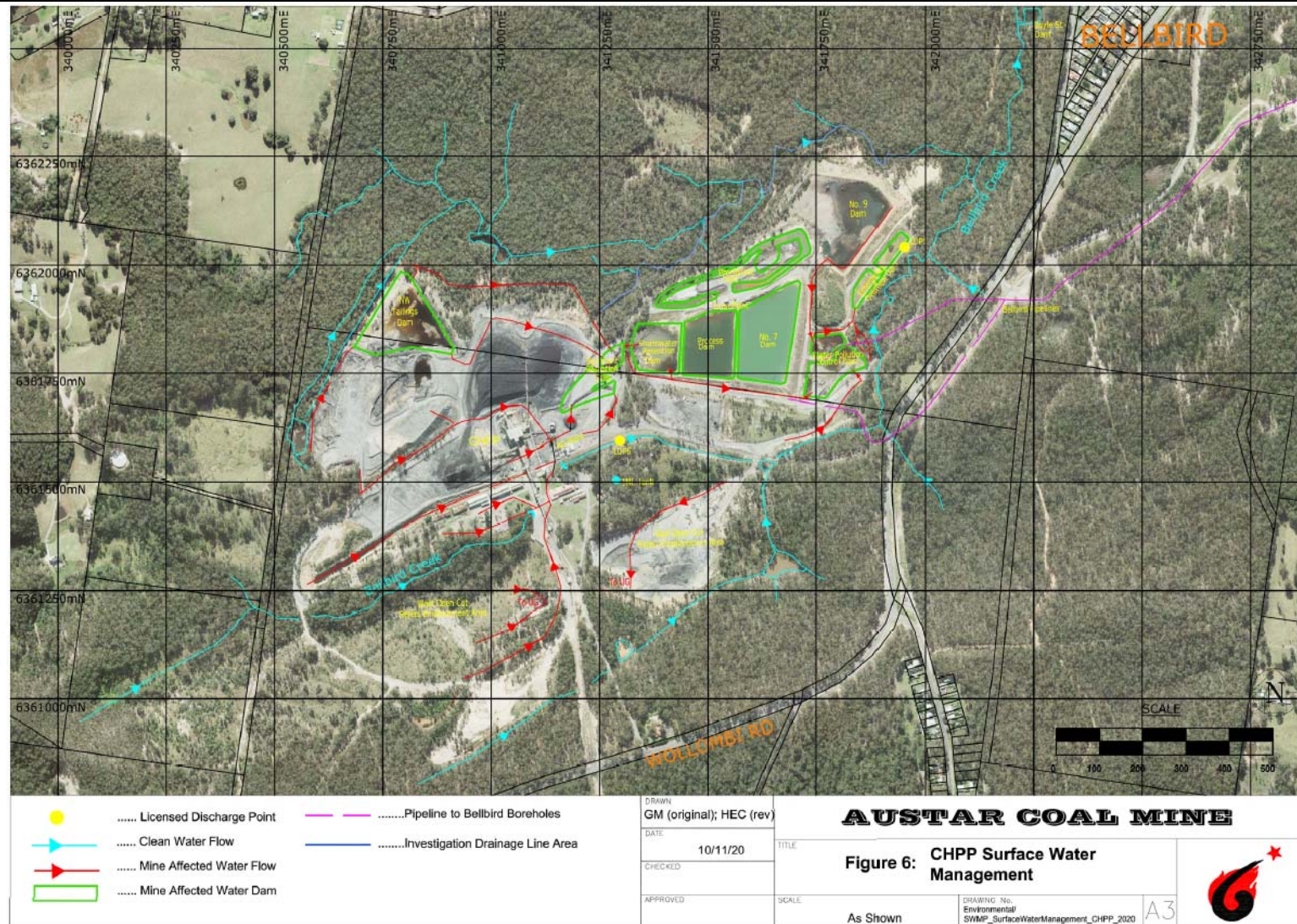


FIGURE 6 - CHPP SURFACE WATER MANAGEMENT

6.4.2.2 Reverse Osmosis Water Treatment System

Mine water pumped from underground workings is pre-treated prior to the RO Plant by an alkaline neutralisation process. Passive oxidation and precipitation occurs in both Kalingo and Austar Dams which receive water pumped directly from underground. All water being treated is then pumped to the Lime Plant where the pH is increased. This reduces water hardness and promotes the removal of iron and other metals. The water is then fed into the Precipitate Dam where the metals precipitate and excess lime are able to settle out. The clarified water then flows to the Process Dam from where it is pumped to the RO Plant.

The RO Plant contains 3 Reverse Osmosis Trains and can treat up to 6 ML of pre-treated mine water per day. Water pumped from the Process Dam undergoes primary screening filtration followed by secondary filtration through multi-media filters and final tertiary filtration through cartridge and bag filters. Water is then fed to the RO Trains where the process produces permeate and a waste brine stream. The RO system is a two stage process achieving maximum 40-65% recovery of permeate. Generally, RO Trains 1 & 2 operate in parallel, with the brine from both trains combining to feed RO Train 3 as the second stage improving recovery. The waste brine is returned underground via the Bellbird Boreholes. The permeate is pumped to the 1ML tank and used on site, with any excess discharged to Bellbird Creek in accordance with EPL requirements.

6.4.2.3 Coal Processing System

When operational, the CHPP required up to 3 ML/day of makeup water. The CHPP makeup water was predominately supplied from Dam No. 7 or permeate from the 1 ML tank. Approximately 2.3 ML/day of fine tailings (approximately 12-30% solids content) was returned underground.

6.4.2.4 Storm Water Run-off and Management System

All mine affected runoff from the CHPP area is contained within the mine water management system (refer **Figure 2** and **Figure 6**). Clean water diversion drains are in place to divert upslope runoff around operational and disturbed areas of the site to maintain separation between upslope and mine affected runoff. These diversions form part of drainage lines and first order tributaries to Bellbird Creek, which flows to Black Creek in Cessnock.

Stormwater management at the CHPP aims to contain all stormwater runoff in surface dams up to their capacity. Water levels in the surface dams are monitored and pump status checked regularly. The ultimate storages in the CHPP area are the Water Pollution Control Dam (WPCD) and the Emergency Overflow Dam. Water is pumped from the WPCD to the Bellbird boreholes. In addition, there is a licenced discharge point (LDP1) at the overflow weir of the Emergency Overflow Dam. EPL 416 prescribes that discharge from LDP1 must only occur during rainfall events of certain volume and length, not exceed 2 ML/day on an average annual basis as well as prescribing discharge water quality criteria.

In December 2017, Austar and the EPA agreed to a Pollution Study and Reduction Program requiring the investigation and monitoring of “orange staining/residue” in a clean water diversion line to the north of the CHPP area. This area is noted as the “Investigation Drainage Line” on **Figure 6**. The investigation has been completed and a report submitted to the EPA. Ongoing activities are being

undertaken to monitor the surface water flows and quality in this area, including monitoring and reporting in accordance with EPL 416 requirements.

The EPL requires the orange staining residue within the clean water drain to be fully contained within the premises at all times and any discharge to waters of this residue must comply with Condition L1.1 of the EPL.

6.4.2.5 Surface Water Storages

As shown in **Figure 2** and **Figure 6**, the CHPP water management system includes a number of surface storage dams. The system has been developed over time and is designed to limit the need for off-site discharges to Bellbird Creek whilst also increasing the potential for water reuse on site.

An overview of the purpose of each storage area is provided in the tables below.

Precipitate Dam

Feature	Information
Purpose	Allows residence time for precipitate from pH adjustment in Lime Plant to settle out.
Capacity	8 ML
Operating range	0 - 8 ML
Receives water from / rate	Lime plant @ 8.0 ML/Day (max)
Sends water to / rate	Process Water Dam @ 8.0 ML/Day (max), can also send to Water Pollution Control Dam, Bellbird Boreholes or Austar Dam.
Overflow protection system	Overflows into Process Water Dam
Regulatory information	Turkey nest dam. Not on a water course. Used for pollution control as an integral part of the RO plant.

Process Dam

Feature	Information
Purpose	Storage for RO feed water and CHPP process water. Also allows extra residence time for precipitation of solids and scale.
Capacity	70 ML
Operating range	17.5 – 63 ML
Receives water from / rate	Precipitation Dam @ 8.0 ML/Day (max), No. 7 Dam and RO Plant permeate
Sends water to / rate	RO Plant (feed) @ 10.0 ML/Day (max), Water Pollution Control Dam @ 10.0 ML/Day (if required). Number 7 Dam
Overflow protection system	Water Pollution Control Dam
Regulatory information	Turkey nest dam. Not on a water course*. Used for pollution control as an integral part of the RO Plant.

* Bellbird Creek (a 3rd order stream) has been diverted around this dam

Number 7 Dam

Feature	Information
Purpose	Water Storage
Capacity	100 ML
Operating range	35 – 50 ML
Receives water from / rate	RO Plant @ 4.0 ML/Day (max), Emergency Overflow Dam, Doyle Street Dam, Process Water Dam
Sends water to / rate	CHPP @ 2.5ML/Day (max), Process Water Dam, Lime Plant, Truckfill
Overflow protection system	Water Pollution Control Dam
Regulatory information	Turkey nest dam. Not on a water course*. Used for pollution control as an integral part of the water treatment plant.

* Bellbird Creek (a 3rd order stream) has been diverted around this dam

Sediment Retention Cells

Feature	Information
Purpose	To remove suspended solids in site runoff prior to the Stormwater Retention Dam
Capacity	8 ML
Operating range	0 - 8 ML
Receives water from / rate	CHPP and RO Plant surface runoff and washdown, runoff/overflow from old north-west tailings dam area
Sends water to / rate	Stormwater Retention Dam via overflow
Overflow protection system	Stormwater Retention Dam
Regulatory information	Mine water dam on minor stream (drainage line*) within mine affected area of CHPP. Exempt from licencing as an excluded work under Clause 3 of Schedule 1 of <i>Water Management (General) Regulation 2018</i> .

* Bellbird Creek (a 3rd order stream) has been diverted around this dam

Storm Water Retention Dam

Feature	Information
Purpose	Retain stormwater flows from CHPP site, RO Plant and stockpile areas
Capacity	10 ML
Operating range	0 - 10 ML
Receives water from / rate	Sediment Retention Cells
Sends water to / rate	Water Pollution Control Dam via pipe outlet control
Overflow protection system	Overflow weir to Water Pollution Control Dam
Regulatory information	Mine water dam on minor stream (drainage line*) within dirty water area of CHPP. Exempt from licencing as an excluded work under Clause 3 of Schedule 1 of <i>Water Management (General) Regulation 2018</i> .

* Bellbird Creek (a 3rd order stream) has been diverted around this dam

Water Pollution Control Dam

Feature	Information
Purpose	Storage of runoff water from site
Capacity	40 ML
Operating range	0 - 40 ML
Receives water from / rate	CHPP surface runoff via overflow from other dams
Sends water to / rate	Bellbird Borehole at a rate of up to 10 ML/day normally and up to 13ML/day (if required by addition of diesel pumps – provision of quick access is incorporated in the design)
Overflow protection system	Emergency overflow dam and emergency pumping system
Regulatory information	Mine water dam on minor stream (drainage line*) within dirty water area of CHPP. Exempt from licencing as an excluded work under Clause 3 of Schedule 1 of <i>Water Management (General) Regulation 2018</i> .

* Bellbird Creek (a 3rd order stream) has been diverted around this dam

Emergency Overflow Dam

Feature	Information
Purpose	Overflow protection for Water Pollution Control Dam, Licensed Discharge Point
Capacity	40 ML
Operating range	0 - 40 ML
Receives water from / rate	Overflow from Water Pollution Control Dam
Sends water to / rate	Pump to Dam 7 or Water Pollution Control Dam if required up to 3.0 ML/day
Overflow protection system	Overflow is permitted to Bellbird Creek in accordance with Environment Protection Licence requirements (up to 2 ML/day)
Regulatory information	Mine water dam on minor stream (drainage line) within dirty water area of CHPP. Exempt from licencing as an excluded work under Clause 3 of Schedule 1 of <i>Water Management (General) Regulation 2018</i> .

Number 9 Tailings Dam

Feature	Information
Purpose	Former tailings storage
Capacity	Approx. 5 ML
Operating range	0 ML
Receives water from / rate	Runoff from storage area
Sends water to / rate	Overflow to Water Pollution Control Dam
Overflow protection system	Overflow to Water Pollution Control Dam
Regulatory information	Turkeys nest dam. Not on a water course. Used for pollution control.

Doyle Street Dam

Feature	Information
Purpose	Collection of clean run off water from clean water channels, and return of clean run off water to Bellbird Creek. Emergency use for controlling potential pollution incidents to Bellbird Creek.
Capacity	5 ML
Operating range	0 -5 ML
Receives water from / rate	Clean water channels and Bellbird Creek on-site
Sends water to / rate	Normal operation returns water to Bellbird Creek without consumptive use. In the event of an emergency, water can be pumped to either Number 7 Dam or the Emergency Overflow Dam for transfer on to the Process Dam and treatment in the RO plant.
Overflow protection system	Clean water – no overflow protection required
Regulatory information	3 rd order stream. In stream dam for emergency use for controlling potential pollution incidents to Bellbird Creek. Licencing status of this dam is under review.

6.4.2.6 Potable Water and Sewage Treatment

Water for human contact and potable use to offices, workshops and bathhouses at the CHPP is supplied by Hunter Water. Sewage treatment is provided by a dedicated sewage treatment plant (STP) in the CHPP area, with treated effluent combined with RO Plant brine and pumped underground via the brine pipeline

6.4.3 Surface Water Storage and Pumping System

The Austar surface water management system has been designed to match the capacity of the underground dewatering systems with additional provision to store and handle surface runoff during heavy rain events. The main pipelines used to transfer water between storages are shown on **Figure 1** and connections between storages are shown on **Figure 2**.

Mine water is pumped to the surface at No 2 Shaft. Once at the surface, the mine water is conveyed from the No 2 Shaft site to Kalingo Dam via two buried HDPE pipelines. Water stored in the Kalingo Dam is then piped to other mine water storages via buried HDPE pipelines or to the underground workings as required. The pipeline route(s) traverses Austar-owned land, Council road reserves and Crown Land, as generally shown on **Figure 1**. The maintenance regime for this water conveyancing infrastructure requires augmentation and / or replacement pipework to be installed from time to time on an as needed basis. Periodic maintenance of this pipeline infrastructure is undertaken, including excavation to expose sections of the pipeline to test, repair and / or replace the pipe. Approval from Council and State authorities is obtained prior to works in Council and Crown Land road reserves.

An overview of the purpose of each storage located outside the CHPP area is provided in the tables below. The Austar Pit Top water management system is shown in **Figure 7**, the Kalingo Dam is shown in **Figure 8** and the Kitchener SIS water management system is shown in **Figure 9**.

