BHP

South Walker Creek Mulgrave Resource Access: Stage 2C (MRA2C)

EPBC 2017-7957

Appendix H:
SWC Water Management Plan

BHP

South Walker Creek Water Management Plan

BMC-SWC-HSEC-ENV-PLN0002 V15

1 April 2018

Contents

Purpose

The primary purpose of this Water Management Plan (WMP) is to identify the potential risks to the environment from operations at South Walker Creek Mine (SWCM) and the controls necessary to mitigate any impacts. The WMP aims to minimise the release of contaminants to the receiving environment and ensure water resource use does not adversely impact the local and regional environment.

This plan meets obligations of the ***SWCM Environmental Authority*** and the ***BHP Billiton Our Requirements (GLD) Environment and Climate Change***.

Scope

This WMP describes SWCM's planning, operational and reporting requirements for minimising impacts within the defined area of influence for water.

This WMP covers anyone involved in planning or executing exploration, operational or closure activities at SWCM.

The plan forms part of the SWCM Environmental Management System (EMS).

Risk Management

Risks associated with SWCM have been assessed in accordance with the ***Coal Risk Management Framework***.

Project Overview

South Walker Creek (SWCM) mine currently performs open cut coal mining on two mining leases (ML4750 and ML70131) located between Nebo and Moranbah in the geological formation known as the Bowen Basin in Central Queensland. The coal seams being mined generally dip towards the west and as such pit migration is also moving westwards. Six (6) pits are currently active being Toolah, Walker, Carborough, Mulgrave, Kemmis 1 and Kemmis 2. These pits are linked by one main haul road and coal is processed on site at the Coal Handling Preparation Plant (CHPP). The coal is railed to the Hay Point Coal Terminal. A number of waterways, dams and pipes form the water network at SWCM.

Legal & Other Requirements

SWCM operations are subject to various statutory and subordinate obligations in relation to the management of water.

This Water Management Plan (WMP) has been developed to examine and address all issues relevant to the importation, generation, use, and management of water on SWCM in order to minimise the quantity of water that is contaminated and released by and from the project.

The WMP documents and communicates the surface water resources, the environmental values, potential and actual risks posed by mining activity and identifies the management controls and processes that are in effect at South Walker Creek Mine to minimise harm to the receiving environment. The objective of this plan is to enable the processes that achieve:

- Operational efficiency in managing drainage, dewatering, water supply and usage;
- Compliance with regulatory and policy requirements as set out in the Environmental Management System;
- Define actions, controls and responsibilities regarding water management so that personnel accountable for water management outcomes are able to identify their responsibilities;

- Continually improve water management onsite through the identification of corrective actions control strategies identified in the risk register are implemented.

Relevant legislation includes:

- *Environmental Protection Act 1994 and Regulation 2008 (Qld);*
- *Water Act 2000;*
- *Environmental Protection (Water) Policy 2009; and*
- *Sustainable Planning Act 2009.*

Legal and other requirements include:

- ***Environmental Authority (Mining Activities) – EPML00712313 SWCM Mine;***
- ***BHP Billiton Our Requirements - Environment and Climate Change; and***
- ***BHP Billiton Our Requirements - Health, Safety, Environment and Community Reporting.***

Environmental Authority

The main regulatory tool at SWCM used by the Regulator to implement the *Environmental Protection Act 1994* (EP Act) is the Environmental Authority (EA). The EA sets the acceptable level of impact to water resources and may change over time in consultation with the regulator and other stakeholders.

This WMP has been prepared to comply with EA ***EPML00712313 – South Walker Creek Mine*** condition W31 which stipulates that a Water Management Plan must:

- Provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity carried out under its environmental authority; and
- Be developed in accordance with Department of Environmental and Resource Management guideline ***Preparation of Water Management Plans for Mining Activities*** and include:
  - A study of source contaminants;
  - A water balance model;
  - A water management system for the site;
  - Measure to manage and prevent saline drainage;
  - Measures to manage and prevent acid rock drainage;
  - Contingency procedures for emergencies; and
  - A program from monitoring and review of the effectiveness of the water management plan.

Surface Water Hydrology

Regional Surface Water Hydrology

South Walker Creek mine is located in the Bee Creek catchment of the Isaac/Connors and Mackenzie water management area in the Fitzroy River Basin. The Fitzroy River drains into the Great Barrier Reef Marine Park some 650 km's from the mine and recently has become highly regulated through the development of numerous management plans including ***"Establishing Environmental Values, Water Quality Guidelines and Water Quality Objectives for Fitzroy Basin Waters (DERM, 2010)."***

Local Surface Water Hydrology

The SWCM lease runs roughly north-west to south-east and is divided in the middle by Walker Creek that also runs roughly NW to SE through the lease. Carborough Creek joins Walker Creek near the western boundary prior to

flowing through the lease. A short distance downstream of the eastern lease boundary Walker Creek joins Bee Creek which then runs in a southerly direction near the eastern lease boundary. Sandy Creek is a small tributary to Bee Creek which is located at the southern end of mining operations and flows west to east.

Description of Receiving Waterways

Bee Creek

Bee Creek extends from its headwaters, located approximately 40 km north of SWCM, to Funnel Creek which eventually flows into the Connors River approximately 40km downstream of the mine. Recent flow recordings in Bee Creek show that the catchment upstream of the mine can deliver up to 1500 cubic metres per second during flood conditions. Hail Creek and SWCM may discharge mine-affected into Bee Creek (via Walker or Sandy Creeks in the case of SWCM). Bee Creek forms the western border of Dipperu National Park (NP), approximately 18 km south-east of the SWCM.

Based on the in-stream and riparian habitat conditions, Bee Creek (adjacent to the mine) is considered to be in a slightly-to-moderately disturbed condition.

Walker Creek

The headwaters of Walker Creek begin approximately 25 km north-west of SWCM. The catchment delivers large flows, with recent major events exceeding 400 cubic metres per second. The waterway dissects the active mine area roughly in the middle of the lease and is in close proximity to the Mulgrave and Carborough Pits. Two reaches of Walker Creek have previously been diverted to accommodate SWCM. The Carborough Creek joins Walker Creek downstream of the upstream diversion. Walker Creek may receive mine-affected discharge water through large capacity release valves on C Dam, from the F Dam discharge point (pumped) and possibly from the Kemmis Dam release point (via pipe). The distance from the most downstream discharge point on Walker Creek (Ramp C Dam) to its confluence with Bee Creek is 8.1 km.

