



APPIN MINE COAL WASH EMPLACEMENT AREA MANAGEMENT PLAN

<i>This document UNCONTROLLED once printed</i>				Page 1 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Table of Contents

1. INTRODUCTION.....	5
1.1 Plan Objectives	5
1.2 Scope	6
1.3 Environmental Management System	6
1.4 Consultation Process.....	6
2. ROLES AND RESPONSIBILITIES	6
3. LEGISLATION AND PLANNING	7
3.1 Project Approval	7
3.2 Relevant Legislation	9
3.3 Guidelines and Standards	10
4. COAL WASH EMPLACEMENT MANAGEMENT	10
4.1 Emplacement Design and Staging.....	10
4.2 Emplacement Works	12
5. CULTURAL HERITAGE MANAGEMENT.....	24
5.1 Overview	24
5.2 Background Information	24
5.3 Stage 3 Emplacement Section 87 Permits and Associated Study.....	24
5.4 Stage 3 Emplacement Section 90 Consents.....	25
5.5 Stage 4 Emplacement Impact Assessment.....	25
5.6 Heritage Management Plan	25
5.7 Management and Mitigation	27
6. VEGETATION AND FAUNA MANAGEMENT	28
6.1 Pre-Clearing Actions.....	28
6.2 Clearing Process	29
6.3 Emplacement Rehabilitation	31
6.4 <i>Persoonia hirsuta</i> Management Strategies	40
6.5 Broad-headed Snake and Southern Brown Bandicoot Management Strategies	40
7. POLLUTION CONTROL MEASURES.....	40
7.1 Water.....	41
7.2 Dust Control	41
7.3 Noise Control.....	42
7.4 Visual Impact.....	42
8. MONITORING PROGRAM	43

<i>This document UNCONTROLLED once printed</i>				Page 2 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



8.1	Emplacement Rehabilitation Monitoring Program	43
8.2	Emplacement Height	46
8.3	Emplacement Compaction.....	46
8.4	Emplacement Run-off and Subsurface Drainage.....	46
8.5	Emplacement Erosion and Sediment Control	46
9.	COMPLAINTS AND NON-COMPLIANCE MANAGEMENT	47
9.1	Complaints and Dispute Resolution.....	47
9.2	Non-Compliance, Corrective Action and Preventative Action.....	47
9.3	Notification of Pollution Incidents to Government Authorities and the Public.....	48
10.	REPORTING AND REVIEW	48
10.1	Reporting.....	48
10.2	Exceedance/Non-compliance Notifications	49
10.3	Review of CWEAMP	49
10.4	Audits	50
11.	SUMMARY OF COMMITMENTS	51
12.	ACRONYMS	53
13.	PLANS.....	55
	Plan 1: Emplacement Outline and Location Plan.....	56
	Plan 2: Stage 3 Final Emplacement Design (Concept).....	57
	Plan 3: Stage 4 Final Emplacement Design (Concept).....	57
	Plan 4: Stage 4 Final Emplacement Staging Sequence (Concept).....	59
	Plan 5: Cultural Heritage Plan	60
14.	REFERENCES.....	61
15.	SUPPORTING DOCUMENTS.....	62
16.	APPENDICES.....	63
	Appendix 1: Project Approval Conditions and Statement of Commitments: Coal Wash Management	63
	Appendix 2: EPBC Approval Conditions: Coal Wash Management.....	66
	Appendix 3: CWEA Cultural Heritage Site Summary Table	68
	Appendix 4: Agency Consultation.....	72
	Appendix 5: Management Plan Approval - DPIE	76
	Appendix 6: Management Plan Approval - DAWE.....	77

<i>This document UNCONTROLLED once printed</i>				Page 3 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



DOCUMENT REVISION LOG

Persons authorising this Plan

Name	Title	Date
Chris Schultz	Superintendent Environment	16/12/2020

Document Revisions

Revision	Description of Changes	Date
3.0	Document updated to include BSO Project requirements for Stage 4 emplacement.	29/06/2013
3.1	Incorporate comments from OEH.	2/04/2014
4.0	Updated to reflect South32 name and branding. Changes made to emplacement monitoring programs and roles and responsibilities.	21/07/2017
5.0	Review of content/format. Revision of closure criteria and commitment to use best endeavours to direct coal wash to beneficial uses. Incorporate comments from regulatory agencies.	16/12/2020

Persons involved in the review of this Plan

Name	Title	Company	Exp (yrs)	Date
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<i>This document UNCONTROLLED once printed</i>				Page 4 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



1. INTRODUCTION

Appin Mine incorporates the underground mining operations, which extract coal from the Bulli Seam, and associated surface activities, including the West Cliff Coal Preparation Plant (WCCPP) and Coal Wash Emplacement Area (CWEA). Appin Mine is located approximately 25 kilometres (km) north-west of Wollongong in New South Wales (See Plan 1). Appin Mine is owned and operated by Endeavour Coal Pty Ltd, a subsidiary of Illawarra Coal Holdings Pty Ltd (ICHPL), which is a wholly owned subsidiary of South32 Limited. Appin Mine, Cordeaux Colliery and Dendrobium Mine (and associated facilities) collectively operate as South32 Illawarra Metallurgical Coal (IMC).

ICHPL received Project Approval 08_0150¹ (the Project Approval) from the Planning Assessment Commission of NSW under delegation of the Minister for Planning and Infrastructure on 22 December 2011 for current and proposed mining of the Bulli Seam Operations (BSO) for the next 30 years, and production of up to 10.5 million tonnes per annum of run of mine (ROM) coal. This approval incorporates underground mining, transport and coal wash emplacement activities undertaken 24 hours a day, seven days per week.

ICHPL also received approval EPBC No. 2010/5350 (the EPBC Approval) from the Department of the Environment and Energy (DoTEE) under the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999* in May 2012.

This Coal Wash Emplacement Area Management Plan (CWEAMP) has been prepared to detail the control measures, compliance procedures, monitoring programs, evaluation protocols, notification and communication processes for coal wash management at the CWEA, as well as best endeavours to direct coal wash to beneficial uses. This plan has been prepared to satisfy Condition 17 of Schedule 4 of the Project Approval for the West Cliff Coal Wash Emplacement Area Management Plan and Condition 6 of the EPBC Approval which requires the preparation of a Coal Wash Emplacement Staging and Rehabilitation Plan (Staging Plan).

The CWEA receives coal wash primarily from the WCCPP. Coal wash may also be received from the Dendrobium Coal Preparation Plant (DCPP) if beneficial reuse options are unable to be sourced.

1.1 Plan Objectives

The objective of the CWEAMP is to establish the standards and procedures for the:

- establishment of pollution control measures;
- construction of coal wash haul roads;
- construction and management of emplacement drainage and ponds;
- preparation of active emplacement areas;
- coal wash transport and deposition operations;

¹ As modified by MOD 1 (April 2015) and MOD 2 (October 2016)

<i>This document UNCONTROLLED once printed</i>				Page 5 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- vegetation and fauna management;
- revegetation and rehabilitation of finished emplacement areas;
- management of Archaeological sites, including sites of Aboriginal cultural heritage significance;
- ongoing monitoring associated with the emplacement; and
- best endeavours to direct coal wash to beneficial uses.

1.2 Scope

The scope of the CWEAMP includes all existing and future activities undertaken at the CWEA, as well as best endeavours to direct coal wash to beneficial uses. Emplacement construction and operations will be conducted in accordance with the detailed design plans prepared for each emplacement phase. Due to the long life of the emplacement, detailed final design details are prepared progressively and are therefore not outlined in this plan for Stage 4. Emplacement of coal wash in Stage 3 is currently underway. The Stage 4 CWEA is scheduled to commence in approximately ten (10) years.

1.3 Environmental Management System

IMC has a comprehensive Environmental Management System (EMS) in place to minimise the impact of its operations on the local environment and community. The CWEAMP is a component of the EMS which is certified to ISO 14001.

1.4 Consultation Process

Consultation has been undertaken as part of this review of the CWEAMP with the Environment Protection Authority (EPA), Biodiversity and Conservation Division of the Department of Planning, Industry and Environment (DPIE) and the Department of Agriculture, Water and the Environment (DAWE). The comments from the consultation process have been incorporated into the current version of the CWEAMP.

Appendix 4 outlines comments from the relevant government agencies following consultation and the IMC response.

Consultation with agencies as stated in Condition 17 of Schedule 4 will only be undertaken where there is a material change to the management of the CWEA or if specifically requested by DPIE. Administrative or descriptive changes do not constitute a material change.

2. ROLES AND RESPONSIBILITIES

Roles and responsibilities associated with environmental management at Appin Mine are defined in the Environmental Management Strategy. Table 1 outlines the roles and responsibilities associated with the implementation and periodic review of the CWEAMP.

<i>This document UNCONTROLLED once printed</i>				Page 6 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Table 1: Roles and Responsibilities

Role	Responsibilities
General Manager Appin Mine	Legal and statutory requirements for emplacement of coal wash. Provide the necessary resources and systems to ensure that requirements of the CWEAMP are met.
Manager Surface and Infrastructure	Emplacing coal wash in approved sites and in accordance with the CWEAMP.
Emplacement Contractor	Emplacement construction, clearing activities and rehabilitation in accordance with the CWEAMP.
Specialist Environment	Environmental monitoring at the CWEA to meet the CWEAMP and Environment Protection Licence requirements. Review of the CWEAMP. Monitoring and reporting of the emplacement rehabilitation performance. Reviewing and issuing Permits to Disturb Vegetation and fauna management, including threatened species.
Superintendent Environment	Liaise with regulators with regard to the CWEAMP. Review of the CWEAMP.
Superintendent Logistics	Implement best endeavours to direct coal wash to beneficial uses.

3. LEGISLATION AND PLANNING

3.1 Project Approval

3.1.1 Stages 1 and 2

Wollondilly Shire Council (WSC) granted development consent for West Cliff Mine in 1975, which included the deposition of coal wash in Brennans Creek Valley (now known as the Stage 1 CWEA). The consent was conditional on each phase of the emplacement facility complying with legislation administered by relevant Government Authorities.

<i>This document UNCONTROLLED once printed</i>				Page 7 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Approval for Stage 2 of the CWEA comprised of several approvals and various conditions. Approval for commencement of coal wash deposition in Stage 2 was granted in 1999 by the then Department of Mineral Resources.

Emplacement of coal wash in Stage 1 and 2 is complete and these areas are now rehabilitating.

3.1.2 Stage 3

Approval for Stage 3 of the CWEA was issued by the Minister for Planning on 20 December 2007. The Stage 3 CWEA is located to the north of the Stage 2 CWEA in the Brennans Creek Valley.

The specific approvals required for the Stage 3 CWEA were:

- Further approval from the Minister of Planning pursuant to Condition 2(e) of DA 60-03-2001 (the Dendrobium Mine consent) under the *Environmental Planning and Assessment (EP&A) Act, 1979*.
- Approval under Section 100 of the *Coal Mine Health and Safety Act 2002* No 129 for consent to establish Stage 3 of the emplacement area at West Cliff Colliery (the then Department of Primary Industry).
- Approval under provisions of the *Water Act 1912* No 44 for consent to divert Brennans Creek around the Stage 3 CWEA (the then Department of Water and Energy).
- Approval under Section 90 of the *National Parks and Wildlife Act 1974* No 80 for consent to destroy Aboriginal sites in the Stage 3 CWEA (the then Department of Environment and Climate Change (DECC)).
- Approval under Section 87 of the *National Parks and Wildlife Act 1974* No 80 for permission to excavate Aboriginal objects in the Stage 3 CWEA (the then DECC).

Note: Condition 8 of Schedule 5 of the Dendrobium Mine Development Consent states:

All references in this consent (including conditions 3 – 7 of this schedule and Appendix 3) that have direct application to the West Cliff Coal Wash Emplacement shall cease to have force and effect subsequent to the grant of any project approval under Part 3A of the Environmental Planning & Assessment Act 1979 which includes the West Cliff Colliery and the West Cliff Coal Wash Emplacement Area.

ICHPL received project approval under Part 3A of the *EP&A Act 1979* in 2011 which incorporates any future emplacement activities at the BSO. The Dendrobium Consent no longer has direct application to Stage 3 as emplacement operations are being undertaken in accordance with the Project Approval.

Emplacement of coal wash in this area is ongoing.

<i>This document UNCONTROLLED once printed</i>				Page 8 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



3.1.3 Stage 4

Approval for Stage 4 was issued by the Minister for Planning and Infrastructure under section 75J of the *EP&A Act 1979*. The approval was granted in December 2011.

The specific approvals required for Stage 4 are:

- approval under the *EPBC Act 1999* (EPBC Approval 2010/5350); and
- approval under Section 75J of the *EP&A Act 1979* (the Project Approval).

The requirements of Condition 17 of Schedule 4 of the Project Approval and Condition 6 of the EPBC Approval, and the relevant sections of this Management Plan where these requirements are addressed, are outlined in Appendix 1 and Appendix 2 respectively

3.1.4 Dendrobium Mine Extension Project

The development application and Environmental Impact Statement (EIS) for the Dendrobium Mine Extension Project (SSD-8194) was submitted to DPIE in July 2019. The project seeks approval for the continuation of mining activities in Dendrobium's next two underground mining areas (Areas 5 and 6), within the existing mining lease until 2048. This would include the use of existing infrastructure and require minimal additional surface infrastructure.

Section 3.8 of the EIS outlines the proposed management of coal wash. The Project would involve the continued use of the Stage 3 and Stage 4 CWEA for the emplacement of coal wash that is not diverted to alternate beneficial uses. The project does not seek to increase maximum production from 5.2 Mt /year of ROM coal.

Table 3-6 of the EIS provides an Indicative Production Schedule of coal wash to be emplaced at the CWEA and/or available to be supplied for beneficial re-use. The currently approved CWEA has sufficient capacity for the Project, the Approved Mine and the approved BSO Project.

If development consent is granted for the Project, the new consent would prevail to the extent of any inconsistency with Development Consent DA 60-03-2001 in relation to development and rehabilitation of Stage 3 of the CWEA.

Development and rehabilitation of Stage 4 of the CWEA would continue to be conducted in accordance with the Project Approval.

It is intended that development and rehabilitation of Stage 3 of the CWEA would continue to be integrated with the management activities at the Appin North and WCCPP surface facilities, including continued implementation of the CWEAMP.

Determination of the Dendrobium Mine Extension Project is expected early 2021.

3.2 Relevant Legislation

Key regulatory and coal wash emplacement obligations are managed via an online obligations management database. The obligations are allocated to responsible personnel. This process is detailed in the Environmental Compliance/Conformance Assessment and Reporting Procedure.

<i>This document UNCONTROLLED once printed</i>				Page 9 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Legislation applicable to the coal wash management includes but is not limited to:

- *Protection of the Environment Operations Act 1997 (POEO Act);*
- *Environmental Planning and Assessment Act 1979 (EP&A Act);*
- *Water Act 1912;*
- *Water Management Act 2000;*
- *Mining Act 1992;*
- *Environment Protection and Biodiversity Conservation Act (EPBC Act);*
- *National Parks and Wildlife Act 1974;*
- *Biosecurity Act 2015;*
- *Rural Fires Act 1997;*
- *Coal Mine Health and Safety Act 2002;* and
- *Biodiversity Conservation Act 2016.*

3.3 Guidelines and Standards

This CWEAMP has been developed to be consistent with the principles of the following:

- ISO 14001:2015 Environmental Management Systems;
- South32 Sustainability Policy;
- South32 Environment Standard; and
- South32 Closure Standard.

Other relevant guidelines for coal wash management include:

- Leading Practice Handbook: Mine Closure and Rehabilitation;
- Managing Urban Stormwater – Soils and Construction, Volume 1 (Blue Book) (Landcom, 2004); and
- Managing Urban Stormwater – Soils and Construction, Volume 2E Mines and Quarries (Landcom, DECC).

4. COAL WASH EMPLACEMENT MANAGEMENT

4.1 Emplacement Design and Staging

The design of the CWEA has been developed to minimise environmental impacts to sites of Aboriginal cultural significance and threatened flora and fauna species. The alignment and location of haul roads, construction roads, drainage works, and emplacement ponds have been carefully chosen to avoid threatened flora species, sensitive habitat and Aboriginal sites where possible.

<i>This document UNCONTROLLED once printed</i>				Page 10 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



The maximum design parameters for Stage 3 of the CWEA are:

- no more than 60.5 ha of native vegetation to be cleared.

The maximum design parameters for Stage 4 of the CWEA are:

- volume of 26 Mt;
- height of 331 m AHD;
- footprint that retains the existing Brennans Creek Dam storage capacity and stockpile areas (refer to Plan 1); and
- maximum of 60 ha of native vegetation clearance.

Measures to limit the clearing of native vegetation to no more than 60 ha will include:

- survey and demarcation of the Stage 4 boundary prior to clearing works by a qualified surveyor;
- Stage 4 boundary will be clearly outlined on site plans and plans will be provided to clearance contractors;
- pre-clearing survey will be undertaken by Specialist Environment who will be trained appropriately in survey methodology (training provided by external consultancy) or a specialist consultant. The area to be cleared will be clearly demarcated with flagging tape. Boundary markings will be placed in a way to ensure that each marker is within line of site.

Clearing of native vegetation for emplacement preparatory works in the Stage 4 CWEA is required to be undertaken in line with the staging plan.

The Stage 3 and 4 CWEA is located to the north of the Appin North Pit Top and west of the WCCPP. It will be operated as a controlled valley fill. The overall planning concept for the CWEA is to provide a facility that will accept coal wash over an extended period of time. The Stage 3 valley will be filled in a north westerly direction and Stage 4 from the eastern (or upstream/upslope) boundary and progress in corridors from east to west down the valley, as required by EPBC Approval Condition 6 (d).

Coal wash will be deposited in benches across the valley (in the case of Stage 4 which will be north-south) and progressively down the valley from east to west.

As each section of fill reaches the designed height, it is top soiled and revegetated. The final landform created by the CWEA will be sympathetic with the regional morphology and will be largely masked from public view by the visual screening of existing eucalypt forest.

CWEA construction and operations will be conducted in accordance with the final detailed engineering drawings prepared for each CWEA. The Stage 3 and 4 final landform concept designs are illustrated on Plan 2 and Plan 3.

Due to the anticipated life of the Stage 3 CWEA, (which has an expected life of approximately ten (10) years); detailed engineering drawings for Stage 4 are not yet prepared. The engineering drawings for the Stage 4 CWEA will be prepared prior to implementation of the Stage 4 CWEA and these plans will show staging of the emplacement and will comply with Condition 17 (a) and (b) of the Project Approval and Condition 6(b) of the EPBC Approval. Plan 4 shows a preliminary concept staging plan that provides for the progressive staging of the Stage 4 CWEA to keep the minimum 100 m wide habitat corridor

<i>This document UNCONTROLLED once printed</i>				Page 11 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



to link the *Persoonia hirsuta* core population with habitat north of the Stage 4 CWEA, as required by Condition 6(b) of the EPBC Approval.