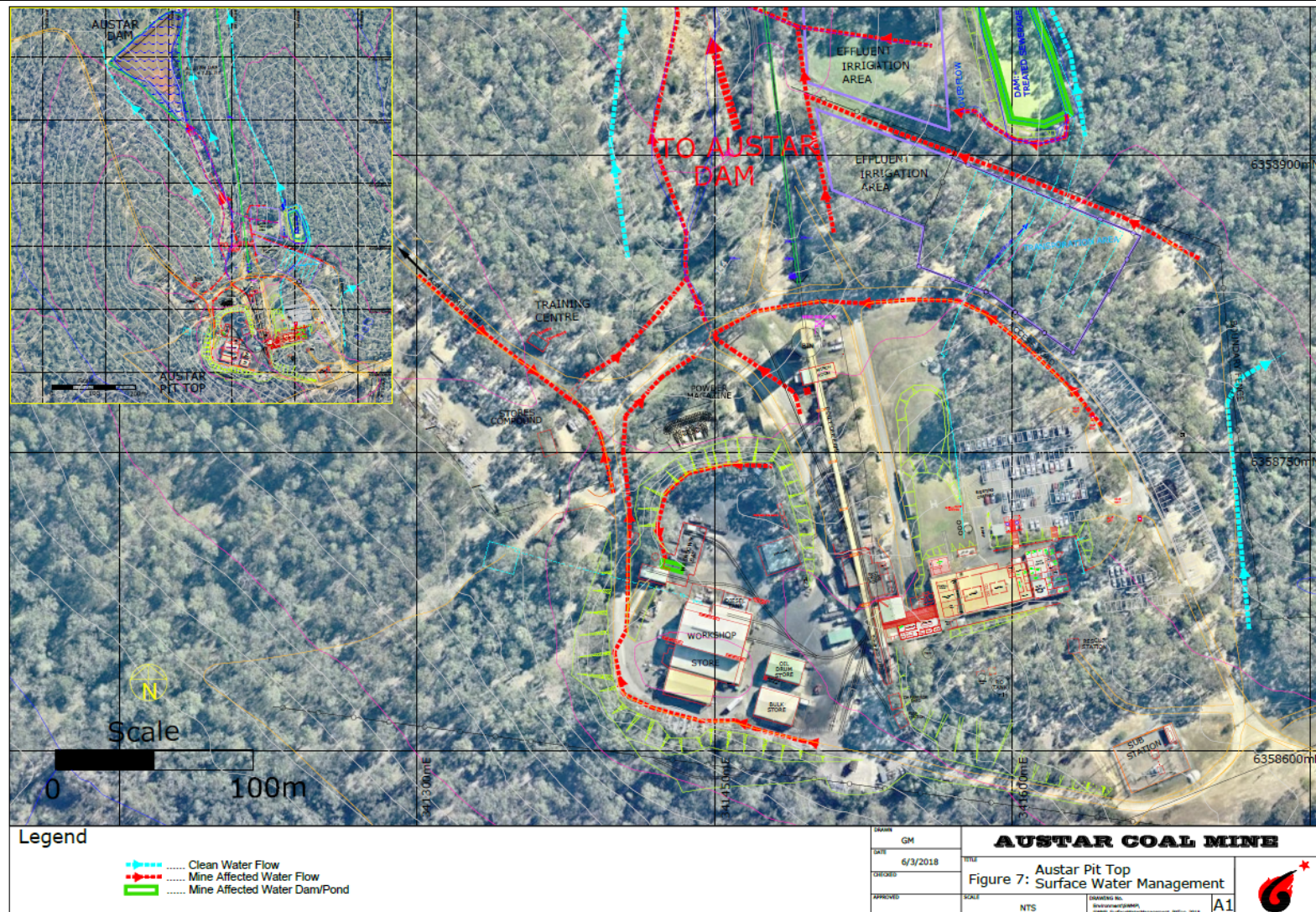


FIGURE 7 - AUSTAR PIT TOP SURFACE WATER MANAGEMENT

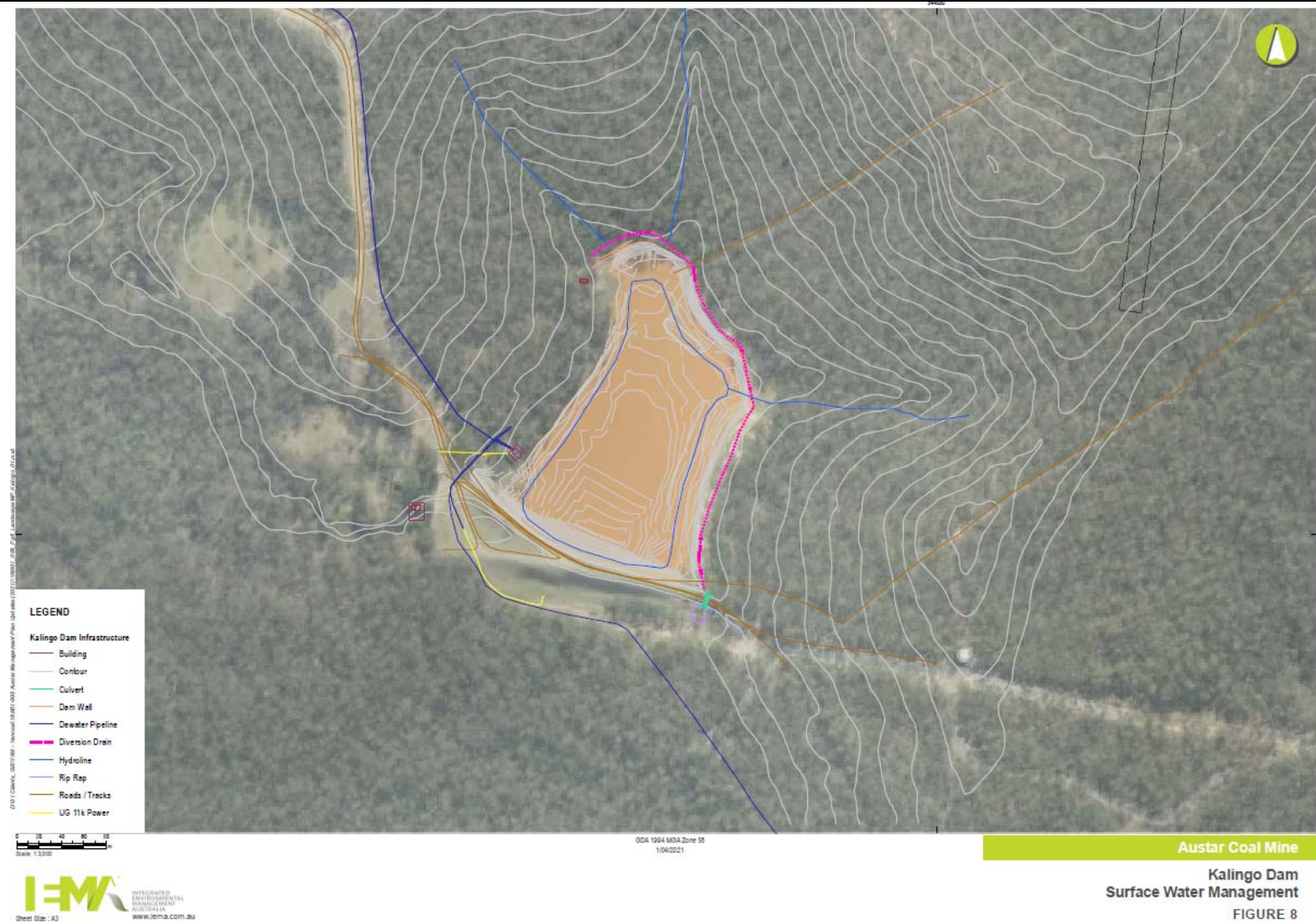


FIGURE 8 - KALINGO DAM



FIGURE 9 - KITCHENER SIS SURFACE WATER MANAGEMENT

Kalingo Dam

Feature	Information	
Purpose	Receives water from underground via #2 shaft pumping system and pipelines, Kitchener SIS and No. 3 Shaft sump. Used as a staging and storage facility. Assists in the removal of iron and manganese via oxidation.	
Capacity	110 ML	
Operating range	0 - 65 ML	
Receives water from / rate	Normal Operating Capacity - No 2 Shaft @ 7 ML/day Kitchener SIS @ 0.5ML/day No. 3 Shaft Sump @ 0.1 ML/day	
Sends water to / rate	Normal Operating Capacity- Austar Dam or Lime Plant @ 4.8ML/day	Possible Operating Capacity- 11 ML/Day Can transfer to Kalingo Shaft, Water Pollution Control Dam at CHPP or Bellbird Boreholes @ 6 ML/day
Equipment details	Main Flowserve CPX125/100/250 Centrifugal Pump Suction Boost – Flowserve CPX150/125/250 Centrifugal Pump	
Monitoring	End of line flow for leak protection, discharge flow, level, pump operation	
Maintenance options	Weekly Mechanical Inspection	
Overflow protection system	Direct link and gravity overflow to abandoned Kalingo shaft (up to 6ML/day pumped). Kalingo shaft has 12ML storage capacity.	
Regulatory information	Mine water dam on minor stream (less than 3 rd order). Disconnected from clean water catchment (has upslope diversions). Receives water from the underground mine for storage and management. Exempt from licencing as an excluded dam under <i>Schedule 5 of Water Management (General) Regulation 2011</i> .	

Austar Dam

Feature	Information	
Purpose	Receives water from Kalingo Dam via a buried 315mm HDPE pipeline, from 16 c/t Main South underground pumping station via drift rising main and contingency pumping from Precipitate Dam at CHPP. Surface run off from the Austar mine pit top and effluent from the pit top washbay also reports to Austar Dam.	
Capacity	35 ML	
Operating range	15 ML	
Receives water from / rate	Kalingo Dam 3 - 7 ML/Day 16 c/t Main South pump station up to 3.5 ML/day Precipitate Dam 6 ML/Day	
Sends water to / rate	Normal Operating Capacity Lime Plant at CHPP 3 – 10 ML/Day No 7 Dam @ CHPP or either Precipitate Dam or Bellbird boreholes if required	Possible Operating Capacity Bellbird Boreholes or Water Pollution Control Dam @ 6 ML/day if required

Feature	Information
Equipment details	1 x 125/100 Flowserve CPX200 90kW and 1 x Flowserve CPX100/65/250 55kW Centrifugal Pumps in parallel operation.
Monitoring	Flow, Level, pump operation, Programmable Logic Controller (PLC) control
Maintenance options	Weekly Mechanical Inspections
Overflow protection system	Level monitoring linked to PLC control (currently alarms at 80% capacity). All inflow water sources are linked via CITECT and will shut down once level (high) set point is reached. Also if Austar Dam pumps stop, all inflow water sources will stop after a pre-determined time. Discharge end of line flow monitoring for leak protection. Would overflow to a tributary of Congewai Creek.
Regulatory information	Mine water dam on minor stream (drainage line). Disconnected from clean water catchment. Exempt from licencing as an excluded dam under <i>Schedule 5 of Water Management (General) Regulation 2011</i> .

Kitchener Surface Infrastructure Site Water Storage Dams & Sediment Basins

Feature	Information
Purpose	Receives surface runoff drainage water from rehabilitated areas (stabilised with vegetation) at the Kitchener SIS.
Capacity	Sediment Basins 1.6 ML Upper and Lower Sediment Dams 5 ML (approx.)
Receives water from / rate	Rainfall runoff from disturbed surface area of SIS
Sends water to / rate	Eastern Sediment Basin pumps to Upper Sediment Dam, Lower Sediment Dam pumps to Upper Sediment Dam and Upper Sediment Dam pumps to Kalingo Dam using diesel pumps or electric pumps.
Equipment details	Electric or diesel pumps
Monitoring	Water level in Eastern Sediment Basin and Upper and Lower Sediment Dam 1, pump operation, water quality monitoring during discharge from site
Maintenance options	Weekly Mechanical Inspection
Overflow protection system	Sediment Basins are designed to capture up to: -90 th percentile 5 day rainfall event Above this rainfall intensity the dams are designed to discharge.
Regulatory information	Sediment dams on minor stream (drainage line and 2 nd order stream). Disconnected from clean water catchment (has upslope diversions). Exempt from licencing as an excluded dam under Clause 1 of Schedule 1 of <i>Water Management (General) Regulation 2018</i> .

6.4.4 Pit Top Water Management

Water for human contact and potable use at the Austar pit top is supplied by Hunter Water. Sewage treatment is provided by a dedicated STP at the pit top, with effluent discharged to a nearby dedicated effluent dam, from which disposal occurs by irrigation over an area near the dam.

6.4.5 Offsite Water Transfers or Discharges

There are no offsite water transfers at Austar Coal Mine.

Austar Coal has two licenced discharge points located at the CHPP:

- Emergency Overflow dam (LDP1) - Overflow is permitted to Bellbird Creek in accordance with EPL (LDP1) requirements (up to 2 ML/day)
- SW6 – Discharge from the 1ML permeate tank – discharge of up to 5ML/day to Bellbird Creek is permitted in accordance with EPL416 requirements.

6.5 Water Management Initiatives

The presence of Austar's RO Plant has enabled large volumes of treated mine water to be reused for beneficial purposes on site. This includes use within the CHPP (when operational) and also in the underground mine. This has significantly reduced the reliance on reticulated water supplied by Hunter Water and has reduced the need to discharge water off site. Any discharges from site to Bellbird Creek are undertaken in accordance with the requirement of EPL 416. The RO Plant can currently treat up to 6 ML of water per day.

6.5.1 Underground

To maximise the use of treated water on site and reduce the reliance on water supplied by Hunter Water, permeate from the RO Plant is utilised for maintenance of the underground during closure (e.g. for dust suppression). Hunter Water is used as a backup supply to ensure continuity of closure maintenance activities when there is insufficient treated suitable water available.

6.5.2 Ancillary On-Site Use

Other opportunities that may be available for the use of treated water on site include dust suppression and irrigation of rehabilitated land and other areas within the site.

Water supplied by Hunter Water will continue to be used to meet human contact requirements (e.g. at the Austar pit top and CHPP area facilities) as the RO permeate water is not disinfected or monitored to ensure there are no potential health issues.

6.5.3 Offsite Use

Consideration has also been given to possible off site use rather than discharging directly to Bellbird Creek. Whilst downstream users in Bellbird Creek benefit from clean water discharged from the site, it is likely there are other possible direct uses that could be economically and environmentally viable. Opportunities that may arise in the future will continue to be explored.

6.6 Reporting Procedures

Reporting of water management, monitoring and review is undertaken via:

- Internal reporting processes; and
- External reporting via:
 - The Annual Review, which presents graphical water results for the year and longer term (the last five years as available) with average or baseline water data shown clearly;
 - EPL reporting (Annual Return and Pollution Reduction Program requirements);
 - Water licence reporting requirements;
 - Incident reporting (refer to Section 12.2); and
 - Information dissemination to the community including the Community Consultative Committee (refer to Section 12.3).

7 EROSION AND SEDIMENT CONTROL

7.1 Overview

Changes in land use have the potential to disturb soils, alter drainage patterns and affect environmental values both on and off site (Landcom 2004). The site is an existing underground mine with limited potential for erosion and sediment generation. The surface facilities and surface water management system have been developed over time as the mine has developed and the area is well vegetated.

Erosion is mostly a short term problem that results from the removal of vegetation and ground cover. The existing infrastructure areas (Pit Top, CHPP and supporting infrastructure) were constructed many years ago and have become stabilised over time. The potential for erosion and sediment generation is limited as large scale clearing and ground disturbance is typically not required. Notwithstanding, the majority of the CHPP area drains to sediment retention cells, a stormwater retention dam and a water pollution control dam from which water is recycled to other storages or reticulated underground. Runoff from the pit top area is directed to the Austar Dam from which water is reticulated to the CHPP area for treatment. The Kitchener SIS has been temporarily stabilised and revegetated or gravelled, with no ongoing active erosion and sediment control requirements.