Based on the degree of modification to its catchment, quality of aquatic habitat, and overall stream condition, Walker Creek is considered to be in slightly-to-moderately disturbed condition.

Carborough Creek

The upper part of the Carborough Creek catchment is located approximately 20 km west of SWCM in the Carborough Range. Its catchment size is roughly equivalent to that of Walker Creek and subsequently conveys similar sized flows, although timing of flows on a hydrograph is quite different. Carborough Creek joins Walker Creek upstream of any mining activity at the confluence with the Walker Creek diversion (upstream). As such, Carborough Creek does not receive any mine-affected water.

Based on the likely regularity of inundation, modification to its catchment, quality of aquatic habitat, and overall stream condition, Carborough Creek is considered to be in a moderately disturbed condition.

Sandy Creek

The headwaters of Sandy Creek begin approximately 6 km west upstream of SWCM. Due to the small catchment area, creek flows are relatively short-lived and small in magnitude compared to those in Carborough and Walker Creeks. SWCM may discharge mine-affected water from the Eastern Sediment Dam or Bidgerley Cleanside Dam into Sandy Creek via a small (first order) drain approximately1.5 km upstream of its confluence with Bee Creek.

Based on the modification to its catchment, quality of aquatic habitats, and overall stream condition, Sandy Creek is considered to be in a slightly-to-moderately disturbed condition.

Sub-Catchment Delineation

The local hydrology has been divided into hydrological sub-catchments for the purpose of improving water management on site. A total of 40 sub-catchments that are affected by mining activity to some degree have been identified.

The 40 sub-catchments are summarised in Table 1.

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Table 1. Local Sub-Catchment Details

Sub-Catchment Name	CatchmentType	Catchment Area (Ha)
C Dam 2	Clean	168
Diversion	Clean	4268
Pink Lily	Clean	1230
B Pit	Mine Affected	77
C Dam / C Spoil	Mine Affected	119
C Pit	Mine Affected	82
D Pit	Mine Affected	157
D Spoil	Mine Affected	4268
Eastern Sediment Dam	Mine Affected	93
F Pit	Mine Affected	53
F Pit Void	Mine Affected	9
GN Pit	Mine Affected	183
GS Pit	Mine Affected	86
I Ramp	Mine Affected	66
IN Pit	Mine Affected	81
IN Spoil	Mine Affected	33
IS Pit	Mine Affected	114
IS Spoil	Mine Affected	34
JS Pit	Mine Affected	47
JS Spoil	Mine Affected	162
K1 Spoil	Mine Affected	68
K1N Pit	Mine Affected	78
K1S Pit	Mine Affected	69
K2N Pit	Mine Affected	38
K2S Pit	Mine Affected	11
K2S Spoil	Mine Affected	35
Toolah Pit	Mine Affected	391
Walker Pit	Mine Affected	257
Walker Spoil	Mine Affected	12
Bidgerley Cleanside	Process Water	61
Bidgerley Tailings Dam – Cell 1	Process Water	64
Bidgerley Tailings Dam – Cell 2	Process Water	42
Bidgerley Tailings Dam – Cell 3	Process Water	46
Return Water / Old Tailings Dam	Process Water	285
Down Dip Diversion Drain	SEMP	391
F Rehab	SEMP	74
G & H Rehab	SEMP	156
Kemmis 2 North	SEMP	124
Walker Creek Diversion	SEMP	188
Mulgrave	SEMP	335
Ramp F Dam	SEMP	150
St Albans	SEMP	369
Toolah Dam	SEMP	413

Groundwater Aquifers

Alluvial groundwater supplies throughout the Bee Creek region are variable but generally range between 1-2 l/sec. The aquifers are associated with Cainzoic (alluvial) or fractured rocks of the Upper Permian Coal measures at depths ranging down to 45m.

Standing water level data obtained during exploration broadly indicates a groundwater flow direction from north-west to south-east as a subdued reflection of the surface topography coincident with Walker Creek. The hydraulic gradient is gentle at approximately 4.2m/km (0.0042).

Groundwater quality is reasonable in the Isaac and Nebo valleys but of poor quality in the alluvium of the lower Bee Creek where total solids of 10,000 to 30,000 mg/l have been recorded.

Bore water is used in the Kemmis-Walker and Bee Creek areas where it is generally extracted from the sandstone layers associated with coal seams 35-45m deep. However water supply is not always permanent and many bores yielding 0.5 l/sec have dried out after years of production.

Environmental Values of Water Resources & the Receiving Environment

An assessment of the environmental values and water quality objectives of the receiving waterways from SWCM was undertaken in 2011 (BMT WBM, 2011). This included the waterways of Bee Creek, Sandy Creek, Walker Creek and Carborough Creek. A summary of the findings is presented below. An overview of the environmental values of the receiving waterways is shown below in Table 2.

Table 2: Human Uses and Environmental Values of the SWCM Receiving Waters

Environmental Value	Sandy Creek	Walker / Carborough Creek	Bee Creek	Connors River
Protection of aquatic ecosystems	✓	✓	✓	✓
Suitability for crop irrigation	×	×	×	✓
Suitability for farm supply / use	×	✓	✓	✓
Suitability for stock water	✓	✓	✓	✓ (H)
Suitability for aquaculture	×	×	×	×
Suitability for human consumers of wild or stocked fish, shellfish or crustaceans	×	×	×	✓
Suitability for primary recreation	×	×	×	✓
Suitability for secondary recreation	×	×	×	✓
Suitability for visual recreation	×	✓	✓	✓
Suitability for drinking water	×	×	×	✓
Suitability for industrial use	✓	✓	✓	✓
Protection of cultural and spiritual values	✓	✓	✓	✓

Aquatic Ecosystem and Species Conservation

Generally the waterways within close proximity to the mining operation can be considered to represent slightly- to-moderately disturbed (SMD) aquatic ecosystems, based on ANZECC/ARMCANZ (2000) and Queensland Water Quality Guidelines (QWQG) definitions.