The Stage 4 Design Plans will be implemented and remain in place for at least ten years, unless otherwise agreed to in writing by the Minister of DAWE, at which point a revised plan taking into account the monitoring referred to above must be submitted to and approved by the Minister (refer to Section 10.3 for more detail on CWEAMP review).

4.2 Emplacement Works

4.2.1 Overview

Works associated with the emplacement area include:

- clearing of vegetation;
- establishment of clean water diversion drains and channels;
- temporary drainage and diversion works;
- construction of coal wash haul roads and construction roads;
- construction of emplacement ponds and treatment systems;
- preparation of active emplacement areas;
- deposition of coal wash in active emplacement areas;
- use of surface gas management drilling and exploration cuttings or imported fill as capping material (if available and approved);
- revegetation of emplacement areas; and
- ongoing maintenance and monitoring of emplacement areas.

The Stage 3 and 4 CWEAs are planned to progress in phases with each phase utilising extended sections of coal wash haul roads, clean water diversion channels, clean water cut-off drains, and phase specific emplacement ponds. The general procedure is outlined in the following sections.

4.2.2 Coal Wash Properties

Coal wash is obtained from the processing of raw coal in a coal preparation plant. The coal wash product is a non-coal material from the coal seam and material cut from the seam roof and floor during mining. The coal wash generally consists of a mixture of carbonaceous shale and mudstone with minor proportions of sandstone. Small quantities of low-quality coal can also be present.

Coal wash deposited at the CWEA is sourced from the WCCPP and the DCP. The WCCPP processes raw coal mined from Appin Mine and the DCP processes raw coal from Dendrobium Mine. Coal wash from the DCP is preferentially used for beneficial purposes (see Section 4.2.12), with any excess coal wash transported to the CWEA via backloaded truck.

The typical size fraction and moisture content of coal wash from the WCCPP and DCP is provided in Table 2.

<i>This document UNCONTROLLED once printed</i>				Page 12 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Table 2: Typical size fraction and moisture content of coal wash

Coal wash source	Size Fraction				Approximate moisture content (%)
	0 mm to 0.15 mm (%)	0.15 mm to 0.6 mm (%)	0.6 mm to 37.5 mm (%)	37.5 mm to 200 mm (%)	
WCCPP (Bin)	3.0	6.8	76.4	13.8	7.2
WCCPP (Belt)	92.9	5.7	1.4	0.0	33.8
DCPP	5.7	6.9	72.3	15.1	12.0

The larger particle size coal wash material is mixed in the WCCPP process and delivered to the CWEA as a coarse coal wash product. A finer graded coal wash which generally has higher moisture content is produced from the WCCPP belt press filter equipment. A comparatively small quantity of sediment (coal wash sludge) is also produced when the site dirty water treatment ponds and sumps are periodically cleaned out and taken to the CWEA. These products are separately trucked to the CWEA, the moist fine coal wash and sludge requiring some degree of natural drying before being incorporated into the emplacement fill.

4.2.3 Procedures for Emplacement Works

4.2.3.1 Coal Wash Haul Roads

Haul roads are used to transport coal wash from the WCCPP site or the DCPP coal wash receipt point to the CWEA. Construction roads will be used for construction access to emplacement pond sites and drainage works. The erosion and sediment control measures are similar for both construction and operational activities.

4.2.3.2 Construction/Operational Activities

Construction activities for haul and construction roads will include:

- vegetation clearing along road alignment;
- minor earthworks and re-grading of road surfaces;
- construction of road drainage; and
- Installation of road sub-grade and pavement material.

Operational activities at the haul and construction road sites will include:

- use of heavy vehicles for construction access and transportation of site won material/coal wash for dam wall construction; and
- transportation of coal wash for emplacement in Stages 3 and 4.

As the active emplacement area advances down the valley its shape and surface topography will change. Consequently, haul roads on active emplacement areas will be constantly evolving and changing as the CWEA progresses. Operational constraints on

<i>This document UNCONTROLLED once printed</i>				Page 13 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



active emplacement areas limit various road design parameters such as curve radii, maximum road grades and sight distances, and subsequently vehicle speeds in these areas are slower than on long term haul roads. It is therefore necessary to divide road types into two categories for the purposes of assigning road design guidelines:

- temporary coal wash haul roads: planned to be in operation without change for up to 12 months; and
- long term haul roads: planned to be in operation without change for more than 12 months.

4.2.3.3 Haul Road Design

Construction of coal wash haul roads associated with the emplacement are to be carried out in accordance with the CWEAMP.

Minimum Road Width:

Minimum road pavement widths for coal wash haul roads associated with the emplacement area are to be no less than 15 m along curved and straight sections.

Maximum Grade:

The grade of haul roads should generally not be greater than a 1:9 grade or 11%. If the grade of the haul road is greater than 11%, a risk assessment is to be conducted as detailed in Table 3.

Table 3: Haul road grades and risk assessment requirements (articulated haul trucks)

Maximum Grade	Haul Road Type
11% to 20%	A risk assessment is to be conducted to identify all of the requirements that are to be put in place before operating on such grades.
Greater than 20%	A risk assessment is to be conducted and approval obtained from the Manager Surface and Infrastructure where haul road is planned to operate for more than 12 months.

It is noted that the articulated haul trucks used at the CWEA are capable of driving up a 40% grade and any steep sections of temporary haul road on active emplacement areas would be over relatively short distances and would not be classed as sustained grades.

Horizontal Curve Dimensions:

Horizontal curves will be designed as required to suit site constraints taking into account safety and operational requirements. Where possible, the following guidelines will be applied to haul road design:

- sharp horizontal curves will be avoided at or near hill crests, at the bottom of hills, and after long sustained downgrades;
- if passing will be required, sections of haul road will be designed with long tangents and constant grades;

<i>This document UNCONTROLLED once printed</i>				Page 14 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- intersections will be avoided at the crest of vertical and/or sharp horizontal curves; and
- tight curves will be avoided.

Vertical Curve Dimensions:

Coal wash haul roads associated with the emplacement are to be designed and constructed to a minimum vertical curve radius of 1500 m and a minimum vertical curve length of 150 m.

4.2.4 Construction of Brennans Creek Diversion Channel

The Brennans Creek Diversion Channel on the south western side of the CWEA diverts flows in Brennans Creek around the CWEA. The alignment of the channel has been designed with consideration of environmental, Aboriginal and European cultural heritage constraints to achieve the largest possible emplacement footprint and maintain a suitable drainage grade.

Progressive rehabilitation of the Brennans Creek Diversion Channel will be undertaken in accordance with the approved Brennans Creek Bypass Channel Rehabilitation Plan.

4.2.5 Construction of Clean Water Cut-Off Drains

4.2.5.1 Construction Activities

Construction activities for clean water cutoff/diversion channels will include:

- vegetation clearing along the channel alignment;
- excavation of sandstone bedrock to develop channels;
- earthwork trimming to the design surface;
- transportation of excavated material to a suitable onsite location to be stockpiled for later use in emplacement pond dam wall construction, emplacement rehabilitation or other suitable uses; and
- installation of culverts/pipes where necessary.

4.2.5.2 Erosion and Sediment Control Management Measures

The drains are positioned to capture clean water runoff from valley sides and divert it past the emplacement dirty water pond system and into Brennans Creek Dam (BCD).

The drains are to be sized as required for the catchment area. Excavated material will be placed beside the drains to form access tracks in the valley for construction of emplacement ponds and development of the emplacement.

The channels will be modified as necessary during the life of the CWEA to adapt to the changing runoff conditions created by the advancing emplacement.

4.2.6 Construction of Emplacement Subsoil Drainage Network

Subsurface drains will be installed on the prepared active CWEA under engineering supervision before coal wash emplacement commences. Construction of the subsurface drains shall be in accordance with detailed engineering drawings.

<i>This document UNCONTROLLED once printed</i>				Page 15 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Subsurface drains will be progressively linked to subsoil drainage from previous sections of the CWEA.

4.2.7 Construction of Emplacement Ponds

4.2.7.1 Description of Works

Emplacement ponds are designed to contain and treat dirty runoff from active emplacement areas. The CWEA to be supported by two sequential ponds sited down the Brennans Creek Valley. As each phase approaches completion, and filling of the first pond is imminent, a new pond will need to be constructed and so on.

Clean water cut-off drains will be established prior to construction of ponds and flows in Brennans Creek will be diverted around the construction area via a temporary dam and pump. This will prevent sediment contamination of clean water from surrounding clean water catchment and treated water from upstream emplacement ponds. Emplacement pond dam walls will be constructed using site won material excavated from an appropriate area onsite (most likely excavated material from the base of the dam storage area or areas being prepared for active emplacement) or coal wash. Where possible, dam wall fill material will be transported directly to construction areas however it may be necessary at times for this material to be temporarily stockpiled until required.

4.2.7.2 Construction Activities

Construction activities for emplacement ponds will include:

- topsoil and vegetation clearing;
- earthworks including cut and fill works and excavation of sandstone and/or other appropriate material for dam wall construction;
- transportation of suitable material to dam construction sites from elsewhere on the site;
- temporary stockpiling of dam wall material;
- dam wall construction;
- temporary creek diversion works including construction of small temporary dams and sediment basins and establishment of pumping equipment to divert treated water from upstream emplacement ponds and clean emplacement ground water flows around pond construction areas; and
- establishment of operational monitoring and water treatment facilities.

4.2.7.3 Erosion and Sediment Control Management Measures

Each phase of the CWEA is supported by two sequential ponds sited down Brennans Creek Valley. The first (upstream) pond allows passive settling of particles, while the second pond will have the capability to be chemically dosed to remove fine particulates from the water column.

Each pond must be operational prior to commencement of coal wash emplacement in the catchment area for that pond. As each phase approaches completion and filling of the first pond is imminent, a new pond is to be constructed downstream, prior to the emplacement

<i>This document UNCONTROLLED once printed</i>				
Document ID	WCPMP0019	Version	5.0	Page 16 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



encroaching on the upstream pond. Emplacement pond dam walls will be constructed using coal wash or site won material excavated (sandstone, coal wash or other appropriate material) from prepared active emplacement areas or other suitable areas.

4.2.8 Preparation of Active Emplacement Areas

4.2.8.1 Description of Works

Preparation of active emplacement areas will take place progressively as the emplacement advances down Brennans Creek Valley. The process of preparing an active emplacement area consists of vegetation clearing, stripping of topsoil and surface preparation such as removal of soft materials, like clays, from the valley floor.

Clearing of native vegetation for emplacement preparatory works in the Stage 4 CWEA is required to be undertaken in line with the staging plan.

The area of land cleared and dedicated as the active emplacement area will be restricted to an operational size of 18 ha (where practical, with a maximum area of 21 ha) in order for the emplacement ponds to effectively treat surface flows.

In general, stripped topsoil will be placed on finished emplacement areas and stripped sandstone/bedrock will be used onsite for emplacement pond dam wall construction. This may require temporary stockpiling of stripped topsoil and sandstone material and appropriate mitigative measures will be undertaken to minimise the effects of erosion and sediment runoff. Stage 4 of the CWEA has a design footprint of 59.4 ha as shown in Plan 3.

4.2.8.2 Construction Activities

Construction activities for preparation of active emplacement areas will include:

- removal of vegetation including shrubs, trees and roots;
- mulching of loose vegetation such as tree branches;
- stripping of topsoil;
- proof rolling of other-than-rock areas;
- excavation of sandstone and soil areas;
- transportation of topsoil and mulch material to finished emplacement areas for rehabilitation;
- temporary stockpiling of topsoil, cleared vegetation, and sandstone material; and
- installation of emplacement subsurface drainage network.

4.2.8.3 Vegetation and Topsoil Removal

All vegetation including shrubs, trees and roots shall be cleared from the active emplacement area using the two-stage clearing process before coal wash emplacement commences. Refer to Section 6 for more detail on vegetation removal. Loose vegetation from site clearing, such as tree branches, shall be used as mulch or brush matting over areas of the CWEA being rehabilitated. Soil will be stripped from areas cleared for coal wash emplacement and where practicable, the seed rich surface layer of topsoil shall be

<i>This document UNCONTROLLED once printed</i>				Page 17 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



separated from lower level soils. Stripped soil will be applied to a depth of typically 0.5 m (where appropriate) over completed areas of the emplacement as soon as practical. When seed rich topsoil stripped from cleared areas is available it will be spread as the surface layer on emplacement areas being rehabilitated. Seed rich topsoil is to be reused as quickly as possible to maintain viability of seeds.

When the emplacement is progressing to its final stages, particular attention must be paid to stockpiling the necessary volumes of soil to ensure adequate soil cover is achieved during rehabilitation of the final landform. Where required, suitable material may be sourced from off-site locations to supplement on-site material where deficiencies are identified.

4.2.9 Emplacement of Coal Wash in Active Emplacement

4.2.9.1 Description of Works

In general, emplacement of coal wash will include transportation of coal wash to the active area, deposition, drying, and compaction, and take place in horizontal benches stepping down the valley. Emplacement operations take place on a 24-hour 7 days per week basis and all operations will be confined to designated active areas, haul roads, and access roads.

Active emplacement areas will be revegetated as soon as possible after the final emplacement design level has been reached.

4.2.9.2 Operational Activities

Coal wash emplacement operations take place on the active emplacement area and are permitted on a 24-hour 7 days per week basis. Floodlights (mobile light towers) for night operation of the emplacement illuminates the active emplacement area with minimal light spillage to surrounding areas. Operational activities for emplacement of coal wash in active emplacement areas include:

- transport of coal wash to the emplacement via dump truck;
- tipping of coal wash in benches across the active emplacement area;
- drying of coal wash in temporary drying basins;
- compaction of coal wash by rollers; and
- ongoing construction of surface water channels and sediment controls as the emplacement progresses.

The active emplacement area includes a:

- tipping area;
- drying area; and
- compaction area.

The emplacement activity in each of these areas will be rotated as coal wash is progressively placed.

4.2.9.3 Coal Wash Transportation

The following procedures must be adhered to with regard to transportation of coal wash associated with the emplacement operations:

<i>This document UNCONTROLLED once printed</i>				Page 18 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- coal wash shall be transported in trucks on the mine site;
- coal wash trucks shall be restricted to designated haul roads on the mine site;
- coal wash haul roads shall be designed in accordance with the haul road design guidelines in this management plan (see Section 4.2.3.3);
- coal wash haul roads must drain to contaminated water catchments and have standard berms installed;
- coal wash haul roads must be maintained to minimise airborne dust;
- only dump trucks shall be permitted on the emplacement area (semi-trailers shall only be permitted on areas of the emplacement that have been specially prepared for their access);
- dump trucks will be speed restricted to an appropriate speed to meet the site requirements; and
- all haul trucks must adhere to site speed limits to maintain operational safety and minimise dust impacts.

Coal wash transport will comply with the safety and operational conditions of the WCCPP Surface Transport Management Plan (Document Number: WCPMP0012), Stockpile and Slope Stability Management Plan (Document Number: WCPMP0001), and the WCCPP Road Maintenance Manual (Document Number: WCPM0004).

4.2.9.4 Coal Wash Tipping

A tipping area is provided on each active coal wash bench for haul trucks to tip their loads onto the bench. There are currently eight different materials which are required to be placed in a controlled manner into the emplacement.

The tipping areas must be set up to handle all eight materials, each of which have different characteristics:

- DCCP coal wash;
- WCCPP coal wash;
- belt press fines from the WCCPP;
- oversize stone (Big Rock) from the WCCPP;
- thickener sludge from the WCCPP;
- drilling muds, waters and drill cuttings from IMC exploration and methane drainage programs;
- inert waste (including concrete and soil) and virgin excavated natural material (VENM); and
- sump/dam clean out materials.

The Material Acceptance Form must be completed and approved prior to the transport of any material not generated by the WCCPP or DCCP to the emplacement for use or disposal.

Each area is prepared in such a way that allows safe operation of mobile equipment while accessing the area for tipping. This includes:

<i>This document UNCONTROLLED once printed</i>				Page 19 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- adequate areas and lighting for night time operations;
- berms in place;
- signage marking tip areas;
- allowance for drainage;
- surfaces suitable for dump trucks and other approved surface mobile equipment; and
- surfaces suitable for tankers around sludge ponds.

The Contract Supervisor for the CWEA operations is responsible for ensuring required inspections are undertaken. The adequacy of these inspection records will be checked by IMC personnel on a periodic basis (nominally annually).

4.2.9.5 Coal Wash Drying

If the moisture content of coal wash delivered to the emplacement area is too high for satisfactory compaction it will be left to dry naturally until suitable moisture content for compaction is reached.

Coal wash slimes/fines and drilling muds will be tipped into shallow temporary drying basins (i.e. sludge ponds) constructed with coarse coal wash. Temporary drying basins will be carefully located on the emplacement area well away from the embankment face and perimeter drains. No surface drainage will be permitted to enter a temporary drying basin.

4.2.9.6 Compaction

Coal wash will be spread from tipped heaps and where necessary compacted with vibratory rollers. Fine coal wash will be combined with coarse coal wash in the spreading and compaction operation. Material from temporary drying basins will be placed and compacted into the emplacement in a similar manner to fine coal wash.

Compaction and subsequent firmness of the coal wash surface is dependent on several variables including but not limited to coal wash type (DCPP vs WCCPP), volumes delivered to the CWEA, moisture content, fine clay content and sizing. The Contract Supervisor manages the deposition of coal wash and is required to balance available areas for deposition, volumes and material types and compaction results. The number of layers and the level of compaction is dependent on the variables noted previously.

The developing emplacement benches are graded back into the valley to prevent surface water flowing over the front batter of the bench.

Compaction testing is nominally carried out ten times per year with each testing campaign comprised of at least five representative samples. The compaction testing tests for Standard Maximum Dry Density (SMDD) and the results are compared with a compaction criterion of 95% Standard Compaction. The tests are carried out by a Geotechnical consultant at test locations selected by the Contract Supervisor for the emplacement operations.

A record of the test results and locations of where they have been taken shall be maintained in the document management system.

<i>This document UNCONTROLLED once printed</i>				Page 20 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



4.2.9.7 Bench Heights

Coal wash emplacement will progress in a series of filled horizontal benches until each active emplacement area reaches its finished height. Coal wash benches will extend down the valley in a repetitive sequence of tipping, spreading, and compacting. Coal wash material that is too wet to be emplaced immediately will be placed in temporary drying ponds, which will be located within the emplacement footprint

Coal wash emplacement in the valley shall commence at the lower end of the prepared active emplacement area and progress in a series of filled horizontal benches until the emplacement reaches the finished height. Coal wash shall be deposited on the benches and compacted in layers as shown in Figure 1 to achieve better than 95% dry density ratio.