Erosion and sediment control measures that were implemented and managed during operations remain largely unchanged during the current stage of transitioning to closure. Any ground disturbance works associated with closure planning activities (such as investigative drilling) will be managed in accordance with existing erosion and sediment control protocols.

It is anticipated this Plan will be updated once closure planning has been completed and prior to execution of closure works.

7.2 Site Activities and Potential for Soil Erosion

The main activities that have potential for erosion and sediment generation include surface activities associated with infrastructure areas and closure planning activities; Subsidence and surface changes resulting from longwall mining; and Reject emplacement and rehabilitation activities.

7.2.1 Surface Activities

Austar Pit Top and CHPP

The Austar Pit Top facilities are well established and areas that were disturbed during the construction phase have been stabilised. Surface water runoff has the potential to cause erosion and is managed as part of the normal site operations. **Figure 6** shows the surface water management system around the CHPP and **Figure 7** shows the controls around the pit top facility.

Several types of erosion control measures have been implemented with the aim of preventing soil erosion and the entry of sediments into any of the surrounding water bodies.

A system of clean water diversion drains and mine affected collection drains are shown on **Figure 6** and **Figure 7**. Drains are typically constructed with either a parabolic or trapezoidal cross section rather than a V-shape which can be easily eroded. Channels and associated banks have been grassed where possible to assist with stability during water flows and to control sediment movement. Channels are periodically inspected (at least annually) to identify and repair damage caused by scour, sediment deposition, channel obstruction and loss of vegetative cover.

Several small sediment retention cells have been constructed within the water management systems. These are in addition to the main control structures that are designed to manage mine affected water and are described in **Section 6**. The sediment retention cells have been designed and located to contain runoff from currently and previously disturbed areas on site. The primary purpose of these retention cells is to trap sediment by gravity settling from normal rainfall events as well as to reduce flow velocity during high rainfall events.

These structures are regularly maintained and de-silted once the capacity of the structure is deemed to have been reduced significantly. The structures are inspected after major rainfall events (>50mm in 48 hours) and maintenance undertaken as required.

Kitchener Surface Infrastructure Site

Construction activities at the Kitchener SIS commenced in November 2009 and comprised shaft construction and ancillary services (power and pipelines). During closure this infrastructure will be decommissioned, and the shafts sealed. There are three natural catchment areas upstream of the SIS and access road area. These catchment areas continue downstream of the site into the Werakata State Conservation Area. The headwaters of Black Creek bisect the Kitchener SIS. The erosion and sediment controls for the Kitchener SIS have been developed in accordance with the practices detailed in *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004) (the Blue Book). The intent of the erosion and sediment controls is to minimise the generation of sediment on site and its transport around and off the site.

The general arrangements and drainage for the Kitchener SIS are shown on **Figure 9**.

Upslope clean water diversion drains have been constructed on both sides of Black Creek to divert upslope runoff away from the SIS area. On the eastern side of Black Creek, a sediment basin and runoff collection drains capture runoff from disturbed parts of the site. The stockpile areas indicated on the eastern side have been successfully revegetated and further water sampling over the next few years should demonstrate negligible contribution to the sediment basin. On the western side of Black Creek, runoff is directed to two sediment dams via runoff collection drains. It is intended that there is no discharge from sediment dams for storm events that are less than the Blue Book design event.

The sediment basins have been sized based on the Blue Book methods. The eastern sediment basin design capacity is based on a catchment area of 3.7 ha and Type F basin, to capture runoff from a 90th percentile five day rainfall depth of 42.8mm (Cessnock). Assuming a high runoff potential soil, the eastern sediment basin design capacity is approximately 1.1 ML.

The western disturbed catchment area is estimated at 2.4 ha. The two dams in this area, which were previously used for shaft construction purposes in the western catchment area, were repurposed as sediment dams. A spillway connects the two sediment dams. Assuming a high runoff potential soil, the minimum capacity to capture runoff from a 90th percentile, five day rainfall depth of 42.8mm for the 2.4 ha western catchment is 0.7 ML. The sediment dams have an estimated combined volume of approximately 5 ML, significantly exceeding the minimum capacity requirement.

Pumping facilities are available to dewater the eastern sediment basin and the lower sediment dam to the upper sediment dam. Pumping may be activated during a rainfall event, which in effect provides additional capacity for the Kitchener SIS, in excess of the 90th percentile 5 day rainfall depth.

A water supply and dewatering pipeline (refer **Figure 1** and **Figure 2**) between the SIS and Kalingo Dam allows water from the upper sediment dam to be pumped to Kalingo Dam for treatment in the mine water treatment system.

When discharge from the sediment dams occurs off site, water quality monitoring is undertaken in the eastern sediment basin, lower sediment dam and upstream and downstream Black Creek. Since 2011, there have been approximately 19 occasions on which discharge has occurred. Discharge events are reported to the EPA and DPIE, as well as being reported in the Annual Review.

The erosion and sediment control strategy at the SIS has been designed to minimise the potential impacts on the surrounding environment and downstream catchment areas, including:

- Minimise erosion potential of the site and sediment transport off site;
- Maintain water quality in downstream watercourses; and
- Protect the existing streamlines and riparian habitat.

The shaft construction activities at the SIS were substantially complete in 2013-2014 with the SIS then transitioning to an operational phase. The disturbed working parts of the site for construction have

been stabilised with vegetation, and further water sampling over the next few years should demonstrate negligible contribution to sediment load from this site.

7.2.2 Longwall Mining and Subsidence

Bellbird South and Stage 3

Assessments of subsidence impacts from mining in the Bellbird South and Stage 3 areas on surface water have been documented in Environmental Assessments by Umwelt (February 2007a, November 2015, May 2017) and Umwelt (September 2008, September 2011) respectively. The area overlying Bellbird South encompasses the gentle south facing lower slopes of the Broken Back Range and the extensive creek flat of the Quorrobolong Creek system (Umwelt, February 2007b). Cony Creek joins Quorrobolong creek in the east of the Stage 2 area. The area overlying Stage 3 also encompasses the south facing lower slopes of the Broken Back Range and includes the Sandy and Cony Creek systems and associated flats and footslopes. The areas overlying Bellbird South and Stage 3 are mostly used as farm land, with some areas of natural bushland and State Conservation Area in the north of the Bellbird South and Stage 3 areas.

Surface water assessments undertaken by Umwelt for Bellbird South and Stage 3 of the project found:

- No significant changes in stream power and erosive potential were predicted along Quorrobolong, Cony and Sandy Creeks as a result of Bellbird South and Stage 3 mining operations;
- Bellbird South and Stage 3 mining operations were unlikely to significantly alter stream velocities; and
- The potential to increase erosion on the land surface as a result of Bellbird South and Stage 3 mining was also expected to be minimal due to the relatively small predicted changes in landform grades and the high level of ground cover over the area.

The Bellbird South Stage 2 mining area (LW A3 to A5a) was completed in February 2013, where mining occurred beneath private rural landholdings and Quorrobolong Creek. There were no erosion matters identified or reported by members of the community during mining of Stage 2, which confirms the predictions of the Environmental Assessments. Subsidence in this area is substantially complete and no further monitoring is undertaken.

The Bellbird South LWB1-B3 mining area commenced in July 2016. This approved mining area was extended to include LWB4-B7 in August 2017, however only LWB2 to B6 were mined. Mining ceased in February 2020. No surface water issues of concern have been observed. Subsidence in this area is substantially complete and no further monitoring is undertaken.

Mining of LWA8 was completed in June 2015 and subsidence in the Stage 3 area is complete for the panels extracted.

7.2.3 Reject Emplacement Areas

The reject material at Austar can potentially form acid drainage due to compounds within the reject. Rehabilitation aims to maximise compaction thus reducing the potential for oxidation that can lead to acid mine water. The emplacement areas have been designed so that leachate drains directly to old mine workings located in the base of the open cut voids (refer **Figure 2**).

Material deposited in the old open cut is progressively rehabilitated in accordance with the Mining Operation Plan as approved by the Department of Planning, Industry and Environment – Resources Regulator. The principal objective of the final rehabilitation plan is to form a stable landform consistent with surrounding features which will pose no long-term environmental hazard. The approved methodology involves capping the coarse reject with inert overburden prior to stabilising with vegetation.

The CHPP site reject emplacement areas are integrated into the CHPP surface water management system, including the separation and management of mine affected and clean water flows (refer **Section 6.4.2**).

The Aberdare Extended Emplacement Area drains to Black Creek, therefore specific surface water management and erosion and sediment controls have been developed to protect the ephemeral tributaries of Black Creek from both surface runoff that has been in contact with coarse reject, and also potential sediment generated from active rehabilitation areas. Placement of the coarse reject will be to ensure potentially acidic surface water runoff from coarse reject areas drains to old workings at the base of the pit.

Presently, the Aberdare Extended Emplacement Area (refer **Figure 10**) is not connected to the surrounding clean water systems with all water that falls within the open cut pit captured or directed to the base of the pit to drain to old workings. Notwithstanding, an Aberdare Extended Emplacement Area Erosion and Sediment Control Plan (Umwelt, 2010) has been developed which incorporates a combination of clean water diversion drains, collection drains, and sediment basins designed to minimise the mobilisation and exportation of sediment to the downstream receiving environment.

The methods adopted to determine the necessary size of the channels and basins is adapted from the methods outlined in *Managing Urban Stormwater – Soils and Construction Volume 1* (Blue Book) (Landcom, 2004) and *Managing Urban Stormwater – Soils and Construction Volume 2e – Mines and Quarries* (DECC, 2008). The general layout of the ESC measures for Aberdare extended are shown in **Figure 10**.

During closure, it is planned to maintain reject emplacement areas where the reject has been compacted but not capped with inert material by monitoring for erosion and implementing remedial measures if required. Rehabilitated rejects emplacement areas will be monitored to check against rehabilitation completion criteria given in the approved Mining Operations Plan.

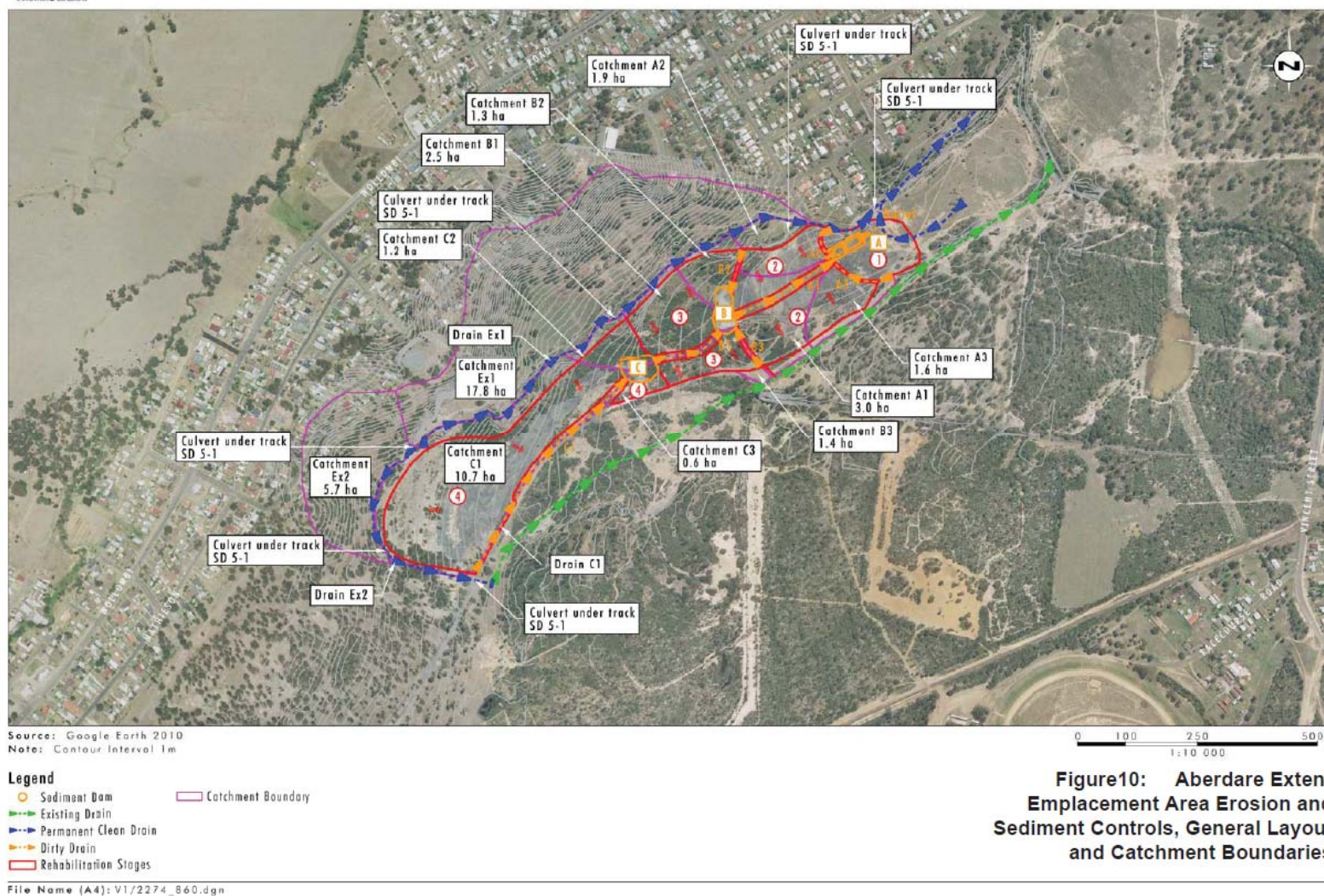


FIGURE 10 - ABERDARE EXTENDED WATER MANAGEMENT

7.3 Maintenance of Erosion and Sediment Controls

Regular inspection and maintenance of permanent structures ensures that the water management system, sediment and erosion controls remain effective. At active disturbed areas (Kitchener SIS and rehabilitation areas), regular inspections are undertaken to monitor the condition and effectiveness of controls.

Measures to control erosion and sediment generation include:

- Identification and review of surface activities that may change surface water flows and result in erosion;
- Regular checking of rehabilitated areas;
- Installation of temporary and/or additional permanent controls to manage locations that have been identified as requiring attention;
- Diversion of surface and road runoff away from disturbed areas;
- Inspection and cleaning (if required) of diversion and collection drains and structures following major rainfall events (>50mm in 48 hours) or other activities that may result in damage; and
- Clearing of excessive vegetation and weeds along drainage lines.

8 MONITORING

Monitoring results will be used to assess the effectiveness of the management measures outlined in Section 6. Exceedances of the Impact assessment criteria will be investigated as detailed in Section 12.2.

8.1 Surface Water Monitoring Program

8.1.1 Onsite Monitoring Requirements

The SWMP takes into consideration the surface water monitoring requirements required under DA 29/95 and PA 08_0111 and EPL 416 (**Appendix A**).

8.1.2 Surface Water Monitoring Locations and Frequency

The location and frequency of surface water monitoring required to satisfy the requirements of the EPL are summarised in **Table 8-1** and are shown on **Figure 11**.

