6 IMPACTS, MANAGEMENT AND MITIGATION

The potential environmental impacts of MOD 4 have been assessed as part of this SEE. The findings of this assessment as well as a description of the measures that will be implemented to manage and mitigate potential impacts are presented below.

6.1 SURFACE WATER

6.1.1 Impact Assessment

A '*Surface Water Impact Assessment*' (SWIA) (WSP, 2017) for MOD 4 was completed by WSP and is presented in **Appendix B**. Specifically, the SWIA identified the impacts as a result of MOD 4 on the Bengalla water management system and in particular the potential impacts to local surface hydrology.

Surface water management at Bengalla is based on the following key principles where reasonable and feasible:

- Minimise use of fresh water from external sources (Bengalla has a current allocation from the Hunter River);
- Diversion of clean surface water runoff away from areas disturbed by mining activities where possible;
- Collection of surface water runoff from areas disturbed by mining activities in catch drains and direction of this to sediment traps;
- Collection of runoff from industrial areas in catch drains and containment within the Bengalla water management system. Processing of waste water through the Bengalla Waste Water Treatment Plant for treatment and reuse as mine water supply;
- Transfer of open cut water to storage dams for reuse as mine water supply; and
- Minimal discharge of surplus mine water off-site (i.e. promote recycling of captured water).

Modelling

The water balance modelling completed for the '*Bengalla EIS Surface Water Impact Assessment*' (WRM, 2013) and the Bengalla MOD1 SEE 'Surface Water Impact Assessment' (WRM, 2015) was the basis adopted for MOD 4 assessment. The computer based OPSIM model has been used to simulate and assess the dynamics of the site water balance at Bengalla (incorporating MOD 4) under varying climatic sequences across four representative mine stages previously utilised for the Bengalla EIS. The model simulates the operations of all major components of the proposed water management system on a daily basis using different historical sequences of recorded rainfall data. The inflows and outflows for the water management system are outlined in **Table 6**.

Table 6
Simulated Inflows and Outflows for the Water Management System

Inflows	Outflows
Direct rainfall onto water surface of storage	Evaporation from water surface of storages
Catchment Runoff	Water demands (CHPP, dust suppression, vehicle wash down)
Groundwater Inflows	Overflows from storages (in accordance with Blue Book design criteria).
Raw water extracted from the Hunter River	Controlled releases under the HRSTS

The revised water balance modelling provides an assessment of surface water impacts under the full range of wet and dry conditions that have historically been experienced in the region. The model results are presented as a statistical summary of the results from different realisations, represented as percentiles. For example, the 50th percentile value represents the median of all realisations. The 1st percentile represents the value which has been exceeded by only 1% of realisations and the 99th percentile represents the value which has been exceeded in 99% of realisations.

Four different stages of Bengalla were considered in the modelling (Years 4, 8, 15 and 24). Although the catchment areas will continually change as mining progresses, these modelled years will provide a good representation of conditions over Bengalla's life. The surface water runoff volumes used in the water balance model were estimated using the '*Australian Water Balance Model'* (Boughton, 1993).

Uncontrolled Offsite Releases

The results of the revised site water balance modelling show that the mine water management system can be operated in accordance with the conditions of BMC's existing Environment Protection Licence (EPL) 6538. The revised model results indicate that there is:

- No uncontrolled release of mine affected water from Dry Creek East Dam prior to its conversion to a sediment dam;
- No uncontrolled releases of mine affected water from ED1; and
- No uncontrolled releases from the East and West Facilities Dam.

MOD 1 indicated that there was a <1% annual risk of overflow from the East and West Facilities Dam. The reduction in overflow risk can be attributed to the additional out-of-pit storage capacity provided in the enlarged ED1 which allows additional water to be pumped out of the East and West Facilities dams during extremely wet periods, to the Washery Dam.

Controlled offsite releases

Controlled offsite discharges refer to water discharged under the HRSTS from the existing SDD and yet to be constructed ED1 to Dry Creek. The results from the assessment indicate the following:

- The 50th percentile annual discharge shows that no discharges are required apart from one year where approximately 42 ML/a is modelled to be discharged under the HRSTS;
- The 10th percentile annual discharge shows that up to approximately 662 ML/a are discharged under the HRSTS, a reduction from 750 ML/a predicted in MOD 1; and
- The 1st percentile annual discharge shows that up to approximately 1,747 ML/a are discharged under the HRSTS, a slight increase from the 1,550 ML/a predicted in MOD 1.

Controlled releases of mine water to the Hunter River will continue to be undertaken in accordance with the conditions of the HRSTS and EPL 6538, with a maximum daily release limit of 200 ML/day.

External Water Supply Requirements

BMC holds licences to draw raw water from the *Hunter Regulated River Water Source* to meet site demands. The water is pumped to the Raw Water Dam for use when required. Raw water is used as a last priority to meet site demands, with the exception of the vehicle wash demand which ranges between 97 ML/a and 132 ML/a.

BMC hold Water Access Licences (WALs) with sufficient share component totalling 6,017 units (comprising 1,455 high security units and 4,562 general security units) to account for the maximum predicted take for the life of Bengalla based on predicted demands from the Hunter Regulated River Water Source (Management Zone 1A). BMC maintains exclusive rights for the dedicated use of at least 3,310 units (comprising 1,449 high security units and 1,860 general security units) under these WALs. The remaining units of the WALs (comprising five high security units and 2,702 general security units) are currently subject to use by licensees of BMC owned land for agricultural purposes.

The SWIA (**Appendix B**) presents the total annual modelled demand for water from an external source over the life of Bengalla. A summary of these results indicates the following:

- Compared with the results of MOD 1, the median (50th percentile) raw water requirement from an external source increases slightly from 1,530 ML/a to 1,575 ML/a; and
- Compared with the results of MOD 1, the 1st percentile (very dry) raw water requirement from an external source drops slightly from 1,920 ML/a, to 1,833 ML/a.

No additional water access licences for water take from water sources regulated under the WM Act will be required for MOD 4.

Mining Area availability

The median (50th percentile) inventories of Main Pit and Satellite Pit show that the mining areas are generally maintained dry with no long term build up for both MOD 1 and MOD 4. The 10th percentile inventory in Main Pit and the Satellite Pit reduces from 240 ML to 60 ML, and 450 ML to 35 ML, respectively.

Other impacts

The revised modelling indicates that MOD 4 will have no significant changes to:

- The Bengalla catchment area;
- Water quality in the Hunter River and Dry Creek;
- The Hunter River floodplain; and
- The geomorphology of the Hunter River or Dry Creek.

MOD 4 does not propose any changes to the assumptions utilised in the previously completed surface water or groundwater modelling completed for the Bengalla EIS and Bengalla SEEs. The results of the previous site water balance modelling show that the mine water management system can be operated in accordance with BMC's existing EPL 6538 conditions.

MOD 4 will not result in any significant changes to the currently approved water management regime at Bengalla. It is noted that the water management system will continue to evolve as the mine develops. Sediment dams and mine water dams will continue to be designed, constructed and operated in accordance with the requirements of SSD-5170 (as modified).

6.1.2 Mitigation and Management

As discussed in **Section 2.1.2**, the footprint of the Dry Creek East Dam extends onto the area estimated to include quaternary alluvium. Test pit investigations found that one pit indicated approximately 200 mm of alluvial material was present below the topsoil, with no others encountering alluvium. As a conservative measure to prevent potential interaction between mine water and alluvium, the excavated storage area will be lined with approximately 600 mm of compacted clay liner.

Erosion and sediment control devices will be designed and constructed according to the guidelines *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004), as well as recommendations from the *Draft Guidelines for Establishing Stable Drainage Lines on Rehabilitated Minesites* (Department of Land and Water Conservation, 1999).

BMC will hold or have applied for relevant licences, share component and allocation required to comply with the WM Act when water is taken.

6.2 AIR QUALITY

6.2.1 Impact Assessment

An '*Air Quality Assessment*' (TAS, 2017) was completed by Todoroski Air Sciences for MOD 4 and is presented in **Appendix C**. The Air Quality Assessment provided a qualitative assessment of the potential change in air quality associated with MOD 4.

The proposed temporary clay emplacement is expected to generate a small quantity of dust for a short period. Relative to the total quantity of dust generated from Bengalla, any potential dust impacts from this activity would be negligible.

The proposed ROM coal stockpiles and reject emplacement area are located generally along approved haul routes and thus there would be no significant deviation to existing approved haul distances as a result. No additional ROM coal or reject material would be moved in any one year as a result of MOD 4, the materials would only be redirected. The majority of dust emissions associated with the proposed operation of the ROM coal stockpiles and reject emplacement would arise from the handling of the material at the stockpiles and from wind erosion of the stockpiles.

Air Quality Modelling was conducted for Years 4 and 24 of the approved mining operation and including the proposed modifications, using the air dispersion model developed for the Bengalla EIS, and updated to reflect the proposed features of MOD 4. A comparison of the estimated total annual dust emissions for the approved mining operation and the proposed modifications were made.

It is calculated that the total annual dust emissions associated with MOD 4 would increase by approximately 0.56 – 0.91% relative to the approved Bengalla EIS.

The predicted incremental maximum 24-hour average and annual average PM_{10}, annual average TSP and annual average dust deposition levels for Years 4 and 24 of MOD 4 were calculated and compared to those of the approved Bengalla EIS.

The MOD 4 results indicated that the predicted dust levels are unlikely to change materially at any privately-owned receptor locations identified in SSD-5170. Further it is predicted that the dust emissions resulting from the activities to be conducted as part of MOD 4 will remain within air quality emissions criteria presented in SSD-5170.

The results of the modelling are presented in Figure 3 to Figure 20 of the report attached in **Appendix C**.

6.2.2 Mitigation and Management

Existing BMC dust management techniques consistent with '*Bengalla Air Quality Management Plan*' (BMC, 2016b) will be applied to MOD 4.

6.3 ACOUSTICS

6.3.1 Impact Assessment

An Acoustic Assessment was completed by Bridges Acoustics for MOD 4 and is presented in **Appendix D**. The Acoustic Assessment provided a qualitative assessment of the potential change in construction and operational noise associated with MOD 4 in comparison to those presented in the '*Bengalla EIS Acoustic Impact Assessment*' (Bridges Acoustics, 2013) and '*Bengalla MOD2 Acoustic Impact Assessment*' (Bridges Acoustics, 2016).

Noise levels were determined by modifying the most recent noise model for Bengalla, developed for the Bengalla EIS and varied for MOD 2, to include mining equipment accessing and operating on the proposed coal stockpiles. The assessment considered Years 4 and 24.

This assessment indicates MOD 4 would have no material effect on noise levels at any receptor. Minor changes of less than 1 dBA to predicted noise levels would not be discerned by residents and no additional receptors are likely to be affected by project related noise over relevant criteria.

Construction work associated with MOD 4 would either be imperceptible compared to adjacent mining activity or would remain within currently approved levels. MOD 4 would have no appreciable effect on other acoustic issues including sleep disturbance, low frequency noise, road and rail traffic noise and blasting impacts.

Based on the results of this assessment, MOD 4 is unlikely to have a material effect on noise levels and impacts are anticipated to remain within criteria in SSD-5170.