In contrast to the above, a section of Bee Creek 18km downstream of mining activity forms the border of the Dipperu National Park (Dipperu NP). National Parks and other conservation areas are considered High Ecological Value (HEV) areas under the QWQG and require “no change to natural conditions” in terms of protection. There

are limited reference data for Bee Creek at Dipperu NP that can be used to assess background water conditions at this location.

Riparian Flora

The riparian flora identified within the study area as identified as:

- Five Endangered regional ecosystems exist along the riparian zones of the receiving waterways.
- Black Ironbox (Eucalyptus raveretiana) is known to be present along Walker Creek and Bee Creek.

Aquatic Fauna

A review of the aquatic fauna within the study area includes:

- No protected or listed aquatic macroinvertebrate species are known or likely to occur within the study area.
- No IUCN listed Red List invertebrate species occur in the study area.
- One listed threatened or near-threated fish species has been previously recorded in the Fitzroy River catchment, the Mary River cod (Maccullochella peelii). This species was translocated into the Fitzroy River catchment, although the translocation is thought to have failed (Pusey et al. 2004).
- One listed aquatic reptile has been recorded in the Fitzroy River Basin, the Fitzroy River turtle (Rheodytes leukops). The distribution of this species is wholly confined to the Fitzroy River and its tributaries, occurring in permanent freshwater riverine reaches and large, isolated permanent waterholes (Cogger 2000). The study area and the Isaac River do not support the preferred habitat for this species.
- Several fish species within the wider Fitzroy basin are also considered near or potentially-threatened, but are not specifically protected under legislation. Two of these species occur in the Isaac River (BMT WBM 2010; 2011) and although not recorded here to date, may occur occasionally occur in the study area.

Functional Values

The functional values for the study area include:

- The streams in the study area provide temporary habitat and aquatic fauna movement corridors during flow events. It is noted that streams within the study area have a relatively short length and are not known to represent a linkage with high value aquatic ecosystems in upstream areas, apart from Pink Lilly Lagoon.
- As flows recede, the only surface waters present in waterways are deep-water waterholes. Waterholes that persist through dry seasons may function as dry season refugia for aquatic flora and fauna. The deep scours at bends in Bee Creek are likely to approach permanency in wetter years, but probably dry out in periods of drought. Pink Lilly Lagoon is perhaps the only permanent waterhole within the study area which has in recent years dried up.

Conservation Areas

The two key features of conservation significance within the vicinity of SWCM, these are:

- Dipperu National Park (NP) is located 18 km south-east of SWCM. The NP has been classified as a slightly to moderately disturbed (SMD) ecosystem based on ANZECC/ARMCANZ (2000) criteria. However, its status as a National Park suggests it requires a higher level of protection than other waterways in and adjacent to the mine.
- Pink Lilly Lagoon is a wetland of regional significance (DERM 2010) and is located 270 m from the eastern sediment dam of SWCM. Pink Lily Lagoon is not within the downstream catchment of SWCM, and would only be affected by mine-affected water in the event of a catastrophic storage dam collapse.

Agricultural Use

Agricultural water use for the receiving waterways include:

- Stock watering - All waterways within the study area are used to water stock;
- Recharge of groundwater aquifers for groundwater extraction. Groundwater bores are present along Bee Creek downstream of SWCM. There are no bores mapped in the Walker, Carborough or Sandy Creeks. Water from these extraction sites is used for watering stock, irrigation and occasionally for human consumption.
- General Use - Landholders with bores tapping into the aquifers associated with Bee Creek may use the water for general purposes other than crop irrigation.

Recreational Use

Recreational water use for the receiving waterways include:

- The local waterways are only likely to be used for visual amenity and recreation.
- The regional waterway (Connors River) may be used for primary and secondary recreation.

Industrial Use

Industrial waterways use is shown below:

- There is no water extraction associated with industry
- The mining industry and Coal Seam Gas industry may release water into the waterways under specific conditions.

Cultural and Spiritual Use

A summary of the cultural and spiritual areas are summarised below

- Recorded artefacts and sacred sites are present along the riparian zones of the receiving waterways.
- Pink Lilly Lagoon is a wetland of regional significance and a chosen Aboriginal Keeping Place. This area is managed by the Traditional Owners (Barada Barna).

Groundwater

Douglas Partners (2014) described the main groundwater water bearing units in the study area as:

- Alluvium: Unconsolidated Quaternary and Tertiary Alluvium aquifers associated with creek systems. Sands, sandy clays and clay substrates generally <20m thick, which are most likely recharged from stream surface water during flows.
- Permian: Permian fractured rock aquifer comprises grey mudstone and siltstone, fine-grained lithic sandstone, tuff, carbonaceous shale and coal seams.
- The background bores and EA compliance bores are located in the quaternary alluvium/upper tertiary strata and are between 1.8 and 26m in depth.
- The groundwater network comprises of 5 compliance bores. These are currently sampled and water levels checked every 3 months.
- Every 3 months the groundwater levels are checked for the 7 background bores.

Risks & Environmental Impacts

A water management risk assessment has been completed and documented in the ***SWCM Environmental Risk Register*** in accordance with the ***Coal Risk Management Framework.***

The potential risks of water quality impacts; from site operations include, but are not limited to:

- Impacts resulting from the accumulation of salts and metals in waterways and their sediments including as the discharged water evaporates;
- Impacts through drawdown and contamination on local and regional aquifers and the associated environments;
- Impacts associated with cumulative effects of other industries discharging into the same waterways.

Sources of Contamination

Operating open cut coal mines have a range of well recognised contaminant sources which have significant potential to adversely impact downstream water quality. These mine sites require management either at source of contamination or at drainage collection points to prevent impact downstream. The major potential source of contamination is related to land disturbance in which deeper sediments are exposed to surface runoff. Such land disturbance and sources of contamination at SWCM are associated with the characteristics of the coal seams.

A contaminant source study was undertaken by SWCM in 2012 and the main outcomes are summarised in the following sections. A review of the ***SWCM Contaminate Source Study*** was conducted in 2017.