TABLE 8-1 - EPL SURFACE WATER MONITORING POINTS

EPA ID No.	Site ID No	Type of monitoring point	Type of discharge point	Location	Monitoring Frequency	Comment
1	SW1	Wet weather discharge (quality and volume)	Wet weather discharge (quality and volume)	Spillway of the emergency dam at the Pelton Coal Preparation Plant site	Special Frequency 1 (*)	Licensed Discharge Point No 1
2	SW2	Ambient water quality monitoring	n/a	Bellbird Creek (near Wollombi Road)	Special Frequency 2 (**)	Downstream of CHPP
4	SW4	Ambient water quality monitoring	n/a	Bellbird Creek (northern boundary)	Special Frequency 2 (**)	Downstream of CHPP
5	SW5	Ambient water quality monitoring	n/a	Bellbird Creek (western boundary)	Special Frequency 2 (**)	Upstream of CHPP
6	SW6	Discharge to waters (quality and volume)	Discharge to waters (quality and volume)	Discharge from 1ML permeate tank	Once a month (min. of 4 weeks)	Licensed Discharge Point No 6

Notes: (*) Special Frequency 1 means daily collected at a minimum of twelve hourly intervals when a discharge is occurring.
(**) Special Frequency 2 means three times per week during any period of discharge from Point 1 at a minimum of 48 hour intervals commencing as soon as practical after discharge has commenced. Once per month during any period of discharge from Point 6 at a minimum of 4 weekly intervals.

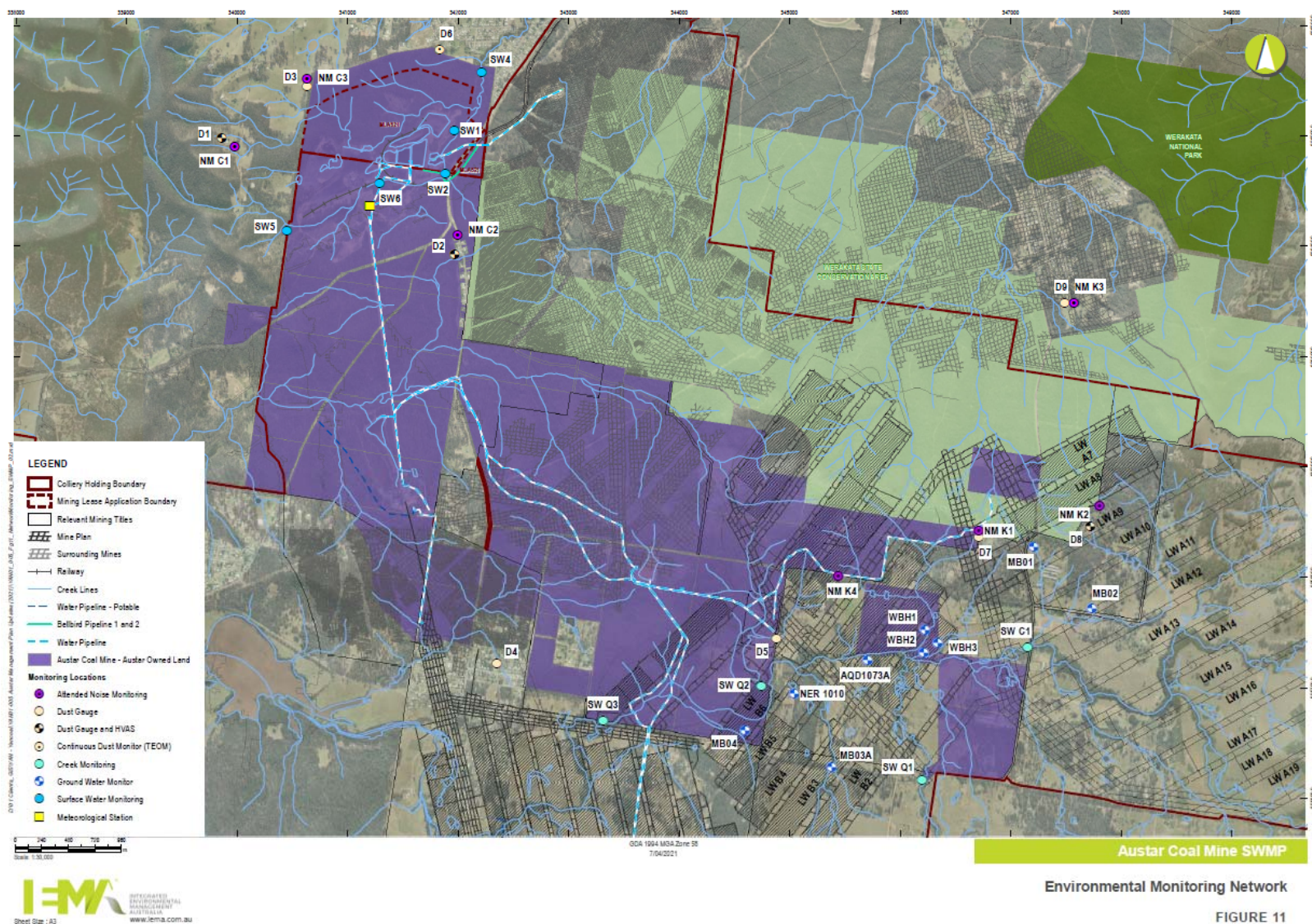


FIGURE 11 - ENVIRONMENTAL MONITORING NETWORK

Water quality monitoring is undertaken once a month (minimum of 4 weeks) at Points 2, 4, 5 and 6 when there are discharges occurring under the EPL from Licenced Discharge Point No 6.

Additionally, if a discharge is occurring under the EPL from Licenced Discharge Point No 1, water quality monitoring will be undertaken at Points 2, 4 and 5 three times per week at a minimum of 48 hour intervals commencing as soon as practical after the discharge commenced.

The results of all monitoring are included in the Annual Return provided to the EPA under EPL 416 and recorded in the Annual Review.

The water quality samples are taken by grab sample in accordance with the requirements of EPL 416 and monitoring undertaken in accordance with the Approved Methods. In line instrumentation is used for volume monitoring, also in accordance with EPL requirements.

In addition to regular surface water monitoring required under the EPL, there is a real time monitoring system in the RO Plant that feeds into the CITECT monitoring system. This system monitors pH, EC and turbidity on a daily basis. Detailed analysis of treated water and feed water to the treatment plant is undertaken periodically as part of the normal operating procedure and quality assurance system.

The channel where treated water is discharged is also examined on a quarterly basis to ensure that no excessive erosion or other problems are occurring.

8.1.3 CHPP Real time Monitoring System

The CITECT system (refer **Section 6.4.1.5**) also includes the major components of the CHPP. The system enables remote control and communications across the mine site. The real time monitoring system includes a wide range of parameters including flow rates and storage levels of dams.

Monitoring at the RO Plant includes incoming flow rate and discharge to the various locations such as permeate from the 1ML tank supplied to the underground, or licenced discharged offsite to Bellbird Creek. Water quality parameters are also monitored so that water that does not meet the specifications is returned through the system for further treatment.

8.1.4 Other Monitoring

Schedule 3 Condition 9(b) of Development Consent DA29/95 indicates the surface water monitoring program should include Black, Cony and Quorrobolong Creeks.

Schedule 4 Condition 9(b) (iii) of Project Approval PA08_0111 indicates the surface water monitoring program should include the above creeks and Sandy Creek. Sandy Creek is a tributary of Cony Creek (refer **Figure 1**) that overlies Stage 3 Longwalls A15 to A17. The only longwalls to be extracted in the Stage 3 area were Longwalls A7 and A8 which are located well north of Sandy Creek and Cony Creek. Therefore, no mining activity has occurred that could impact Sandy Creek and, as a consequence, no monitoring of Sandy Creek has occurred or is proposed during closure.

8.1.4.1 Quorrobolong Creek

Three water quality monitoring sites are located on Quorrobolong Creek: SWQ1, SWQ2 and SWQ3 as shown on **Figure 11**.

The first sample location (SWQ1) is upstream of Austar's Bellbird South mining area, the second location (SWQ2) is on the eastern boundary of Austar's land holding where Quorrobolong Creek enters Austar owned land. The third location is a downstream sample site (SWQ3) on Austar's southern boundary where the creek exits Austar's land holding.

Water quality monitoring frequency and analytes for Quorrobolong Creek are presented in **Table 8-4**. Flow in Quorrobolong Creek and channel stability is also visually monitored and photographically recorded on an annual basis.

Subsidence surveys taken during the year since mining ceased show that no substantial subsidence impacts are occurring. As there is no substantial subsidence predicted during closure, water quality monitoring in this area will be undertaken quarterly at all three locations and visual monitoring of channel stability will revert to annually at locations SWQ1 and SWQ2.

8.1.4.2 Cony Creek

Water quality monitoring occurs at one location on Cony Creek as shown in **Figure 11**. The sample site (SWC1) is located at the point where Quorrobolong Road crosses Cony Creek, approximately at the downstream limit of Stage 3 subsidence impacts that would have occurred from the extraction of Longwalls A11 to A17. Given that Cony Creek is a tributary of Quorrobolong Creek; monitoring results from this site provide background to results from downstream locations on Quorrobolong Creek.

Water quality monitoring frequency and analytes for Coney Creek are presented in **Table 8-4**. Monitoring during closure will be conducted quarterly for water quality and flow. Visual monitoring of channel stability will be undertaken annually.

8.1.4.3 Bellbird Creek/Black Creek

EPL 416 requires water quality sampling (when licensed discharge is occurring) upstream and downstream of the CHPP area in Bellbird Creek. This creek forms part of the Black Creek drainage system and is directly influenced by the quality and quantity of water discharged from the mine.

Monitoring in the upstream sections of the Black Creek drainage system in Bellbird Creek is considered more relevant to the assessment of impacts from Austar's operations than monitoring further downstream in the Black Creek system where water quality may be heavily influenced by non-mining (urban) activities that are beyond the control or influence of Austar's operations. The confluence of the two creeks is over 5 kilometres downstream from the CHPP area on the northern side of Cessnock. At this point the Black Creek system is concrete lined in parts and passes through the urban centre of Cessnock.

The five water quality monitoring sites specified in EPL416 are located as indicated on **Figure 11**. Site SW1 is located at the Emergency Overflow Dam spillway (LDP1) and is monitored when overflow is

occurring (it is otherwise dry). The remaining sites are monitored on a monthly basis (unless there is no water at the sites) when the site is discharging from the RO plant. SW2 is located at a site known as Pinch Bridge and is located upstream of LDP1 but downstream of SW6 (RO Plant permeate discharge) and the majority of the CHPP area. SW4 is located at the northern boundary of Austar's land holding, downstream of SW1 and adjacent to the Doyle St Dam. SW5 is located upstream of the CHPP area. Water quality analysis includes the parameters listed in **Table 8-4**. Flow in Bellbird Creek at sites SW2, SW4 and SW5 is also visually monitored during monthly monitoring. Monitoring of these sites is planned to continue during closure.

Water quality monitoring also occurs in the upper reach of Black Creek immediately upstream and downstream of the Kitchener SIS during times of discharge from the site sediment dams (refer **Section 8.1**). Monitoring occurs as soon as practical after discharge has commenced and includes analysis of pH, EC and Total Suspended Solids (TSS).

8.1.4.4 Reject Emplacement Area

The reject emplacement area is designed so that leachate from the emplacement area percolates into the old mine workings via existing mine headings in the base of the emplacement areas. Water quality in these workings is poor and reflective of historic mine workings. The emplacement areas are managed to contain surface water runoff to the base of the emplacement areas to ensure surface water drains to the old workings and as a consequence no surface discharges of leachate from the site occur to be monitored. Monitoring of groundwater in old workings is discussed in **Section 8.2**.

Monthly visual checks are undertaken to ensure that the area is maintained and surface water controls are functioning appropriately.

8.1.4.5 Farm Dams

Farm dams within the Bellbird South and Stage 3 areas have been identified in the Subsidence Impact Assessments for Bellbird South and Stage 3 set out in MSEC (February, 2007), MSEC (May, 2011), MSEC (October, 2015), MSEC (June, 2017) and MSEC (August, 2018). Farm dams have also been identified in individual Built Features Management Plans for the Bellbird South and Stage 3 area. The Subsidence Impact Assessments indicate that mining of longwalls in the Bellbird South and Stage 3 areas could have the following impacts:

- Change in the water storage capacity of farm dams due to systematic tilt associated with subsidence; and
- Loss of water supply from farm dams as a result of cracking of farm dam walls.

The subsidence impact assessments indicated that there is unlikely to be any significant impact on the stability of farm dam walls and any cracking of farm dam walls is expected to be of a minor nature and easily repaired (MSEC, 2007, 2011, 2015, 2017).

If any leakage or cracking is identified by the landowner, the landowner will be requested to inform Austar and further investigation and repairs can be undertaken as necessary by Subsidence Advisory

NSW. If required, alternative water supply can also be provided to the affected property by Austar until repairs can be made or for the duration of the mining impact.

8.1.4.6 Stream Health

Stream health monitoring and assessments appropriate for a closed site will be considered during detailed mine closure planning.

8.1.4.7 Contamination

As described in Section 1.1, detailed mine closure planning and implementation for the site has commenced and additional surface and groundwater sampling and analysis may be required for surface water and contamination assessments.

8.2 Groundwater Monitoring Program

Monitoring or estimation of groundwater is undertaken for:

- Water pumped underground by events or processes controlled at the CHPP;
- Water inflow from in-seam drilled boreholes;
- Water inflow estimates from stored water bodies;
- Water piped underground and used for mining operations;
- Water pumped out of the mine;
- Water stored on the surface of the mine;
- Water pumped from underground directly to underground workings; and
- Water levels in adjoining underground workings and in shallow and alluvial aquifers;

Measurement of water flow is primarily conducted by means of flow meters and site based inflow measurements. Water quality analysis is conducted by means of grab samples and analysis at a NATA certified laboratory.

8.2.1 Groundwater Monitoring Locations and Frequency

8.2.2 Groundwater Quality

A detailed understanding of the groundwater quality has been determined from an annual sampling program undertaken since 2006 and water quality sampling will continue to be conducted at the following locations for as long as they remain accessible:

- Water pumped out of the mine by the #2 shaft pump (Ellalong Goaf);
- West Pelton goaf;
- East Pelton Goaf;
- Longwall 13;
- 14c/t 1 East Kalingo Borehole (Kalingo workings water);

- SL2 Goaf; and
- Relevant in-seam flanking or dewatering drill holes drilled that remain accessible.

Water quality analysis includes the following parameters: pH, total dissolved solids (TDS), suspended solids, electrical conductivity, calcium, manganese, iron, silica and oil and grease as a minimum.

8.2.3 Groundwater Pumping and Operational Water

Water flows are measured continuously at the following locations by flow meters that report to the CITECT monitoring system:

- Water pumped out of the mine by the pump at 16c/t;
- Water pumped out of the mine by the No. 2 shaft pumps (Ellalong Goaf); and
- Water piped underground to be used for mining operations.

8.2.4 Groundwater Inflows and Water Levels in Underground Workings

Groundwater flows are measured monthly at major water movement locations within the mine as scheduled in the Austar Coal Mine Work Order Management System and this is planned to continue during closure for as long as each site is accessible. **Table 8-2** summarises the location, frequency and schedule of water flow, quality and pressure monitoring currently undertaken at Austar Coal Mine.