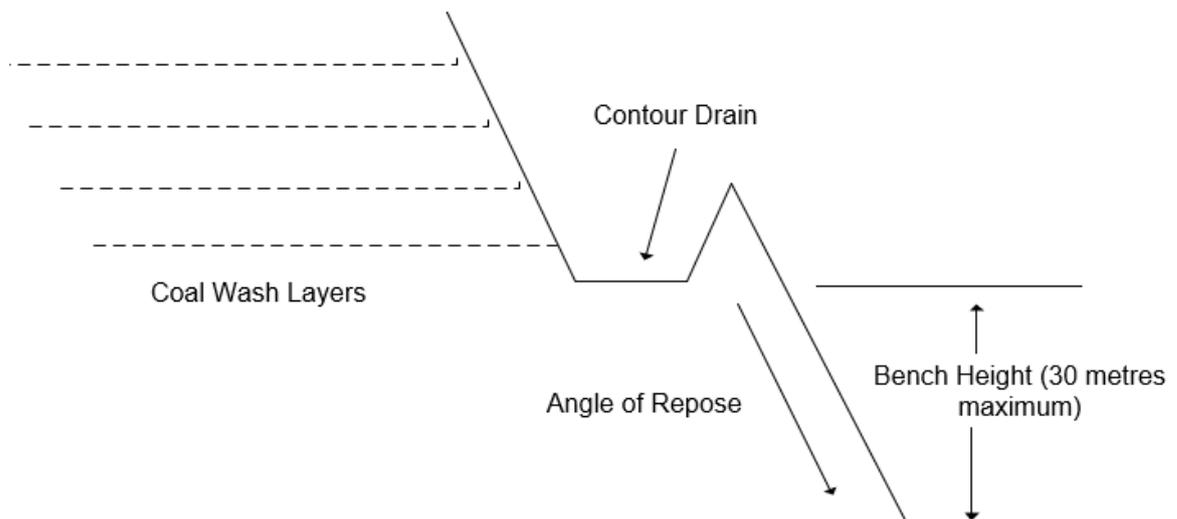


Figure 1: Coal wash emplacement principles

As the above procedure is repeated, each bench will be progressively built up and extended further down the valley until the emplacement reaches the final design landform. The developing benches will be graded back into the valley to prevent surface water flowing over the front batter of the bench and operations will generally aim to maintain coal wash benches with a 30 m lift as outlined in Figure 1.

The vertical height of a bench is measured at its highest point or crest and at the bench toe. A bench is established in four distinct stages and must be built with the materials' natural angle of repose forming the maximum angle or slope. Any under-cut which increases this angle must be avoided and rectified before tipping can proceed on top of the bench. The procedure for constructing the benches is as follows:

- each layer of coal wash is pushed off with the dozer;
- depending on material type and compaction already achieved, a vibratory roller is used to further compact the coal wash;
- edges of the bench are further rolled providing increased compaction;
- surface gradient of the bench top is provided to facilitate quick water run off for rain events; and

<i>This document UNCONTROLLED once printed</i>				Page 21 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- surface contour drains are provided at intervals and a new bench is started. The contour surface drains must have a gradient that allows surface water to be discharged quickly.

Best practice at the CWEA has limited bench heights to 30 m. This height can only be exceeded following a formal risk assessment which involves suitably qualified personnel other than the contractor or persons normally supervising the work.

The surface shape of the CWEA will be finished to blend with the surrounding landform (as per the approved final landform) and provide for non-eroding table drains to carry surface water runoff to the emplacement perimeter drains. Batter slopes on the finished emplacement will be constructed to non-eroding grades where practical in accordance with the approved finished profile design contours. This profile has been designed to a maximum grade of 1(V):3(H) to prevent erosion and sediment runoff. Suitable erosion control methods will be adapted as necessary.

4.2.10 Emplacement Rehabilitation

Emplacement rehabilitation is explained in detail in Section 6.3.

4.2.11 Underground Emplacement Trial

IMC engaged a consultant to develop a conceptual underground emplacement trial. Areas of consideration for the consultant included methods of emplacement used elsewhere within the industry, technical aspects of underground emplacement within a high productivity mining setting, suitable underground storage areas, equipment suitability and estimates of capital and operating costs.

IMC considers the work completed to date, including the assessment by the consultant, along with IMC's commitment to undertake best endeavours to direct coal wash to beneficial use in preference to surface emplacement, has fulfilled Condition 20 of Schedule 4 of the Project Approval. IMC received advice from DPIE on 3 September 2020 that the Department considers that South32 has met the intent of Condition 20 of Schedule 4.

4.2.12 Best Endeavours to Redirect Coal Wash to Beneficial Uses

IMC has committed to pursuing alternative uses for coal wash as part of the Project Approval and the Dendrobium Mine Development Consent. This commitment is demonstrated from the continuing work in this area, including researching new technologies which would enable beneficial coal wash uses. The Appin Mine CWEAMP address these commitments, including consideration of:

- blending coal wash with product coal;
- opportunities for coal wash use within brick making;
- road pavement and capping materials;
- opportunities for using coal wash as a fuel;
- cement manufacture; and
- civil fill applications and site rehabilitation.

<i>This document UNCONTROLLED once printed</i>				Page 22 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



IMC has made progress in several of the areas outlined above relating to beneficial coal wash use. Redirecting coal wash to beneficial use has substantially reduced the volume of material directed to the CWEA.

Coal wash has been diverted from the emplacement to the following beneficial uses:

- as fill materials for civil engineering and construction projects;
- as fill for rehabilitation projects;
- construction road base;
- a component of soil media;
- cattle herd management e.g. raised walkways;
- capping material;
- cement manufacture; and
- a coal substitute in film making.

Since 2013, IMC has diverted approximately 3 Mt of coal wash from emplacement to beneficial use. As well as current shorter-term supply contracts, IMC has commercial arrangements in place for long-term supply of coal wash to Lend Lease for use as construction fill material at the Calderwood Valley residential development and with Fulton Hogan for construction material for the Albion Park Rail Bypass Stage 2 – Princes Motorway between Yallah and Oak Flats. It is anticipated there will be further use of coal wash from subsequent stages of these large projects.

Specific projects have been identified through to FY23. Beyond FY23 there is significant uncertainty in regard to which large scale industrial, public infrastructure and residential developments will proceed and when. However, given the Illawarra’s ongoing industrial activity and expected population growth, it is reasonable to assume that an ongoing pipeline of projects will be available for beneficial coal wash use.

IMC will use its best endeavours to redirect coal wash from the approved CWEA to beneficial use. This will be achieved through:

- prioritising the redirection of coal wash over emplacement and building this into the IMC Business Plan;
- setting, tracking and reporting against key performance indicators for beneficial coal wash use;
- providing incentives to potential users of coal wash, where required;
- having dedicated resources managing the beneficial use of coal wash; and
- undertaking and/or funding research and development into alternate uses for coal wash.

The progress of beneficial reuse of coal wash activities will be reported in the Annual Review.

<i>This document UNCONTROLLED once printed</i>				Page 23 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



5. CULTURAL HERITAGE MANAGEMENT

5.1 Overview

This section describes the process for the ongoing management of the recorded Aboriginal and historical archaeological sites within and in the vicinity of the footprint of the CWEA and addresses Condition 17 (a) and (b) of the Project Approval which requires:

- (a) detailed design plans which include options for reducing, avoiding and/or managing impacts on Aboriginal heritage sites in and adjacent to the southwestern fringe of the proposed Stage 4 footprint (including sites 52-2-2228/3617, 52-2-1373, 52-2-3533/3613 and 52-2-3506); and
- (b) management strategies to ensure no impacts to Aboriginal heritage site 52-2-3505 other than negligible impacts, including consideration of potential staged development of the emplacement and/or buffer areas.

5.2 Background Information

Several archaeological and cultural heritage assessments have been undertaken within and in the vicinity of the footprint of the CWEA (Sefton 1989; Navin Officer 2000; Biosis Research 2007; Biosis Research 2009). These archaeological assessments have identified a total of 13 Aboriginal archaeological sites, including three sandstone shelters with Potential Archaeological Deposit (PAD). Two historical archaeological sites have also been identified within the Brennans Creek Valley (Biosis Research 2007). A description of these sites is provided in Appendix 3.

The following sections are based upon the former West Cliff Emplacement Area Cultural Heritage Management Plan (Biosis WCPMP0031) which was developed for the Stage 3 CWEA in consultation with the Tharawal Local Aboriginal Land Council and the Cubbitch Barta Native Title Claimants Aboriginal Corporation, and the then Department of Environment, Climate Change and Water (DECCW).

5.3 Stage 3 Emplacement Section 87 Permits and Associated Study

As part of the Stage 3 Emplacement EA, Biosis Research Pty Ltd (Biosis) recommended that ICHPL apply for Section 87: Preliminary Research Permits at selected sites in order to firstly carry out salvage excavation works at BC2 and BC6 and allow further investigations to be undertaken at BCPAD5 and BCPAD6 to test for potential archaeological deposits.

ICHPL subsequently applied for and received the Section 87 permits from DECCW on 9 April 2008 (Permit Number: 2908).

The Preliminary Excavation study was subsequently undertaken by Biosis during April and May 2008 (Biosis 2008). Representatives from the Tharawal Local Aboriginal Land Council and Cubbitch Barta Native Title Claimants Aboriginal Corporation were involved in the fieldwork component of the study. The outcomes of the study were as follows:

- The archaeological deposits at sites BC2 and BC6 were entirely salvage excavated in accordance with the Preliminary Research Permit #2908. As a result, Biosis, recommended that ICHPL apply for a 'Section 90: Consent to Destroy' for these sites (See Table 3).

<i>This document UNCONTROLLED once printed</i>				
Document ID	WCPMP0019	Version	5.0	Page 24 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- The additional testing undertaken at both BCPAD5 and BCPAD6 confirmed that there were no archaeological deposits contained at either of the sites. These sites will not be discussed any further.

5.4 Stage 3 Emplacement Section 90 Consents

The sites listed in Table 4 received Section 90 Consent to Destroy as part of the Stage 3 CWEA approvals.

Table 4: Section 90 Consents for the Stage 3 CWEA

Site Name	s90 Consent	Date granted	Valid till	Status
BC2 (52-2-1368)	2970	04/07/2008	04/07/2021	Buried by emplacement landform in 2016
BC5 (52-2-1371)	2859	09/04/2008	09/04/2021	Not yet destroyed
BC6 (52-2-1372)	2970	04/07/2008	04/07/2021	Not yet destroyed
BC7 (52-2-1373)	2859	09/04/2008	09/04/2021	Not yet destroyed
West Cliff 4 (52-2-3507)	2859	09/04/2008	09/04/2021	Not yet destroyed
Dendrobium 11 (52-2-3533)	2859	09/04/2008	09/04/2021	Not yet destroyed

Note: For the sites planned to be destroyed by Stage 4, which is approved under a Part 3A approval, permits under Section 87 or consent under Section 90 of the National Parks and Wildlife Act 1974 are not required.

5.5 Stage 4 Emplacement Impact Assessment

The proposed Stage 4 CWEA has the potential to impact sites either through the burial of the sites under the CWEA, through direct impact by associated works supporting the Stage 4 emplacement area (such as channel diversion drains, settling dams and haul roads) or through secondary impacts (such as dust settling on art panels). The design of the Stage 4 CWEA was amended to avoid three Aboriginal heritage sites, including the only highly significant (both culturally and archaeologically) site (i.e. 52-2-3505) in Stage 4.

Appendix 3 summarizes the risk impact for the sites from the Stage 3 and Stage 4 CWEAs.

5.6 Heritage Management Plan

A Heritage Management Plan (HMP) was prepared in accordance with Condition 24 of Schedule 4 of the Project Approval that covers both Aboriginal and Non-aboriginal heritage. The objectives of the HMP are to:

<i>This document UNCONTROLLED once printed</i>				Page 25 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- outline statutory requirements for Aboriginal and Non-Aboriginal Heritage, including any Project Approval performance measures to be achieved;
- provide an overview of Aboriginal and Non-Aboriginal heritage sites within the study area;
- detail the procedures for ongoing consultation with Registered Aboriginal Parties (RAPs) and other community stakeholders, including the provision of access to archaeological sites to the Aboriginal community;
- detail the procedures for the preparation and integration of HMPs to be undertaken as part of Extraction Plans;
- detail the procedures for the preparation and integration of Conservation Management Plans (CMPs) to be undertaken for heritage items of State or National Heritage Significance;
- detail the procedures for publishing, lodgment and provision of public access of CMPs;
- detail the procedures for archaeological excavation, archival recording, conservation and subsidence monitoring programs;
- detail management options and procedures for any heritage sites that may be affected due to mining subsidence;
- present contingency plans for the unexpected discovery of Aboriginal objects, sites and human remains; and,
- present contingency plans for the unexpected discovery of historical relics and sites.

Figure 2 shows the link between the HMP and the CWEAMP. The procedures outlined in the HMP will be undertaken when developing the detailed design plans for Stage 4 for inclusion in the CWEAMP as required.

<i>This document UNCONTROLLED once printed</i>				Page 26 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	

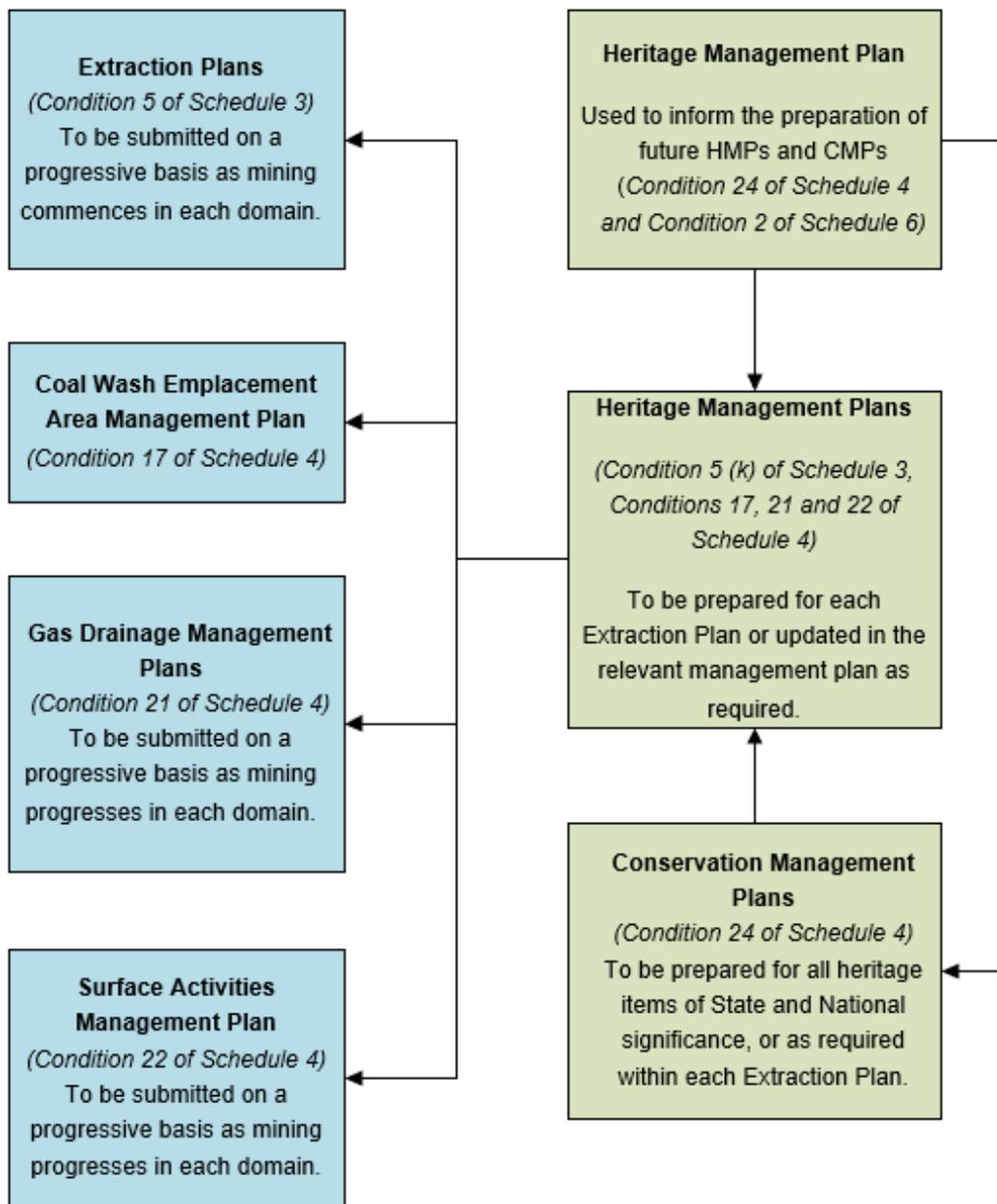


Figure 2: Heritage Management Strategy (from Heritage Management Plan)

5.7 Management and Mitigation

There are 13 cultural heritage sites within the footprint or in close proximity of the CWEA that will require some form of management. In the first instance, mitigation through avoidance has been incorporated into the design of the proposed Stage 4 CWEA. The design of the proposed Stage 4 CWEA considered the location of Aboriginal sites and where practical the footprint of the Stage 4 CWEA has been designed to avoid impact to known sites, including the only highly significant (both archaeologically and culturally) site in the area (Plan 5).

For sites located within the boundaries of the proposed Stage 4 CWEA, the proposed management approach is to conduct detailed recording and, where appropriate,

<i>This document UNCONTROLLED once printed</i>				Page 27 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



archaeological salvage of a sample of occupation deposit. This strategy is consistent with that successfully employed for the Stage 3 CWEA. For sites avoided by the emplacement footprint, but located in close proximity, proposed management includes conducting detailed recording of the site prior to works in the vicinity, and demarcation of the site to minimise the potential for accidental impacts from mobile machinery working in the area. Detail and scheduling of these management strategies should be developed in consultation with the Aboriginal community through the HMP process.

Appendix 3 outlines the management/mitigation measures relating specifically to each heritage site located within or in close proximity to the CWEA.

The detail and scheduling of the management strategies outlined in Appendix 3 will be developed in consultation with the Aboriginal community through the HMP process.

6. VEGETATION AND FAUNA MANAGEMENT

6.1 Pre-Clearing Actions

6.1.1 Pre-Clearance Habitat Survey

The unit of vegetation to be cleared will be surveyed by appropriately qualified personnel (suitably trained Environmental Representative or specialist consultant) and marked out using flagging tape. Surveys of each unit will involve traversing the study area to locate, record and mark specific habitat features that are proposed for preservation and redistribution to the emplacement (e.g. rocks and boulders, stags and large hollows).

The selection process for hollows and hollow bearing trees will be based on the habitat requirements of target fauna and/or to provide a representative sample of specific hollow types that currently occur within remnant vegetation on the site. The following four main hollow types will be selected for relocation where practical:

- a) main stem hollows (large hollows);
- b) hollows occurring in living or dead crown branches;
- c) fire scars at the base of trees; and
- d) fissures or cracks in branches on the main stem.

Selected tree hollows must have entrance diameters ranging from a few centimetres to a maximum of 30 cm and have cavities that are suitable for target species. Primary limbs and stags (hollow types a, b or d) will be used to create dead stags on the cleared emplacement where practical.