The receiving waterways are considered to be slightly-to-moderately disturbed systems. South Walker Creek mine could potentially impact upon the values of the receiving aquatic environment in many ways including:

Potential sources of contamination include:

- Sediment input, thus smothering of habitat,
- Erosion of bed and banks
- Pest plant and animal colonisation and spread
- Input of poor quality water
- Changes to hydrology and hydraulic characteristics
- Damage to riparian zones
- Drawdown of ground water aquifers
- Saline drainage
- Acid rock drainage

Potential Contamination Sources

Potential impacts to the values of the receiving environment include the following:

- Degradation of ecosystem health (loss of species of conservation, abundance, diversity, ecosystem resilience)
- Reduction in use of water for agricultural purposes
- Cumulative impacts affecting the Fitzroy River and the Great Barrier Reef

These impacts may be affected by one or more of the following causes associated with mining activity as shown in Table 3.

Table 3: Summary of Potential Sources of Contamination

Contaminant Source	Potential Contaminants	Mechanisms of Contamination
Runoff from disturbed land	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic spoils (elevating pH), acid generating rejects (lowering pH).
Runoff from rehabilitated land (contaminant loading expected to be significantly lower than disturbed areas)	Suspended Solids (Turbidity), Dissolved Solids, +/- pH, Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Erosion, overland flow, capillary rise of salts, sodic spoils (elevating pH).
Release of recycled waters from tailings dams, sewage treatment plants, industrial areas, etc.	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, hydrocarbons, pathogenic micro organisms, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, spills, acid generating rejects (lowering pH) ineffective sewage treatment, release from sewage ponds
Release of waters from pits and storages	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	Releases from dams (seepage, catastrophic failure, by wash), pipes, drains, etc.
Release of waters from sediment dams	Suspended Solids (Turbidity), Dissolved Solids (sodium, chloride, sulphate), +/- pH, metals	By wash, capacity reduced due to sedimentation.
Spilt or leaking flammable and combustible liquids and chemicals	Hazardous or toxic products, +/- pH, metals.	Contamination of land and surface runoff causing impact to regional water systems.

Potential Water Quality Impacts

Potential impacts to the values of the receiving environment include the following:

- Degradation of ecosystem health (loss of species of conservation, abundance, diversity, ecosystem resilience)
- Reduction in use of water for agricultural purposes
- Cumulative impacts affecting the Fitzroy River and the Great Barrier Reef

These impacts may be affected by one or more of the following causes associated with mining activity as shown in Table 4.

Table 4: Potential Causes for Receiving Water Impacts

Cause	Mining Activity
Release of poor quality water to surface water	Release of mine-affected water (salts, metals and nutrients) Inefficient sediment and erosion control
Leaching of contaminants to surface or ground waters	Groundwater recharge through spoil dumps containing contaminants Groundwater recharge from pits or mine water dams Seepage from spoil dumps into surface waterways and dams (acid drainage)
Destruction of habitat	Clearing of riparian zones
Smothering of habitat	Ineffective sediment and erosion control Loss of riparian vegetation thereby increasing bank erosion Unstable waterway diversions
Pest species colonisation	Ineffective weed seed control Ineffective pest plant and animal control
Changes to hydrology and hydraulic characteristics	Waterway diversion construction Construction of dams
Drawdown of groundwater aquifers	Intersection of pits with aquifers and subsequent removal of pit water

SWCM has developed management controls to minimise harm to the receiving environment resulting from the above functions. These are discussed in the Water Management System section.

Determining Acceptable Levels of Impact

As mentioned in previous sections, the receiving waterways are considered to be slightly-to-moderately disturbed systems, with the exception of Bee Creek at Dipperu National Park. This determination allows for the setting of guideline values relevant to measurable indicators.

The process of defining waterway condition enabled the setting of values for various measureable water quality indicators which have been stated in the Environmental Authority. The achievement of the EA values will provide for an acceptable level of impact.

Table 5: Waterway Definition for Receiving Environments

Waterway Name	Waterbody type	Aquatic Ecosystem Condition	Basis for Determining Guideline Values
Sandy Creek	Lowland stream (>150m altitude)	SMD	Guidelines based on 20th and / or 80th percentiles of reference data from good quality reference sites
Walker Creek	Lowland stream (>150m altitude)	SMD	Guidelines based on 20th and / or 80th percentiles of reference data from good quality reference sites
Bee Creek	Lowland stream (>150m altitude)	SMD	Guidelines based on 20th and / or 80th percentiles of reference data from good quality reference sites
Bee Creek at Dipperu National Park	Lowland stream (>150m altitude)	HEV	No change to natural values
Connors River	Lowland stream	SMD	Guidelines based on 20th and / or 80th percentiles of reference data from good quality reference sites

Environmental Targets

Environmental targets are based on risks, impacts and legislative requirements, including the conditions of the Environmental Authority, and aim to drive continuous improvement.

SWCM must meet the water management environmental targets listed in Table 6.

Table 6: Environmental Targets for Water Management

Aspect	Target Environmental Outcome
Water Management	No unacceptable environmental impact to surface water and groundwater.
Water Management	No unacceptable change to the function of key water-dependent ecosystems.

Continuous Improvement

The HSE Department shall ensure that the WMP is reviewed annually. The WMP Review document is submitted to the Authority with the Annual Return in accordance with Conditions W32, W33 and W34 of the EA. The findings from these reviews shall be used to continually improve the management of impacts to water quality.

Water Management System

The SWCM Water Management System aims to reduce the risks of impacts to the environment identified earlier in this plan. The system comprises 5 main features:

- Water management administration
- Water management operating plans
- Water management infrastructure
- Water management monitoring and reporting
- Water management action plans

Water Management Administration

Operational accountabilities for site water management and water release are defined in the ***SWCM Water Release RACI***. Mine Planning, Production Mining and the Engineering, Maintenance and Environment Departments all have water management responsibilities.

Guiding Principles

Water Management objectives are achieved through setting and achieving the following core guiding principles:

- Compliance with legal requirements and policy commitments
- Minimise the volume of water becoming 'mine-affected' by diverting clean catchments away from mine active mine areas and rehabilitating disturbed areas
- Minimise the reduction in quality of mine-affected water
- Minimise the duration that mine-affected water can enter groundwater aquifers
- Use, reuse, recycle or release water as efficiently as possible

Guiding Hierarchy of Controls

The mine is required to prevent the uncontrolled release of mine-affected water, however the un-controlled release of *non-mine-affected* water is permissible as is the controlled release of mine- affected water (when EA Conditions are met). As such the classification of water types and their level of mine impact is crucial when managing the water system.