Water levels are also monitored in the surrounding old workings of surrounding old workings of the Ellalong, Pelton, Kalingo, Bellbird, Aberdare Central and Elrington Collieries by dipping shafts or boreholes. The water level database for Pelton Colliery, Bellbird Colliery, Aberdare Central Colliery, Kalingo Colliery, Elrington Colliery and Ellalong Goaf is maintained by the Austar Coal Mine surveyor. This is also planned to continue during closure for as long as sites are accessible.

TABLE 8-2 - WATER SAMPLING, PRESSURE AND FLOW MONITORING

LOCATION	MONITORING FREQUENCY			
	FLOW	PRESSURE	QUALITY	SHAFT/BORE DIP
West Pelton 12c/t Borehole	Monthly	Monthly	Annual *	N/A
East Pelton 16c/t Borehole	Monthly	Monthly	Annual *	N/A
16c/t Pump	CITECT	N/A	N/A	N/A
Blue Panel Boreholes	Monthly	N/A	Annual *	N/A
LW13 Siphon	Monthly	N/A	Annual *	N/A
SL2 Siphon / Borehole	Monthly	Monthly	Annual *	N/A
LWA7 Holes	N/A	N/A	Annual *	N/A
Bellbird Colliery	N/A	N/A	N/A	Monthly
Aberdare Central Colliery	N/A	N/A	N/A	Monthly
Kalingo Colliery	N/A	N/A	N/A	Monthly
Ellalong	N/A	N/A	N/A	Monthly

Pelton	N/A	N/A	N/A	Monthly
Elrington	N/A	N/A	N/A	Monthly
#2 Shaft Pump	CITECT	N/A	Quarterly *	Monthly

* Water quality testing not undertaken if sample location is not running

8.2.5 Shallow (Porous Rock) and Alluvial Aquifers

Alluvium associated with the Quorrobolong/Cony/Sandy Creek system is present over the Bellbird South and Stage 3 areas. Numerous bores and wells draw water from these sediments, which usually comprise a fine-grained surface layer underlain by sand and gravel deposits, with flows from these mostly ranging from 0.1 L/s to 9 L/s and water quality generally reasonable (AGEC, 2018). However, these aquifers are not predicted to have been affected by the Austar mining activities due to the depth of cover (Dundon Consulting, 2017). While there are no known Groundwater Dependent Ecosystems (GDEs) within the LWB1-B7 Area, riparian vegetation comprising Riparian Swamp Oak Open Forest and Riparian Cabbage Gum Open Forest is at least partially dependent upon shallow alluvial groundwater sources during periods of reduced surface water flow (Umwelt, 2017).

There is evidence to suggest that there may be water bearing zones associated with jointing or fracturing within the Branxton Formation above the mine at a depth of approximately 100m to 170m below the ground surface (referred to as a porous rock aquifer), however, the importance of this water resource is likely to be minimal, since the water quality in these water bearing zones is poor (EC greater than 10,000 uS/cm) and the yield low (less than 1 L/s) (AGEC, 2018).

For underground mines which cause subsidence, the upper limit of the subsidence fractured zone will be reached when the strata above the collapsed zone are sufficiently strong to span the goaf area without significant bending or shear strains being developed. MSEC (2008) estimated that the upper limit of the fracture zone is between 225 metres and 355 metres for Bellbird South and Stage 3 mining. The depth of cover above the longwalls ranges from approximately 450 metres to 740 metres. It is unlikely, therefore, that the fractured zone would extend up to the surface nor to the shallow or alluvial aquifers.

Based on worst case predictions, it is possible that discontinuous fracturing may extend marginally into the shallow water bearing zones within the upper Branxton Formation where depth of cover is less than 455 metres. However, fracturing within this zone will not result in an increase in vertical hydraulic conductivity and will not result in direct hydraulic connection with the goaf, with any changes in this zone only affecting horizontal hydraulic conductivity (Umwelt, September 2017).

Potential subsidence impacts and their likely environmental consequences on hydrological features within the LWB1-B7 mining area are documented in the Extraction Plan Water Management Plan – LWB1-LWB7).

Austar's monitoring program for the Bellbird South and Stage 3 area has been aimed at confirming the above predictions. Austar has six monitoring piezometers within alluvium in the Bellbird South

area (AQD1073A, WBH1 to WBH3, MB03 and MB04 shown on **Figure 11**), one piezometer within the shallow porous rock aquifer in the Bellbird South area installed to 100m depth (NER1010 on **Figure 11**), and two piezometers within the shallow porous rock aquifer in the Stage 3 area (MB01, MB02 on **Figure 11**). Monitoring results during Stage 2 mining showed no identifiable impact of mining on the shallow porous rock or alluvial aquifers. In addition, microseismic monitoring undertaken during mining of LWA5 indicated that the height of fracturing likely has not extended above 220 metres – less than the upper limit of fracture zone predicted by MSEC (2008).

Conservatively, water levels in the shallow porous rock aquifers and the alluvium have been monitored on a regular basis during mining. Monitoring has included the following:

- Continuous monitoring of alluvial groundwater levels in monitoring bores AQD1073A, WBH1, WBH2, WBH3, MB03A and MB04 with EC readings taken every three months.
- Continuous monitoring of groundwater levels in bore NER1010 in the Bellbird South area to monitor the porous rock (sandstone) aquifer.
- Daily rainfall in the vicinity of the site to provide context for fluctuations in groundwater level (via the meteorological station located at the CHPP – refer **Figure 11**).
- Review of groundwater levels in DPIE-Water bore GW080975 (30m deep) and the adjacent shallow bore GW080974 (7m deep) (when data is available).
- Monitoring of the Stage 3 porous rock aquifer in bores MB01 and MB02 over the Stage 3 area. Groundwater levels have been monitored continuously and EC is recorded periodically.

For water level monitoring, quarterly dips are taken. Water quality monitoring frequency and analytes for groundwater monitoring bores are presented in **Table 8-4**.

Monitoring results are reported in the Annual Review.

Monitoring is planned to continue until subsidence surveys show that no on-going subsidence impacts are occurring at or near these sites. Groundwater monitoring will continue during closure, however the frequency of water level monitoring may be reduced to 6 monthly following confirmation of no further subsidence.

8.2.6 Privately Owned Bores

Similar to the management of farm dams, Austar has committed to monitoring all privately owned bores within the Bellbird South and Stage 3 subsidence affected area during and following undermining where access is granted. If the capacity of any utilised private bore is reduced to unacceptable levels as a result of subsidence, Austar will provide an alternative supply of water until such time as Subsidence Advisory NSW re-establishes or replaces the bore. This process will be undertaken through preparation of individual property Built Features Management Plans as a management strategy of the relevant Extraction Plan.

8.2.7 Groundwater Dependent Ecosystems (River-flat Eucalypt Forest EEC)

The Bellbird South Stage 2 Area Ecological Monitoring Program was conducted on a twice yearly basis to monitor potential effects of subsidence on groundwater dependent ecosystems (River-flat Eucalypt Forest EEC) and riparian vegetation associated with the alluvium of Quorrobolong Creek / Cony Creek system.

The monitoring program has been completed with Stage 2 mining having been completed in 2013 and no impacts due to longwall mining having been observed. Results of monitoring were provided to DPIE – Environment, Energy and Science (EES) (formerly the Office of Environment and Heritage – OEH) for review. In correspondence from DPIE – ESS dated 17 May 2019 it was concluded the monitoring program demonstrated that no harm from mine subsidence occurred in riparian vegetation above the Stage 2 Area and no further monitoring is required.

8.2.8 Groundwater Quality Monitoring Methodology

A summary of the site groundwater monitoring methodology is provided in **Table 8-3**. Monitoring bore locations are shown in **Figure 11**.

TABLE 8-3 - GROUNDWATER MONITORING METHODOLOGY

Monitoring Location ID	Groundwater Monitoring Methodology
AQD1073A	Low-flow purging until water quality parameter stabilisation or three-bore volumes. This bore can run dry if purged too quickly.
MB01	Sampled via Hydrasleeve discrete-point sampler.
MB02	Sampled via Hydrasleeve discrete-point sampler.
MB03A – installed to replace MB03	Low-flow purging until water quality parameter stabilisation or three-bore volumes.
MB04	Low-flow purging until water quality parameter stabilisation or three-bore volumes.
NER1010	Sampled via Hydrasleeve discrete-point sampler.
WBH1	Low-flow purging until water quality parameter stabilisation or three-bore volumes.
WBH2	Low-flow purging until water quality parameter stabilisation or three-bore volumes.
WBH3	Low-flow purging until water quality parameter stabilisation or three-bore volumes.

Groundwater monitoring is undertaken in accordance with:

- The Australian / New Zealand Standard Water Quality – “Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples” (AS / NZS 5667.1:1998).
- The Australian / New Zealand Standard Water quality – “Sampling, Part 11: Guidance on sampling of groundwaters” (AS / NZS 5667.11:1998).
- Geoscience Australia, (2009), “Groundwater Sampling and Analysis – A Field Guide”.
- Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) Standard operating procedures (SOPs) for groundwater level, groundwater quality sampling and transport, and groundwater level logger download and installation.

Bores with suitable recovery rates and permeability are purged with an electro-submersible pump and purged using standard low-flow technique or until three bore volumes have been abstracted. The sampling pump is equipped with a no-return valve at the pump and is flushed with clean water between each monitoring bore.

A number of bores have been deemed “no-purge bores” due to their low permeability/slow recovery rates and/or the depth to water, namely MB01, MB02 and NER1010. Their low permeability makes purging problematic and inconsistent between monitoring rounds. In order to monitor these bores in a consistent manner, a Hydrasleeve discrete-point sampler is used to recover a sample at the same depth/screen interval at each monitoring round.

Site monitoring bores are only assessed for field parameters on a quarterly basis, with laboratory samples collected annually as part of the monitoring program.

All field parameters are measured using a calibrated water quality meter. The water quality meter is serviced once per year and the measuring elements are replaced regardless of their condition. Calibration solutions are stored as per the SDS/instructions and only small amounts are taken into the field during monitoring campaigns.

Laboratory samples are placed in laboratory supplied pre-prepared sample bottles with appropriate preservative added, stored in chilled insulated containers and despatched for analysis at a NATA certified laboratory.

8.3 Monitoring Program Summary

The relevant monitoring requirements are summarised in **Table 8-4**. Additional groundwater monitoring bores may be installed to inform groundwater modelling and assessments for the mine closure planning program.

TABLE 8-4 - MONITORING PROGRAM SUMMARY

Routine Environmental Monitoring	Reason	Location(s)	Frequency
General Condition			
Environmental inspection	EMP	Austar Pit Top Pelton CHPP No 1 Shaft No 2 Shaft Kalingo Infrastructure Area (3 shaft) Kitchener Surface Infrastructure Site Rehabilitation areas (Area 12, Area 13) Aberdare Extended Reject Emplacement	Monthly general condition / observations (including erosion and sediment control integrity) Periodic (at least annually) inspection of channels at CHPP and Pit Top. Sediment retention cells – after major rainfall events (>50mm in 48 hours)
Meteorology			
Meteorological station	EPL 416	CHPP (<i>refer Figure 11 for location</i>)	Continuous for air temperature, wind direction, wind speed and sigma theta. Rainfall per 24 hour period.
Water – Surface			

Routine Environmental Monitoring	Reason	Location(s)	Frequency
CHPP – EPL points	Consent / EPL 416 / SWMP	SW1 (LDP 1 – Emergency Dam Spillway) SW2 (Bellbird Creek Pinch Bridge) SW4 (Bellbird Creek, Downstream Boundary) SW5 (Unnamed Creek, Upstream Boundary) SW6 (LDP6 – 1ML tank discharge to Bellbird Ck) (Refer Figure 11 for locations)	<p>Monthly (unless there is no water at the sites):</p> <ul style="list-style-type: none"> Quality – SW2, SW4, SW5, SW6 (pH, EC, TSS, Fe) Volume – SW6 (kL/day) Qualitative flow estimate – SW2, SW4, SW5 <p>Twice per year (unless there is no water at the sites):</p> <ul style="list-style-type: none"> Quality – SW2, SW4, SW5, SW6 (EC, pH, TSS, Total Dissolved Solids, redox potential, Major ions and charge balance error, Total Metals) <p>During discharge at SW1:</p> <ul style="list-style-type: none"> Quality daily – SW1. At a minimum of 12 hourly intervals (pH, EC, TSS, TDS, Fe) Volume daily – SW1. At a minimum of 12 hourly intervals (kL/day) Quality 3 times per week – SW2, SW4, SW5. At a minimum of 48 hour intervals (pH, EC, TSS, Fe)
Creeks – Bellbird South UG mining area	Consent / SWMP	SW Q1 (Quorrobolong Ck, Sandy Ck Rd) SW Q2 (Quorrobolong Ck Upstream) SW Q3 (Quorrobolong Ck Downstream) SW C1 (Cony Ck) (Refer Figure 11 for locations)	<p>Quarterly (unless there is no water at the sites):</p> <ul style="list-style-type: none"> Quality (pH, EC, TSS, Fe) <p>Twice per year (unless there is no water at the sites):</p> <ul style="list-style-type: none"> Quality (EC, pH, TSS, Total Dissolved Solids, redox potential, Major ions and charge balance error, Total Metals) <p>Annual</p> <p>Visual monitoring of stream health and channel stability (SW Q1, SW Q2 & SW C1 only)</p>

Routine Environmental Monitoring	Reason	Location(s)	Frequency
Dams – Farm	Consent / SWMP	Various landholders	BFMP's identify all farm dams in mining areas. Subsidence is substantially complete. Any claims for damage to farm dams will be addressed as required and referred to Subsidence Advisory NSW if required. No further scheduled monitoring of farm dams will occur.
Inspection of sediment and erosion control works, monitoring of sediment basin volume	Consent / SWMP	Kitchener Surface Infrastructure Site, CHPP area, Austar Pit Top, Aberdare Extended Emplacement Area	After major rainfall events (>50mm in 48 hours)
Water – Ground			
Aquifer level logging – Bellbird South	Consent / SWMP	AQD1073A, WBH1, WBH2, WBH3, MB03A and MB04 (alluvial aquifers) NER1010, MB01, MB02 (shallow porous rock aquifer) (Refer Figure 11 for locations)	Daily level, downloaded quarterly. Quarterly field parameters (pH, EC, ORP, temperature). Twice per year (unless there is no water in the bores): <ul style="list-style-type: none"> Quality – EC, pH, TSS, Total Dissolved Solids, redox potential, Major ions and charge balance error, Total Metals
Private Groundwater Bores – capacity	Project Approval / Extraction Plan	At any utilised private bore within the Bellbird South or Stage 3 subsidence affected area where access is granted	As requested if within Austar's subsidence zones. Subsidence is substantially complete. Any claims for damage to bores will be addressed as required and referred to Subsidence Advisory NSW if required. No scheduled monitoring of privately owned bores has or will occur.