Prior to any vegetation clearance occurring on site, specific details including the type and number of each habitat feature will be clearly recorded and identified on a pre-clearing checklist. Clearance will only occur following demarcation and survey by appropriately qualified personnel.

The survey will identify appropriate candidate boulders and outcrop rock that could be translocated for habitat creation in revegetated areas. Boulders shall be placed on top of replaced soils (on top of the CWEA) to recreate habitat for species dependent on rocky outcrops, such as the Broad-headed Snake.

<i>This document UNCONTROLLED once printed</i>				Page 28 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



During the pre-clearance survey, habitat features within each unit will be inspected in order to identify the need for any relocation of resident fauna species. Relocation of fauna will also involve the identification of capture and release methods and release areas for the relocation of fauna species prior to clearing.

6.1.2 **Permit to Disturb**

Prior to any vegetation clearance occurring on site, a Permit to Disturb (ICHF0209) is to be issued. Specific details including the type and number of each habitat feature will be clearly recorded and identified on Permits to Disturb prior to issue. Permits to Disturb will only be issued following demarcation and survey by the Environmental Representative.

A post-clearing inspection will be undertaken by the site Environmental Representative to verify the clearing was done in accordance with the Permit to Disturb.

If unapproved clearing goes beyond the emplacement boundary:

- the incident will be reported in accordance with the Environmental Compliance/Conformance Assessment and Reporting Procedure (IMCP0186); and
- the disturbed area will be rehabilitated as soon as practicable.

6.2 **Clearing Process**

6.2.1 **Timing**

Where possible, the timing of vegetation clearance of important habitat features will be between January and May to avoid the primary breeding and nesting periods of most hollow-dwelling species (Niche, 2011). During this time, most plant reproductive lifecycles have finished and this will allow for improved fertility of translocated soil as most species will have released the current seasons' seed.

Clearing of native vegetation for emplacement preparatory works in the Stage 4 CWEA is required to be undertaken in line with the staging plan.

6.2.2 **Two-Stage Clearing**

The primary mitigating measure for protection of fauna within the CWEA is two-stage clearing.

Where possible, (i.e. where access to trees by the excavator is safe and practical), clearing of hollow bearing trees will be performed in a two-stage process where surrounding vegetation is cleared separately, before the removal of habitat trees to allow fauna an opportunity to move.

6.2.2.1 **Site Operator or Clearance Contractor**

The process for two-stage clearing (from Niche, 2011) is:

- Stage 1 - clear all vegetation not marked during the pre-clearance survey and engage the site Environmental Representative to undertake stag watching and spotlighting prior to Stage 2 clearing.
- Stage 2 - following a minimum 24-hour grace period, clear all remaining habitat trees.

<i>This document UNCONTROLLED once printed</i>				
Document ID	WCPMP0019	Version	5.0	Page 29 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Note: During both Stage 1 and Stage 2, the site Environmental Representative is to be engaged to implement fauna recovery procedures as necessary. The procedure for fauna recovery is:

- If any habitat tree is found or suspected (based on fresh tree markings or scats) to contain any threatened species during the clearing operation, leave the tree in place for a minimum of 24-hours and, if possible, re-inspect prior to felling.
- Mechanically shake or agitate habitat trees prior to felling to encourage any remaining animals to either leave the tree or at least show themselves and possibly be removed (including the removal of the tree hollow), where possible.
- Always keep the contact details of the site Environmental Representative, veterinary care and local animal welfare groups on-site.

6.2.2.2 Environmental Representative

The role of the site Environmental Representative is to:

- Identify all potential fauna habitat that should be retained (where safe and practical) prior to Stage 1. They will attend the site, inspect habitat features (such as hollows and rock outcrops) and map and flag features to be retained until Stage 2. A map showing the location of all features to be retained will be supplied to the vegetation clearance contractors prior to Stage 1 of vegetation clearing.
- Identify capture and release areas for fauna which may be captured during the vegetation clearing process prior to Stage 2.
- Undertake a dusk or dawn stag watching exercise following the first stage of clearing so that any hollows observed to be occupied or used can be identified. These hollows will be afforded special attention during the second stage of clearing as they are most likely to contain fauna which may be injured during the clearing exercise.
- Relocate all uninjured animals that are rescued to suitable predetermined locations within adjoining bushland. Captured animals will be released immediately or held for the shortest time possible (preferably less than 24 hours).
- Release nocturnal animals captured in the clearing process at dusk. If an animal is reluctant to move away, then it shouldn't be released, and the site Environmental Representative shall contact a fauna welfare group or veterinarian and deliver the animal to that group for care.
- Secure any animals kept for any purpose in a cloth bag, stored with an appropriate material (woollen cloth) for warmth and placed in an appropriate non-sealed container until its release or for transport to an approved carer. Species such as reptiles, possums and koalas are known for their ability to escape poorly secured cloth bags and should be placed within double lined canvas bags.
- Prepare a record detailing the findings of the survey and relocation efforts. This should include details of any live animals that are sighted, captured, released, injured, shocked, escape or killed as a result of clearing operations and fauna rescue.
- Relocate fauna within suitable habitats that are within CCL724. On this basis, no licensing is required for fauna relocation. If, however, animals are relocated further

<i>This document UNCONTROLLED once printed</i>				Page 30 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



afield, or outside a species normal home-range, this is likely to trigger DPIE biodiversity conservation licencing requirements.

Any translocation proposal may require referral to DAWE for any species listed under the *EPBC Act*.

It should be recognised that the above control measures will not always be possible to implement safely, given the presence of uneven ground and structurally unsound trees.

6.2.2.3 *Injured Animals*

The general practice of dealing with injured or captured fauna will be for the site operators to notify the site Environmental Representative who will arrange for fauna rescue or veterinary treatment. If the site Environmental Representative is not present when an injured or juvenile animal is found, the following steps will be implemented:

- cover animal with a towel or blanket to minimise stress and place in an appropriate hessian or cloth bag;
- move animal to designated holding area; and
- contact the local animal welfare group or veterinarian immediately.

6.2.3 **Stockpiling**

Vegetation shall be removed from the area being cleared in stages and stockpiled adjacent to the clearing.

Rocks and logs are to be redistributed to the recipient sites (as per the Permit to Disturb). Large boulders and stags which require partial soil cover to be secured in place will be moved to the recipient sites prior to soil translocation.

Where practical, soil stockpiling will be avoided, and stripped soil layers will be immediately redistributed to the donor sites. Soils will not be stockpiled for long periods of time. Soil horizons will not be removed during or immediately following rain to minimise the composting process during stockpiling.

6.2.4 **Stripping of Soil Horizons**

Topsoil from the donor site will be stripped from the surface in layers. The most valuable layer is the top 50 mm of soil which contains the majority of soil stored seed and propagules, plant nutrients and beneficial soil microbes. The top 50 mm of soil will be stripped and mixed with the cleared vegetation and stockpiled adjacent to or on the selected and pre-prepared recipient site ready for spreading.

Stripping and stockpiling of subsoil horizons will be undertaken depending on depth of bedrock. Where possible the depth of subsoil removal should exceed 500 mm. Subsoil layers will then be translocated to the recipient sites.

6.3 **Emplacement Rehabilitation**

The emplacement rehabilitation methodology has been adopted from the Stage 2 CWEA program due to its success. Some of the indicators that the methodology used in Stage 2 CWEA has been successful are:

<i>This document UNCONTROLLED once printed</i>				Page 31 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- scores of between 50 and 70 species have been recorded (well above benchmarks for the local vegetation types);
- a good cover of difficult to grow species such as: heaths; some sedges; rushes, and *Persoonia* spp. have been recorded, and two threatened plant species, *Pultenaea aristata* and *Persoonia hirsuta*, have been recorded in the rehabilitation area; and
- many species have seeded multiple times and young germinates are evident. This indicates that the stand will be self-sustaining over time and seed fall will provide insurance if the area is burnt in a bushfire.

6.3.1 Progressive Rehabilitation

Rehabilitation of the emplacement surface will take place progressively as each section of embankment fill reaches the finished level. Completed sections of the emplacement will be trimmed to even grades and spread with approximately 0.5 m of soil (including subsoil and topsoil).

Habitat reinstatement techniques such as transplanting dead stags, addition of habitat logs and woody debris, nest box use, and installation reconstruction of rock outcrops will be undertaken as described in the following sections.

6.3.2 Landform Design

The surface of the emplacement will be reshaped in order to mimic micro-topographic features. Where possible, more natural concave slope profiles and slope angles will be used to limit the loss of sediment off the slope. The finished surface profile of the CWEA must be in accordance with the approved design contours (refer to Plan 2 and Plan 3).

6.3.3 Translocation of Habitat and Soil

6.3.3.1 Respreading Soil Horizons

To facilitate successful long-term plant growth, it is necessary to avoid capillary rise of potential saline seepage from the coal wash. To avoid the potential for saline seepage (which can prevent seed germination and retard plant growth), the emplacement will be fully encapsulated by soil horizons to a depth of typically 0.5 m where appropriate.

Subsoil horizons will first be spread over the allocated recipient sites on the emplacement surface. Finally, the remaining 50 mm (topsoil) will be spread on top.

6.3.3.2 Redistribution of Logs and Rocks on Recipient Sites

All remaining stockpiles of rocks, logs and vegetation will then be redistributed over the recipient site. Avoiding excessive soil compaction is crucial to maximising plant establishment and all traffic should be excluded from the translocated soil horizons once all materials have been spread on the surface. Habitat logs and coarse woody debris from the cleared vegetation will provide microhabitat for fauna and protection for emerging seedlings.

6.3.3.3 Transplanting Dead Stags

Large hollow bearing trees are numerous within areas proposed for clearing. Selected large hollow bearing trees within each clearance compartment will be transplanted to areas within

<i>This document UNCONTROLLED once printed</i>				Page 32 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



the rehabilitating emplacement to become standing dead trees (stags). Provision of these dead stags will provide fauna habitat which may otherwise take decades to form. The quantity of dead stags transplanted to the emplacement will aim to mimic the numbers originally present within the cleared compartments.

6.3.3.4 *Reconstruction of Rock Outcrops*

To provide suitable habitats for certain fauna species (especially reptiles), relocation of sandstone rock outcrops will be undertaken. The location of rock outcrops will account for the thermoregulatory requirements of reptile fauna by concentrating placement of boulders and exfoliating rocks on westerly aspects of the CWEA.

6.3.4 **Seeding**

Seed mixes should resemble the local vegetation types (Exposed Sandstone Scribbly Gum Woodland (ESSW) and Sandstone Gully Peppermint Forest (SGPF)) to supplement rehabilitation of the emplacement and associated areas. Seed is harvested by contractors from areas of land within the regional locality, and will be spread over bare areas of the CWEA. Where required (i.e. in areas that remain without any, or poor, natural regeneration for a period longer than six months), supplementary planting of local provenance tubestock will be considered to ensure vegetation is progressively reinstated.

A list of suitable plant species for collection, propagation and installation has been derived from the Species Impact Study species list and is included in Table 5.

<i>This document UNCONTROLLED once printed</i>				Page 33 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Table 5: Plant species appropriate for revegetation at the CWEA

<i>Acacia linifolia</i>	<i>Dianella caerulea</i> var. <i>producta</i>	<i>Hardenbergia violacea</i>
<i>Acacia longifolia</i>	<i>Dodonaea triquetra</i>	<i>Kunzea ambigua</i>
<i>Acacia myrtifolia</i>	<i>Eriostemon australasius</i>	<i>Lepidosperma laterale</i>
<i>Acacia suaveolens</i>	<i>Eucalyptus agglomerata</i>	<i>Leptospermum</i> <i>arachnoides</i>
<i>Acacia terminalis</i>	<i>Eucalyptus globoidea</i>	<i>Leptospermum</i> <i>continentale</i>
<i>Acacia ulicifolia</i>	<i>Eucalyptus haemastoma</i>	<i>Leptospermum</i> <i>polygalifolium</i> ssp. <i>polygalifolium</i>
<i>Allocasuarina littoralis</i>	<i>Eucalyptus oblonga</i>	<i>Leptospermum</i> <i>trinervium</i>
<i>Angophora costata</i>	<i>Eucalyptus piperita</i>	<i>Lomandra longifolia</i>
<i>Aotus ericoides</i>	<i>Eucalyptus punctata</i>	<i>Notodanthonia longifolia</i>
<i>Banksia ericifolia</i> ssp. <i>ericifolia</i>	<i>Eucalyptus sclerophylla</i>	<i>Patersonia glabrata</i>
<i>Banksia marginata</i>	<i>Eucalyptus sieberi</i>	<i>Patersonia sericea</i>
<i>Banksia serrata</i>	<i>Gonocarpus teucrioides</i>	<i>Pomaderris elliptica</i> ssp. <i>Elliptica</i>
<i>Banksia spinulosa</i> var. <i>spinulosa</i>	<i>Hakea dactyloides</i>	<i>Pultenaea daphnoides</i>
<i>Callistemon citrinus</i>	<i>Hakea sericea</i>	<i>Pultenaea elliptica</i>
<i>Corymbia gummifera</i>	<i>Hakea teretifolia</i> ssp. <i>teretifolia</i>	



6.3.5 Rehabilitation Maintenance

6.3.5.1 Weed and Pest Management

Weeds and vertebrate pests will be managed as detailed in Table 6.

Table 6: Weed and Pest Management Strategy

Aspect	Monitoring	Trigger	Action/Response
Weeds	Annual rehabilitation monitoring program which includes assessment of exotic weed cover within biometric plots.	>20% weed cover in established plots	Implement weed control program to target noxious weeds and perennial weed grasses
	Quarterly observational survey.	Identification of declared noxious weeds (e.g. Pampas Grass)	
Vertebrate Pests	Annual rehabilitation monitoring program (includes camera trap survey) in rehabilitation areas to identify target species and relative abundance of pests.	Significant damage to rehabilitation observed (e.g. erosion caused by rabbits or excessive herbivory of native seedlings).	<p>The following options will be considered (in order of preference):</p> <ul style="list-style-type: none"> If regional pest management program is available, participate in association with NPWS or NSW Local Land Services. If no program is available, engage a pest management contractor to implement shooting and/or baiting program.

6.3.5.2 Bushfire Management

Fire history records covering the surrounding Dharawal State Conservation Area/National Park and Sydney Metropolitan Catchment Area Land are maintained by WaterNSW and the National Parks and Wildlife Service (NPWS). Fire history records in these areas include five major wildfires in 1965/66, 1968/69, 1990/91, 2001/02 and 2005/06 each of which burnt the majority of the area within the reserves (NPWS 2006).

<i>This document UNCONTROLLED once printed</i>				Page 35 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



The last major fire at the Appin North site started near the township of Appin on 25 December 2001 and burnt through to Helensburgh in January 2002 (NPWS 2006). A smaller area on the southern side of the site was impacted by bushfire in January 2006. Significant bushfires occurred in the wider area in 2019/2020.

The Appin North site is not currently subject to a hazard reduction burn regime. Bushfire management at the site will be reviewed once the current *Persoonia hirsuta* research project findings are completed (which includes ecological burning). The updated bushfire management for the site will also consider the fire ecology of all threatened species at the site. Bushfire trials are being considered on the CWEA, in particular Stage 1 and Stage 2.

6.3.6 Rehabilitation Phases, Indicators, Objectives and Completion Criteria

The Appin Mine Mining Operations Plan (that also meets the requirements of Condition 33 of Schedule 4 of the Project Approval for the Appin Mine Rehabilitation Management Plan) summarises the rehabilitation processes for all surface facilities and sites associated with Appin Mine. Table 7 outlines the rehabilitation phases, indicators, objectives and completion criteria for the CWEA.

In accordance with the ESG3: Mining Operations Plan Guidelines, rehabilitation of completed emplacement areas will include the following stages:

1. Decommissioning – Removal of all infrastructure (where applicable);
2. Landform Establishment – gradient, drainage, slope and aspect;
3. Growth Medium Development – topsoil;
4. Ecosystem Establishment – establishment of flora and habitat; and
5. Ecosystem Development – re-colonisation by key flora and fauna/maintain community structure and function.

<i>This document UNCONTROLLED once printed</i>				Page 36 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Table 7: Emplacement Rehabilitation Phases, Objectives, Indicators and Completion Criteria

Domains	Rehabilitation Phase	Domain Objective	Indicator	Completion Criteria	Justification/Sources	Complete?
Domain 11: CWEA	Landform Establishment	Landform established to be consistent with the surrounding environment or post-mining land use.	Final landform design.	Site reprofiled as per final landform design (where applicable). Note Stages One and Two emplacements were reprofiled to the standard of the day.	Section 5.1 – Landform construction - Mine Rehabilitation Leading Practice Sustainable Development Program for the Mining Industry (2016).	Emplacement Stage One and Two are completed. Stage Three is being rehabilitated progressively.
Domain 11: CWEA (Stage Two and Three emplacements only)			Compaction testing (For CWEA stages two & three only).	>95% compaction achieved as evidenced by compaction test reports. Note Stages One and Two emplacements were constructed to the standard of the day.	CWEAMP – Section 8.3. - Emplacement Compaction.	
Domain 11: CWEA (all emplacement stages)			Combustion testing.	Coal wash ignition testing results within acceptable range (using the Coal Washery Rejects Order 2014 as a guide unless otherwise determined by the regulatory authority).	Coal Washery Rejects Order 2014.	
Domain 11: CWEA	Growth Medium Development.	Establish plant growth medium.	CWEA Capping.	No coal wash is left exposed (Stage One emplacement).	Wollondilly Shire Council Development Consent (1975).	Emplacement Stage One and Two are completed. Stage Three is being rehabilitated progressively.
Domain 11: CWEA			Topsoil/ capping depth.	Bare or stripped areas topsoiled/capped – Depth will be governed by factors such as desired vegetation, quantity and quality of the surface and subsoil available and the nature of underlying material.	For CWEA, CWEAMP – Section 6 - Vegetation and Fauna Management.	Emplacement Stage One and Two are completed.