6.3.2 Mitigation and Management

Existing BMC noise management techniques consistent with *'Bengalla Noise Management Plan'* (BMC, 2016d) will be applied to MOD 4.

6.4 VISUAL ASSESSMENT

6.4.1 Impact Assessment

The '*Visual Impact Assessment*' (JVP Planning and Design, 2013) undertaken for the Bengalla EIS characterised the local visual landscape within the vicinity of Bengalla as being that of a rural setting dominated by mining activities along with agricultural activities associated with the Hunter River Floodplain. The visual character varies as a result of topography, vegetation cover, and land use types. This can create screening or visual buffers, or alternatively provide a viewing corridor to specific areas within the Project Boundary.

The visual impacts associated with the expanded ROM stockpiles have been considered. The expanded ROM stockpiles are generally located north of the existing CHPP and west of the main OEA.

To assess worst case views of the ROM stockpiles, a desktop assessment was conducted and representative viewing locations were selected consistent with visual assessment locations utilised for the Bengalla EIS. The ROM stockpiles (up to 10m in height) would be screened by the OEA, or topography and vegetation cover from most of the locations considered in the Bengalla EIS. Views may be possible from locations PM5 (Denman Road) and PM6 (Roxburgh Road). **Figure 5** to **Figure 8** present cross sections associated with these locations.

These figures indicate that the stockpile is screened from PM5 by intervening topography and the location of existing infrastructure for Years 4 and 24.

Figure 7 and **Figure 8** show that views from Roxburgh Road will initially be screened by topography, with further reduction in visual effect as the tree screens along the relocated Bengalla Link Road develop. Views of the temporary ROM stockpiles from Bengalla Link Road may be possible, however will only be experienced for a limited time and in the context of an existing mine and Mine Infrastructure Area.

6.4.2 Mitigation and Management

As outlined in Section 8.5.4 of the Bengalla EIS, BMC will, where appropriate, establish tree screens and plantings to minimise visual impacts.

Visual impacts to sensitive receivers will be considered during the future development of the Bengalla Link Road realignment proposed around Year 13. By Year 24 the proposed tree screens will likely be established along the realigned Bengalla Link Road.

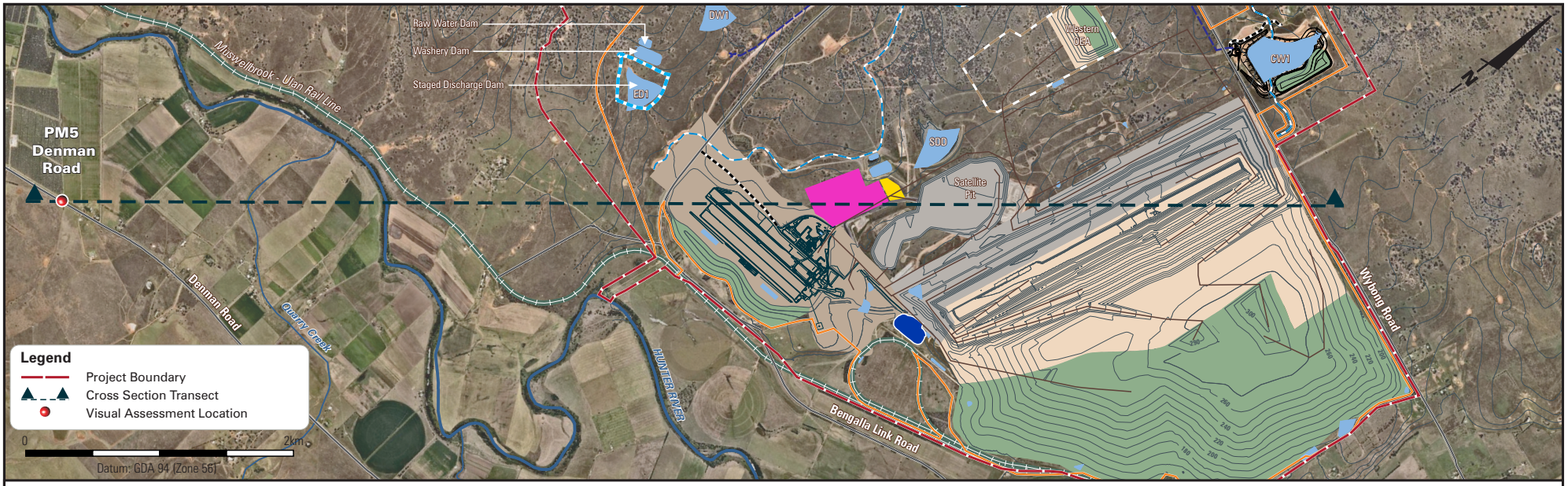
6.5 ECOLOGY

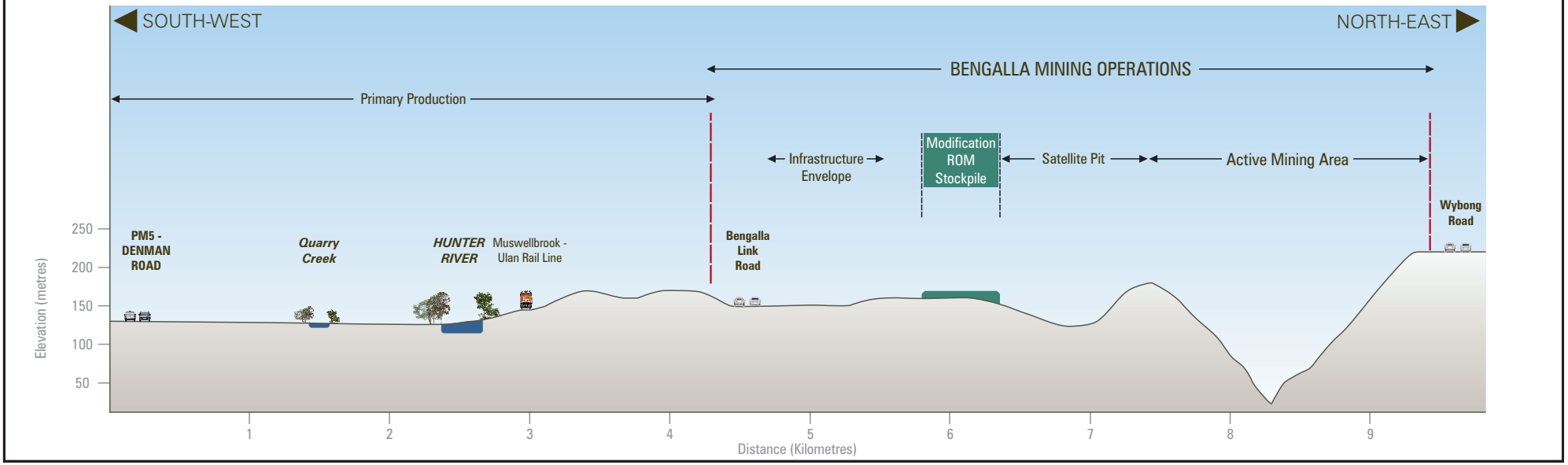
A desktop review of the previously completed Bengalla EIS '*Ecological Impact Assessment'* (Cumberland Ecology, 2013) and Bengalla SEE '*Ecological Impact Assessment'* (Cumberland Ecology, 2015) was completed for MOD 4.

All components of MOD 4 are located entirely within the existing Approved Disturbance Boundary. Therefore, no additional disturbance to any flora or fauna species, including any listed under the TSC Act and/or EPBC Act will occur.

The existing Ground Disturbance Permit (GDP) process will continue to be implemented prior to clearing or disturbing vegetation and applies to all land owned or managed by BMC that have not previously been disturbed by mining or associated activities.

BMC will continue to manage all ecological matters on-site in accordance with the *Bengalla Biodiversity Management Plan* (BMC, 2016c).





HB BENGALLA MOD 4 1655 F5 PM5 Denman Road Cross Section - Year 4 04 12 2017

BENGALLA MINE

BENGALLA

Hansen Bailey
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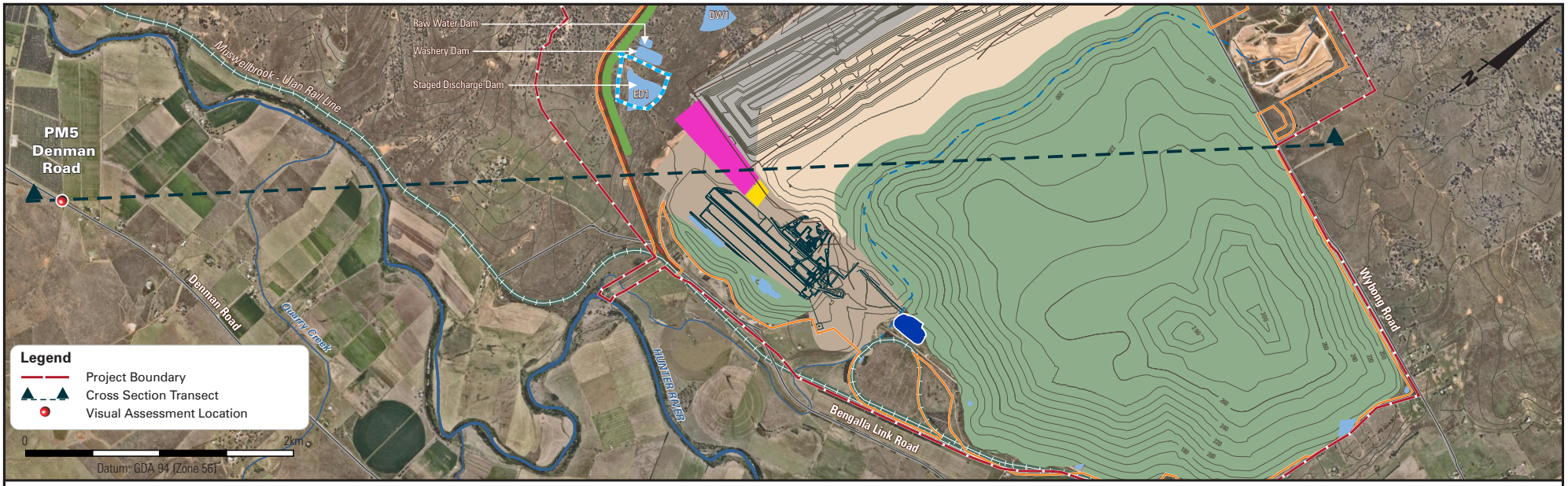
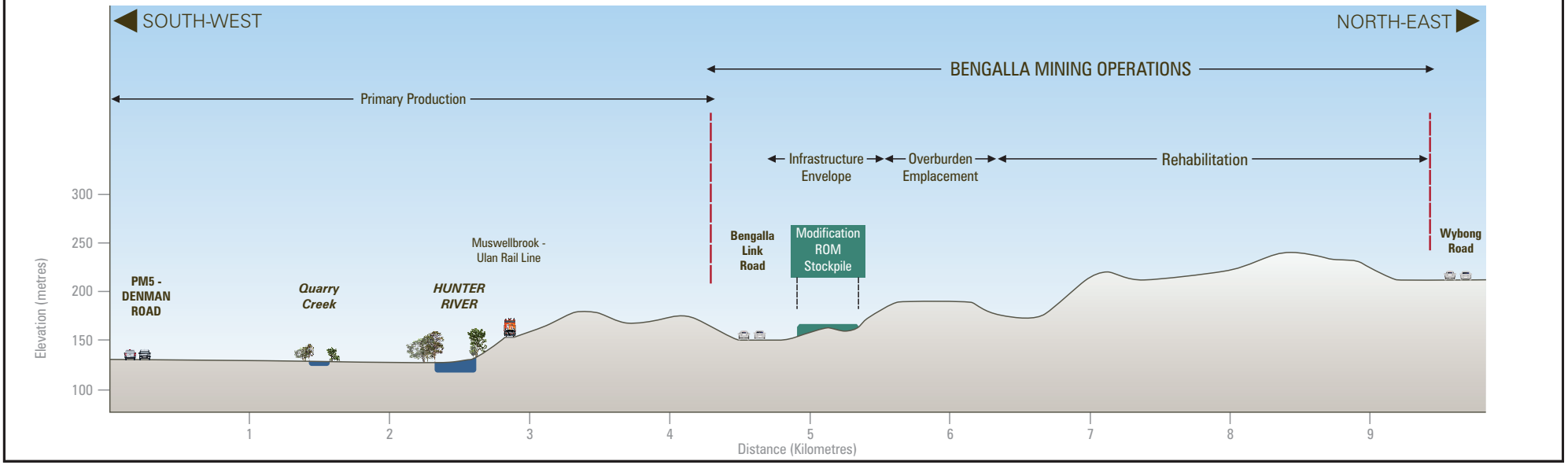
MOD4 PM5 Denman Road Cross Section - Year 4