Routine Environmental Monitoring	Reason	Location(s)	Frequency
UG waters	Consent / SWMP / Water Licence	East Pelton * † West Pelton * † Blue Panel * † 13.5ct 1 East Mains (Kalingo workings)* † 5.5ct North West * † LW 13 Goaf * † SL2 Goaf * † LWA7 Holes † Ellalong Goaf (2 Shaft) * † (Refer Figure 11 for indicative locations)	* Monthly flow and/or pressure (where the sites are accessible) † Annual water quality (if there is water at the sites and the sites are accessible) Quality – EC, pH, TSS, Total Dissolved Solids, redox potential, Major ions and charge balance error, Total Metals† Quarterly water quality (when mine dewatering is occurring) (pH, TDS, TSS, EC, Ca, Mg, Fe, Si, Oil & Grease at a minimum)
UG workings	SWMP / Austar information	Kalingo Colliery (Shaft) Bellbird Colliery (Borehole 1 and 2) Aberdare Central Colliery (Shaft) Ellalong Colliery (No 2 Shaft) Pelton Colliery (Refer Figure 11 for locations)	Monthly level dipping
Investigation Drainage Line	EPL 416 PRP	Investigation Drainage Line Photo points 1 – 26 Groundwater Monitoring Bore Water sampling points 1 - 6	As specified in the EPL

9 SURFACE AND GROUNDWATER RESPONSE PLAN

This section sets out the surface and groundwater response plan for Austar Coal Mine. Potential impacts on surface and groundwater, triggers, actions and responsibilities for addressing potential impacts are summarised in Table 9-1.

9.1 Water Quality Exceedance

Notification and investigation of water quality exceedances will be undertaken in accordance with the process set out in **Section 12.2**.

9.2 Unlicensed Discharge

In the event of an unlicensed discharge, Austar will assess the incident against the criteria in the Pollution Incident Response Management Plan (PIRMP) to determine if the incident classifies as a notifiable pollution incident, i.e. has the pollution incident caused or does it threaten material harm to the environment. Where the incident is notifiable, notification procedures in the PIRMP are to be followed.

An investigation report on the unlicensed discharge will be prepared and provided to the EPA and/or other relevant agencies in accordance with licence and consent conditions

9.3 Loss of Surface Water Flows in Farm Dams

As set out in **Table 9-1**, should visual monitoring of farm dams within the Bellbird South or Stage 3 management areas indicate a loss of water, Austar will conduct an investigation into the potential causes of the loss. If the loss of water is found to be a result of longwall mining in the Bellbird South or Stage 3 areas, further actions will be taken to address the matter including remedial measures in creeks or repairs to farm dams where required.

In the event that subsidence has been found to cause a significant loss of water from farm dams, Austar will provide an alternative water supply to the affected property until the farm dam is repaired.

9.4 Adverse Impacts on Groundwater Dependent Ecosystems or Riparian Vegetation

Adverse impacts of Groundwater Dependent Ecosystems and Riparian Vegetation due to subsidence were covered in the Extraction Plan management plans for Longwalls LWB1-LWB3, LWB4-LWB7 and Stage 3 Longwalls A7- A10.

Ecological monitoring programs for each extraction plan considered the health of riparian vegetation and groundwater dependent ecosystems for the duration of mining and for one year after mining to allow for subsidence impacts. A review of subsidence monitoring by MSEC in February 2021 concluded:

The ongoing long-term residual subsidence effects (i.e. after the survey dated 10 February 2021) are expected to be very small and unlikely to result in adverse physical impacts to the

natural environment. MSEC therefore considers that ground monitoring could be ceased as the ongoing subsidence effects are expected to be very small and similar to the order of natural ground movements and survey tolerance.

In the tributary impact statement for Bellbird Creek, undertaken in 2014, there were no identified Groundwater Dependent Ecosystems, and no significant riparian vegetation that were considered to be dependent upon the current water discharges. On this basis and given mining has ceased, a TARP is not considered necessary in this review of the management plan.

TABLE 9-1 - SURFACE AND GROUNDWATER RESPONSE PLAN - TRIGGERS, ACTIONS AND RESPONSIBILITIES

Aspect	Trigger	Action	Responsibility	Further Information
Surface water quality impacts	Exceedance of water quality criteria set out in EPL 416	Investigate and prepare report outlining causes, impacts and recommended mitigation measures. Supply report to DPE, EPA, and any other relevant agency as required by approvals, within required timeframe of approvals. Implement report recommendations.	Environment and Community Superintendent	Section 9.1
Surface water discharge	Surface water discharge that is not licenced under EPL 416	<p>Stop discharge if possible through pumping to relevant dams or storages.</p> <p>Notify DPIE, EPA and any other relevant agency and potentially affected persons (where necessary) as required by the notification requirements of DA 29/95, PA 08_0111 and EPL 416, within the timeframe specified in these approvals.</p> <p>Consider whether the Pollution Incident Response Management Plan should be activated (i.e. PIRMP material harm incident trigger).</p> <p>Investigate and prepare report outlining causes, impacts and recommended mitigation measures.</p> <p>Provide investigation report to relevant agencies (EPA within 7 days in case of triggered PIRMP action), and within required timeframes (refer DA 29/95, PA 08_0111 and EPL 416, as appropriate).</p> <p>Implement agreed report recommendations.</p>	Environment and Community Superintendent	Section 9.1
Impact on groundwater levels in alluvial aquifer or shallow porous rock aquifer	Alluvial or shallow porous rock aquifer groundwater level monitoring results are outside impact predictions, but sufficiently benign to cause no immediate adverse impact including minor temporal (RL) change as a result of surface subsidence.	<p>Assess if groundwater level change is due to mining related activities in the Extraction Plan area.</p> <p>Increase monitoring and review frequency whilst monitoring results are outside of predictions and continue to assess.</p>	Environment and Community Superintendent	

Site Water Management Plan

Aspect	Trigger	Action	Responsibility	Further Information
	<p>Increased frequency of monitoring shows continual departure from range of approved impact predictions (i.e. during 3 or more consecutive monitoring events in previous 12 months).</p> <p>Monitoring results outside impact predictions and cause immediate adverse impact.</p> <p>Monitoring results indicate potential groundwater take in excess of current licenced entitlement.</p>	<p>Assess if groundwater level change is due to mining related activities in the Extraction Plan area.</p> <p>Trigger incident investigation and reporting protocols. Notify DIPE and any other relevant agency and potentially affected persons (where necessary) as required by approvals, within required timeframe of approvals. Conduct an investigation to determine the extent of the incident's impacts and identify contributing factors. Develop an appropriate course of action in consultation with relevant stakeholders and DIPE-Water. Implement the approved course of action.</p> <p>Review monitoring program, Extraction Plan Water Management Plan and this SWMP.</p> <p>Review monitoring results of Groundwater Dependent Ecosystems from the LWB1-B7 Biodiversity Management Plan.</p> <p>Review groundwater assessment and update monitoring and management plans.</p> <p>Procure additional licences for the relevant water source, where required.</p>	Environment and Community Superintendent	
Impact on stream health and stability in Quorrobolong Creek	<p>Impacts for Quorrobolong Creek and Unnamed Tributary are outside those described in the LWB1-B7 Water Management Plan.</p> <p>Deteriorating trend in stream health and/or stability.</p>	<p>Assess if exceedance is due to mining related activities in the Extraction Plan area.</p> <p>-If not due to mining impacts – continue monitoring.</p> <p>-If attributable to mining – trigger non-compliance reporting protocols, and remediate as required. Notify DIPE and any other relevant agency and potentially affected persons (where necessary) as required by development consent or project approval conditions, within specified timeframe. Develop an appropriate course of action with stakeholders. Implement agreed course of action. Review monitoring program.</p>	Environment and Community Superintendent	Section 8.1.4.1
Subsidence monitoring identifies remnant ponding	<p>Monitoring results identify remnant ponding in excess of impact predictions and the ponding area does not infiltrate back to alluvial soils over period of one year.</p>	<p>Undertake land remediation in accordance with the Land Management Plan to remediate the unplanned ponding where requested by the land owner.</p>	Environment and Community Superintendent	LWB1-B7 Extraction Plan – Water Management Plan
Impact on water levels in farm dams	<p>Minor impact to farm dam volumes detected - no interruption to water supply</p>	<p>Assess if water level change is due to mining related activities in the Extraction Plan area.</p> <p>Farm dam repair to be managed by Subsidence Advisory NSW and water supply restored in accordance with respective Built Features Management Plan.</p>	Environment and Community Superintendent	Section 8.1.4.5
	<p>Significant loss of water level during or after mining under dam that is not associated with pumping / farm use</p>	<p>Assess if water level change is due to mining related activities in the Extraction Plan area.</p>	Environment and Community Superintendent	Section 8.1.4.5

Site Water Management Plan

Aspect	Trigger	Action	Responsibility	Further Information
		Austar to supply alternative water supply until farm dam is repaired, as per current Subsidence Advisory NSW process and in accordance with respective Built Features Management Plan. Notify DPIE and any other relevant agency and potentially affected persons (where necessary) as required by approvals, within required timeframe of approvals.		
Impact on yield of private bores	Bore yield is reduced to unacceptable level as a result of subsidence (as indicated by pre and post-mining groundwater yield testing where permitted by landholder, or as advised by landholder)	Confirm water level change is due to mining related activities in the Extraction Plan area. Undertake pumping test, compare with pre-mining hydraulic performance, and assess if impact is due to mining. If impact is concluded to be likely due to mining impacts, provide alternative water supply to affected landholder until private bore is repaired or replaced by Subsidence Advisory NSW and water supply restored in accordance with relevant Built Features Management Plan. Notify DPIE and any other relevant agency and potentially affected persons (where necessary) as required by approvals, within required timeframe of approvals.	Environment and Community Superintendent	Section 8.2.6
	Bore capacity is damaged due to mining impacts and cannot be used.	Austar to provide alternative water supply to affected landholder until private bore is repaired or replaced by Subsidence Advisory NSW and water supply restored in accordance with relevant Built Features Management Plan. Notify DPIE and any other relevant agency and potentially affected persons (where necessary) as required by approvals, within required timeframe of approvals.	Environment and Community Superintendent	Section 8.2.6
Impacts to DPI-Water monitoring bores	Monitoring of bore condition by WaterNSW indicates damage to bore during or post mining.	Confirm impact is due to mining related activities in the Extraction Plan area. If not due to mining related impacts – liaise with DDPIE-Water and continue monitoring if agreed. If damage attributable to mining impacts and cannot be used – liaise with DPIE-Water and, if required, bore to be repaired/replaced in accordance with the respective Built Features Management Plan.	Environment and Community Superintendent	LWB1-B7 Extraction Plan – Water Management Plan
Orange staining in Investigation Drainage Line	Quarterly inspection identifies orange staining in Investigation Drainage Line, OR Groundwater level in groundwater Bore 1 between 0-2.5m from Top of Casing (RL 112.7 or above)	Commence monthly monitoring. Check containment points and ensure processes are in place to prevent orange staining leaving site.	Environment and Community Superintendent CHPP Supervisor	Section 8.4

10 CONTINGENCY PLAN FOR UNPREDICTED IMPACTS

Should impacts eventuate that have not been predicted or contemplated in this SWMP, the following contingency plan will apply:

1. Assess whether impacts constitute a material risk of harm to the environment and trigger the PIRMP and reporting requirements of the EMS if necessary.
2. Investigate the cause of the unpredicted impact. This may include onsite process owners or external specialists as required.
3. Consult with government agencies regarding the unpredicted impact if the impact is material and require additional management strategies.
4. Revise SWMP.

The scale of the unpredicted impact will inform the level of response required through this process and whether the impact is material enough to require government agency consultation.

11 CONTINUAL IMPROVEMENT AND CLOSURE PLANNING

Austar will implement reasonable and feasible best practice water management measures appropriate for a closed site. The basis for continuous improvement of water management measures will be through the ongoing monitoring of water and the contingency response and adaptive management process outlined in **Section 9**.

Current closure planning studies are assessing surface and groundwater impacts and mitigation measures and will, where reasonable and feasible, consider current best practice water management measures in planned closure activities.

The Mining Operations Plan contains commitments to undertake a mine closure planning strategy, including a water management study. The water management study commits to:

- Review the existing groundwater information to consider aspects related to the closure of the mine
- Review the site water balance and any post closure water management requirements, including management of acid mine drainage
- Review post closure water licencing requirements

The mine closure planning strategy is designed to inform the preparation of a detailed Mine Closure Plan. During the development of the detailed Mine Closure Plan, Austar will liaise with relevant regulators, including DPE and Resources Regulator. The detailed mine closure plan will consider likely controls required to mitigate risks, and contain relevant objectives for closure in relation to water management.

Any new mitigation measures that are implemented as a result of these investigations will be reported in the Annual Review Report.

12 COMPLAINTS, INCIDENTS AND REPORTING

12.1 Community Complaints and Independent Review

Community complaints are to be managed in accordance with the requirements of the Environmental Management Strategy.

A complaints register will be published on the Austar Coal Mine website, which will be updated monthly, and a summary of complaints will be provided in the Annual Review.

12.2 Incident Reporting

Schedule 7 Condition 6 of PA 08_0111 and Schedule 5 Condition 4 of DA 29/95 specify the requirements for incident reporting. An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the approval.

There is inconsistency between the wording of the conditions, however the following protocol addresses the requirements of both conditions.

Austar will notify the Department and any other relevant agencies, of any incident associated with the mine complex as soon as practicable after Austar becomes aware of the incident.

Within 7 days of the date of the incident, Austar will provide a detailed report on the incident to the Department and any other relevant agencies. The report will include the following details:

- The date, time and nature of the exceedance/incident;
- Identify the cause (or likely cause) of the exceedance/incident;
- Describe what action has been taken to date; and
- Describe the proposed measures to address the exceedance/incident.

Further investigation may be required beyond the 7 days depending on the nature of the incident.

The EPL should be referred to for notification requirements relating to incidents causing or threatening material harm to the environment.

12.3 Information Dissemination

A summary of monitoring results will be presented at Austar Community Consultative Committee (CCC) meetings.

Information will also be made available on the Austar website in accordance with the requirements of Schedule 7 Condition 9 of PA 08_0111 and Schedule 5 Condition 12 of DA 29/95.

12.3.1 Advice to Black Creek Water Users

Where possible, water users will be advised within the 24 hour period immediately prior to the commencement of any discharge from SW1. Where prior advice is not possible, advice will be given as soon as practicable after discharge commences.

The site will advise water users of the conductivity of water being discharged and conductivity of the waters of Bellbird Creek and the intersection of Black Creek with Lomas Lane will be advised to water users on request.

12.4 Annual Review

In accordance with Schedule 7 Condition 3 of PA 08_0111 and Schedule 5 Condition 5 of DA 29/95, Austar will prepare an Annual Review for submission to the Department.

13 DOCUMENT REVIEW AND REVISION

Schedule 7 Condition 4 of PA 08_0111 and Schedule 5 Condition 8 of DA 29/95 specify the requirements for revision of strategies plans and programs. There is inconsistency between the wording of the conditions, however, both require that within 3 months of:

- The submission of an Annual Review;
- The submission of an incident report;
- The submission of an audit report; or
- The approval of a modification to the conditions of consent;

Austar shall review the strategies, plans and programs required by the approval/consent to the satisfaction of Department.

DA 29/95 requires Austar to notify the Department in writing of any such review being undertaken.

Where a review leads to revision of a document, the revised document must be submitted to the Department for approval. The timing for submission of revised plans differs between the consents, being 4 weeks in PA 08_0111 and 6 weeks in DA 29/95. Given this, the 4 week requirement in PA 08_0111 will prevail.

Any changes made to this Plan or supporting documents as a result of the review will be made in consultation with relevant agencies.