<i>This document UNCONTROLLED once printed</i>				Page 37 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



				Generally, >50 mm depth required for seed germination. Combined topsoil and capping depth min requirement for the CWEA is 0.5 m (Stages Two and Three).		Stage Three is being rehabilitated progressively.
Domain 11: CWEA (Stage Two and Three)	Ecosystem Establishment	Stable landform capable of supporting and sustaining vegetation growth (subject to post-closure land use considerations).	Translocated habitat (rocks and logs).	Rocks and logs spread across the surface of the rehabilitating emplacement in accordance with the CWEAMP. Broad-headed Snake habitat incorporated into Stage Three and Four rehabilitation areas.	CWEAMP – Section 6 - Vegetation and Fauna Management.	Landform established, and site preparation works are largely completed within Stages 1 and 2; however, some minor areas require further habitat placement, planting and weeding (for example, Stage Two lookout point).
Domain 11: CWEA			Site preparation and seeding/ planting with appropriate species.	Area ripped (if required) and seeded/planted using the appropriate method.	Section 5.3 (Establishment of a Plant Growth Medium) - Mine Rehabilitation Leading Practice Sustainable Development Program for the Mining Industry (2016).	
			Plant establishment and growth.	50% combined vegetative cover achieved and sustained for a period of two years.	Target was determined based on past experience and taking into consideration: 1. Observational evidence from the CWEA rehabilitation program. 2. Vegetation types and climate of the area. 3. Local Benchmarks as determined in the CWEA rehabilitation monitoring program.	
			Weed cover.	Regular weed control undertaken.	Project Approval Condition 17 (f). <i>NSW Biosecurity Act 2015.</i>	

<i>This document UNCONTROLLED once printed</i>				Page 38 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Domain 11: CWEA	Ecosystem development.	Ecosystem is self-sustaining.	Succession.	Rehabilitation report indicates plants in rehabilitated areas show evidence of seed setting and seed germination.	CWEAMP Section 8.1.1.1 – Key Performance Criteria. Also applies to other domains due to similar vegetation community.	Rehabilitation works in some sections of Emplacement Stage One and Two are complete. Stage One was rehabilitated to the standard of the day.
Domain 11: CWEA			Weed cover.	Weed cover is no greater than 20% (at the time of relinquishment) as determined by relevant survey method.	Target is defined in Table 5 of the CWEAMP and Section 8.1.1.1 – Key Performance Criteria. Also applies to other domains due to similar vegetation community.	
Domain 11: CWEA (Stages One and Two)			Bushfire resilience.	Rehabilitation can withstand a bushfire. Germination is observed and evidence of recovery after a test burn (subject to approval under the <i>Rural Fires Act 1997</i>).	Following a site inspection with the Resources Regulator, this area was determined as being an area prone to wildfire.	
Domain 11: CWEA (Stages One and Two)			Floristic structure, species composition.	Trajectory analysis indicates selected biometric indicators (species richness and vegetation cover) are on track to achieve like that of pre-determined reference benchmarks. For example, a statistical test indicates biometric indicators show a year on year improvement and on-track to achieve (or exceed) the reference benchmarks.	CWEAMP – Section 6.3 - Emplacement Rehabilitation which outlines the monitoring program and benchmarks. Also applies to other domains due to similar vegetation community.	
All domains	Relinquished lands.	Stakeholders satisfied.	Regulator and/or landholder satisfied.	Formal Regulator and/or landholder sign-off.		Nil.

<i>This document UNCONTROLLED once printed</i>				Page 39 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



6.4 *Persoonia hirsuta* Management Strategies

Details of management strategies for the protection and conservation of *Persoonia hirsuta* are addressed in the *Persoonia hirsuta* Offset Management Plan which was approved by DSEWPaC in November 2013.

The Stage 4 conceptual staging plan will facilitate pollination vectors for *Persoonia hirsuta* across remnant bushland for Corridors 1 through 3 as shown in Plan 4. Previous rehabilitation experience (in Stage 2) indicates that once the rehabilitating emplacement reaches the Ecosystem Establishment Phase (Table 7), the area will have the required vegetation density and diversity to facilitate movement of pollination vectors for *Persoonia hirsuta* as required by EPBC Approval Condition 6 (c).

In addition, the findings from the research being conducted on *Persoonia hirsuta* pollination (overview provided in the *Persoonia hirsuta* Offset Management Plan) will be used to improve Stage 4 rehabilitation methods to facilitate the movement of pollination vectors for *Persoonia hirsuta* while Corridor 4 is being emplaced.

The approved *Persoonia hirsuta* Offset Management Plan is available on the South32 website at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents> under Bulli Seam Operations Project > Management Plans > EPBC Approval Management Plans.

6.5 Broad-headed Snake and Southern Brown Bandicoot Management Strategies

Details of management strategies for the protection and conservation of Broad-headed Snake and Southern Brown Bandicoot are addressed in the Broad-headed Snake and Southern Brown Bandicoot Management Plan (approved under Condition 7 of the EPBC 2010/5350 Approval).

The approved Broad-headed Snake and Southern Brown Bandicoot Management Plan is available on the South32 website at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents> under Bulli Seam Operations Project > Management Plans > EPBC Approval Management Plans.

7. POLLUTION CONTROL MEASURES

Water, air quality and noise are managed in accordance with the following approved management plans:

- Appin Mine Air Quality and Greenhouse Gas Management Plan;
- Appin Mine Water Management Plan; and
- Appin Mine Noise Management Plan.

The approved management plans are available on the South32 website: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents> under Bulli Seam Operations Project > Management Plans > Development Consent Management Plans.

This document UNCONTROLLED once printed			
Document ID	WCPMP0019	Version	5.0
Last Date Updated	16/12/2020	Next Review Date	16/12/2023

Page 40 of 77



7.1 Water

The water management system at the CWEA consists of onsite drains, treatment systems, and surface water storage/treatment ponds. The infrastructure is used to store and treat all site dirty surface runoff from coal stockpile areas, haul roads and active CWEAs.

The segregation of clean and dirty water is an important feature of the site water management system as it minimises the clean catchment area draining to the active emplacement catchment and ensures that the CWEA water management system is not overloaded.

Stormwater runoff from emplacement areas with established landform (with vegetation spread) is considered to be clean runoff and is directed to the clean water diversion system to minimise the load entering the CWEA water management system. Runoff from the active emplacement areas (or areas where the vegetation has not yet been spread) is directed to the emplacement water management system (i.e. Ponds P4A, EP2 and EP3) for treatment prior to being gravity fed to BCD.

As the emplacement construction progresses, a subsurface drainage system is installed in the base of the cleared area. Emplacement under-drainage flows are generally clean. The emplacement under-drainage is pumped to the clean water diversion channel for release into BCD. If required (i.e. if the water is turbid), the underdrainage can be directed into the CWEA dirty water system. Overflow from the CWEA under-drainage system feeds directly to the CWEA water treatment system.

It is considered that the current management practices are sufficient for controlling any potential groundwater contamination or downstream effects. The coal wash resulting from the washing of the Bulli Seam and Wongawilli Seam coal is classified by the EPA as inert waste. Extensive long-term experience with large scale emplacements of Southern Coalfield coal wash shows that the most significant water related issues associated with coal wash are:

- suspended fines in runoff;
- leaching of low concentrations of soluble organic nitrogen compounds (i.e. filterable Total Kjeldahl Nitrogen (TKN) and ammonia from Nitrogen (NH₃-N)); and
- leaching of low concentrations of arsenic, copper, nickel and zinc.

Groundwater impacts resulting from emplacement of coal wash are considered unlikely, given the above elements are managed by a dedicated dirty water treatment system.

7.2 Dust Control

Dust impacts from emplacement operations will be mitigated by the coal wash material containing moisture from coal washing processes and being compacted once emplaced. Active emplacement areas will be vegetated as soon as is practical after emplacement and revegetated emplacement is typically stable.

The following measures are in place to reduce dust emissions associated with emplacement operations:

- regular inspections are undertaken to identify the presence of dry windy conditions and appropriate dust suppression is implemented as necessary;

<i>This document UNCONTROLLED once printed</i>				Page 41 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- early warning weather alerts are received that predict adverse weather conditions and pre-emptive dust controls are implemented where required. A water cart is maintained on site and is used when the surface of the emplacement is dry and airborne dust can be created; and
- vehicle speed limits are followed to reduce the risk of dust emissions from unsealed roads due to vehicle movements.

Air quality around the CWEA will be monitored by:

- collection and measurement of dust samples from strategically placed dust deposition gauges²;
- use of real-time air quality monitors; and
- dust emission surveys and spot checks using hand-held photometers (as required).

7.3 Noise Control

Noise generated on the CWEA is from coal wash haul trucks and earthmoving equipment. The noise impact from these operations is deemed to be minimal as noise is naturally mitigated by the CWEA being located in a valley and at a distance of 1.5 km to 2.5 km from the nearest residential development in Appin. This is confirmed by the quarterly noise monitoring program (site AE-NS4) and the lack of community complaints about noise from the site.

The CWEA will continue to develop down the valley and therefore operations will gradually move closer to the residential fringes of Appin.

Noise complaints will continue to be recorded and if a notable increase is identified, IMC will undertake further investigations.

7.4 Visual Impact

The visual impact of the emplacement was assessed as part of the application to the Department of Planning (DoP) for Stage 3 and the BSO Project EA. The following measures will be undertaken to minimise impacts on visual amenity due to emplacement operations:

- the finished level of the CWEA will be in accordance with approval conditions;
- the land area dedicated to active emplacement operations will be kept to a minimum (typically 18 ha, maximum 21 ha);
- the finished surface of the emplacement will be of a shape which complements and blends, as much as possible, with the surrounding natural landform, as per the approved final landform plans; and
- completed sections of the CWEA will be revegetated as soon as possible.

² It is planned for these to be decommissioned following approval of the revised Appin Mine Air Quality and Greenhouse Gas Management Plan

<i>This document UNCONTROLLED once printed</i>				Page 42 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



8. MONITORING PROGRAM

8.1 Emplacement Rehabilitation Monitoring Program

8.1.1 Aim

The aim of the emplacement rehabilitation monitoring program is to measure over time the success of the rehabilitation of the CWEA, particularly the regeneration of natural vegetation and placement of specific habitat features including rocks and logs.

This will be achieved through monitoring of biometric attributes, fixed photo points and threatened plant meander surveys as well as measuring the presence/absence of fauna within the various rehabilitation sites of varying age.

8.1.1.1 Performance Criteria

The monitoring program is designed to monitor the success according to the criteria in Table 7 and to ensure adequate regeneration of translocated communities: ESSW and SGPF. Regeneration is to reflect the composition and structure of the two communities.

8.1.1.2 Biometric Vegetation Assessment

This assessment utilises the NSW Biodiversity Assessment Method (OEH 2017). This methodology is used as it is a ready-made vegetation condition assessment, incorporating parameters (known as site attributes) that reflect changes in condition over time against benchmarks. Furthermore, the methodology allows for the calculation of local benchmark data, thereby providing a more accurate picture of the condition of the suitable vegetation types locally. In summary, the system is a vegetation condition assessment predicated on the basis of a comparison of site attributes against benchmarks for those attributes within the relevant vegetation types. Local benchmark data can be collected to reflect local conditions.

Vegetation plots (50 x 20 metres) were established within each of the monitoring zones and data for the following site attributes was collected:

- native plant species richness;
- native overstorey cover;
- native midstorey cover;
- native groundcover (grasses);
- native groundcover (shrubs);
- native groundcover (other);
- exotic plant cover; and
- total length of fallen logs.

<i>This document UNCONTROLLED once printed</i>				Page 43 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



8.1.1.2.1 Control Sites

Six locations have been chosen as control sites. Monitoring the controls sites will:

- allow the measurement of the success of soil translocation within the CWEA through the comparison of a range of site condition attributes with local benchmark conditions;
- provide long term data regarding the condition of local vegetation types and the targets for rehabilitation; and
- account for any stochastic variability within the local ecosystems (e.g. bushfire, climate, etc.) and allow for the consideration of such variability in relation to the outcomes on the site.

The six locations chosen as control sites have been stratified evenly (three of each) between the two locally dominant vegetation types: ESSW and SGPF.

8.1.1.2.2 Monitoring Sites

Stratification of the monitoring sites, within the CWEA, occurred according to their treatment histories, age and the respective areas they occupied in hectares. Accordingly, 11 monitoring sites were chosen across three different treatment types in 2011. This was been expanded to 15 plots across four separate treatments in 2014. A further four sites were added to the program in 2019 (19 sites in total).

8.1.1.2.3 Local Benchmarks

Local benchmark data is collected at six control sites. The BioBanking Local Benchmark Calculator is then used to calculate the benchmark levels and the range of values for each of the collected attributes. Benchmarks are recalculated every three years.

8.1.1.2.4 Photo Point Vegetation Monitoring

Permanent photographic points have been established at each of the biometric vegetation plots.

8.1.1.3 Threatened Plant Random Meander

A random meander for threatened plants (Cropper 1993) is conducted through the CWEA. This method is the most appropriate and accurate for the purposes of the monitoring survey. Two people, approximately 10 metres apart, traverse the CWEA. Targeted species included those known to exist locally (some within the Appin North surface lease-area) and include *Acacia bynoeana*, *Epacris purpurascens* var. *purpurascens*, *Grevillea parviflora* ssp. *parviflora*, *Melaleuca deanei*, *Persoonia hirsuta*, *Persoonia nutans* and *Pultenaea aristata*.

8.1.1.4 Fauna Using Camera Traps

Camera traps are the preferred survey method over traditional cage traps or hair tubes as they are more efficient, less labor intensive and non-invasive. The method is well documented for monitoring small to medium sized mammals. Some useful resources are Eyre et al (2012) and Meek et al. (2012).

<i>This document UNCONTROLLED once printed</i>				Page 44 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Camera traps are deployed to the rehabilitating areas, using a passive survey approach (i.e. non-baited). The sites target specific habitat features i.e. logs, log hollows and rock crevasses/overhangs to determine occupation. As a general rule, there is a minimum one trap per rehabilitation compartment.

The cameras used are infra-red type and are placed to aim the lens at the core body zone of the animal. The cameras are placed approximately 20-30 cm above the ground and the distance from the feature is no more than 2-3 m (Meek et al. 2012).

A measurement of scale is placed in the background (e.g. 30 cm ruler, steel pole or other aid).

The recommended minimum deployment time is 12 nights (Meek et al. 2012 and Paull et al. 2011).

8.1.1.5 Timing

Criteria can be measured most easily in spring by noting flowering, seed production, seedling growth and establishment.

The monitoring program is summarised in Table 8.

Table 8: Emplacement Rehabilitation Monitoring Program

Type	Who	Aspects monitoring	Output
Quarterly Inspection	Environmental Representative	Identification of issues with weeds or sediment and erosion control.	Inspection report (internal).
Annual Inspection (See notes below)	Qualified ecologists or suitably trained Environmental Representative	Fixed photo points throughout the emplacement***. Quadrat monitoring in rehabilitation and surrounding areas* Random meander transects (every three years) in rehabilitated areas*** Fauna Monitoring****	Report (internal). Outcomes from monitoring summarised in the Appin Mine Annual Review. Monitoring Report appended to the Appin Mine Annual Review.

*Biometric assessments are required annually, starting at one year after translocation. Surveys at control sites only required once every three years and the benchmarks as calculated remain so for the ensuing three-year period.

**Photo point monitoring is required annually and done in conjunction with the above.

***Meanders for threatened plants are undertaken every three years.

****Fauna monitoring using camera traps is required annually, starting five years after translocation or as deemed appropriate depending on the maturity of the revegetation.

<i>This document UNCONTROLLED once printed</i>				Page 45 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



8.2 Emplacement Height

Permanent survey control benchmarks are established on stable ground outside the perimeter of the CWEA from which the monitoring stations can be surveyed. Survey heights are taken regularly to determine the appropriate design heights.

8.3 Emplacement Compaction

Compaction testing is nominally carried out ten times per year. Each testing campaign must take at least five representative samples. Compaction testing will test for SMDD and the results will be compared with a compaction criterion of 95% Standard Compaction. If after testing the compaction results are less than 95% then the fail area must be reworked and re-tested.

The fail area shall be isolated from normal emplacement operation until results of re-testing indicate 95% or better compaction.

8.4 Emplacement Run-off and Subsurface Drainage

Runoff from active emplacement areas or areas where vegetation is not established is directed to the CWEA water management system (i.e. Ponds P4A, EP2 and EP3) for treatment prior to being diverted to BCD. Emplacement under-drainage flows are generally clean but have the potential to be dirty during the first-flush period of a rainfall event, especially after a prolonged dry period. Any first flush flows that are dirty are directed to the CWEA water treatment system (i.e. Ponds P4A, EP2, and EP3). During clean subsurface flows, or once the dirty first flush flows have cleared, emplacement under-drainage is pumped to the clean water diversion channel for release into BCD. The water management system is explained in more detail in the Appin Mine Water Management Plan.

Monthly water samples are taken to monitor the quality of the CWEA subsurface drainage.

Surface water quality monitoring is undertaken in accordance with the Environment Protection Licence (EPL) 2504 conditions and the Appin Mine Water Management Plan. More detail on water management at the CWEA is provided in the approved Water Management Plan that is available on the South32 website at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents> under Bulli Seam Operations Project > Management Plans > Development Consent Management Plans.

Regular inspections of the site and water infrastructure will be conducted to ensure the water management system is functioning effectively.

8.5 Emplacement Erosion and Sediment Control

Erosion and sediment control structures will be regularly inspected to check they are operating satisfactorily and to perform any maintenance work and repairs that may be required. Regular maintenance will include:

- sediment removal from drains and sediment basins;
- installation, proper operation and routine maintenance of any flocculant dosing equipment;
- replacement and or repair of sediment control structures as required; and

<i>This document UNCONTROLLED once printed</i>				Page 46 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



- repair of areas that become unstable following periods of high flow.

More detail on erosion and sediment control at Appin Mine is provided in the approved Water Management Plan that is available on the South32 website at: <https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents> under Bulli Seam Operations Project > Management Plans > Development Consent Management Plans.

9. COMPLAINTS AND NON-COMPLIANCE MANAGEMENT

9.1 Complaints and Dispute Resolution

IMC has a 24 hour, free community call line (1800 102 210) and email address (illawarracommunity@south32.net) which is displayed at IMC Projects and Mine Sites, and included in newsletters, letters and other correspondence. The call line is for all complaints and general enquiries regarding environmental or community issues associated with IMC's operations.

Community complaints and enquiries may also be received in person by any employee of IMC, with details to be immediately shared with the Community Team for investigation. All CWEA complaints received in relation to Appin Mine will be managed in accordance with the Handling Community Complaints, Enquiries and Disputes Procedure.

Upon receipt of a community complaint, preliminary investigations will commence as soon as practicable to determine the likely cause of the complaint. An initial response will be provided to the complainant within 24 hours of the complaint being made, with a follow up response being provided as soon as practicable once a more detailed investigation is complete.

A summary of all complaints received during the reporting year will be provided as part of the Annual Review. A log of complaints is also maintained on the IMC website at:

<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

9.2 Non-Compliance, Corrective Action and Preventative Action

Events, non-compliances, corrective actions and preventative actions are managed in accordance with the Reporting and Investigation Standard and Environmental Compliance/Conformance Assessment and Reporting Procedure. These procedures, which relate to all IMC operations, detail the processes to be utilised with respect to event and hazard reporting, investigation and corrective action identification. The key elements of the process include:

- identification of events, non-conformances and/or non-compliances:
- recording of the event, non-conformance and/or non-compliance in the event management system (G360);
- investigation/evaluation of the event, non-conformance and/or non-compliance to determine specific corrective and preventative actions;
- assigning corrective and preventative actions to responsible persons in G360; and
- review of corrective actions to ensure the status and effectiveness of the actions.

<i>This document UNCONTROLLED once printed</i>				Page 47 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Exceedances of or non-compliances with relevant criteria will be reported to all relevant agencies via the Annual Review and EPL Annual Return or notified in accordance with Section 10.2.