FIGURE 5





HB BENGALLA MOD 4 1655 F6 PM5 Denman Road Cross Section - Year 04 12 2017

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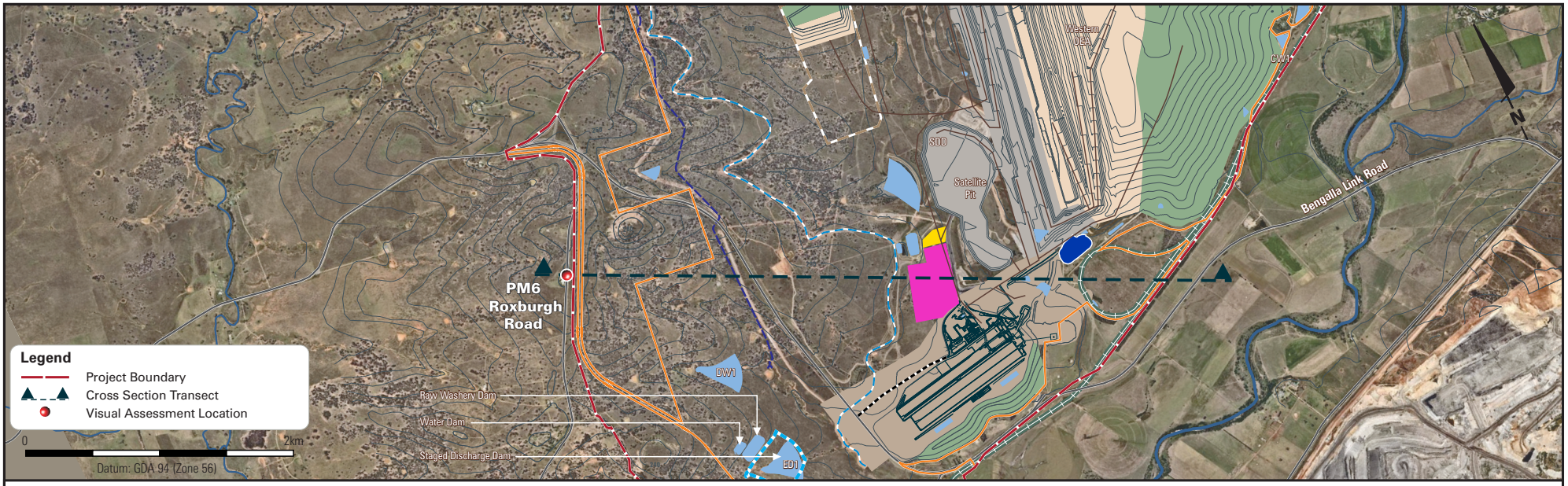
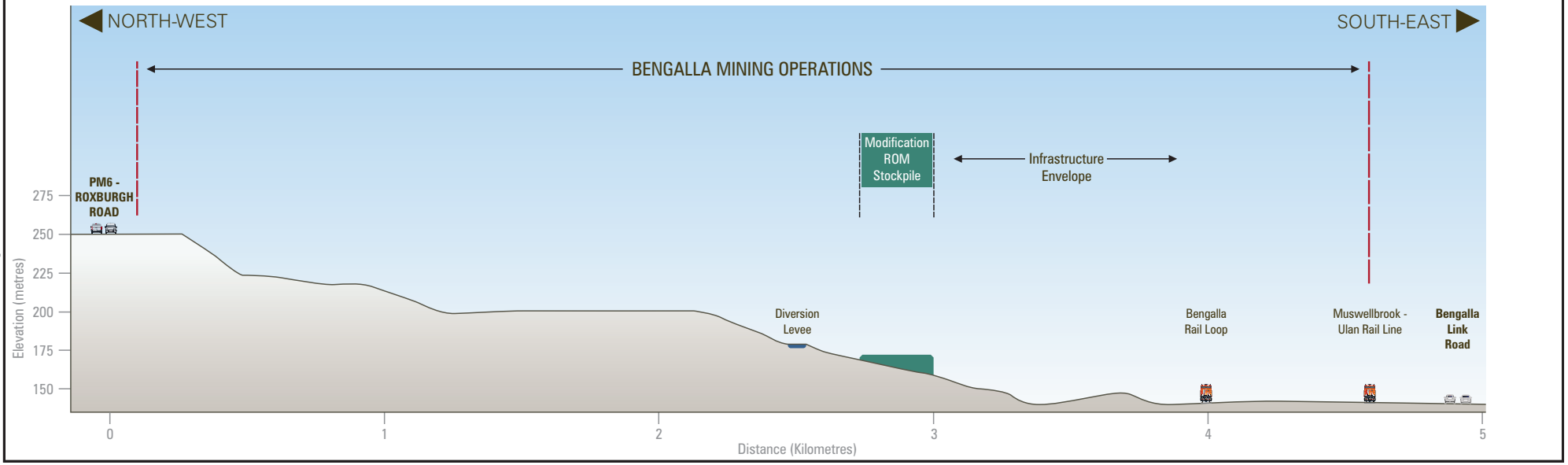
MOD4 PM5 Denman Road Cross Section - Year 24

FIGURE 6





HB BENGALLA MOD 4 1655 F7 PM6 Roxburgh Road Cross Section - Year 4 04 12 2017

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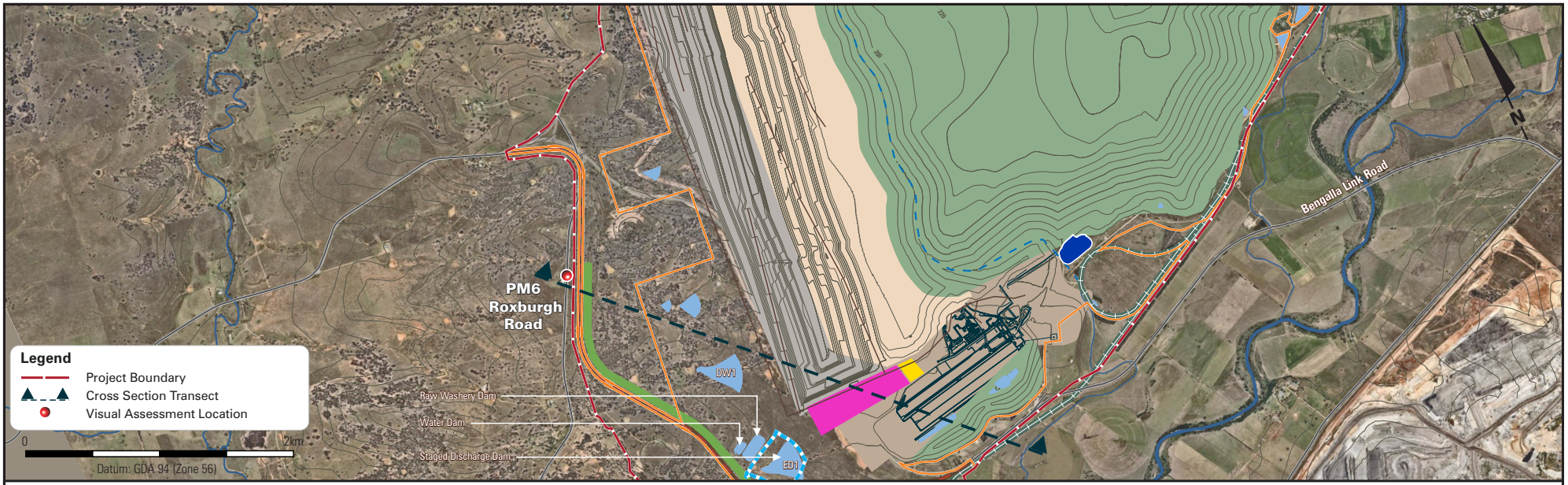
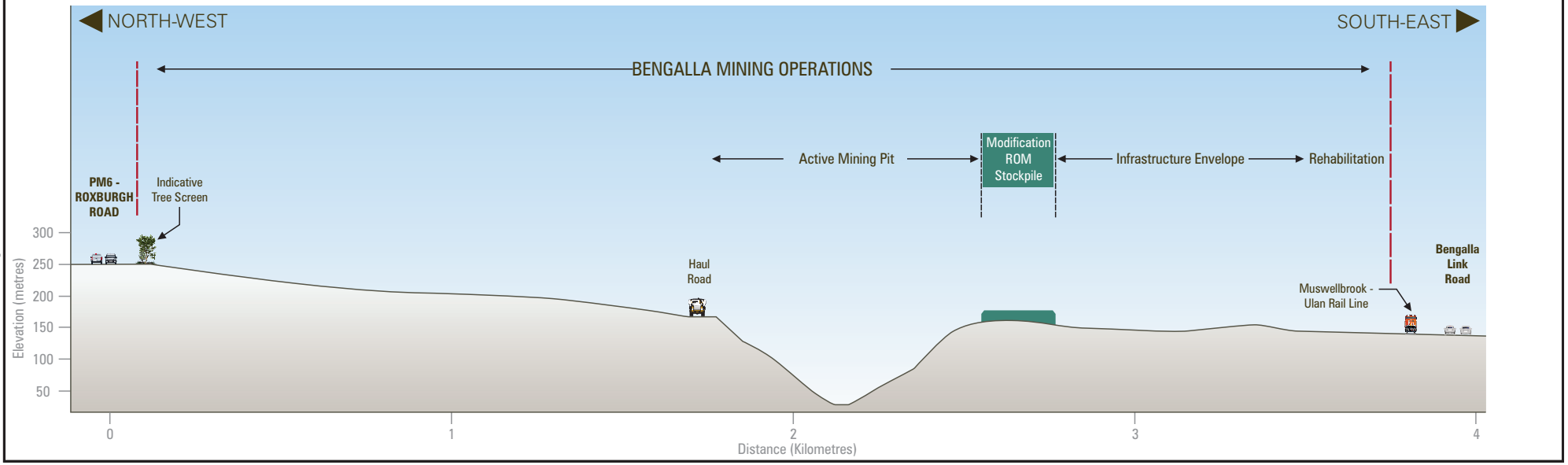
MOD4 PM6 Roxburgh Road Cross Section- Year 4

FIGURE 7





HB BENGALLA MOD 4 1655 F8 PM6 Roxburgh Road Cross Section - Year 24 04 12 2017

BENGALLA MINE

BENGALLA

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MOD4 PM6 Roxburgh Road Cross Section - Year 24

FIGURE 8

6.6 ABORIGINAL ARCHAEOLOGY

A desktop review of the previously completed Bengalla EIS *Aboriginal Archaeological and Cultural Heritage Impact Assessment* (AECOM 2013a), Bengalla SEE *Aboriginal Archaeology Due Diligence Assessment* (AECOM 2015), the Bengalla *Aboriginal Archaeology and Cultural Heritage Management Plan* (BMC, 2015) and the *Bengalla Continuation of Mining Project: Aboriginal Archaeological Salvage Program* (AECOM, 2016) was completed for MOD3.