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Appendix A:

Approval Requirements

PROJECT APPROVAL/DEVELOPMENT CONSENT REQUIREMENTS

Relevant conditions from PA 08_0111 and DA 29/95 and where these conditions are addressed in this Plan are listed in the tables below.

PROJECT APPROVAL CONDITIONS (PA 08_0111)

Schedule	Project Approval Condition	Section of this Plan
2	STRATEGIES, PLANS AND PROGRAMS	
2	12. With the approval of the Director-General, the Proponent may submit any strategies, plans or programs required by this approval on a progressive basis.	Noted
2	13. With the approval of the Director-General, the Proponent may integrate any strategies, plans, programs, reviews, audits or committees required by this approval with any similar requirement under another development consent or approval relating to the Austar Mine Complex.	SWMP addresses PA 08_0111 and DA 29/95 conditions
3	SECOND WORKINGS	
3	Extraction Plan 4. The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General. This plan must: (a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Director-General, and be approved by the Director-General prior to the commencement of any second workings covered by the Extraction Plan; (b) include a detailed plan for the second workings, which has been prepared to the satisfaction of DRE, and provides for adaptive management; (c) include detailed plans of any associated surface construction works; (d) include the following to the satisfaction of DRE: · a coal resource recovery plan that demonstrates effective recovery of the available resource; · revised predictions of the subsidence effects and subsidence impacts of the extraction plan, incorporating any relevant information that has been obtained since this approval; and · a Subsidence Monitoring Program to: o validate the subsidence predictions; and o analyse the relationship between the subsidence effects and subsidence impacts of the Extraction Plan and any ensuing environmental consequences; (e) include a: · Watercourse Management Plan, which has been prepared in consultation with OEH and NOW, to manage the environmental consequences of second workings on watercourses (including flooding and ponding) and alluvial aquifers; · Biodiversity Management Plan, which has been prepared in consultation with OEH, to manage the potential environmental consequences of second workings on aquatic and terrestrial flora and fauna, with a specific focus on threatened species;	Extraction Plans in place. Applicability during closure to be determined.

Schedule	Project Approval Condition	Section of this Plan
	<ul style="list-style-type: none"> · Land Management Plan, to manage the potential environmental consequences of second workings on steep slopes and land in general; · Heritage Management Plan, which has been prepared in consultation with OEH and the relevant Aboriginal groups, to manage the potential environmental consequences of second workings on heritage sites or values; · Built Features Management Plan, which has been prepared in consultation with the owner of the relevant feature, to manage the potential environmental consequences of second workings on any built features; and (f) include a Public Safety Management Plan, which has been prepared in consultation with DRE, to ensure public safety in the mining area. <p><i>Notes:</i></p> <ul style="list-style-type: none"> · <i>In accordance with condition 12 of schedule 2, the preparation and implementation of Extraction Plans for second workings may be staged, with each plan covering a defined area of second workings. In addition, these plans are only required to contain management plans that are relevant to the specific second workings that are being carried out.</i> · <i>The Watercourse Management Plan must be integrated with all relevant aspects of the Site Water Management Plan required under condition 8 of schedule 4.</i> 	
	<p>5. In addition to the standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 4(e) above include:</p> <ul style="list-style-type: none"> (a) a program to collect sufficient baseline data for future Extraction Plans; (b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; (c) a detailed description of the measures that would be implemented to remediate predicted impacts; and (d) a contingency plan that expressly provides for adaptive management. 	Extraction Plans in place. Applicability during closure to be determined.
4	SURFACE AND GROUNDWATER	
4	<p>Discharge Limits</p> <p>8. The Proponent shall not discharge any water from the site except as may be expressly provided by an EPL, or in accordance with section 120 of the <i>Protection of the Environment Operations Act 1997</i>.</p>	5
4	Site Water Management Plan	
4	<p>9. The Proponent shall prepare and implement a Site Water Management Plan for the mine complex to the satisfaction of the Director-General. This plan must:</p> <ul style="list-style-type: none"> (a) be prepared in consultation with EPA, NOW and DRE, and be submitted to the Director-General for approval prior to the commencement of second workings in Stage 3 and construction of the Surface Infrastructure Site (other than shaft construction referred to in condition 1 above); and 	2
4	<ul style="list-style-type: none"> (b) include, in addition to the standard requirements for management plans (see condition 2 of schedule 7): (i) a Site Water Balance, which details; <ul style="list-style-type: none"> · sources and security of water supply; · water use and management on site; · any off-site water transfers or discharges; and 	6.16.2 6.3, 6.4 6.4.5 6.5

Schedule	Project Approval Condition	Section of this Plan
	<ul style="list-style-type: none"> · measures to minimise water use by the project; 	7
	(ii) an Erosion and Sediment Control Plan;	8.1
	(iii) a Surface Water Monitoring Program, including programs to monitor:	
	· surface water flows and quality, stream health and channel stability in Black Creek, Cony Creek, Sandy Creek and Quorrobolong Creek; and	
	· impacts on water users and water levels in farm dams;	8.2.4
	(iv) a Ground Water Monitoring Program, including programs to monitor:	
	· groundwater volumes and quality seeping into the underground mine workings;	8.2.4
	· impacts on regional aquifers;	8.2.6
	· impacts on the groundwater supply of potentially affected landowners;	8.2.4
	· impacts on the alluvial aquifers in Black Creek, Cony Creek, Sandy Creek and Quorrobolong Creek; and	8.2.7
	· impacts on groundwater dependent ecosystems and riparian vegetation (including the River-flat Eucalypt Forest EEC); and	9
	(v) a Surface and Ground Water Response Plan, which describes the measures and/or procedures that would be implemented to:	
	· respond to any exceedances of the relevant performance measures/criteria;	
	· compensate landowners of privately-owned land whose water supply is adversely affected by the project; and	
	· mitigate and/or offset any adverse impacts on groundwater dependent ecosystems or riparian vegetation.	
7	ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING	
	Management Plan Requirements	
	2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
	(a) detailed baseline data;	3
	(b) a description of:	4
	<ul style="list-style-type: none"> • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; 	5
	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;	
	(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	
	(d) a program to monitor and report on the:	8
	<ul style="list-style-type: none"> • impacts and environmental performance of the project; • effectiveness of any management measures (see (c) above); 	
	(e) a contingency plan to manage any unpredicted impacts and their consequences;	10

Schedule	Project Approval Condition	Section of this Plan
	(f) a program to investigate and implement ways to continually improve the environmental performance of the project over time;	11
	(g) a protocol for managing and reporting any: <ul style="list-style-type: none"> incidents; complaints; non-compliances with statutory requirements; and exceedances of the impact assessment criteria and/or performance criteria; and	12
	(h) a protocol for periodic review of the plan.	13

DEVELOPMENT CONSENT CONDITIONS (DA 29/95)

Schedule	Development Consent Conditions	Section of this Plan
	Site Water Management Plan	
3	6. Prior to mining commencing in panel A3, or other date agreed by the Secretary, the Applicant must revise its Site Water Management Plan for the mine, in consultation with the DPI-Water and the EPA, and to the satisfaction of the Secretary. This plan must be implemented to the satisfaction of the Secretary, and must include: <ul style="list-style-type: none"> (a) a Site Water Balance; (b) an Erosion and Sediment Control Plan; (c) a Surface Water Monitoring Program; (d) a Ground Water Monitoring Program; and (e) a Surface and Ground Water Response Plan. 	6.1 7 8.1 8.2 9
	Site Water Balance	
3	7. The Site Water Balance must: <ul style="list-style-type: none"> (a) include details of: <ul style="list-style-type: none"> · sources of water and water licences; · water use on site; · water management on site; · off-site water transfers or discharges; · reporting procedures; and (b) describe measures to minimise water use by the development. 	6.1
	Erosion and Sediment Control	
3	8. The Erosion and Sediment Control Plan must: <ul style="list-style-type: none"> (a) be consistent with the requirements of Landcom's <i>Managing Urban Stormwater: Soils and Construction</i> manual; (b) identify activities that could cause soil erosion and generate sediment; (c) describe measures to minimise soil erosion and the potential for transport of sediment downstream; (d) describe the location, function and capacity of erosion and sediment control structures; and 	7

Schedule	Development Consent Conditions	Section of this Plan
	(e) describe what measures would be implemented to maintain the structures over time.	
	Surface Water Monitoring	
3	<p>9. The Surface Water Monitoring Program must include:</p> <p>(a) surface water assessment criteria;</p> <p>(b) a program to monitor surface water flows and quality (particularly in Black, Cony and Quorrobolong Creeks) and stream health;</p> <p>(c) a program to monitor water levels in farm dams within the subsidence zone and impacts on other water users;</p> <p>(d) a program to monitor channel stability in Quorrobolong and Cony Creeks;</p> <p>(e) reporting procedures; and</p> <p>(f) a protocol for the investigation, notification and mitigation of identified exceedances of the surface water criteria that are related to the development (particularly in respect of acid mine drainage and acid leachate).</p>	8.1
	Groundwater Monitoring	
3	<p>10. The Groundwater Monitoring Program must include:</p> <p>(a) ground water impact assessment criteria;</p> <p>(b) a program to monitor the volume and quality of ground water seeping into the underground mine workings;</p> <p>(b1) a program to monitor impacts to groundwater dependent ecosystems and riparian vegetation;</p> <p>(c) a program to monitor ground water levels and quality; and</p> <p>(d) a protocol for the investigation, notification and mitigation of identified exceedances of the ground water impact assessment criteria.</p>	8.2
	Surface and Ground Water Response Plan	
3	<p>11. The Surface and Ground Water Response Plan must include:</p> <p>(a) the procedures that would be followed in the event of any exceedance of the surface or groundwater impact assessment criteria, or other identified impact on surface or groundwater;</p> <p>(b) measures to mitigate, remediate and/or compensate any identified impacts (including measures to mitigate and/or compensate potentially affected landowners for any loss of surface water flows in local creeks or farm dams); and</p> <p>(c) disposal/neutralisation contingencies in the event that acid leachate problems emerge after the mine closes.</p>	9
5	ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING AND REPORTING	
5	<p>Incident Reporting</p> <p>4. Within 7 days of detecting an exceedance of the limits/performance criteria in this consent, the Applicant must report the exceedance/incident to the Department (and any relevant agency). The report must:</p> <p>(a) describe the date, time, and nature of the exceedance/incident;</p> <p>(b) identify the cause (or likely cause) of the exceedance/incident;</p> <p>(c) describe what action has been taken to date; and</p> <p>(d) describe the proposed measures to address the exceedance/incident.</p>	12.2

Schedule	Development Consent Conditions	Section of this Plan
5	<p>Regular Reporting</p> <p>4A. The Applicant must provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.</p>	12.3
5	<p>Annual Review</p> <p>5. By the end of September each year, unless the Secretary agrees otherwise, the Applicant must submit a review to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:</p> <p>(a) describe the development (including any rehabilitation) that was carried out in the previous year to 30 June, and the development that is proposed to be carried out over the current year to 30 June;</p> <p>(b) include a comprehensive review of the monitoring results and complaints records of the development over the previous year to 30 June, which includes a comparison of these results against the:</p> <ul style="list-style-type: none"> • relevant statutory requirements, limits or performance measures/criteria; • requirements of any plan or program required under this consent; • monitoring results of previous years; and • relevant predictions in the documents listed in condition 2 of Schedule 2; <p>(c) identify any non-compliance over the past year, and describe what actions were (or are being) taken to ensure compliance;</p> <p>(d) identify any trends in the monitoring data over the life of the development;</p> <p>(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and</p> <p>(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.</p>	12.4
5	<p>Updating and Staging of Strategies, Plans or Programs</p> <p>8A. To ensure that strategies, plans or programs required under this consent are updated on a regular basis, and that they incorporate any appropriate additional measures to improve the environmental performance of the development, the Applicant may at any time submit revised strategies, plans or programs for the approval of the Secretary. With the agreement of the Secretary, the Applicant may also submit any strategy, plan or program required by this consent on a staged basis.</p> <p>With the agreement of the Secretary, the Applicant may prepare a revision of or a stage of a strategy, plan or program without undertaking consultation with all parties nominated under the applicable condition in this consent. While any strategy, plan or program may be submitted on a staged basis, the Applicant will need to ensure that the operations associated with the development are covered by suitable strategies, plans or programs at all times.</p> <p>If the submission of any strategy, plan or program is to be staged; then the relevant strategy, plan or program must clearly describe the specific stage/s of the development to which the strategy, plan or program applies; the</p>	Noted

Schedule	Development Consent Conditions	Section of this Plan
	relationship of this stage/s to any future stages; and the trigger for updating the strategy, plan or program.	
5	Relationship with other consents 8B. With the agreement of the Secretary, the Applicant may combine any strategy, plan, program, review, audit or committee required by this consent with any similar requirement under another development consent or approval relating to the Austar Mine Complex, including Project Approval 08_0111 for the Stage 3 mining area.	SWMP addresses PA 08_0111 and DA 29/95 conditions
5	Evidence of Consultation 8C. Where consultation with any public authority is required by the conditions of this consent, the Applicant must: (a) consult with the relevant public authority prior to submitting the required document to the Secretary for approval; (b) submit evidence of this consultation as part of the relevant document; (c) describe how matters raised by the authority have been addressed and any matters not resolved; and (d) include details of any outstanding issues raised by the authority and an explanation of disagreement between any public authority and the Applicant.	2
5	Access to Information 12. The Applicant must: (a) make copies of the following publicly available on its website: <ul style="list-style-type: none"> the documents listed in condition 2 of Schedule 2; all current statutory approvals for the development; approved strategies, plans and programs required under the conditions of this consent; a comprehensive summary of the monitoring results of the development, which have been reported in accordance with the various plans and programs approved under the conditions of this consent; a summary of the progress of the development; contact details to enquire about the development or to make a complaint; a complaints register, which is to be updated on a monthly basis; minutes of CCC meetings; the last five annual reviews; any independent environmental audit of the development, and the Applicant's response to the recommendations in any audit; any other matter required by the Secretary; and (b) keep this information up-to-date, to the satisfaction of the Secretary.	12.3

EPL REQUIREMENTS

Relevant conditions from EPL 416 and where these conditions are addressed in this Plan are listed in the table below.