SWCM has devised a guiding hierarchy of controls for the management of runoff which is based upon the level of impact a water source has received. Table *7* shows the hierarchy which should be referred to by all staff involved with planning or managing water movement.

Table 7: Hierarchy of Drainage Quality and Control Strategies

Rating	Water Classification	Example	Control Measures	Example Control Measure to Improve
Best ↑	**Clean water runoff**	Runoff that has had no contact with mining associated disturbance.	• Allow to flow unimpeded from site during rainfall	• Divert clean water away from disturbed areas
	Minor sediment affected water (no further treatment required)	Runoff from successfully rehabilitated areas, overflow from sediment dams, diversion dams, flows through constructed drains or diversions.	• Direct to clean water flow paths	• Minimise disturbance footprint
	Sediment affected water (to be routed through sediment dams)	Runoff from overburden dumps, infrastructure areas, areas undergoing rehabilitation.	• Direct runoff to sediment dams. • Discharge during flow events by overflow through spillway or through low flow discharge. • Discharge by pumping permitted only if in accordance with EA.	• Undertake rehabilitation as soon as practical after completion of dumps. • Minimise disturbance footprint • Promptly rehabilitate / remove decommissioned infrastructure, stockpiles and other disturbance.
	Mine Water (with altered pH or EC)	Water removed from pits, runoff from coal and rejects stockpiles, old tailings dam	• Minimise contact time by pumping from pit to mine water impoundments as soon as practical • Direct runoff from coal and rejects stockpiles to mine water dams • Discharge permitted in accordance with EA.	• Divert runoff from high wall areas with natural drainage towards pit away from the pit. • Divert drainage and runoff in the vicinity of the ramp m away from the ramp. • Design overburden dumps to be internally draining or from ramps and pits.
	Process water in circulation	Tailings dam, supply dam	• Contain in closed circuit between tailings dam, CHPP supply dam and CHPP. • Discharge only in abnormal circumstances if allowed under EA.	• Reduce catchment of tailings dam and process water dam. • Reduce inflows into process water dam from other, higher quality sources. • Reduce process water requirements to reduce water in circulation.
Worst ↓	**Water containing anthropogenic chemicals**	Water collected in bunded areas containing chemical residue, sewage effluent etc.	• Contain within controlled system • Collect and dispose/treat in accordance with relevant legal and policy requirements.	• Provide roofing over bunded areas • Minimise process throughput

Water Management Plan Review

The EA states that the WMP must be reviewed each calendar year (W32 and W33) and a review report prepared. The review should be performed prior to the end of each September and after any event involving the uncontrolled release of water to the environment.

The EA (Condition W33) requires that a written response to the review report be prepared detailing the actions taken or to be taken to improve the water management system. The review report and response must be submitted to the administering authority with the annual return (Condition W34).

This water management plan will be updated in the following circumstances (minimum):

- Following any significant incidents or adverse audit findings relating to water management
- In the event of relevant changes to external requirements
- When significant changes are made to the existing to the mine plan
- As part of the 5 year planning process
- All changes to this plan are subject to the change management process.

Water on-site is categorised into the following two groups:

- Clean Water
  - Diverted clean water from undisturbed areas within or around the active disturbance site;
  - Clean water from disturbed areas (i.e. spoil dumps) which have been rehabilitated;
  - Pipeline / potable water.
- Mine-affected water (operational water) including:
  - Pit water;
  - Runoff from areas that are potentially contaminated, such as coal stockpiles, industrial and processing areas (CHPP) and areas of waste rock;
  - Process and tailings water;
  - Surface runoff from any area that flows into the pits;
  - Groundwater ingress into the pits;
  - Sewage effluent;

The objectives of the Mine Water Management System (MWMS) include:

- To divert water away from areas affected by mining activities;
- Contain water from areas disturbed by mining activities;
- Prevent release of water of non-compliant quality;
- Sustainably divert and discharge water suitable for release; and
- Reuse all captured water where possible for dust suppression and process requirements.

Operational Water Requirements

The major water demand for the site arises from coal processing and dust suppression. The mine water system has been configured to maximise the re-use of water on site with the aim to reduce the amount of raw water consumed by the operation.

A summary of operational water requirements is presented in the table below in Table 8.

Table 8: Summary of Operational Water Requirements

Water Use	Location at Mine Site	Volume Required	Source
CHPP	Return Water Dam	Approx. 5-6 ML / day	Recycled water / pit water
Dust Suppression	Ramp C Fill Point Ramp F Fill Point Kemmis 1S Fill Point	Approx. 4-5ML / day	Recycled water / pit water
Pipeline / Potable water	Braeside Pipeline	Approx. 0.4ML / day	Braeside Borefield

Mine Water Storages

SWCM's mine-affected water storages are summarised in Table 9.

Table 9: Mine Water Storage Summary

Storage Name	Size (ML)	Function	Regulated Structure	Overflow Designation
Ramp F Dam	260	• Captures runoff • Pit water pumped to dam • Truck fill point	No	Bee Creek via Walker Creek
Ramp C Dam	142	• Captures runoff • Pit water pumped to dam • Truck fill point	No	Bee Creek via Walker Creek
Eastern Sediment Dam	247	• Captures runoff • Receives overflows from Return Water Dam • CHPP process water	No	Bee Creek via Sandy Creek
Cleanside Bidgerely Tailings Dam	960 (388 to MRL)	• Captures runoff • Captures decant water from Tailings Cells 1, 2 and 3 • Supply CHPP process water	Yes	Bee Creek via Sandy Creek
K1 South Dam		• Truck fill point • Captures runoff	No	J South Pit
Return Water Dam	121	• Captures runoff fom old tailings dam • Supply CHPP processing water	No	Eastern Sediment Dam
Ramp F Pit	1363 (restricted storage level)	• Water storage • Supply truck fill point for dust suppression	No	
Carborough Pit	3883	• Water storage • Supply CHPP process water • Supply truck fill point for dust suppression	No	
Toolah Pit	8485	• Water Storage • Supply CHPP process waterr	No	

Other Water Storages / Dams

SWCM currently has several other water storages: dams, sediment dams and lagoons. These are summarised in Table 10.