All previously identified Aboriginal artefacts located within the Approved Disturbance Boundary have been salvaged in accordance with relevant approvals.

As elements relating to MOD 4 are wholly located within the Approved Disturbance Boundary, no impacts to any Aboriginal artefacts will occur.

6.7 NON-ABORIGINAL HERITAGE

A review of the Non-Aboriginal Heritage items previously identified in the Bengalla EIS *Historic Heritage Impact Assessment* (AECOM, 2013b) was completed for MOD 4. There are no remaining Historic Heritage Sites in proximity to MOD 4.

As MOD 4 is entirely situated within the Approved Disturbance Boundary, no additional mitigation measures are proposed.

BMC will continue to manage items relating to historic cultural heritage in accordance with the approved *Historic Heritage Management Plan* (BMC, 2016f) (as modified).

7 CONCLUSION

The activities presented in MOD 4 will result in the development remaining substantially the same as that already approved at Bengalla and will have minimal environmental impact.

MOD 4 is required to provide BMC with additional water storage, increase the capacity and provide flexibility in the location of ROM coal stockpiles and reject emplacement areas and additional locations for the storage of clay materials for later re-use.

Assessments on air quality, water balance and noise were completed to identify any changes in impacts that MOD 4 may have. These assessments concluded that MOD 4:

- Provides improved operational efficiency by increasing the volume of out of pit water storage, and will not result in any material change to the currently approved water management regime at Bengalla;
- Total annual dust emissions are predicted to be within 1% of the approved Bengalla EIS, and the predicted dust levels are unlikely to change materially at any privately-owned receptor locations; and
- Total noise emissions will result in minor changes of less than 1 dBA to Bengalla EIS predicted noise levels at privately-owned receptor locations. This will not be discerned by residents and no additional receptors are likely to be affected by Bengalla related noise over relevant criteria.

The approval of MOD 4 would provide BMC with the flexibility to better manage its open cut mining operation with minimum environmental impact.

* * *

For

HANSEN BAILEY

Dianne Munro
Principal Environmental Scientist

8 ABBREVIATIONS

Abbreviation	Description
Bengalla EIS	Continuation of Bengalla Mine Environmental Impact Statement (Hansen Bailey, 2013)
Blue Book	Landcom (2004), *Managing Urban Stormwater: Soils & Construction.*
BMC	Bengalla Mining Company Pty Limited
BJV	Bengalla Joint Venture
DP&E	NSW Department of Planning and Environment
DRE	Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulations	*Environmental Planning and Assessment Regulation 2000*
GDP	Ground Disturbance Permit Process
LGA	Local Government Area
MACH	Mach Energy Australia Pty Limited
Mining Act	*Mining Act 1992*
MOD 1 SEE	Bengalla Mine Development Consent Modification Statement of Environmental Effects (SSD-5170 MOD1) (Hansen Bailey, 2015)
MOD 2 SEE	Bengalla Mine Development Consent Modification Statement of Environmental Effects (SSD-5170 MOD2) (Hansen Bailey, 2016a)
MOD 3 SEE	Bengalla Mine Development Consent Modification Statement of Environmental Effects (SSD-5170 MOD3) (Hansen Bailey, 2016b)
MOD 4 SEE	This document
MOD 1 RTS	Bengalla Mine Response to Submissions Development Consent Modification 1 (Hansen Bailey, 2015b)
MOD 2 RTS	Bengalla Mine Response to Submissions Development Consent Modification 2 (Hansen Bailey, 2016c)
MOD 3 RTS	Bengalla Mine Response to Submissions Development Consent Modification 3 (Hansen Bailey, 2016d)
MOP	Mining Operations Plan
MTP	Mount Pleasant Mine
Mtpa	Million tonnes per annum
MSC	Muswellbrook Shire Council
Muswellbrook LEP	*Muswellbrook Local Environment Plan 2009*
OEA	Overburden Emplacement Area
ROM	Run of Mine
RL	Reduced Level
RTS	Continuation of Bengalla Mine Response to Submissions
SEE	Statement of Environmental Effects

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Appendix A

BMC Risk Classification Matrix

RISK ASSESSMENT MATRIX

Likelihood	Consequence				
	1 – Minor	2 – Medium	3 – Serious	4 – Major	5 – Catastrophic
A – Almost Certain	Moderate	High	Critical	Critical	Critical
B – Likely	Moderate	High	High	Critical	Critical
C – Possible	Low	Moderate	High	Critical	Critical
D – Unlikely	Low	Low	Moderate	High	Critical
E – Rare	Low	Low	Moderate	High	High

LIKELIHOOD CLASSIFICATION

LIKELIHOOD	DESCRIPTION	FREQUENCY
Almost Certain	Recurring event during the life-time of an operation / project	Occurs more than twice per year
Likely	Event that may occur frequently during the life-time of an operation / project	Typically occurs once or twice per year
Possible	Event that may occur during the life-time of an operation / project	Typically occurs in 1-10 years
Unlikely	Event that is unlikely to occur during the life-time of an operation / project	Typically occurs in 10-100 years
Rare	Event that is very unlikely to occur during the life-time of an operation / project	Greater than 100 year event

Appendix B

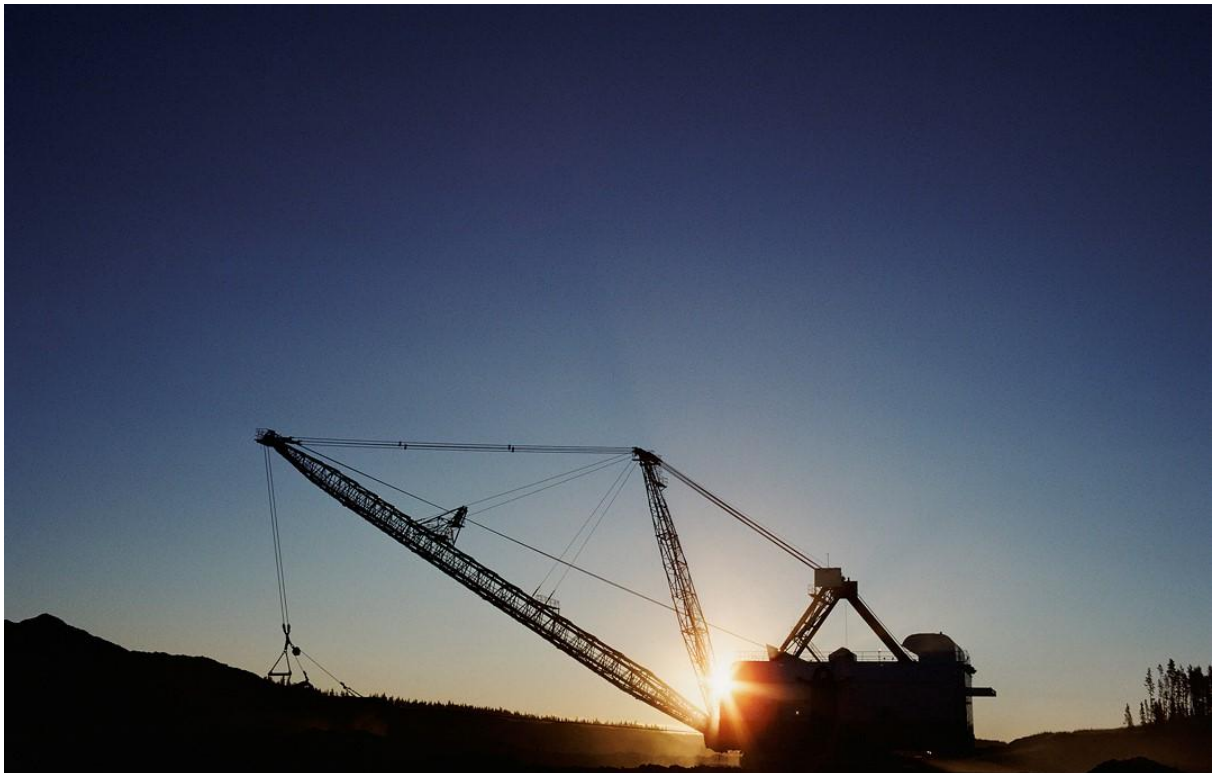
Surface Water Impact Assessment

HANSEN BAILEY

BENGALLA MINE MODIFICATION 4

SURFACE WATER IMPACT ASSESSMENT

DECEMBER 2017



Question today
Imagine tomorrow
Create for the future

Bengalla Mine Modification 4
Surface Water Impact Assessment

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REV	DATE	DETAILS
E	6/12/2017	Revised dam names
F	7/12/2017	Clarifications
G	11/12/2017	Table formatting

	NAME	DATE	SIGNATURE
Prepared by:	Leigh Doeleman	11/12/2017	
Reviewed by:	Amir Hedjripour	11/12/2017	
Approved by:	Andrew Russell	11/12/2017	

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1 INTRODUCTION

Bengalla Mining Company Pty Limited (BMC) operates the Bengalla Mine (Bengalla) in the Upper Hunter Valley of NSW. Bengalla is situated approximately 130 km north-west of Newcastle and 4 km west of the township of Muswellbrook.

BMC holds Development Consent SSD-5170 (as modified) under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act) for the Continuation of Bengalla Mine. SSD-5170 enables BMC to continue open cut coal mining at a production rate of up to 15 million tonnes per annum (Mtpa) of run of mine (ROM) coal until 2039.

SSD-5170 has been modified three times. Modification 1 (MOD 1) granted under Section 96(2) of the EP&A Act on 16 December 2015 authorises the alteration to various water management infrastructure and relocation of an explosives storage facility. Modification 2 (MOD 2) granted under Section 96(2) of the EP&A Act on 1 July 2016 authorises the alteration of the approved Main Overburden Emplacement Area (OEA) to improve visual amenity and establish a new access road. Modification 3 (MOD 3) granted under Section 96(2) of the EP&A Act on 23 December 2016 authorises minor changes to the approved location of an explosives facility, reload facility, Hunter River pipeline and topsoil stockpiles.