9.3 Notification of Pollution Incidents to Government Authorities and the Public

In accordance with Condition 7 of Schedule 6 of the Project Approval and Condition R2 of EPL 2504, IMC is to notify DPIE, EPA and other relevant agencies of any incident that has caused (or threatens to cause) material harm to the environment. The process and contact numbers for these notifications is outlined in the Pollution Incident Response Management Plan. For any other incidents associated with the project, the proponent shall notify the Secretary and any other relevant agencies as soon as practicable after the proponent becomes aware of the incident (refer to Section 10.2).

The EPA is to be notified immediately following detection by telephoning 131 555 and DPIE by emailing compliance@planning.nsw.gov.au at the earliest opportunity.

Within 7 days of these notifications, a written report is to be provided to DPIE and other relevant agencies (in accordance with Condition 4 of Schedule 8 of the Project Approval) and the EPA (in accordance with Condition R2.2 of the EPL).

10. REPORTING AND REVIEW

10.1 Reporting

10.1.1 Annual Review

IMC will report on the performance of the CWEAMP in the Annual Review.

The Annual Review is prepared in accordance with the requirement of Condition 4 of Schedule 6 of the Project Approval and is submitted to relevant agencies in September each year. Annual Reviews are made available to the general public via the South32 website.

The Annual Review will include:

- complaints relating to the CWEA operations and management/mitigation measures undertaken;
- management/mitigation measures undertaken in the event of any confirmed exceedance of performance criteria;
- a progress update on the beneficial reuse of coal wash activities;
- review of the performance of management/mitigation measures and the monitoring program; and
- a summary of rehabilitation undertaken over the reporting period.

10.1.2 Annual Emplacement Rehabilitation Monitoring Report

The Emplacement Rehabilitation Monitoring Report is included as an appendix in the Annual Review. The report provides an analysis of the results from the rehabilitation monitoring in Section 8.1.

<i>This document UNCONTROLLED once printed</i>				Page 48 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



10.1.3 Public Reporting of Results (via website)

A summary of the CWEA monitoring results (where applicable), including details of exceedances and non-compliances (as determined in accordance with Section 9.2 of the CWEAMP), will be provided on the South32 website in the 14-day report at:

<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

10.2 Exceedance/Non-compliance Notifications

In the event that an exceedance or non-compliance of the relevant air quality, noise or water quality criteria is confirmed, a notification is to be made in accordance with Condition 7 of Schedule 6 via the DPIE Major Projects Planning Portal:

<https://www.planningportal.nsw.gov.au/major-projects>.

This notification is to be made as soon as practicable after becoming aware of the exceedance³. The EPA must also be notified of the exceedance/non-compliance (via email).

10.3 Review of CWEAMP

In accordance with Condition 5 of Schedule 6 of the Project Approval, the CWEAMP will be reviewed, and if necessary revised, within three months, of:

- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an Independent Environmental Audit (IEA) report; or
- any modification to the conditions of the Project Approval (unless the conditions require otherwise).

Condition 6 g) of the EPBC Approval requires the Staging Plan to be implemented and remain implemented for a minimum period of 10 years, at which point a revised plan taking into account the monitoring required under Condition 6 f) must be submitted to and approved by the Minister, unless otherwise agreed to in writing. As the CWEAMP is required to be reviewed as detailed above, consultation with DAWE will be undertaken as noted in Section 1.4. Pending approval of the revised CWEAMP by the Minister, this will be considered to meet the requirements of this condition.

A revised CWEAMP will be submitted to DAWE for approval once the elements of the Staging Plan for Stage 4 of the CWEA have been finalised and prior to commencement of emplacement activities in Stage 4.

Outcomes from each review will be documented in the Management Plan Review Log. The CWEAMP will only be revised where a material change to site operations or environmental

³ The definition of an incident in the Project Approval is “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 this approval”.

<i>This document UNCONTROLLED once printed</i>				Page 49 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



management has occurred, or in accordance with the review period on the CWEAMP. Administrative or descriptive changes do not constitute a material change.

Where a review triggers a revision of the CWEAMP, the CWEAMP will be revised and submitted to the Secretary for approval.

10.4 Audits

10.4.1 Independent Environmental Audit

In accordance with Condition 9 of Schedule 6 of the Project Approval, and Condition 18 of the EPBC Approval, an IEA shall be commissioned every three years, that will include a review of the CWEAMP. The report is required to be submitted to the Secretary within six weeks of completion of the audit, in accordance with Condition 10 of Schedule 6.

The IEA Report is also required to be submitted to the Minister of DAWE in accordance with Condition 18 of the EPBC Approval within six weeks of completion of the IEA.

IEAs have been conducted in 2013, 2016/17 and 2019, with the next IEA to be conducted in 2022. Recommendations from the IEA will be incorporated into the CWEAMP where appropriate.

10.4.2 ISO 14001

As part of the ISO 14001 certification, IMC maintains an environmental auditing and governance program across all of its operational sites. The program, which includes the use of competent internal and accredited external auditors, is an integral part of maintaining certification under the ISO 14001 standard.

External surveillance audits are undertaken on an annual basis, with recertification audits undertaken every three years.

Internal Governance Reviews of the CWEAMP are nominally undertaken on an annual basis.

<i>This document UNCONTROLLED once printed</i>				Page 50 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



11. SUMMARY OF COMMITMENTS

Commitment	Section in CWEAMP
IMC will provide personnel and resources to implement the CWEAMP.	Section 2
IMC will comply with the conditions of the approvals and relevant legislation.	Section 3
IMC will implement a monitoring program to assess the success of rehabilitation and potential impacts on the environment from coal wash emplacement.	Section 8
IMC will construct and maintain infrastructure for water diversion, storage, pumping, treatment, discharge and monitoring.	Section 4.2.4, 4.2.5, 4.2.6, 4.2.7, 7.1 and 8.4
IMC will conduct regular inspections of the site and water infrastructure to ensure the water management system is functioning effectively.	Section 8.4
IMC will implement and maintain erosion and sediment controls to reduce the risk of water contamination.	Section 4.2.5.2, 4.2.7.3 and 8.5
IMC will implement controls to minimise dust emissions from the CWEA.	Section 7.2
IMC will implement plans to reduce, avoid and/or manage impacts on Aboriginal Heritage sites, and obtain required approvals.	Section 5
IMC will implement management strategies for the protection and conservation of <i>Persoonia hirsuta</i> , the Broad-headed Snake and the Southern Brown Bandicoot.	Section 6.4 and 6.5
IMC will design haul roads to meet minimum road widths, maximum grades and required curve dimensions.	Section 4.2.3.1, 4.2.3.2 and 4.2.3.3
IMC will progressively rehabilitate completed areas of the emplacement, maximising opportunities for natural regeneration.	Section 6.3.1
IMC will maintain the active emplacement area at 18 hectares.	Section 4.2.8.1 and 7.4
IMC will construct Stage 4 of the emplacement progressively down the valley from east to west.	Section 4.1
IMC will limit the area of clearing for Stage 3 at 60.5 hectares and Stage 4 of the emplacement to 60 hectares.	Section 4.1
IMC will limit the volume of the Stage 4 CWEA to 26 million tonnes and the height to 331 m AHD.	Section 4.1
IMC will survey and demarcate the boundaries of clearing for Stage 4 and include on detailed plans prior to the commencement of clearing.	Section 4.1
IMC will prepare new emplacement areas by vegetation clearing, stripping of topsoil, removal of subsoils and mulching of vegetation, and preferentially directly place these materials on emplacement areas available for rehabilitation or store appropriately.	Section 4.2

<i>This document UNCONTROLLED once printed</i>				Page 51 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



IMC will undertake pre-clearing surveys to identify habitat trees, hollows, boulders and outcrop rocks and use a two-stage clearing process.	Section 4.1 and 6.1
IMC will relocate any animals impacted by the clearing process and organise care for injured animals.	Section 6.2.2.2
IMC will complete a Permit to Disturb prior to undertaking any clearing of vegetation for the emplacement.	Section 6.1.2
IMC will implement weed and pest control strategies.	Section 6.3.5.1
IMC will use seed collected within the regional locality and supplementary planting of local provenance tubestock will be considered where required.	Section 6.3.4
IMC will conduct compaction testing of five representative samples of emplaced coal wash nominally 10 times per year and maintain records.	Section 4.2.9.6 and 8.3
IMC will compact coal wash deposited on the benches to achieve better than 95% dry density ratio.	Section 4.2.9.7
IMC will construct the emplacement to meet design criteria.	Section 4.1
IMC will report and investigate complaints, incidents, exceedances of limits and non-compliances as required, and identify and implement corrective actions.	Section 9
IMC will undertake reporting as required, including performance against rehabilitation completion criteria.	Section 10
IMC will review the CWEAMP and undertake consultation with relevant stakeholders as required.	Section 10.3
A revised CWEAMP will be submitted to DAWE for approval once the elements of the Staging Plan for Stage 4 of the CWEA have been finalised and prior to commencement of emplacement activities in Stage 4.	Section 10.3
IMC will undertake inspections and audits as required.	Section 4.2.9.4, 6.1.2, 7.2, 8.1.1.5, 8.4 and 10.4
IMC will use its best endeavours to redirect coal wash to beneficial uses.	Section 4.2.12



12. ACRONYMS

Term	Definition
BCD	Brennans Creek Dam
BSO	Bulli Seam Operations
CMP	Conservation Management Plan
CWEA	Coal Wash Emplacement Area
CWEAMP	Coal Wash Emplacement Area Management Plan
DAWE	Department of Agriculture, Water and Environment
DCPP	Dendrobium Coal Preparation Plant
DECC(W)	Department of Environment and Climate Change (and Water) (now EPA)
DoP	Department of Planning (now DPIE)
DoPI	Department of Planning and Infrastructure (now DPIE)
DPIE	Department of Planning, Industry and Environment
DoTEE	Department of the Environment and Energy
DeSEWPAC	Department of Sustainability, Environment, Water, Population and Communities
EA	Environmental Assessment
EMS	Environmental Management System
EPA	Environment Protection Authority
EPBC	Environmental Protection and Biodiversity Conservation
<i>EP&A Act</i>	<i>Environmental Planning and Assessment Act</i>
EPL	Environment Protection Licence
ESSW	Exposed Sandstone Scribbly Gum Woodland
FY	Financial Year
G360	IMC event reporting system
ha	hectares
HMP	Heritage Management Plan

<i>This document UNCONTROLLED once printed</i>				Page 53 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



ICHPL	Illawarra Coal Holdings Pty Ltd
IEA	Independent Environmental Audit
IMC	Illawarra Metallurgical Coal
LDP	Licence Discharge Point
mAHD	Metres Australian Height Datum
Mt	Million tonnes
NPWS	National Parks and Wildlife Service
NSW	New South Wales
OEH	Office of Environment and Heritage
POEO	Protection of the Environment Operations
RAP	Registered Aboriginal Party
ROM	Run of mine
SGPF	Sandstone Gully Peppermint Forest
SMDD	Standard Maximum Dry Density
TARP	Trigger Action Response Plan
WCCPP	West Cliff Coal Preparation Plant
WSC	Wollondilly Shire Council

<i>This document UNCONTROLLED once printed</i>				Page 54 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	

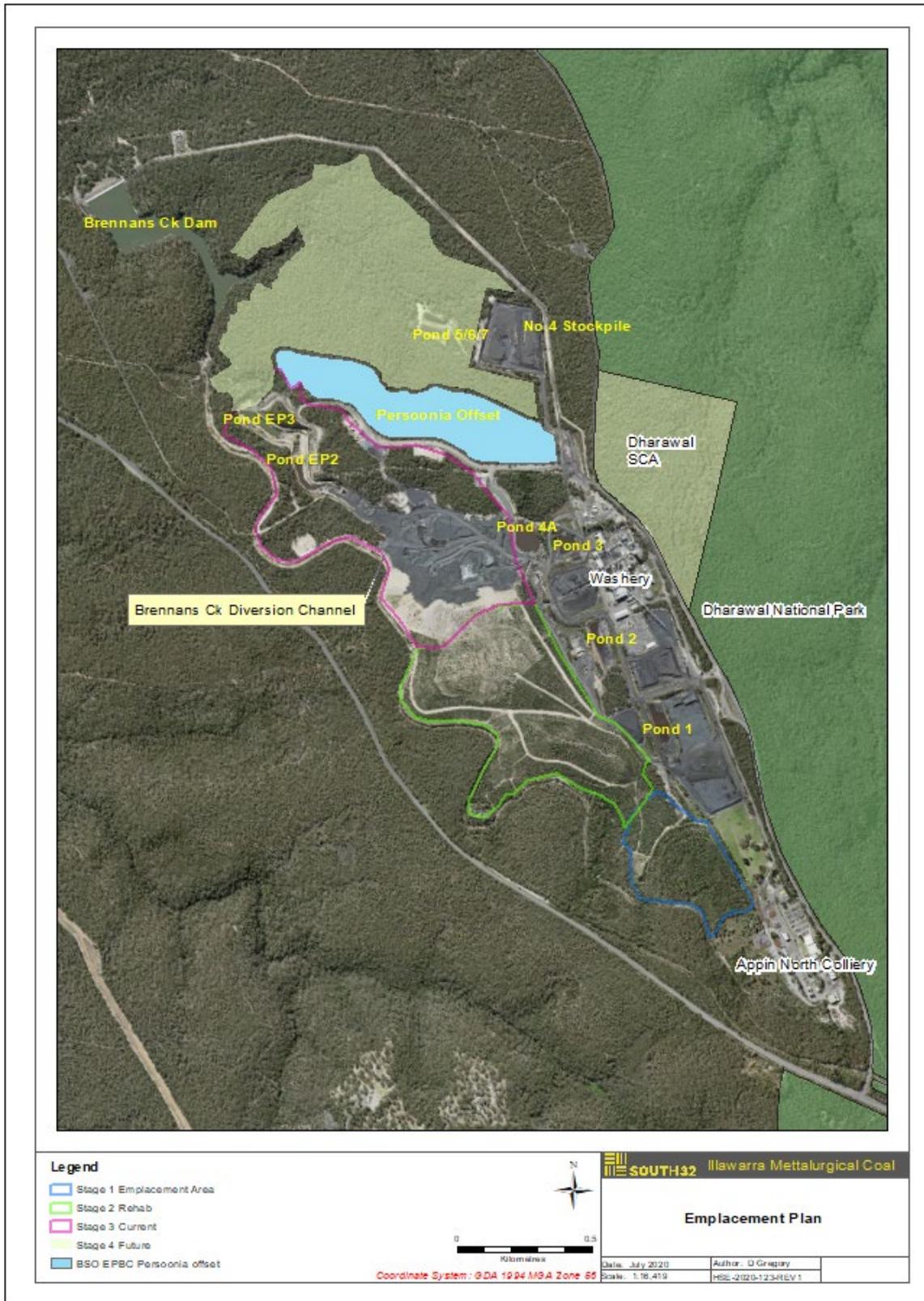


13. PLANS

<i>This document UNCONTROLLED once printed</i>				Page 55 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



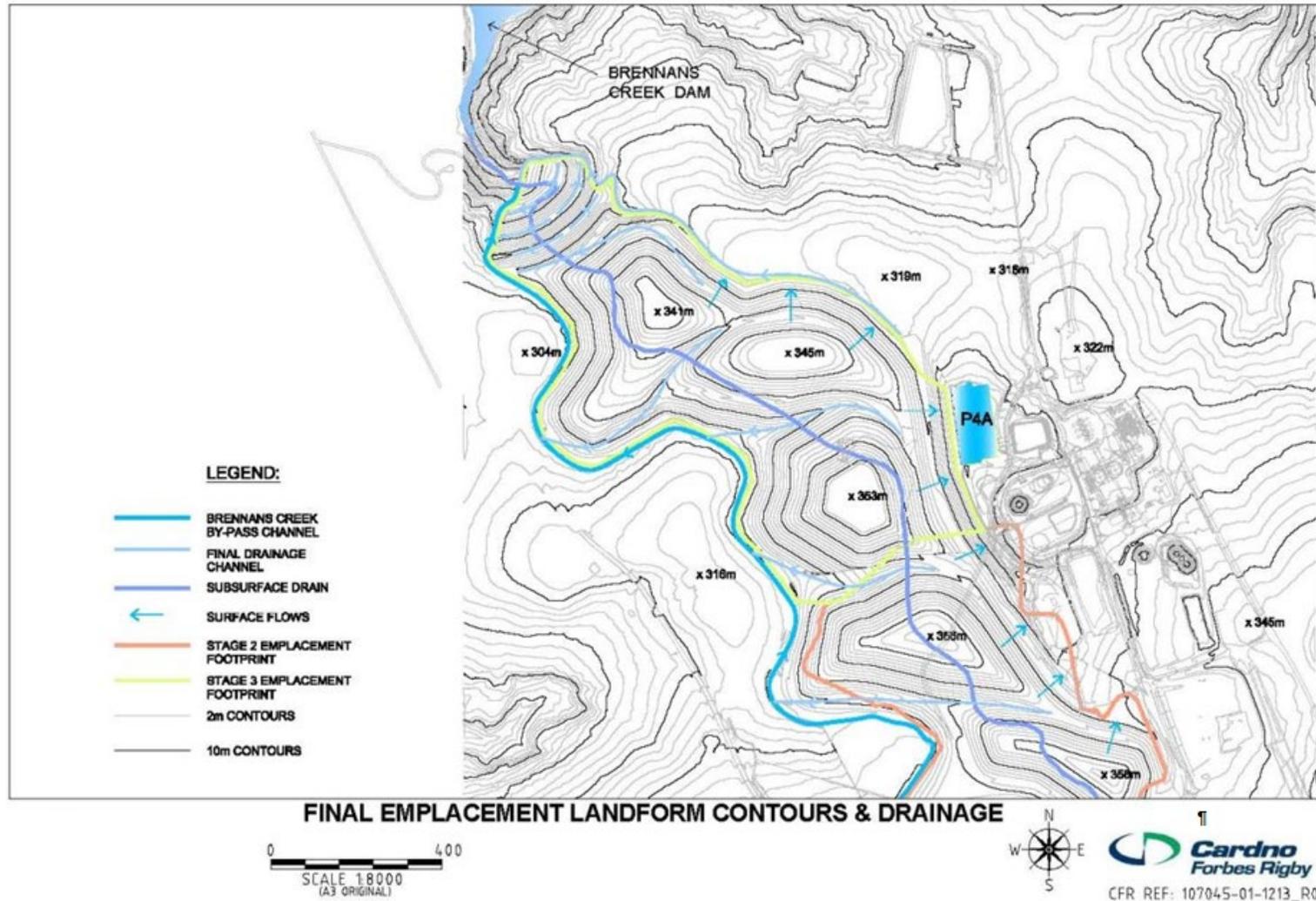
Plan 1: Emplacement Outline and Location Plan



<i>This document UNCONTROLLED once printed</i>				Page 56 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	