Table 10: Other Water Storages

Storage Name	Size (ML)	Function
Haul Road Dam 3		• Captures runoff
Haul Road Dam 4		• Captures runoff
Haul Road Dam 5		• Captures runoff
Haul Road Dam 6		• Captures runoff
Haul Road Dam 7		• Captures runoff
K2 North Dam	150	• Captures runoff
K2 South Dam	30	• Captures runoff
K1 North Dam	40	• Captures runoff
Ramp F Dump Lagoon	50-100	• Captures runoff fom rehabilitated areas
Ramp G Dump Lagoon		• Captures runoff fom rehabilitated areas
DRE Walk Dam 1		• Captures runoff
Toolah Sediment Dam	75	• Captures runoff fom rehabilitated areas
Ramp D Sediment Dam	10	• Captures runoff
Ramp F Sediment Dam		• Captures runoff
Rail Loop Dam		• Captures runoff
Walker Creek Diversion Basins		• Captures runoff
Pink Lily Lagoon		• Clean water lagoon. Cultural Heritage site.

Water Transfers & Pumping

SWCM has constructed an extensive pipe and pump network designed to meet the mines needs of:

- Transferring water to required operational infrastructure (i.e. CHHP);
- Processing or treatment;
- Transferring mine-affected water to the release points to release off site when EA release criteria is met;
- Dewatering of sumps and pits to allow for the continuation of mining;
- Dust suppression; and
- Mine expansion / construction activities.

Table 11 summarises the pumping infrastructure installed onsite at SWCM.

Table 11: Pumping Infrastructure

Infrastructure Name	Pump/Release Rate (L/sec)	Pump Type	Function
PU001	160	HH1601 CAT	Supplys process water to the RWD
PU002	160	HH1601 CAT	Transfer pump
PU003	160	HH1601 CAT	Transfer pump
PU004	160	HH1601 CAT	Out of service
PU005	300	SYKES CP3001 CAT	Transfer pump
PU006	100	CP 1501 CAT	Truck fill point pump
PU007	70	LEGRA HW6000	Highwall pump
PU008	100	LEGRA HW6000	Highwall pump
PU009	100	LEGRA HW6000	Highwall pump
PU010	100	LEGRA HW8000	Highwall pump
PU011	30	MULTINO	Truck fill point pump
PU012	70	DEUTA	Out of service - Offsite
PU013		MULTIFLOW	Out of service
PU014	70	TRUEFLO	Supplys process water to the RWD
PU015	100	LEGRA HW8000	Highwall Pump
PU016	160	HH1601 CAT	Discharge pump
PU017	160	HH1601 CAT	Truck fill point pump
PU018	300	PIONEER	Discharge pump
PU019	220	PIONEER	Truck fill point pump
PU020	160	HH1601 CAT	Discharge pump
PU021	160	HH1601 CAT	Transfer pump
PU022	250	LEGRA HW9000	Highwall pump
PU504	80	Electric Pump	Supplys process water to the RWD – Permanent
CHPP Pump			CHPP

❖ *Current as at 6 November 2017*

Appendix A includes a schematic of the water storage and pumping infrastructure at SWCM.

Water Supply Infrastructure

The water supply infrastructure for SWCM encompasses the following components:

- Potable water supply;
- Mine water supply; and
- Sewage effluent.

Potable Water

Potable water is sourced from the Braeside bore fields.

Mine Water Supply

Mine water supply is considered to be any water that is mine affected and can be utilised onsite, including:

- Dust Suppression;
- Fire Water; and
- CHPP

Dust Suppression

Water used for dust suppression is recycled water and is sourced from two (2) fill points – Ramp C Dam and Ramp F Dam. A third fill point will be commissioned at K1 South Dam in 2018.

Fire Water

Water is stored on site for firefighting purposes. Currently raw water/mine water is pumped into on-site water storages. This water is then mechanically filtered and stored in tanks ready for use.

CHPP

The estimated demand for CHPP process water is approximately 5-6 ML per day. This water is sourced from the recycled water from mine-affected storages.

Acid Rock and Saline Drainage

Acid rock drainage (ARD) is not an issue for SWCM. No significant ARD has been identified on site. Alkaline overburden counteracts any acid generating potential.

Waste dumps or spoil dumps have the potential to leach saline water either back into the pit or on the outward face of rehabilitated and non-rehabilitated dumps, the latter being far more likely. Currently pit water is pumped into mine water dams and stored until appropriate release opportunities arise. Drainage at the toe of spoil dumps is generally captured in sediment dams. The historical measured electrical conductivity (EC) of water stored in these sediment dams has not been of sufficient levels to indicate saline drainage. Salinity monitoring is undertaken as per EA, discharges are meeting EA salinity limits (as per previous salt assimilation investigation), and thus no management actions required unless future monitoring triggers investigation levels in Bee Creek (downstream).

Water Releases

The water balance model results indicate that the risk of uncontrolled release from the water management system is very low.

Criteria set in the ***EA EPML00712313 – SWC Mine*** provide environmental triggers under which compliant release of mine-affected water to Bee Creek via Walker and Sandy Creeks can occur. If any of these conditions are not met, site cannot release water.

SWCM has six (6) licensed mine-affected water release points (Table 12).

Table 12. Release Points

Release Point	Mine-Affected Water Source
RP1	Ramp F Dam
RP2	Ramp C Dam
RP3	Eastern Sediment Dam
RP4	Cleanside Bidgerley Tailings Dam
RP5	Mine Affected Water Mixed In-pipe (previously Down Dip Dam)
RP6	Kemmis Dam Pipeline (not used currently – requires an EA amendment for updated location)

NOTE: RP5 has recently been relocated and must not be operated until an EA amendment has been approved by the administering authority.

Further details regarding release criteria and associated monitoring of the receiving environment are documented in the ***SWCM EA, Annual REMP Report*** and ***SWCM Water Release Procedure.***

Creek / River Diversions

SWCM has diverted creeks to allow for the continuation of mining and/or diverting water away from active mining areas.

The mine currently has diverted the following systems:

- Walker Creek

Creek Levees

A pit protection levy for the Toolah Pit was constructed in early 2018. The levy is currently undergoing RPEQ certification. As with other regulated structures it will undergo annual RPEQ inspections.