BMC is now seeking approval from the NSW Minister for Planning for Modification 4 (MOD 4) to SSD-5170 under Section 96(2) of the EP&A Act to facilitate the following:

— Changes to the approved water management system to reflect operations at Bengalla Mine (Bengalla) including the proposed Dry Creek East Dam (mine water storage dam) and proposed enlargement of the approved Future Staged Discharge Dam (ED1) to approximately 700 ML capacity;

— Temporary storage of approximately 2,500m^3 of excess material from the construction of ED1;

— Increase in the capacity and additional locations of temporary Run Of Mine (ROM) coal stockpiles:

— Increase the capacity of temporary ROM coal stockpiles to 1,215,000 t from the approved 350,000 t;

— Additional storage locations for temporary emplacement of coal processing reject material, prior to permanent emplacement

— Temporary clay emplacement within the Main OEA or to the west of this for later use in the reinstatement of Dry Creek

All of MOD 4 activities are within the approved Project Disturbance Boundary. No changes are being sought to the method, extent or intensity of mining or mining equipment fleet.

WSP Australia Pty Limited has been engaged by Hansen Bailey Pty Limited to prepare a revised Surface Water Impact Assessment (SWIA) to support the Statement of Environmental Effects (SEE) for MOD 4. This report presents the assessment methodology, assumptions and findings, and is structured as follows:

— Section 1 provides background information on Bengalla.

— Section 2 provides a brief overview of the national and state regulatory framework relating to surface water resources.

— Section 3 describes the existing surface water environment.

— Section 4 describes the existing, approved and proposed water management systems for Bengalla.

— Section 5 provides details of the site water balance for MOD 4, including modelling methodology, assumptions, results and relevant water licencing.

— Section 6 provides an assessment of potential surface water impacts of MOD 4.

— Section 7 outlines mitigation and management measures for MOD 4.

— Section 8 summarises the findings of the assessment.

2 REGULATORY FRAMEWORK

2.1 REGULATORY DOCUMENTS

Key regulatory documents and guidelines relevant to this assessment include:

— Protection of the Environment Operations Act 1997.

— Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002 and Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Amendment Regulation 2016.

— Water Management Act 2000 (and associated Water Sharing Plans).

— *Managing Urban Stormwater: Soils and Construction - Volume 1* (Landcom, 2004) ('Blue Book') and *Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and Quarries* (Department of Environment and Climate Change (DECC), 2008).

2.1.1 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

Bengalla holds Environment Protection Licence (EPL) 6538 under the Protection of the Environment Operations Act 1997 (POEO Act). EPL 6538 includes a licensed discharge point to allow for release of water from the Existing Staged Discharge Dam (SDD) to the Hunter River. The discharge volume and concentration limits are provided in Table 2.1.

Table 2.1 EPL 6538 discharge conditions

PARAMETER	LIMIT
pH	6.5 - 9.5
TSS	120 mg/L
Volume	200 ML/day

EPL 6538 was recently varied in December 2016 to change the location of the licensed discharge point, and associated surface water monitoring points, following completion of the Dry Creek diversion works. The old discharge point to Dry Creek was located at the Existing SDD. The new discharge point is located within the Western Diversion Levee, with discharge water now being pumped from the Existing SDD to the discharge point via a pipeline. This location may be amended again in the future as operations move westward via an EPL 6538 amendments.

2.1.2 WATER MANAGEMENT ACT 2000

Under the Water Management Act 2000, BMC must hold Water Access Licences (WAL) with sufficient water allocation to account for the water Bengalla takes from a water source. A summary of surface water entitlements held by BMC for exclusive use by Bengalla is provided in Table 2.2.

Table 2.2 Surface water entitlements held by BMC for Bengalla

WATER SOURCE	ENTITLEMENT
Hunter Regulated River Water Source (Management Zone 1A)	1,449 high security units 1,376 general security units
Hunter Unregulated and Alluvial Water Source - Muswellbrook Water Source	109 ML (harvestable right)

HUNTER REGULATED RIVER WATER SOURCE

BMC holds WALs with sufficient share component totalling 6,017 units, comprising 1,455 high security units and 4,562 general security units from the Hunter Regulated River Water Source under the Water Sharing Plan (WSP) for the Hunter Regulated River Water Source 2016. Bengalla currently has exclusive rights for the use of at least 2,826 units (comprising 1,449 high security units and 1,376 general security units) under these WALs. The remaining units of the WALs (comprising 5 high security units and 3,186 general security units) are currently subject to temporary use by licensees of BMC owned land for agricultural purposes (BMC, 2017).

HUNTER UNREGULATED AND ALLUVIAL WATER SOURCE

The WSP for the Hunter Unregulated and Alluvial Water Sources 2009 applies to the Muswellbrook Water Source, including Dry Creek and its tributaries. A WAL is not required to take and use water by means of harvestable rights dams in accordance with the applicable harvestable rights order under the Water Management Act 2000. Harvestable rights may be available to account (wholly or partially) for the take of water from a water source.

2.1.3 PROTECTION OF THE ENVIRONMENT OPERATIONS (HUNTER RIVER SALINITY TRADING SCHEME) REGULATION 2002 AND AMENDMENT REGULATION 2016

The Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002 (the HRSTS) operates in the Hunter River catchment.

The central idea of the HRSTS is to only discharge salty water when there is lots of low salt, fresh water in the river (NSW DEC, 2016). The Hunter River is broken into three sectors for the purposes of the HRSTS: the upper, middle and lower sectors. Bengalla is located within the upper sector. Monitoring points along the Hunter River are used to measure whether the river is in 'low', 'high' or 'flood' flow. When the river is in 'low' flow, no discharge is allowed. When the river is in 'high' flow, limited discharge is allowed controlled by a system of salt discharge credits. The amount of discharge allowed depends on the ambient salinity in the river, so it can change daily. The total allowable discharge (TAD) is calculated so that the salt concentration does not exceed 900 µS/cm in the middle and lower sectors of the river or exceed 600 µS/cm in the upper sector. When the river is in 'flood', unlimited discharge is allowed as long as the salt concentration does not exceed 900 µS/cm. Members of the HRSTS coordinate their discharges so that this goal is achieved (NSW DEC, 2016).

There is a total of 1000 salt discharge credits in the HRSTS, with different licence holders having different numbers of credits. Licence holders can only discharge salt into the river in proportion to the credits they hold: 1 credit allows a discharge of 0.1% of the TAD (NSW DEC, 2016).

The NSW Environment Protection Authority (EPA) has recently completed a review of the HRSTS. The Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Amendment Regulation 2016 implements the recommendations of the review and commenced on 16 March 2017. The primary change contained in the Amendment Regulation is an increase to the flood flow thresholds to significantly lower the risk that salinity targets could be exceeded by simultaneous, full capacity discharges by all participants during 'flood' flows. The new 'flood' flow thresholds will not impact the total amount of salt that can be discharged by participants or the frequency, size and duration of discharge opportunities under the Scheme. However, the new thresholds will change the number of discharge opportunities that are classified as 'high flow' versus 'flood flow' and there may be slightly more discharges being classified as 'high flow'. Participants will need to ensure that they hold sufficient credits in order to discharge their desired quantity of saline water into these 'high flow' discharge opportunities (NSW EPA, 2016).

The amended HRSTS flow thresholds are summarised in Table 2.3. The 'flood' flow threshold increased from >4,000 to >6,500 ML/day in the upper sector, from >6,000 to >16,500 ML/day in the middle sector, and from >10,000 to >28,500 ML/day in the lower sector.

Table 2.3 Amended flow thresholds for HRSTS

FLOW CATEGORY	FLOW RATE (ML/DAY)		
	UPPER SECTOR	MIDDLE SECTOR	LOWER SECTOR
Low flow (no discharge)	0 to 1,000	0 to 1,800	0 to 2,000
High flow (discharge with credits)	1,000 to 6,500	1,800 to 16,500	2,000 to 28,500
Flood flow (discharge unrestricted by credits)	> 6,500	> 16,500	> 28,500

Bengalla participates in the HRSTS. BMC's EPL 6538 stipulates the concentration and volume limits at the licensed discharge point applicable to HRSTS releases (refer to Section 2.1.1 Table 2.1).

2.1.4 MANAGING URBAN STORMWATER: SOILS AND CONSTRUCTION

The *Managing Urban Stormwater: Soils and Construction* publications provide guidelines for erosion and sediment control during construction and other land disturbance activities.

Managing Urban Stormwater: Soils and Construction - Volume 1 (Landcom, 2004) ('Blue Book') provides general guidelines for the design, construction and implementation of measures to improve stormwater management, primarily erosion and sediment control, during the construction-phase of urban development. *Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and Quarries* (DECC, 2008) provides supplementary guidelines, principles and recommended minimum design standards for erosion and sediment control at mines and quarries.

Erosion and sediment controls for Bengalla will be designed, installed and maintained in accordance with the guidelines *Managing Urban Stormwater: Soils and Construction - Volume 1* (Landcom, 2004) ('Blue Book') and *Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and Quarries* (DECC, 2008).

3 EXISTING SURFACE WATER ENVIRONMENT

3.1 REGIONAL AND LOCAL DRAINAGE NETWORKS

Bengalla is located adjacent to the Hunter River floodplain and is entirely encompassed by the Hunter River catchment. Upstream of Muswellbrook the Hunter River has a catchment area of approximately 4,200 km². From Muswellbrook, the Hunter River continues to meander for approximately 35 km in a generally south-west direction before turning easterly after it is joined by the Goulburn River near Denman and then continuing toward Newcastle.

The western parts of the Bengalla mining area drain to Dry Creek, which is an ephemeral tributary of the Hunter River that runs through the mine site capturing runoff from an area of about 18 km². The Dry Creek catchment has mostly been cleared for agriculture and is dominated by grasslands, although some areas of scattered woodland remain. Dry Creek has been temporally diverted to allow mining operations as per the development consent SSD-5170 (as modified). The Dry Creek Diversion works were completed in December 2016.

3.2 CLIMATE DATA

Daily rainfall and evaporation data for the site for the 114-year period between 1893 and 2006 was obtained from the Bureau of Meteorology (BOM) Data Drill service. This is the period that rainfall data overlaps with the available streamflow data (refer Section 3.4). The Data Drill accesses grids of data derived by interpolating the BOM's station records. The data in the Data Drill are all synthetic and there are no original meteorological station data left in the calculated grid fields (BOM, 2006).

The Data Drill is considered superior to individual BOM station records and site meteorological station data for long-term water balance modelling purposes because it draws on a greater dataset, both spatially and in time. The Data Drill is also considered superior for modelling purposes as it does not contain gaps.

The rainfall records from the two rainfall stations closest to Bengalla with the longest period of record (Muswellbrook (BOM Station No. 61053) and Aberdeen (BOM Station No. 61000)) were obtained and average monthly rainfall compared to that from the Data Drill. The evaporation record from Scone SCS (BoM Station No 61089) was also obtained as this is the closest station where evaporation is recorded and a similar comparison made with the Data Drill. This comparison is shown below in

Table 3.1.