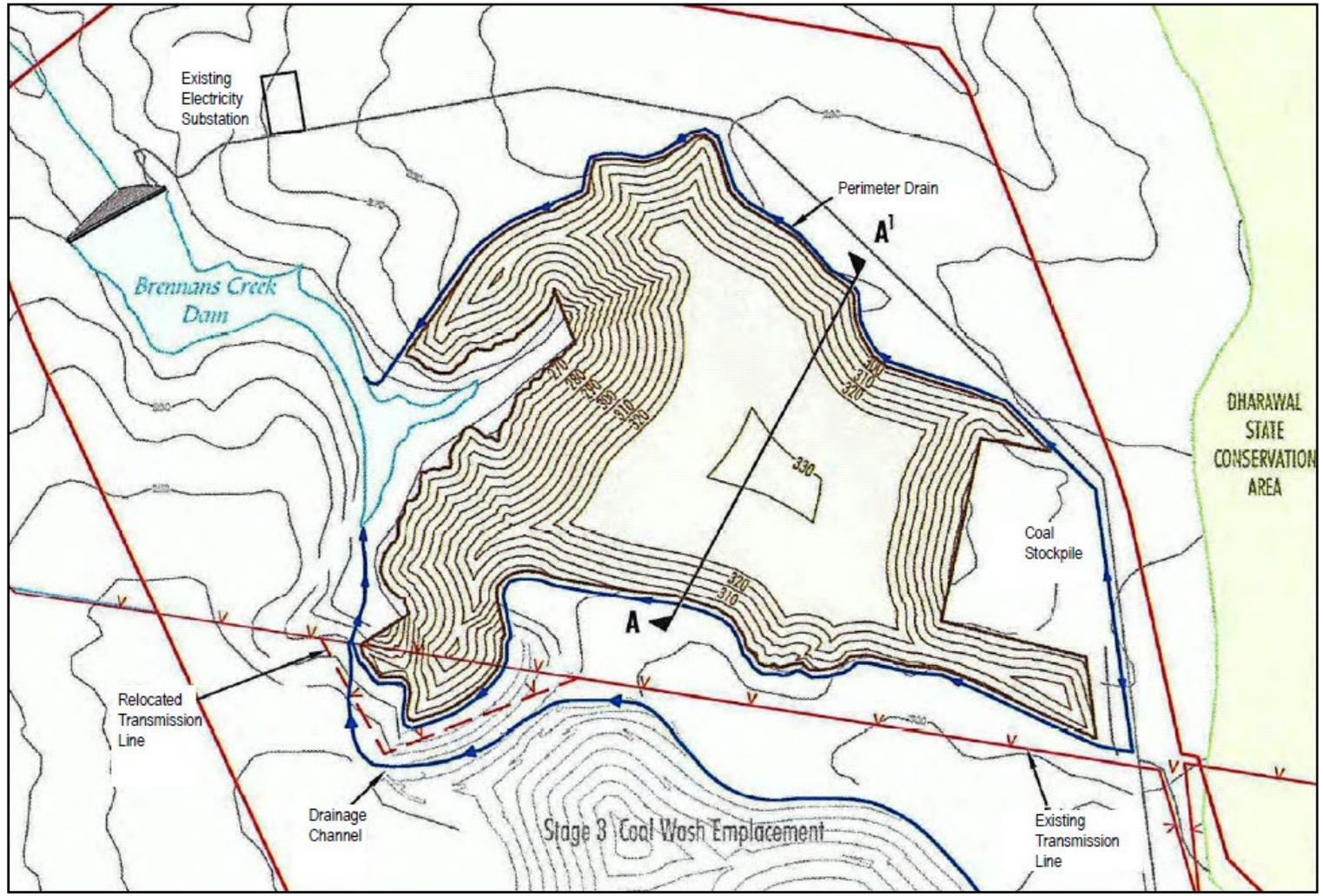


Plan 2: Stage 3 Final Emplacement Design (Concept)



Plan 3: Stage 4 Final Emplacement Design (Concept)

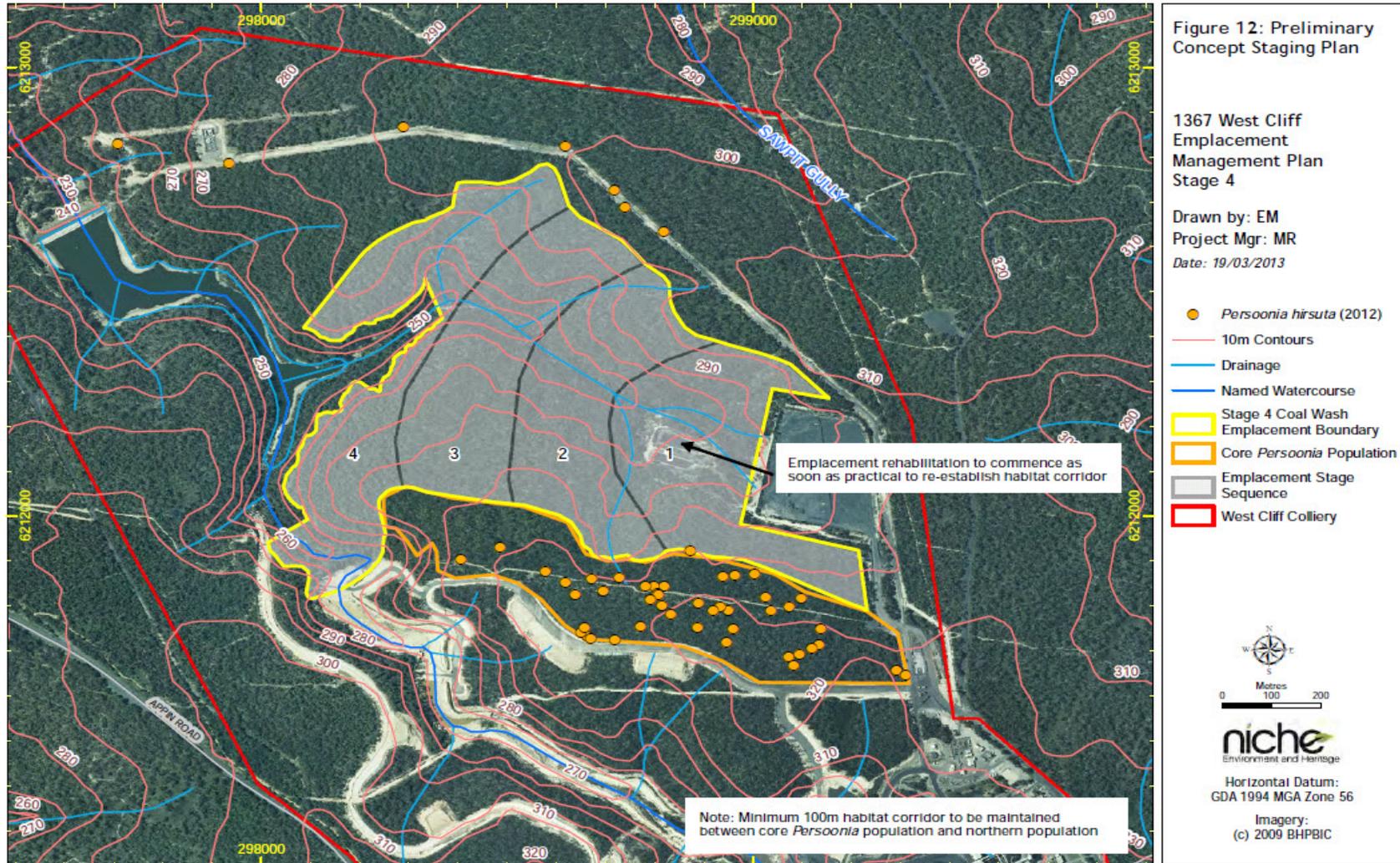
<i>This document UNCONTROLLED once printed</i>				Page 57 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



<i>This document UNCONTROLLED once printed</i>				Page 58 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Plan 4: Stage 4 Final Emplacement Staging Sequence (Concept)



<i>This document UNCONTROLLED once printed</i>				Page 59 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Plan 5: Cultural Heritage Plan



<i>This document UNCONTROLLED once printed</i>				Page 60 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



14. REFERENCES

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- Biosis Research (2007), Vegetation and Fauna Management Plan
West Cliff Colliery and Stage 3 Coal Wash Emplacement
- Biosis Research (2007), Broad-headed Snake Management Plan for West Cliff Colliery - Stage 3 Coal Wash Emplacement Area
- Biosis Research 2008. West Cliff Colliery Stage 3 Coal Wash Emplacement Area. Archaeological Research and Study Design for Section 87 (1) Preliminary Research Permit and Section 90 Consent. Report for BHP Billiton Illawarra Coal.
- Biosphere Environmental Consultants (2009). Bulli Seam Operations Terrestrial Fauna Assessment prepared for Illawarra Coal Holdings Pty Ltd July 2009.
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- Department of Planning (2011). Project Approval – Bulli Seam Operations Project.
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- FloraSearch (2009). Illawarra Coal Bulli Seam Operations Project Terrestrial Flora Assessment prepared for Illawarra Coal Holdings Pty Ltd July 2009.
- Niche (2011). Stage 3 Pre-clearing Assessment. Report prepared for Illawarra Coal.
- OEH (2017). Biodiversity Assessment Method.
- Resource Strategies (2011) Bulli Seam Operations- Environmental Assessment. Report prepared for BHPBIC.
- Trade and Investment (2013). ESG3: Mining Operations Plan (MOP) Guidelines.

<i>This document UNCONTROLLED once printed</i>				Page 61 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



15. SUPPORTING DOCUMENTS

- Appin Mine Heritage Management Plan (ICHMP15129)
- Appin Mine Mining Operations Plan FY21 to FY24 (Rehabilitation Management Plan) (APNMP0107)
- Appin Mine Water Management Plan (ICHMP0235)
- Appin Mine Air Quality and Greenhouse Gas Management Plan (ICHMP0233)
- Appin Mine Noise Management Plan (ICHMP0232)
- Persoonia hirsuta* Offset Management Plan (ICHMP0249)
- Broad-headed Snake and Southern Brown Bandicoot Management Plan (ICHMP0250)
- Appin Mine Biodiversity Management Plan (APNMP0111)
- Road Maintenance Manual (WCPM0004)
- Stockpile and Slope Stability Management Plan (WCPMP0001)
- Appin Mine Adaptive Management Plan for Water Sensitive EPBC Act Listed Species (ICHMP0253)
- WCCPP Surface Transport Management Plan (WCPMP0012)
- Permit to Disturb (ICHF0209)
- Permit to Disturb Procedure (IMCP0207)
- Environmental Compliance/Conformance Assessment and Reporting (IMCP0186)
- Reporting and Investigation Standard (IMCSTD0069)
- Handling Community Complaints, Enquiries and Disputes Procedure (IHP0112)
- Material Acceptance Form (WCPF0663)

<i>This document UNCONTROLLED once printed</i>				Page 62 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



16. APPENDICES

Appendix 1: Project Approval Conditions and Statement of Commitments: Coal Wash Management

Condition	Requirement	Section
Condition 17 of Schedule 4	<p>West Cliff Coal Wash Emplacement Area Management Plan</p> <p>The Proponent shall prepare and implement a West Cliff Emplacement Area Management Plan for the project to the satisfaction of the Secretary. This plan must be prepared in consultation with OEH and be submitted to the Secretary for approval by the end of June 2013. This plan must include:</p>	<p>This Plan.</p> <p>Plan was initially submitted by due date.</p>
	<p>a) detailed design plans which include options for reducing, avoiding and/or managing impacts on Aboriginal heritage sites in and adjacent to the south-western fringe of the proposed Stage 4 footprint (including sites: 52-2-2228/3617, 52-2-1373, 52-2-3533/3613 and 52-2-3506).</p>	Section 5
	<p>(b) management strategies to ensure no impacts to Aboriginal heritage site 52-2-3505 other than negligible impacts, including consideration of potential staged development of the emplacement and/or buffer areas;</p>	Section 5
	<p>(c) management strategies for the protection and conservation of <i>Persoonia hirsuta</i>;</p>	Section 6.4 and <i>Persoonia hirsuta</i> Offset Management Plan
	<p>(d) management strategies for the protection and conservation of the Broad-headed Snake and the Southern Brown Bandicoot;</p>	Section 6.5 and Broad-headed Snake and Southern Brown Bandicoot Management Plan
	<p>(e) a comprehensive water monitoring program for the emplacement;</p>	Section 8.4 and 8.5 and Appin Mine Water Management Plan.
	<p>(f) provide for progressive rehabilitation of the emplacement area, including through:</p> <ul style="list-style-type: none"> maximising opportunities for natural regeneration; 	Section 6.3

<i>This document UNCONTROLLED once printed</i>				Page 63 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Condition	Requirement	Section
	<ul style="list-style-type: none"> • maximising retention of suitable habitat species; • appropriate weed and pest control strategies; and • planting only endemic species in habitat mixes appropriate for soil, slope and aspect. 	
<p>Condition 18 of Schedule 4</p>	<p>West Cliff Coal Wash Emplacement Area Biodiversity Offset Strategy</p> <p>The proponent shall provide a suitable biodiversity offset strategy to compensate for the impacts of Stage 4 of the West Cliff Coal Wash Emplacement Area, to the satisfaction of the Secretary. This offset strategy must:</p> <ul style="list-style-type: none"> (a) be prepared in consultation with OEH; (b) be submitted to the Secretary for approval by the end of December 2012, or as otherwise agreed by the Secretary; and (c) fulfil “maintain or improve” and seek to fulfil “like for like or better” conservation outcomes for the vegetation associations and the <i>Persoonia hirsuta</i> impacted by clearing. 	<p><i>Persoonia hirsuta</i> Offset Management Plan</p>
<p>Condition 19 of Schedule 4</p>	<p>The Proponent shall make suitable arrangements to provide appropriate long-term security for the offset areas by 31 December 2012, or other date agreed by the Secretary, to the satisfaction of the Secretary.</p>	<p><i>Persoonia hirsuta</i> Offset Management Plan</p>
<p>Condition 20 of Schedule 4</p>	<p>Underground Coal Wash Emplacement Trial</p> <p>The Proponent shall prepare and undertake an Underground Coal Wash Emplacement Trial for the project to the satisfaction of the Secretary. The design of the trial must:</p> <ul style="list-style-type: none"> (a) be undertaken in consultation with OEH; (b) be submitted to the Secretary for approval by the end of December 2012; (c) contain a two year program to undertake both pilot scale and demonstration scale trials of underground coal wash disposal; (d) include commitments for ongoing development and/or implementation of underground emplacement options following this two-year trial; and (e) include 6 monthly progress reporting to the Department and OEH. 	<p>Section 4.2.11</p>



Condition	Requirement	Section
Condition 24 of Schedule 4	<p>Heritage Management Plan</p> <p>The Proponent shall update the approved Heritage Management Plan for the project to the satisfaction of the Secretary.</p> <p><i>Note: This plan must be suitably integrated with Heritage Management Plans that form part of Extraction Plans, and the West Cliff Coal Wash Emplacement Area Management Plan.</i></p>	Appin Mine Heritage Management Plan
SOC1	The provision of a compensatory land package for the Stage 4 Coal Wash Emplacement.	<i>Persoonia hirsuta</i> Offset Management Plan
	The management of the Hairy Geebung (<i>Persoonia hirsuta</i>) in the vicinity of the West Cliff Stage 4 Coal Wash Emplacement.	<i>Persoonia hirsuta</i> Offset Management Plan
	The management of the Southern-Brown Bandicoot (<i>Isodon obesulus obesulus</i>) in the vicinity of the West Cliff Stage 4 Coal Wash Emplacement.	Broad-headed Snake and Southern Brown Bandicoot Management Plan



Appendix 2: EPBC Approval Conditions: Coal Wash Management

Condition	Requirement	Section
Condition 6	<p>Coal Wash Emplacement Staging and Rehabilitation Plan</p> <p>The person taking the action must provide a Coal Wash Emplacement Staging and Rehabilitation Plan (the Staging Plan) for the stage 4 coal wash emplacement area to the Minister for approval. Clearing of vegetation for stage 4 coal wash area must not occur until the Staging Plan has been approved by the Minister. The Staging Plan must include, but not be limited to:</p>	This Plan
	a. measures to limit the clearing of native vegetation to no more than 60 hectares;	Section 4.1
	b. provision for the progressive staging of coal wash emplacement to ensure at all times a minimum 100 m wide habitat corridor is maintained linking the <i>Persoonia hirsuta</i> core population with habitat adjacent to the Stage 4 coal wash emplacement area;	Section 4.1 and 6.4
	c. measures to ensure that, if the corridor is to include land previously used as emplacement areas (either in whole or part), native re-vegetation is established to the extent that it facilitates the movement of pollination vectors for <i>Persoonia hirsuta</i> ;	Section 6.4
	d. staging of emplacement from east to west;	Section 4.1
	e. provision for progressive rehabilitation of the emplacement area, including through: <ul style="list-style-type: none"> i. staged clearing of native vegetation within the stage 4 coal wash emplacement area; ii. maximising opportunities for natural regeneration, including through salvage, storage and re-use of site top soil and maximising the retention time of suitable habitat species within the stage 4 coal wash emplacement area adjacent to active emplacement areas to assist re-colonisation of native species to rehabilitated areas; iii. key performance objectives for site rehabilitation, including indicative timelines, performance measures, management actions and responsibilities and accountabilities; iv. planting only endemic species in habitat mixes appropriate for the local surrounding environment, soil, slope and aspect, in accordance with relevant published guidelines; and v. appropriate weed and pest control strategies. 	Section 4.1, 4.2.8, 6.2.1, 6.3.1, 6.3.4 and 6.3.6
f. monitoring and rehabilitation actions including but not limited to, measures to assess the success of management actions, natural regeneration and revegetation. The reporting of	Section 8 and 10.1	

This document UNCONTROLLED once printed

Document ID	WCPMP0019	Version	5.0	Page 66 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



	<p>monitoring results must be submitted to the department within 30 days of every 12-month anniversary of the implementation date of the Staging Plan; and</p> <p>g. unless otherwise agreed to in writing by the Minister, the Staging Plan must be implemented and remain implemented for a minimum period of 10 years at which point a revised plan taking into account the monitoring referred to above must be submitted to and approved by the Minister.</p>	Section 10.3
Condition 2	<p><i>Persoonia hirsuta</i> (Hairy Geebung)</p> <p>The person taking the action must provide a plan for the management of the <i>Persoonia hirsuta</i> offset to the Minister for approval no later than 31 December 2012...</p> <p>...The approved <i>Persoonia hirsuta</i> Offset Management Plan must be implemented. Clearing of native vegetation for the stage 4 coal wash emplacement area must not occur until the <i>Persoonia hirsuta</i> Offset Management Plan has been approved by the Minister.</p>	<i>Persoonia hirsuta</i> Offset Management Plan
Condition 7	<p>Southern Brown Bandicoot and Broad Headed Snake Management Plan or Plans</p> <p>Within one year of the date of this approval the person taking the action must provide for the Minister's approval a Southern Brown Bandicoot and Broad Headed Snake conservation plan or plans...</p> <p>...The approved plan or plans must be implemented within 2 years of the date of this approval. The clearing of native vegetation for the stage 4 coal wash emplacement cannot occur until the approved plan or plans have been implemented.</p>	Broad-headed Snake and Southern Brown Bandicoot Management Plan
Condition 8	<p>Surface and Ground Water Quality Monitoring and Adaptive Management Plan</p> <p>The person taking the action must provide a Surface and Ground Water Quality Monitoring and Adaptive Management Plan (the Water Plan) to the Minister for approval by 30 September 2012. Clearing of native vegetation for the stage 4 coal wash emplacement area and new mining activities beneath water courses containing habitat for EPBC listed species cannot occur until or unless the Water Plan has been approved and implemented.</p>	Adaptive Management Plan for Water Sensitive EPBC Species