Treated Sewage Effluent

Treated sewage effluent produced on-site must only be released in accordance with the relevant conditions of the EA. Where the treated effluent is to be used for the purposes of dust suppression, irrigation (surface or sub-surface), and/or discharge to receiving waters, sampling of the appropriate effluent characteristics as outlined in the EA shall be conducted and evaluated to determine if the effluent is of suitable quality for the proposed use.

Water quality data is submitted annually to the WaTERS Database in accordance with Condition W29 of the Authority.

Water Balance Model

The water balance model is managed by Water Planning (Coal Strategy & Development) at the asset level and by the Mine Planning Department at the site level.

SWCM has developed a water balance model to assist with management of its stored water inventories, releases and investigations into improved water management overall. The ***GoldSim*** model has been specifically designed for water management investigations covering the entire mine site including breakdown of all catchments.

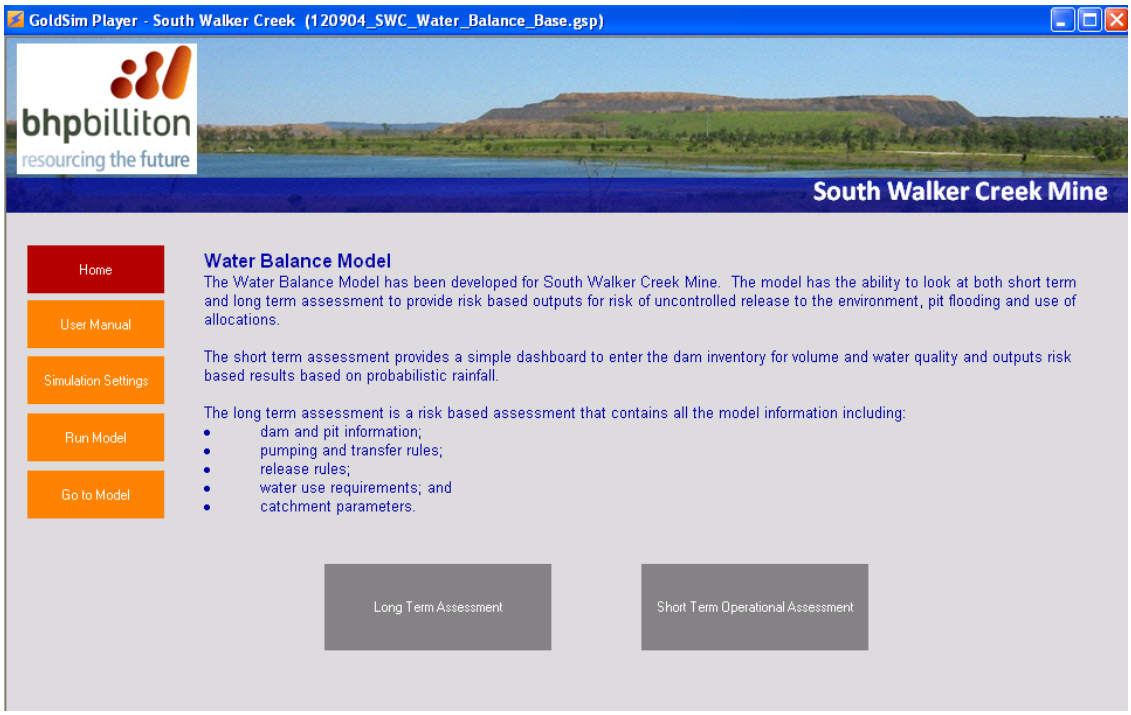
GoldSim is a dynamic model which simulates the operation of the sites water management system and is based on a daily time step process in which a complete account of water stored and transferred can be achieved. The model accounts for the following:

- Climatic variability;

- Catchment runoff and collection;
- Pit dewatering;
- Water reuse in support of mine operations and the CHPP;
- Pumped and gravity transfers;
- Haul Road and hard stand watering for dust suppression;
- Evaporative losses, ground water seepage; and
- Spills – controlled and passive from mine storages to surrounding creeks,

The ***GoldSim*** model has been formulated to enable SWCM to test the capability of its water management system and identify improvement initiatives. The model is confined by a series of operational guidelines which can be altered to test the capability of the system under a range of scenarios.

The ***GoldSim*** model is run prior to the commencement of the wet season using Bureau of Meteorology seasonal outlook information to determine water management risks and options for the wet season.



Monitoring & Control Verification

Water quality monitoring provides the mechanism for assessing performance against SWCM's environmental targets and statutory requirements. This includes monitoring requirements of the SWCM's EA relating to contaminant release, water storage quality and the receiving environment.

Background Monitoring

Background monitoring of surface water quality and flows and of groundwater quality and quantity has been undertaken in order to determine baseline conditions.

Further details of the background monitoring requirements are set out in the annual REMP report.

Surface and Groundwater Monitoring Plan

The monitoring of surface and ground waters is an EA requirement and the details of required monitoring are provided in the ***SWCM Environmental Monitoring Procedure***. The monitoring plan should meet the requirements of the EA as a minimum. On-going monitoring of water quality throughout the year is a condition that must be achieved with subsequent action based upon the sampling results if required.

A total of 7 surface water monitoring stations are operational and a further 4 stations on dams and 5 groundwater monitoring bores.

The surface water and dam monitoring stations are regularly calibrated to ensure data is accurate.

Mine Water Discharge Procedure

The EA authorises the release of mine-affected water into the receiving environment under specific conditions and at designated locations (refer Table 12). The quantity and quality of water that can be released from the release points is stipulated in Table 4 of the EA.

Sediment and Erosion Control Plan

The EA requires that SWCM maintain and implement a ***Sediment and Erosion Management Plan*** (SEMP). The SEMP should be reviewed and updated biennially as a minimum.

Compliance Monitoring

Compliance monitoring is being undertaken to ensure the EA requirements regarding surface water and groundwater management are met.

Compliance monitoring is being undertaken for:

- Receiving waters - upstream and downstream monitoring sites on the Bee Creek;
- Water storage dams, including mine water and sedimentation dams;
- Groundwater quality and levels at specified monitoring bores;
- Release from site;
- Contaminated water released to land (from the sewage treatment plant).

Further details of the compliance monitoring requirements for the receiving environment are detailed in the ***SWCM REMP Design Report (2016)***.