Summary statistics for the Data Drill rainfall data are provided in Table 3.2.

Table 3.1 Mean monthly rainfall and evaporation

MONTH	MEAN MONTHLY RAINFALL (mm)			MEAN MONTHLY EVAPORATION (mm)	
	MUSWELLBROOK (61053) (125 YEARS DATA)	ABERDEEN (61000) (113 YEARS DATA)	DATA DRILL * (114 YEARS DATA)	SCONE SCS (61089) (66 YEARS DATA)	DATA DRILL (128 YEARS DATA)
January	69.6	73.5	71.4	220	214
February	66.9	62.2	62.6	174	169
March	52.8	51.6	53.8	155	150
April	43.5	40.2	42.3	105	106
May	41.5	41.5	40.4	68	72
June	51.3	44.5	44.6	48	53
July	44.2	40.6	39.9	59	61
August	38.6	36.5	36.3	84	88
September	40.7	39.1	38.0	117	118
October	48.6	49.3	49.3	158	157
November	56.1	50.9	49.7	183	184
December	67.0	66.1	61.7	223	217
Total	620.7	596.0	589.8	1,594	1,583

*Notes: * Data Drill for coordinates -32.25S, 150.85E (decimal degrees)*

Table 3.2 Summary statistics for modelled rainfall data (Data Drill – 1893 to 2006)

STATISTIC	ANNUAL RAINFALL (mm/YR)
Minimum	285
5th percentile (dry)	348
10th percentile	373
50th percentile (median)	591
90th percentile	766
95th percentile (wet)	815
99th percentile	940
Maximum	1225
Standard deviation	154

3.3 RAINFALL RUNOFF

The volume of surface water runoff from mine site catchments has been estimated using the Australian Water Balance Model (AWBM) rainfall-runoff model (Boughton, 1993) that is incorporated in the OPSIM water balance model.

The AWBM is a partial area saturation overland flow model. The use of partial areas divides the catchment into regions (contributing areas) that produce runoff during a rainfall-runoff event and those that do not. These contributing areas vary within a catchment according to antecedent catchment conditions and allow for the spatial variability of surface storage in a catchment. The use of the partial area saturation overland flow approach is simple and provides a good representation of the physical processes occurring in most Australian catchments (Boughton, 1993). This is because daily infiltration capacity is rarely exceeded, and the major source of runoff is from saturated areas. Figure 3.1 shows a schematic layout of the AWBM.

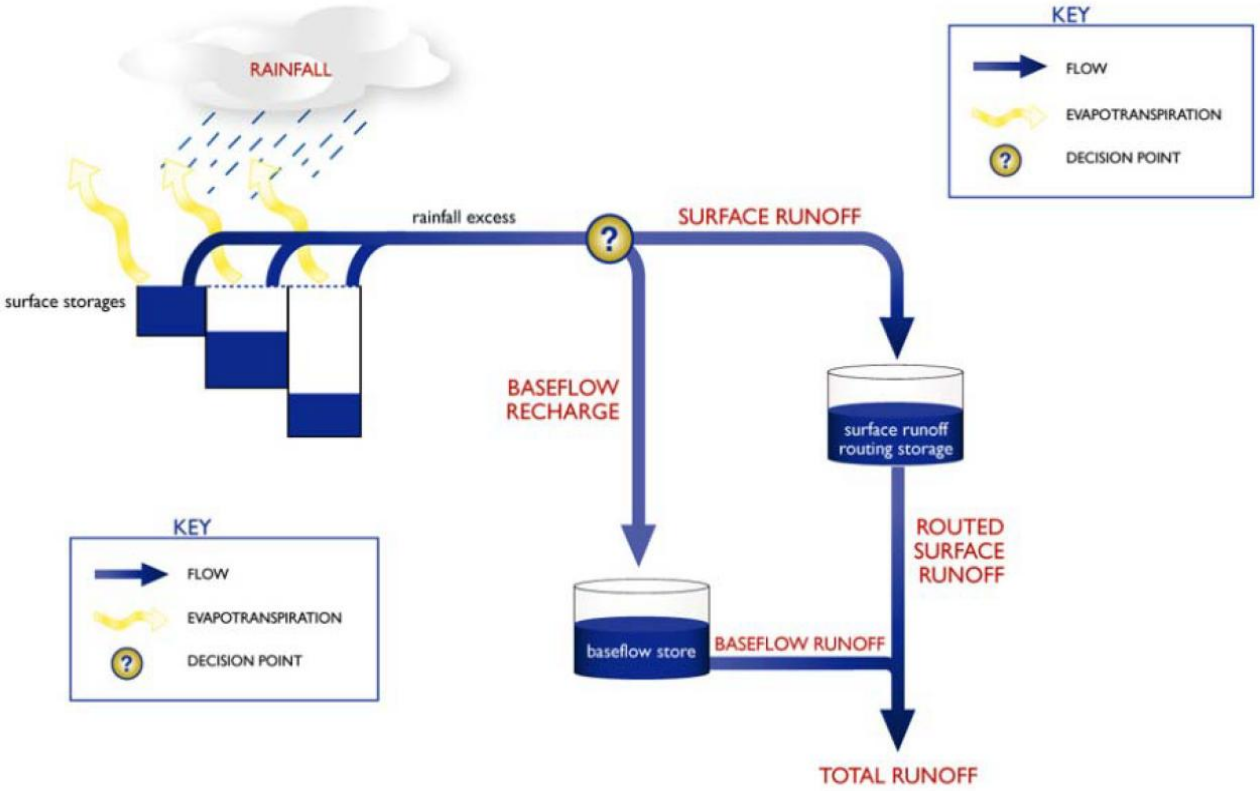

Figure 3.1 Schematic layout of the AWBM rainfall-runoff model (CRC for Catchment Hydrology Australia, 2004)

To implement the AWBM in a given catchment, a set of nine parameters must be defined as summarised in

Table 3.3. These parameters define the generalised model for a particular catchment. The parameters are usually derived for a gauged catchment by a process of calibration where the recorded streamflows are compared with calculated streamflows. The parameters are adjusted to produce the best match between the means and standard deviations of the daily streamflows, to match the difference in peak flow discharges.

Table 3.3 Description of AWBM parameters

PARAMETER	DESCRIPTION
A1, A2, A3	Partial areas represented by surface storages
C1, C2, C3	Surface storage capacities
Ks	Daily surface flow recession constant
BFI	Baseflow index
Kbase	Daily baseflow recession constant

AWBM parameters for Bengalla have been obtained from the Bengalla Continuation of Mining Project Environmental Impact Statement (EIS) SWIA (WRM, 2013) and are summarised in Table 3.4. Verification of the water balance model and adopted AWBM parameters was undertaken for the period January 2010 to December 2011 as part of the EIS SWIA. No further calibration or verification has been undertaken of the adopted AWBM parameters. Average long term volumetric runoff coefficients estimated from the AWBM are also summarised in Table 3.4. The volumetric runoff coefficient is the ratio of the volume of runoff to the volume of rainfall. Rainfall losses include interception by vegetation, evaporation from the land surface, depression storage on the land surface and infiltration into the soil.

Table 3.4 Adopted AWBM parameters for mine site catchments

LAND USE	AWBM PARAMETERS								
	BFI	K_{BASE}	A1	A2	A3	C1 (mm)	C2 (mm)	C3 (mm)	VOLUMETRIC RUNOFF COEFFICIENT
Undisturbed area	0.134	0.433	0.433	5.7	57.8	115.7	0.933	0.39	12.4%
Rehabilitated spoil	0.134	0.433	0.433	5.7	57.8	115.7	0.933	0.39	12.4%
Industrial	0.134	0.433	0.433	2.6	26.7	53.3	0	0	21.8%
Open cut pit	0.2	0.6	0.2	5	70	90	0	0	15.7%
Active spoil	0.136	0.27	0.594	50	100	500	0	0.103	2.7%

Source: EIS SWIA (WRM, 2013)

3.4 STREAMFLOW

The streamflow record for the Hunter River at Muswellbrook Bridge (Station No 210002) was obtained from the NSW Government Department of Primary Industries Water (DPI Water) 'real-time data' website. The Muswellbrook Bridge gauge has been in operation since 1913 and is still operating, however, there is more than 30 years of missing data over this period of record. The catchment area for the Hunter River at Muswellbrook Bridge is approximately 4,220 km^2.

Historical streamflow timeseries for the Hunter River at Muswellbrook Bridge (Station No 210002) for the full period of record from 1913 to 2017 is provided in Figure 3.2 and a low flow frequency analysis is provided in Figure 3.3. A flow duration curve for the full period of record from 1913 to 2017 is provided in Figure 3.4. The flow duration curve shows the percentage of time that flow in the Hunter River equals or exceeds a specific value based on the historical record. The Hunter River catchment was modified in 1988 with completion of upgrade works to Glenbawn Dam, and the daily flow duration curve for the period 1988 to 2017 is also provided in Figure 3.4 as this curve is more representative of the catchment in its current developed condition.

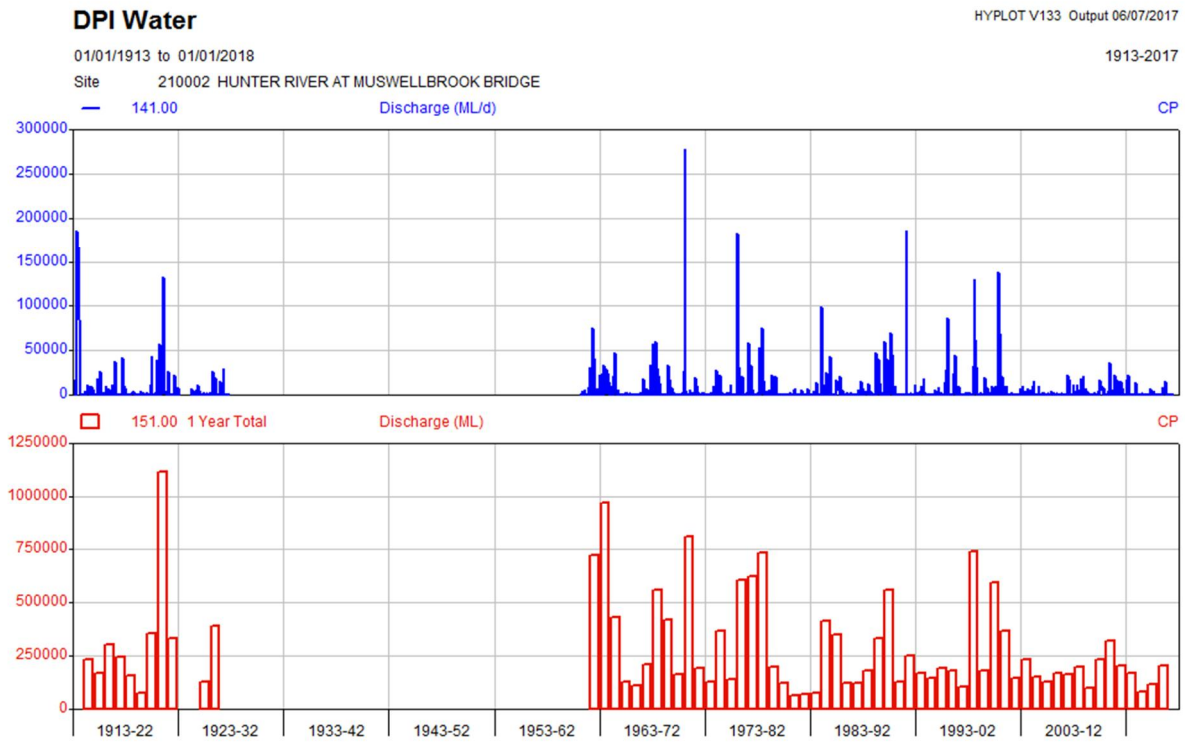

Figure 3.2 Streamflow timeseries for Hunter River at Muswellbrook Bridge (Station No 210002) for 1913 to 2017 (Source: DPI Water 'real-time data' website)