Appendix 3: CWEA Cultural Heritage Site Summary Table

Emplacement Area	Site Name and No.	Site Description	GPS Location	Archaeological or Scientific Significance	Potential / Planned Impact	Timeframe	Management/Mitigation Measures	Proposed Monitoring & Reporting Methods
Stage 3	BC2 (52-2-1368)	Shelter with surface artefacts	298854, 6211380	Low	To be buried by emplacement landform	Site was buried in 2016.	<p>The following actions have been completed:</p> <ul style="list-style-type: none"> Detailed recording – including scale photographic recording of the art and the sandstone overhang (art recoding will be undertaken using methods that do not involve touching the art surface) - see baseline report, Biosis 2011. Facilitating the agreed Aboriginal Community Enhancement Program with the Tharawal LALC which included funding for: 3D imaging and recording of the landscape; research and sponsorship; and training and employment. Excavation – The archaeological deposits at BC2 have been entirely salvage excavated as per the Preliminary Research Permit #2908. See excavation report, Biosis 2008. Protection of site using geo-textile and clean sand fill prior to emplacement. <p>The following activities are planned:</p> <ul style="list-style-type: none"> Signage and appropriate interpretation on the final emplacement landform indicating the location of the site below the emplacement. 	Progress against Management / Mitigation measures reported in Annual Review.
Stage 3	BC 5 (52-2-1371)	Single grinding groove	298381, 6211499	Low	To be buried by emplacement landform	<p>Timing will be determined by operational needs.</p> <p>Planned management and mitigation activities will be conducted at least 6 months prior to planned burial.</p>	<p>The following actions have been completed:</p> <ul style="list-style-type: none"> Detailed recording of the site location and detailed photographic record - see Biosis 2011. <p>The following activities are planned:</p> <ul style="list-style-type: none"> Relocation – removal of the sandstone outcrop that contains the axe grinding groove to a 'keeping place' at the Tharawal Local Aboriginal Land Council. The setting in which it is to be placed will be culturally appropriate and accompanied by appropriate interpretation and signage. Signage and appropriate interpretation on the final emplacement landform indicating the location of the site below the emplacement. 	Progress against Management / Mitigation measures reported in Annual Review.
Stage 3	BC6 (52-2-1372)	Singular grinding grooves	298354, 6211530	Moderate	To be buried by emplacement landform	<p>Timing will be determined by operational needs.</p> <p>Planned management and mitigation activities will be conducted at least 6 months prior to planned burial.</p>	<p>The following actions have been completed:</p> <ul style="list-style-type: none"> Detailed recording – including scale photographic recording of the art and the sandstone overhang (art recoding will be undertaken using methods that do not involve touching the art surface) - see Biosis 2011. Facilitating the agreed Aboriginal Community Enhancement Program with the Tharawal LALC which included funding for: 3D imaging and recording of the landscape; research and sponsorship; and training and employment. 	Progress against Management / Mitigation measures reported in Annual Review.



Emplacement Area	Site Name and No.	Site Description	GPS Location	Archaeological or Scientific Significance	Potential / Planned Impact	Timeframe	Management/Mitigation Measures	Proposed Monitoring & Reporting Methods
							<ul style="list-style-type: none"> Excavation – The archaeological deposits at BC6 have been entirely salvage excavated as per the Preliminary Research Permit #2908. See excavation report, Biosis 2008. <p>The following activities are planned:</p> <ul style="list-style-type: none"> Protection of site using geo-textile and clean sand fill prior to emplacement. Signage and appropriate interpretation on the final emplacement landform indicating the location of the site below the emplacement 	
Stage 4	BC 7 (52-2-1373)	Shelter with art	298123, 6211871	Moderate	To be buried by emplacement landform		<p>The following actions have been completed:</p> <ul style="list-style-type: none"> Detailed recording – including scale photographic recording of the art and the sandstone overhang (art recording will be undertaken using methods that do not involve touching the art surface) - see Biosis 2011. <p>Archaeological salvage is not considered appropriate for this site given the characteristics of the site.</p>	Progress against Management / Mitigation measures reported in Annual Review.
Stage 4	D10 (52-2-2229)	Sandstone shelter with deposit only	297936, 6212040	Low	Possible impacts from dust	<p>Timing will be determined by operational needs;</p> <p>Detailed design plans will be prepared at least 12 months prior to the construction works for the Stage 4 emplacement.</p>	<p>The following activities are planned:</p> <ul style="list-style-type: none"> The site will be sign-posted and marked on plans to protect it from impact during construction. Monitoring – site inspections of the shelter periodically during the construction of the emplacement to ensure that impacts from the adjacent landform do not encroach on the site area. 	Progress against Management / Mitigation measures reported in Annual Review.
Stage 4	D11 (52-2-3533)	Sandstone shelter with deposit only	298181, 6211967	Moderate	To be buried by emplacement landform	<p>Planned management and mitigation activities will be conducted at least 6 months prior to construction.</p>	<p>The following activities are planned:</p> <ul style="list-style-type: none"> Detailed recording - including scale photographic recording Development of an excavation strategy in consultation with the relevant department and the Aboriginal community 	Progress against Management / Mitigation measures reported in Annual Review.
Stage 4	WEST CLIFF 1 (52-2-3404)	Shelter with art and deposit	297654, 6212422	Moderate	Possible impacts from dust	<p>Note that the Stage 4 Coal Wash Emplacement will not be constructed for approximately 10 years.</p>	<ul style="list-style-type: none"> The site will be sign-posted and marked on plans to protect it from impact during construction. 	<p>Dust (deposition and surveys) and visual monitoring throughout the emplacement operation for potential impacts on art from dust and vibration.</p> <p>Progress against Management / Mitigation measures reported in Annual Review.</p>
Stage 4	WEST CLIFF 2 (52-2-3505)	Shelter with art	297856, 6211961	High	Possible impacts from dust		<p>The following has been completed:</p>	Dust (deposition and surveys) and visual monitoring



Emplacement Area	Site Name and No.	Site Description	GPS Location	Archaeological or Scientific Significance	Potential / Planned Impact	Timeframe	Management/Mitigation Measures	Proposed Monitoring & Reporting Methods
							<ul style="list-style-type: none"> Detailed recording – including scale photographic recording of the art and the sandstone overhang (art recoding will be undertaken using methods that do not involve touching the art surface). <p>The following work is planned:</p> <ul style="list-style-type: none"> Sign posted – this will include large signage and appropriate fencing to prevent site access and maintain an appropriate distance. Monitoring – site inspections of the shelter and art periodically during the construction of the emplacement to ensure that impacts from dust and water drainage do not enhance natural degradation of the site. 	throughout the emplacement operation for potential impacts on art from dust and vibration. Progress against Management / Mitigation measures reported in Annual Review.
Stage 3/4	WEST CLIFF 3 (52-2-3406)	Shelter with deposit	298292, 6211972	PAD	Potential impacts from dust		<p>The following work is planned:</p> <ul style="list-style-type: none"> Sign posted – this will include large signage and appropriate fencing to prevent site access and maintain an appropriate distance. Monitoring – site inspections of the shelter and art periodically during the construction of the emplacement to ensure that impacts from dust and water drainage do not enhance natural degradation of the site. 	Dust (deposition and surveys) and visual monitoring throughout the emplacement operation for potential impacts on art from dust and vibration. Progress against Management / Mitigation measures reported in Annual Review.
Stage 3	WEST CLIFF 4 (52-2-3407)	Shelter with art	298304, 6211617	Low	To be buried by emplacement landform	<p>Timing will be determined by operational needs.</p> <p>Planned management and mitigation activities will be conducted at least 6 months prior to planned burial.</p>	<p>The following actions have been completed:</p> <ul style="list-style-type: none"> Detailed recording – including scale photographic recording of the art and the sandstone overhang (art recoding will be undertaken using methods that do not involve touching the art surface) - see baseline report, Biosis 2011. Facilitating the agreed Aboriginal Community Enhancement Program with the Tharawal LALC which included funding for: 3D imaging and recording of the landscape; research and sponsorship; and training and employment. <p>The following work is planned:</p> <ul style="list-style-type: none"> Protection of site using signage, geo-textile and clean sand fill prior to emplacement. Signage and appropriate interpretation on the final emplacement landform indicating the location of the site below the emplacement. <p>This site does not contain floor deposits for further investigation.</p>	Progress against Management / Mitigation measures reported in Annual Review.
N/A	WEST CLIFF 5 (52-2-3408)	Stone artefact(s)	298779, 6211832	Low	Possible impacts from road	N/A	<p>The artefacts that were found in the 2007 survey were not found during the 2009 survey. It is likely that material had washed off the track prior to 2009. The proposed management action is to mark its location on site plans to protect it from any impacts.</p>	Dust (deposition and surveys) and visual monitoring throughout the emplacement



Emplacement Area	Site Name and No.	Site Description	GPS Location	Archaeological or Scientific Significance	Potential / Planned Impact	Timeframe	Management/Mitigation Measures	Proposed Monitoring & Reporting Methods
								operation for potential impacts on art from dust and vibration. Progress against Management / Mitigation measures reported in Annual Review.
Historic Heritage Sites								
Stage 3	WCHS1	Stone retaining wall structure	298305, 6211592	Local	To be buried by emplacement landform	Timing will be determined by operational needs. Planned management and mitigation activities will be conducted at least 6 months prior to planned burial.	The following work is planned: <ul style="list-style-type: none"> Detailed mapping and photography – including entire length of retaining wall and associated scatter or artefacts. 	Progress against Management / Mitigation measures reported in Annual Review.
Stage 3	WCHS2	Transient occupation site	298783, 6210990	Local	To be buried by emplacement landform	Already consumed by emplacement	The following has been completed: <ul style="list-style-type: none"> Detailed mapping and photography – See Archival Record report, Niche 2011. 	N/A – already complete



Appendix 4: Agency Consultation

Agency Comments	IMC Response
Environment Protection Authority	
<p>Response received 12 November 2020</p> <p>The Environment Protection Authority (EPA) refers to Endeavour Coal's request for comments on the Appin Colliery Coal Wash Emplacement Area Management Plan, version 5.0.</p> <p>The EPA has reviewed the updated management plan and has no comments to provide.</p>	<p>Noted</p>
Biodiversity and Conservation Division	
<p>Response received 23 November 2020</p> <p>One of the primary concerns with the CWEAMP is in regard to the water (rainfall, runoff and on-site water) management within the site and water quality flowing to Brennans Creek Dam and then to the Georges River. In summary, the proposed strategies outlined in the CWEAMP do not adequately demonstrate sufficient control and management of water quality, prior to delivery into Brennans Creek Dam. Adequate control of the quality of water being delivered to Brennans Creek Dam is considered critical since South32 have recently identified that they will not be able to meet the current licence deadline for the installation of the water treatment plant at Appin North (by 31 March 2021). Furthermore, no timeline has been provided for when the Appin North Treatment Plant will be delivered.</p>	<p>Site water management, including at the CWEA, is covered in the Appin Mine Water Management Plan.</p> <p>It is noted that a Water Treatment Plant is being constructed at Appin North that will utilise the underdrainage water and this will result in improved water quality in BCD.</p>
<p>BCD supports the appropriate management of surface infrastructure and storage areas for the CWEA and the diversion of 'clean' water around the coal storage and processing areas. However, the CWEAMP contains no evidence of any groundwater monitoring program to demonstrate that current management practices are sufficient for controlling any potential groundwater contamination or downstream effects. Indeed, monitoring associated with Brennans Creek Dam discharges by both the company and (earlier) OEH clearly demonstrate that there are significant downstream effects</p>	<p>An underdrainage collection pond is in place. Any seepage/infiltration through the CWEA is captured in the underdrainage which flows to this pond which is sampled and monitored monthly.</p> <p>The Georges River Aquatic Health Monitoring Program is in place that has been approved by the EPA and endorsed by the Georges River Stakeholder Group.</p>

This document UNCONTROLLED once printed

Document ID	WCPMP0019	Version	5.0	Page 72 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



from the operation of (and discharge from) the West Cliff site. A major component of this is potentially rainfall, runoff and on-site water from the CWEA.	
In addition, South32 have not provided any evidence, report or data to support/demonstrate that underground emplacement is not a viable option to reduce both the area required for coal waste emplacement or the generating area for poor quality water which subsequently flows to Brennans Creek Dam.	Refer to Section 4.2.11
It is recommended that South32 consider rewriting the CWEAMP to <ul style="list-style-type: none"> define the term 'clean'. 	Clean is not contaminated with coal fines.
<ul style="list-style-type: none"> demonstrate that stormwater runoff from emplacement areas with established landform (with vegetation spread) is 'clean'. 	Inspections of the CWEA after rainfall confirm that run-off from the CWEA is clean.
<ul style="list-style-type: none"> describe the quality of 'treated water' being gravity fed to Brennans Creek Dam. 	<p>The quality of water in BCD is monitored on a continuous basis, which includes turbidity, pH and electrical conductivity. BCD discharge is automated to respond to changes in water quality.</p> <p>Treated water means flocculant has been added or water filtered to remove suspended solids.</p>
<ul style="list-style-type: none"> define the term 'generally clean'. 	Coal wash acts as a filter and generally the underdrainage flows are clear. Generally clean describes that after heavy rainfall during the first flush event, the flows may have a higher turbidity.
<ul style="list-style-type: none"> describe the quality of emplacement under-drainage flows and demonstrate that they are 'generally clean' before being pumped to the clean water diversion channel for release into BCD 	Underdrainage flows are monitored on a monthly basis at Point 16. These results are provided in the 14 day report available on the South32 website. https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents
<ul style="list-style-type: none"> provide details on what quality of water will trigger underdrainage to be directed into the CWEA dirty water system. 	Underdrainage water would be directed to the dirty water system if the water is observed to be turbid or has a measured higher turbidity.
<ul style="list-style-type: none"> provide details on the quality of 'coal wash' waste water 	Underdrainage flows are monitored on a monthly basis at Point 16. These results are provided in the 14 day report available on the South32 website.

<i>This document UNCONTROLLED once printed</i>				Page 73 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



<ul style="list-style-type: none"> define the term 'trace amounts' 	<p>Trace amounts relates to low concentrations. This has been amended in the text.</p>
<ul style="list-style-type: none"> discuss the long-term experience with discharges from Brennans Creek Dam at West Cliff identifying salinity and, in particular bicarbonate, as potential additional significant water related issues for coal wash waters. 	<p>The history of water quality issues has been detailed in the Environment Improvement Program that was approved by the EPA.</p> <p>This has now been replaced by the Georges River Aquatic Health Monitoring Program. Detail of this program is provided in the Water Management Plan.</p>
<ul style="list-style-type: none"> provide details on any groundwater monitoring program for the CWEA demonstrate contaminants from coal wash or the 'dirty water' system are not making their way into local groundwater aquifers. ensure that current management practices are sufficient for controlling any potential groundwater contamination or downstream effects. 	<p>Refer to Section 7.1</p>

Department of Planning, Industry and Environment

<p>Response received 14 December 2020</p> <ul style="list-style-type: none"> Section 4.2.12 – Please include a commitment within Section 4.2.12 that Bulli Seam Operations will report on the progress of beneficial use in the Annual Review. Condition 17 (c and d) of Schedule 4 – Section 6.4 and 6.5 of the CWEAMP briefly describes the management of the flora and two fauna species. Due to the limited detail in Section 6.4 and 6.5 could you please provide further detail of append a copy of the two management plans to the CWEAMP. Condition 17 (e) of Schedule 4 – Section 8.4 and 8.5 of the CWEAMP briefly describes the management of water at the coal wash emplacement areas. Please update this section with further detail on how the operation is planning to conduct water monitoring or append the Water Management Plan to this document. 	<p>Commitment has been included in this section.</p> <p>Link to South32 website has been provided in text where approved plans are available that contain additional detail.</p> <p>Link to South32 website has been provided in text where approved plans are available that contain additional detail.</p>
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This document UNCONTROLLED once printed

Document ID	WCPMP0019	Version	5.0	Page 74 of 77
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



<ul style="list-style-type: none"> Update Section 10.3 to clarify that the management plan will only be revised then submitted and approved by the secretary in accordance with the requirements of the conditions of approval. General comment – please outline where the reader can find the latest copy of the approved management plans that relate to this management plan. 	<p>Section has been updated as requested.</p> <p>Link to South32 website has been provided in relevant section where approved plans are available that contain additional detail.</p>
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Department of Agriculture, Water and Environment

<p>Response received 3 November 2020</p> <p>Condition 6e(i): This condition needs to be addressed more clearly. It is clear that emplacement and rehabilitation will occur progressively in stages, and the conclusion can be reached that vegetation clearing will follow emplacement schedules as part of the site preparation, however it is recommended that the plan include a commitment that native vegetation in the stage 4 CWEA will only be cleared as part of preparatory works, in line with the staging plan. This could be a minor addition to section 4.1, 4.2.8 and/or 6.2.</p>	<p>The following text has been provided in Sections 4.1, 4.2.8 and 6.2.1:</p> <p><i>Clearing of native vegetation for emplacement preparatory works in the Stage 4 CWEA is required to be undertaken in line with the staging plan.</i></p>
<p>Due to the extended period of time before commencement of stage 4, the plan understandably does not include details/commitments in some areas. To address this, it is recommended that a commitment be included within the plan to submit a revised plan for approval prior to the commencement of emplacement as relevant to project stage 4, once elements such as the staging plan are finalized.</p>	<p>The following text has been provided in Section 10.3 and in Statement of Commitments:</p> <p><i>A revised CWEAMP will be submitted to DAWE for approval once the elements of the Staging Plan for Stage 4 of the CWEA have been finalised and prior to commencement of emplacement activities in Stage 4.</i></p>

<i>This document UNCONTROLLED once printed</i>				Page 75 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Appendix 5: Management Plan Approval - DPIE

To be included when received

<i>This document UNCONTROLLED once printed</i>				Page 76 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	



Appendix 6: Management Plan Approval - DAWE

To be included when received

<i>This document UNCONTROLLED once printed</i>				Page 77 of 77
Document ID	WCPMP0019	Version	5.0	
Last Date Updated	16/12/2020	Next Review Date	16/12/2023	