ENVIRONMENT PROTECTION LICENCE 416 (EPL 416)

Section	EPL Conditions	Section of this Plan																																																												
3	LIMIT CONDITIONS																																																													
3	L1 Pollution of waters L1.2 Discharge from Point 1 is permitted only when the discharge occurs solely as a result of rainfall at the premises exceeding: a) a total of 168 millimetres over any consecutive five day period; or b) 48 millimetres in less than any consecutive 12 hour period.	5																																																												
3	L2 Concentration limits L2.1 For each monitoring/discharge point or utilisation area specified in the table\>s below (by a point number), the concentration of a pollutant discharged at that point, or applied to that area, must not exceed the concentration limits specified for that pollutant in the table. L2.2 Where a pH quality limit is specified in the table, the specified percentage of samples must be within the specified ranges. L2.3 To avoid any doubt, this condition does not authorise the pollution of waters by any pollutant other than those specified in the table\>s. L2.4 Water and/or Land Concentration Limits POINT 1 <table><tr><th>Pollutant</th><th>Units of Measure</th><th>50 percentile concentration limit</th><th>90 percentile concentration limit</th><th>3DGM concentration limit</th><th>100 percentile concentration limit</th></tr><tr><td>Iron</td><td>milligrams per litre</td><td></td><td></td><td></td><td>1</td></tr><tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5-8.5</td></tr><tr><td>Total dissolved solids</td><td>milligrams per litre</td><td></td><td></td><td></td><td>6000</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td></td><td></td><td></td><td>50</td></tr></table> POINT 6 <table><tr><th>Pollutant</th><th>Units of Measure</th><th>50 percentile concentration limit</th><th>90 percentile concentration limit</th><th>3DGM concentration limit</th><th>100 percentile concentration limit</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td></td><td></td><td></td><td>600</td></tr><tr><td>Iron</td><td>milligrams per litre</td><td></td><td></td><td></td><td>1</td></tr><tr><td>pH</td><td>pH</td><td></td><td></td><td></td><td>6.5 - 8.5</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td></td><td></td><td></td><td>50</td></tr></table>	Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit	Iron	milligrams per litre				1	pH	pH				6.5-8.5	Total dissolved solids	milligrams per litre				6000	Total suspended solids	milligrams per litre				50	Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile concentration limit	Conductivity	microsiemens per centimetre				600	Iron	milligrams per litre				1	pH	pH				6.5 - 8.5	Total suspended solids	milligrams per litre				50	5
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3	L3 Volume and mass limits L3.1 For each discharge point or utilisation area specified below (by a point number), the volume/mass of: a) liquids discharged to water; or; b) solids or liquids applied to the area;	5																																																												

Section	EPL Conditions	Section of this Plan																																																																																												
	<p>must not exceed the volume/mass limit specified for that discharge point or area.</p> <table><tr><th>Point</th><th>Unit of Measure</th><th>Volume/Mass Limit</th></tr><tr><td>1</td><td>kilolitres per day</td><td>2000</td></tr><tr><td>6</td><td>Measure 1</td><td>5000</td></tr></table> <p>Note: For the purpose of this condition 'Measure 1' means KL/day measured as an annual average.</p>	Point	Unit of Measure	Volume/Mass Limit	1	kilolitres per day	2000	6	Measure 1	5000																																																																																				
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4	OPERATING CONDITIONS																																																																																													
4	<p>M2 Requirement to monitor concentration of pollutants discharged</p> <p>M2.1 For each monitoring/discharge point or utilisation area specified below (by a point number), the licensee must monitor (by sampling and obtaining results by analysis) the concentration of each pollutant specified in Column 1. The licensee must use the sampling method, units of measure, and sample at the frequency, specified opposite in the other columns:</p> <p>POINT 1</p> <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td>Special Frequency 1</td><td>Grab sample</td></tr><tr><td>Iron</td><td>milligrams per litre</td><td>Special Frequency 1</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Special Frequency 1</td><td>Grab sample</td></tr><tr><td>Total dissolved solids</td><td>milligrams per litre</td><td>Special Frequency 1</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Special Frequency 1</td><td>Grab sample</td></tr></table> <p>POINT 2</p> <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Iron</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr></table> <p>POINT 4</p> <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Iron</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr></table> <p>POINT 5</p> <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Iron</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>pH</td><td>pH</td><td>Special Frequency 2</td><td>Grab sample</td></tr><tr><td>Total suspended solids</td><td>milligrams per litre</td><td>Special Frequency 2</td><td>Grab sample</td></tr></table> <p>POINT 6</p> <table><tr><th>Pollutant</th><th>Units of measure</th><th>Frequency</th><th>Sampling Method</th></tr><tr><td>Conductivity</td><td>microsiemens per centimetre</td><td>Once a month (min. of 4 weeks)</td><td>Grab sample</td></tr></table>	Pollutant	Units of measure	Frequency	Sampling Method	Conductivity	microsiemens per centimetre	Special Frequency 1	Grab sample	Iron	milligrams per litre	Special Frequency 1	Grab sample	pH	pH	Special Frequency 1	Grab sample	Total dissolved solids	milligrams per litre	Special Frequency 1	Grab sample	Total suspended solids	milligrams per litre	Special Frequency 1	Grab sample	Pollutant	Units of measure	Frequency	Sampling Method	Conductivity	microsiemens per centimetre	Special Frequency 2	Grab sample	Iron	milligrams per litre	Special Frequency 2	Grab sample	pH	pH	Special Frequency 2	Grab sample	Total suspended solids	milligrams per litre	Special Frequency 2	Grab sample	Pollutant	Units of measure	Frequency	Sampling Method	Conductivity	microsiemens per centimetre	Special Frequency 2	Grab sample	Iron	milligrams per litre	Special Frequency 2	Grab sample	pH	pH	Special Frequency 2	Grab sample	Total suspended solids	milligrams per litre	Special Frequency 2	Grab sample	Pollutant	Units of measure	Frequency	Sampling Method	Conductivity	microsiemens per centimetre	Special Frequency 2	Grab sample	Iron	milligrams per litre	Special Frequency 2	Grab sample	pH	pH	Special Frequency 2	Grab sample	Total suspended solids	milligrams per litre	Special Frequency 2	Grab sample	Pollutant	Units of measure	Frequency	Sampling Method	Conductivity	microsiemens per centimetre	Once a month (min. of 4 weeks)	Grab sample	8.1.2
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Iron	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample											
pH	pH	Once a month (min. of 4 weeks)	Grab sample											
Total suspended solids	milligrams per litre	Once a month (min. of 4 weeks)	Grab sample											
4	M3 Testing methods - concentration limits M3.1 Subject to any express provision to the contrary in this licence, monitoring for the concentration of a pollutant discharged to waters or applied to a utilisation area must be done in accordance with the Approved Methods Publication unless another method has been approved by the EPA in writing before any tests are conducted.	8.1.2												
4	M7 Requirement to monitor volume or mass M7.1 For each discharge point or utilisation area specified below, the licensee must monitor: a) the volume of liquids discharged to water or applied to the area; b) the mass of solids applied to the area; c) the mass of pollutants emitted to the air; at the frequency and using the method and units of measure, specified below. <div>POINT 1<table><tr><td>Frequency</td><td>Unit of Measure</td><td>Sampling Method</td></tr><tr><td>Special Frequency 1</td><td>kilolitres per day</td><td>In line instrumentation</td></tr></table> POINT 6<table><tr><td>Frequency</td><td>Unit of Measure</td><td>Sampling Method</td></tr><tr><td>Monthly</td><td>kilolitres per day</td><td>In line instrumentation</td></tr></table></div> <p>Note: Special Frequency 1 means daily collected at a minimum of twelve hourly intervals when a discharge is occurring.</p>	Frequency	Unit of Measure	Sampling Method	Special Frequency 1	kilolitres per day	In line instrumentation	Frequency	Unit of Measure	Sampling Method	Monthly	kilolitres per day	In line instrumentation	8.1.2
Frequency	Unit of Measure	Sampling Method												
Special Frequency 1	kilolitres per day	In line instrumentation												
Frequency	Unit of Measure	Sampling Method												
Monthly	kilolitres per day	In line instrumentation												
POLLUTION STUDIES AND REDUCTION PROGRAMS														
8	U3 Clean Water Drainage Line Investigation U3.1 The Licensee must undertake an investigation into the source, cause and environmental impacts of the orange staining/residue within the Austar CHPP Clean Water drain, identified as the ' <i>Investigation Drainage Line</i> ' in Figure 2 CHPP Surface Water Sample locations 25/8/2017, within document titled ' <i>Austar Clean Water Drainage Line Investigation Status Report</i> ' dated 25 August 2017 prepared by Gary Mulhearn, (EPA reference DOC17/440862). The investigation is to be undertaken by a suitably qualified and experienced person or persons. The investigation must as a minimum include but not be limited to; • review historical and site-specific information, • undertake groundwater investigations, • undertake geological investigations, • an assessment of any likely impacts of the orange substance on the environment including groundwater and potential overland flow to waters. An initial scope of works for this investigation is to be provided to the EPA for approval by no later than 5pm Wednesday 31 January 2018. The findings of this investigation are to be submitted in a report to the EPA no later than 5pm Thursday 31 March 2018.	6.4.2.4												

Section	EPL Conditions	Section of this Plan
8	<p>U3.2 Monitoring</p> <p>Surface Water Monitoring</p> <p>The licensee must undertake monthly water monitoring within the Investigation drainage line at Sample Points 1, 2, 3, 4, 5,6 as per Figure 2, CHPP Surface Water Sample locations 25/8/2017 within document titled '<i>Austar Clean Water Drainage Line Investigation Status Report</i>' dated 25 August 2017 prepared by Gary Mulhearn, (EPA reference DOC17/440862). The licensee must monitor (by sampling and obtaining results by analysis) the concentration of pH, EC TSS and Iron.</p> <p>Ground Water Monitoring</p> <p>The licensee must undertake monthly monitoring of the Groundwater Bore located near the Investigation Drain as defined in Figure 2, CHPP Surface Water Sample locations 25/8/2017 within document titled '<i>Austar Clean Water Drainage Line Investigation Status Report</i>' dated 25 August 2017 prepared by Gary Mulhearn, (EPA reference DOC17/440862). The licensee must monitor (by sampling and obtaining results by analysis) the concentration of pH, EC TSS and Iron, and water level. Water level is to be recorded in level below ground and RL.</p> <p>Photo Monitoring</p> <p>The licensee must undertake monthly photo monitoring within the Investigation drainage line at all Photo Points defined in Figure 1 CHPP Surface Water Sample locations 25/8/2017 within document titled '<i>Austar Clean Water Drainage Line Investigation Status Report</i>' dated 25 August 2017 prepared by Gary Mulhearn, (EPA reference DOC17/440862).</p> <p>The EPA will review the requirement to continue monitoring as per this condition within three months of the submission of the Investigation Report required by U3.1.</p>	8.3
	<p>U3.3 The Licensee must provide a monthly status report on the CHPP Clean Water drain contamination to the EPA by 5pm the Third Monday of each Month. The first report is to be submitted to the EPA no later than 5pm Monday 15 January 2018. This report removes the requirement for the Licensee to provide fortnightly updates to the EPA as per EPA letter dated 13 July 2017 DOC17/370341. As a minimum the report must include, but not be limited to;</p> <ul style="list-style-type: none"> • a summary of ongoing actions to identify the source of the orange staining/residue in the clean water drain at the Austar CHPP identified in condition U3.1, • a summary of controls in place to ensure Bellbird Creek downstream is not adversely impacted as a result of water and or aspects associated with the orange staining/residual in the Austar CHPP clean water drain, • results from water monitoring undertaken within the reporting period, in accordance with section M2 of the licence, • results from monitoring undertaken in accordance with condition U3.2. <p>The EPA will review the requirement to continue reporting as per this condition within three months of the submission of the Investigation Report required by U3.1.</p>	6.4.2.4
9	SPECIAL CONDITIONS	
9	<p>E1 Advice to Black Creek Water Users</p> <p>E1.1 The licensee must maintain a system acceptable to water users on Black Creek for advising those water users registered with the company of the discharge of waters from discharge point 1. Where possible, water users will be advised within the 24 hour period immediately prior to the commencement of any discharge. Where prior advice is not possible, advice will be given as soon as practicable after discharge commences.</p>	12.3

Section	EPL Conditions	Section of this Plan
	The licensee will advise water users of the conductivity of water being discharged. The conductivity of the waters of Bellbird Creek at the intersection of Black Creek with Lomas Lane will be advised to water users on request.	
9	E2 CHPP Clean Water Drain Orange Staining Containment E2.1 The orange staining residue within the clean water drain (identifier) must be fully contained within the premises at all times. Any discharges to waters of this residue must comply with condition L1.1 of this EPL	6.4.2.4

STATEMENT OF COMMITMENTS

A list of the Statement of Commitments from PA 08_0111 which are relevant to water management and where these commitments are addressed in this Plan are in the table below.

PROJECT APPROVAL STATEMENT OF COMMITMENTS (PA 08_0111)

Appendix	Statement of Commitments	Section of this Plan
3	1.6 Surface Water and Drainage	
3	1.6.1 Austar will develop a detailed Soil and Water Management Plan for the Surface Infrastructure Site prior to commencement of construction.	The Kitchener SIS SCEMP has been retired as construction has finished.
3	1.6.2 Erosion and sediment control measures will be designed and implemented for construction of surface infrastructure to a standard consistent with Managing Urban Stormwater: Soils and Construction (NSW Landcom 2004) (the Blue Book) and Guidelines for Establishing Drainage Lines on Rehabilitated Minesites (Draft) (DLWC, 1999).	7
3	1.6.3 Any subsidence impacts on drainage lines will be effectively remediated where access is granted such that there is no significant impact on downstream water users and environmental flows. Drainage line monitoring and remediation protocols will be developed as part of the EP process, and in consultation with NOW, to guide the management of subsidence impacts and drainage line remediation works on surface water systems. The drainage line monitoring and remediation protocols will include: <ul style="list-style-type: none"> · detailed monitoring protocols; · a program to complete drainage remediation works in a timely manner, post-subsidence to limit the potential for surface water capture; · details of the design of drainage line remediation works such that the rehabilitated drainage lines maintain a similar channel form and sinuosity to the pre-mining environment, to ensure that the overall erosive power of the creek system is consistent with that existing pre-mining; · assessment of the viability and benefits of applying proactive measures such as the installation of liners or geo-fabrics in drainage lines prior to subsidence; and · the existing Austar Site Water Management Plan will be extended to include the Surface Infrastructure Site and Stage 3 underground mining. The plan will be updated in consultation with NOW and DRE and submitted to the Director-General prior to the commencement of construction of the Surface Infrastructure Site. 	7.2.2
3	1.6.4 Surface water monitoring results will be reported annually in the Annual Review.	12.4

Appendix	Statement of Commitments	Section of this Plan
3	1.7 Groundwater	
3	1.7.1 A groundwater monitoring program will be implemented for the project as outlined in Appendix 14 , or as otherwise agreed by the Director-General in consultation with NOW.	8.2
3	1.7.2 The results of groundwater monitoring and a comparison of measured and predicted impacts will be reported annually in the Annual Environmental Management Report.	12.4
3	1.7.3 Impacts on privately-owned bores will be assessed by monitoring where access is granted and in the event that any utilised privately-owned bore is significantly affected, an alternative water supply will be provided by Austar Coal Mine until such time as the bore is re-established or replaced.	8.2.6
	1.7.4 An annual analysis of surface and groundwater monitoring data will be undertaken and will include: <ul style="list-style-type: none"> · comparison of groundwater levels with rainfall information; · identification of any changes or long-term trends in groundwater levels; and · visual inspection of creeks and drainage lines 	12.4
	1.7.5 The monitoring results and analysis findings will be reported in the Annual Review.	12.4

Appendix B:

Management Plan Approval



Julie McNaughton
Environment & Community Coordinator
Austar Coal Mine
Darling Park - Tower 2
Level 18, 201 Sussex Street
Sydney New South Wales 2000

11/03/2022

Dear Ms. McNaughton

**Austar Coal -(MP08_0111)
Site Water Management Plan**

Thank you for submitting the revised Site Water Management Plan in accordance with Condition 9 of Schedule 4 of the consent for the project name (MP08_0111-PA-41).

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

Accordingly, the Secretary has approved the revised Site Water Management Plan (Revision Final, dated March 2022). 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 02 99955944.

Yours sincerely

A handwritten signature in black ink, appearing to read 'W Jones'.

Wayne Jones
Team Leader - Post Approval
Resource Assessments

As nominee of the Secretary