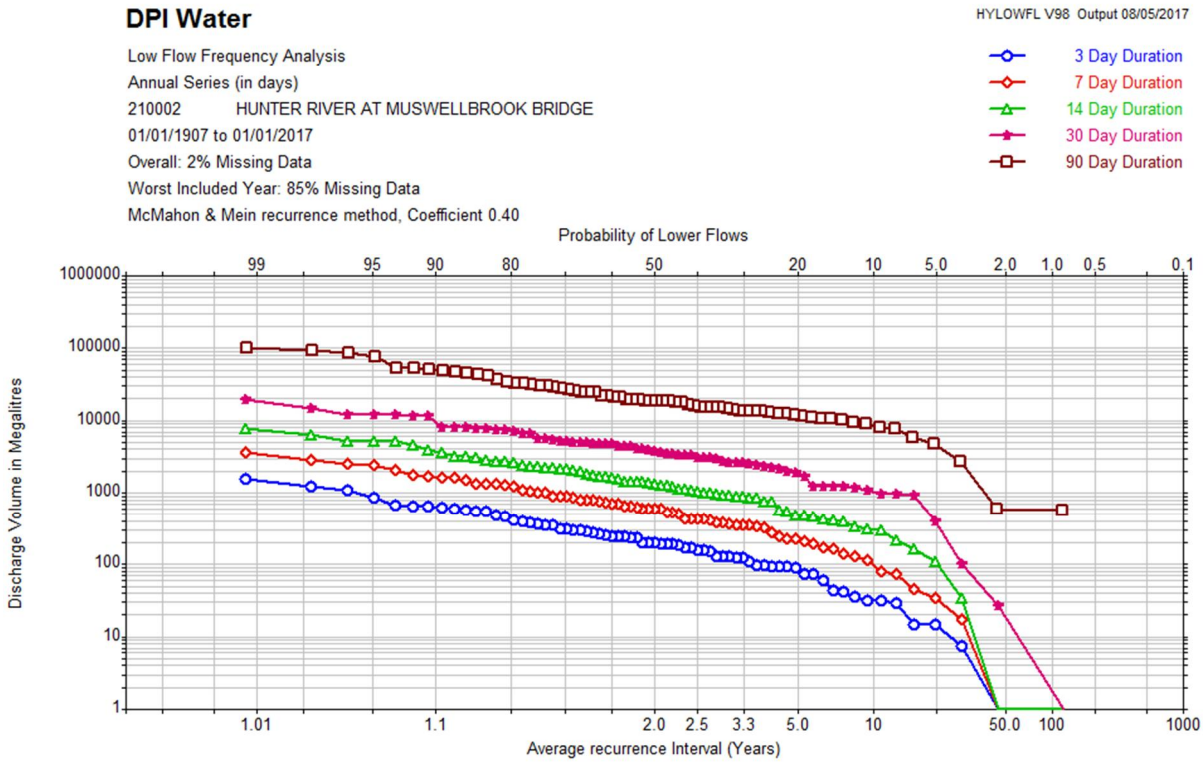

Figure 3.3 Low flow frequency analysis for Hunter River at Muswellbrook Bridge (Station No 210002) for 1913 to 2017 (Source: DPI Water 'real-time data' website)

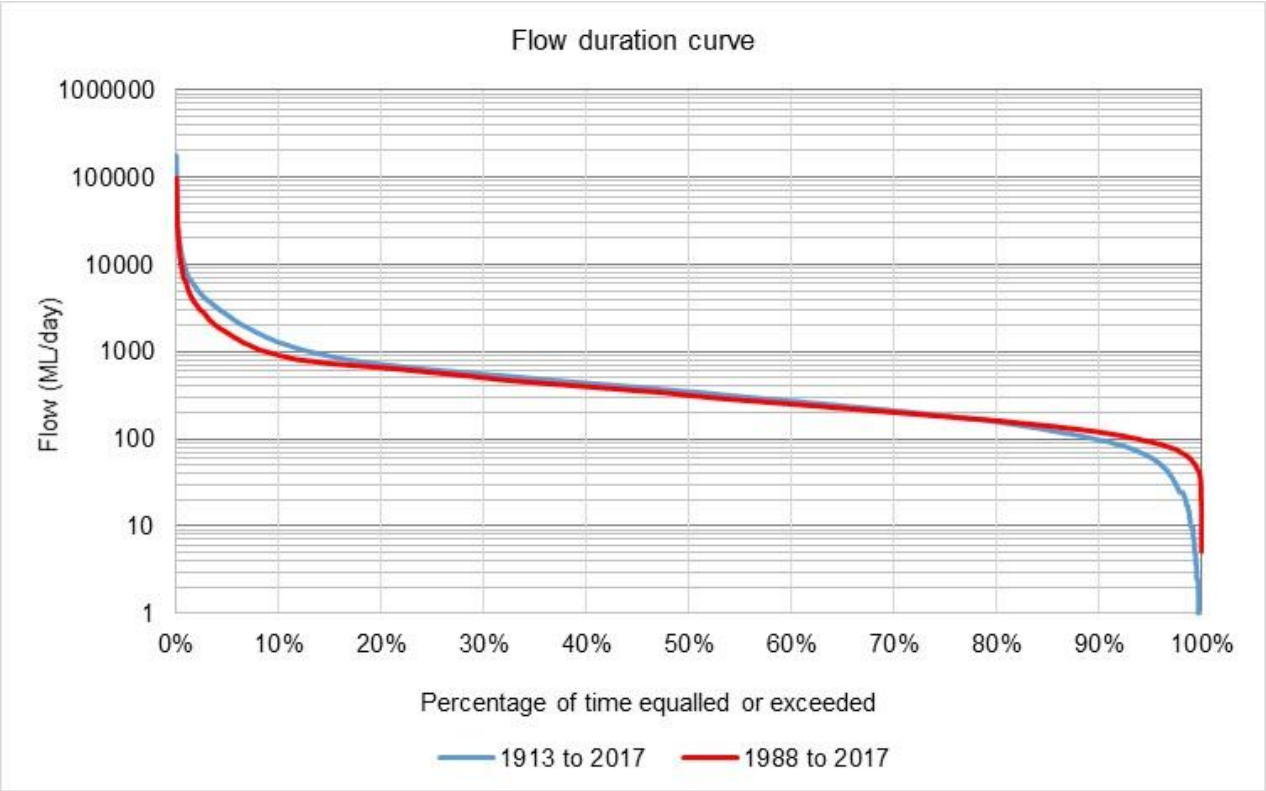

Figure 3.4 Flow duration curve for Hunter River at Muswellbrook Bridge (Station No 210002)

The flow duration analysis for the period 1988 to 2017 shows that flows less than 10 ML/day can be expected 0.01% of time. The minimum flow recorded from 1988 to 2017 was 5.1 ML/day. The flow duration curve for the full period of record from 1913 to 2017 shows that flows less than 10 ML/day can be expected 1.1% of time. Comparison of the two flow duration curves indicates that Glenbawn Dam has increased the frequency of low flows and decreased the frequency of high flows.

For the purposes of water balance modelling, simulated streamflow data for the Hunter River was obtained from DPI Water's Integrated Quantity and Quality Model (IQQM) for the period 1/1/1900 to 30/6/2007 for use in the EIS SWIA (WRM, 2013). The IQQM simulated streamflow data is based on the catchment in its developed condition (with assumed demands for power generation and irrigated crop areas etc) and does not contain data gaps. As such the IQQM simulated data was considered superior to historical streamflow data for the purposes of water balance modelling. Simulated data is not available beyond 30/6/2007.

4 WATER MANAGEMENT

4.1 EXISTING WATER MANAGEMENT STRATEGY

Bengalla's existing water management strategy is described in the Bengalla WMP (BMC, 2017). The following definitions are used for the various water types:

— Clean water - Water pumped from the Hunter River into the Existing Raw Water Dam or runoff from a catchment that is undisturbed by mining and associated activities. Includes runoff from fully rehabilitated mined out areas where the rehabilitation area has been relinquished.

— Mine water - Water that accumulates within, or drains from, active mining and infrastructure areas and any other areas where runoff may have or has come into contact with coal or carbonaceous material.

— Sediment water - Runoff from areas disturbed by mining and associated activities that has not come into contact with coal or carbonaceous material. Includes water from non-relinquished rehabilitation areas.

— Contaminated water - Associated with water used by the vehicle washbay and bathhouse that is captured and processed in the hydrocarbon separation system and waste water treatment plant (WWTP) respectively to enable its transfer and reuse in the mine water system.

Water management at Bengalla is based on the following key principles:

— Minimise the use of clean water from external sources.

— Where possible, divert clean water away from areas disturbed by mining and associated activities.

— Collect sediment water in catch drains and direct to sediment traps and settling dams, and where required reuse as Bengalla water supply.

— Collect runoff from industrial areas (mine water) in catch drains.

— Transfer of open cut pit water (mine water) to storage dams for reuse as Bengalla water supply.

— Minimal offsite discharge of surplus mine water.

4.1.1 CLEAN WATER MANAGEMENT

Dams, pipelines and associated drainage structures redirect clean water away from disturbed areas. A series of temporary drains divert clean water around the disturbance area to the downstream waterway.

4.1.2 MINE WATER MANAGEMENT

Mine water is used onsite or discharged to the Hunter River in accordance with EPL 6538 and the HRSTS. Water stored in the Existing Washery Dam is used for mine site demands, excluding the vehicle wash down, fire suppression and drinking and shower purposes, as a priority over raw water. The pit is utilised for mine water storage, as required. The EPL 6538 licensed discharge point for mine water is located on the Western Diversion Levee, with discharge water being pumped from the Existing SDD to the discharge point via a pipeline.

4.1.3 SEDIMENT WATER MANAGEMENT

Sediment water is detained within the Bengalla water management system. Sediment dams transfer water to the mine water management system, with overflows from sediment dams to natural watercourses only occurring during large rain events or prolonged wet periods.

New sediment dams are designed in accordance with the guidelines *Managing Urban Stormwater: Soils and Construction - Volume 1* (Landcom, 2004) ('Blue Book') and *Managing Urban Stormwater: Soils and Construction - Volume 2E Mines and Quarries* (Department of Environment and Climate Change, 2008). Sediment dams are generally 'wet basins' designed for 'Type D/F' soils.

Following the relinquishment of established rehabilitation areas it is anticipated that relevant sediment dams will be removed from the mine water management system and clean runoff from rehabilitated areas will be released to the environment.

4.1.4 CONTAMINATED WATER MANAGEMENT

Contaminated water at Bengalla is generated by the bathhouse and vehicle wash bay. Contaminated water from the bathhouse is processed through the WWTP which then directs the water into the process water circuit for reuse in the mine water system. Contaminated water from the vehicle wash bay is processed through a hydrocarbon separation system which directs waste oil into a waste oil tank and the water component into the facilities sump. The water from the facilities sump overflows into the East & West Facilities dams for reuse in the Bengalla water management system.

4.2 EXISTING WATER MANAGEMENT SYSTEM

Bengalla's existing water management system is described in the Bengalla WMP (BMC, 2017). The main components of the existing Bengalla water management system (as at June 2017) include:

- The Existing Washery Dam supplies process water to the coal handling and preparation plant (CHPP) and truck fill stations. The Existing Washery Dam is also used as a transfer dam, receiving excess mine water which then overflows to the Existing SDD.
- Water supply infrastructure includes the Hunter River intake and pipeline and the Existing Raw Water Dam which acts as a storage dam for raw water pumped to site.
- The Bengalla WWTP treats effluent and directs it into the Bengalla mine water management system for reuse.
- The East & West Facilities dams capture CHPP return water, contaminated water from the WWTP and vehicle wash, mine water runoff and mine water transferred from the Wantana West Dam and ROM North Dam. Water from the East & West Facilities Dams is transferred to the Existing Washery Dam.
- The South Loop Road Dam and Endwall Dam receive mine water from the pit.
- CW1 (located north of Wybong Road) intercepts runoff from the Dry Creek catchment upstream of Bengalla.
- The Northern Diversion Levees divert clean water from the upper Dry Creek catchment into CW1.
- The Western Diversion Levee, constructed west of Dry Creek and south of Wybong Road, diverts clean water around active mining and into Dry Creek south of the existing Mine Access Road.
- The EPL 6538 licensed discharge point for mine water is located on the Western Diversion Levee, with discharge water being pumped from the Existing SDD to the discharge point via a pipeline. Discharges are undertaken in accordance with conditions of the HRSTS and EPL 6538.
- Sediment traps, drainage channels and sediment dams collect and treat sediment water runoff from overburden, non-relinquished rehabilitation and hardstand areas.
- Various other minor sediment and mine water dams.

A schematic of the existing Bengalla water management system is provided in Figure 4-1.

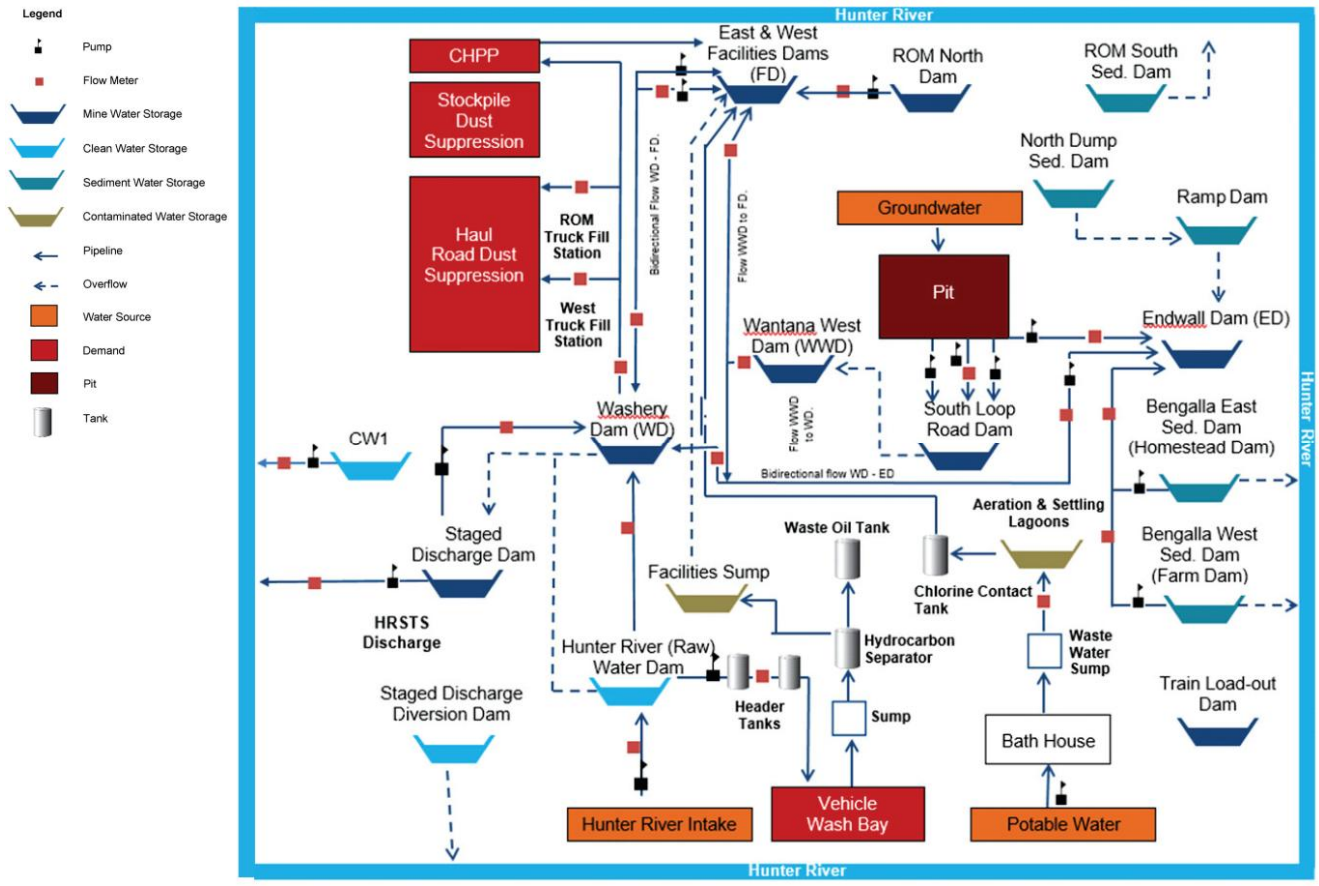

Figure 4-1 Bengalla existing water management system schematic (March 2017) (Source: BMC, 2017)

4.3 APPROVED OPERATIONS

To facilitate ongoing mining operations at Bengalla, a number of changes to the original Bengalla water management system have been approved as part of the Bengalla Continuation of Mining Project (as modified). Key changes include:

BENGALLA CONTINUATION OF MINING PROJECT

— Increased water demands associated with increased production rates, including CHPP water use, stockpile and haul road dust suppression and vehicle wash down.

— Mining operations continuing west through some existing facilities. Some storages will be relocated as this occurs. The Existing Raw Water Dam, Existing Washery Dam and Existing SDD will be relocated. The approved capacity of Future SDD (ED1) is 300 ML.

— The diversion of Dry Creek via dams and pipe work with a later permanent alignment of Dry Creek through rehabilitation areas when overburden areas are suitably advanced.

— Construction of various mine water dams, diversion drains, levees, sediment dams and associated drainage works, as required.

MOD 1

— Utilisation of the Satellite Pit as a temporary mine water catchment dam.

— Relocation of the SDD and HRSTS release point.

— Construction of clean water diversion levees in locations other than those already approved.

— Revised locations for the Future Raw Water Dam and Future Washery Dam.

The performance of the approved Bengalla water management system is described in the Bengalla MOD 1 SEE SWIA (WRM, 2015). The overall health of the water management system is reflected in the modelled stored inventory in the open cut pits. The median (50th percentile) inventories of the Main Pit and Satellite Pit show that the pits are generally maintained dry with no long term build up. The 90th percentile inventory in the Main Pit and Satellite Pit reaches 240 ML and 450 ML respectively. The 99th percentile inventory in the Satellite Pit reaches approximately 1,250 ML (WRM, 2015).

MOD 2

MOD 2 did not include significant changes to the Bengalla water management system. Water balance modelling was not undertaken for MOD 2.

MOD 3

MOD 3 did not include significant changes to the Bengalla water management system. Water balance modelling was not undertaken for MOD 3.

4.4 PROPOSED WATER MANAGEMENT SYSTEM

The proposed MOD 4 water management system includes:

— Enlargement of the Future ED1 to approximately 700 ML in order to provide additional out-of-pit mine water storage onsite and to reduce the volume stored in-pit during wet conditions. This is 400 ML above the approved capacity of 300 ML. There are no changes proposed to the approved location or general operating philosophy of ED1.

— Provision of the proposed approximately 93 ML capacity Dry Creek East Dam.

  — Dry Creek East Dam will initially be a mine water dam (Year 4) and will operate as a midway point between the open cut pit and ED1. Dry Creek East Dam will replace the existing function of Wantana West Dam as a staging point for pit dewatering. Pumped flows from the Main Pit and Satellite Pit will be received via the South Loop Road Dam which will overflow into the Dry Creek East Dam. From the Dry Creek East Dam mine water will be pumped onto the Future Washery Dam for reuse onsite or release from ED1 under the HRSTS. Pumped flows from the Endwall Dam and Wantana West Dam sediment dams will also report to Dry Creek East Dam.

  — Dry Creek East Dam will be converted to a sediment dam (by Year 8) and will capture and treat runoff from a local overburden catchment as well as continuing to receive pumped inflows from other sediment dams. As a sediment dam, Dry Creek East Dam will pump to the Future Washery Dam and Dry Creek East Dam will overflow to the natural watercourse only during large rain events or prolonged wet conditions. When Dry Creek East Dam no longer operates as a mine water dam, pit dewatering will be to the Future Washery Dam. The dewatering pipeline route may include a small staging dam to facilitate efficient pumping.

  — Dry Creek East Dam will be considered a clean water dam when the overburden catchments reporting to it are fully rehabilitated and relinquished and will release to natural watercourses.

— Relocation of the approved Temporary OEA Sediment Dam within the Main OEA. The approved Temporary OEA Sediment Dam was located to the east of the Main OEA ridgeline and overflowed to Bengalla East Sediment Dam. The approved strategy also directed runoff from overburden areas west of the ridgeline to Ramp Dam (and onto Endwall Dam). The proposed approximately 58 ML Temporary OEA Sediment Dam is located to the west of the ridgeline and captures runoff from areas west of the ridgeline. The proposed Temporary OEA Sediment Dam overflows to the open cut pit and pumps to the proposed Dry Creek East Dam.

— Runoff from the proposed ROM stockpile and Temporary Rejects Cells will be captured in the mine water management system. In Year 4, these areas drain to the Satellite Pit and the East & West Facilities dams. In Year 24, these areas drain to the Main Pit and the East & West Facilities dams.

The proposed water management system layouts for the Year 4, 8, 15 and 24 mine stage 'snapshots' are shown in Figure 4-2 to Figure 4-5. The proposed water management system schematics, showing the connectivity between water storages, sources and demands, for the Year 4, 8, 15 and 24 mine stage 'snapshots' are shown in Figure 4-6 to Figure 4-9.