Investigative Monitoring

The EA requires investigative monitoring to be undertaken when the downstream water quality characteristics for the receiving environment exceed the upstream results during any release event.

The details of the investigations carried out and the actions taken to prevent environmental harm must be documented.

Investigative monitoring is also required during an uncontrolled discharge from any component of the mine. Such monitoring includes sampling and monitoring of the:

- Quality and quantity of the uncontrolled release; and
- Water quality of the receiving environment.

Inspections

Inspections are required to ensure requirements of the EA are met with regard to:

- Temporary interference with waterways;
- Erosion and sediment controls are in place and effective;
- Spillages of wastes, contaminants or other materials; and
- The MWMS and appropriate functioning of diversion channels and watercourse levees.
- Regulated dams and structures

Monitoring and Measurement Program

Water monitoring and measurement requirements for SWCM are documented in the ***SWCM Environmental Monitoring Procedure***.

SWCM implements a comprehensive monitoring and measurement program to meet BMC and SWCM's EA requirements and incorporates:

- Water storage water quality and level monitoring;
- Creek and river water quality and level monitoring;
- Weather (rainfall volume and intensity); and
- Release monitoring.

The mine site uses a combination of standalone monitoring equipment, in-situ sampling and laboratory analysis to meet the requirements of the monitoring and measurement program.

Sampling and Analysis Methods

Monitoring requirements for each quality characteristic are detailed in the ***SWCM Environmental Monitoring Procedure***.

The collection method and in-situ field testing of water quality is undertaken in accordance with the latest edition of administering authority's ***Water Quality Sampling Manual***.

Monitoring is carried out by competent persons, as per Condition A7 of the Authority.

Monitoring Equipment and Calibration

The SWC HSE Department shall ensure all equipment used for monitoring and measurement of water quality is identified and documented. Calibration of equipment is carried out prior to water quality sampling.

Monitoring Data

The SWCM HSE Department shall ensure that all data collected as part of water monitoring program is loaded and stored in 'EnviroSys' – the central repository for all environmental data as defined in the ***Coal HSEC Reporting Standard***. Monitoring data is also submitted annually via the WaTERS database with the annual return.

Monitoring data is regularly reviewed by the HSE Department to ensure continuity and compliance with the monitoring program requirements – monitoring frequency, trigger levels.

Emergency & Contingency Planning

The ***SWCM Water Release RACI*** defines the responsibilities of the Mine Planning, Production Mining, Engineering, Maintenance and Environment Departments.

The responsible people will carry out contingency planning prior to the wet-season each year which will include a review of the water balance and running of scenarios through the model to determine the possible impacts.

The Site Leadership team is setup to respond to emergencies through the ***SWCM Incident Management Manual (IMM)***. The IMM should be consulted when contingency planning and during an emergency.

The documents listed below are available in iPick for emergency and contingency planning:

- ***BMC-SWC-HSEC-MAN0001 Incident Management Manual (IMM);***
- ***SWC-HSEC-F024 Severe Weather Event Checklist;***
- ***SWC-HSEC-P023 SWC Severe Weather Procedure;*** and
- ***SWC-HSEC-P008 Working Near a Body of Water or Other Liquid***

Table 13: Dam Types, Design Criteria and Management Requirements

Dam Category / Catchment Type	Design Criteria / Management	Release off Site	Transfers (Other Than to Like Containment)
Clean water (farm dam)	NA	NA	Not authorised other than emergency
Minor sediment (diversion) dam	NA	By overflow only	In Abnormal Circumstances Only
Sediment dam	For new dams, capacity > 0.6 ML/ha, where practical apply a 3:1, length: width ratio. Spillway designed to convey 50yr (nominal) ARI event. Geotechnical advice to be sought with respect to construction specifications for the dam embankment and construction materials suitability if above ground dam.	By overflow only	Emergency Circumstances Only
Mixed purpose – sediment / pit water dam	Both Sediment Dam and Pit Water Dam criteria apply. Hazardous waste dam requirements if relevant[2].	Controlled release in accordance with EA requirements.	
Mine Water dam	Volume and operating regime determined by water balance Controlled release mechanism (e.g. valve) Included in EA Hazardous waste dam requirements if applicable[1].	Controlled release in accordance with EA requirements	
Process water / tailings	Volume determined by water balance Included in EA Hazardous waste dam requirements if applicable[1].	No discharge authorised unless: In abnormal conditions, and If authorised by EA	
Industrial waste water	In accordance with relevant Australian Standard or Code. Hazardous waste dam requirements if applicable[2]	Only if authorised under relevant legislation	

1. Low hazard dams containing hazardous waste must be managed in accordance with the SWCM EA and the Code of Environmental Compliance for Mining Lease Project (particularly Condition 23 and Appendix B). High Hazard Dams containing hazardous waste must be managed in accordance with the SWCM EA and the Code of environmental compliance for environmental authorities.

Training

Effective water quality management requires training commensurate with the roles and responsibilities of personnel.

All persons conducting water quality monitoring are trained for conducting water sampling and are deemed competent.

Reporting

Reporting associated with Group HSE requirements is facilitated by the HSE Reporting Function at the Asset. Data required for reporting is maintained in the environmental database (EnviroSys).

Reporting on performance against the applicable monitoring program data shall be provided to HSE Department in accordance with the ***Coal HSEC Reporting Standard*** and regulatory conditions.

When monitoring results do not conform to the identified requirements, the HSE Department shall advise and consult with the risk owner(s) responsible for the non-conforming plant or process and provide input into corrective or preventative actions. The following table summarises the reporting requirements for SWCM Water Management.

Table 14. SWCM Water Reporting Requirements

Report type	Requirement
Annual Water Monitoring Report	• An annual water monitoring report must be submitted to the administering authority with the submission of the annual return. The details of the report content are specified in the EA. • Annual Water Monitoring Reporting is submitted via the WaTERS Database
Release Reporting	• The release or discharge of mine water requires reporting to the administering authority, whether controlled or otherwise. Reporting is required at the following events: • Within 24 hours of release commencement (WaTERS Database). • Within 24 hours after cessation of release (WaTERS Database).. • Within 28 days of an exceedance of a release that exceeds EA conditions (Note: notification is required with 24 hours if release limits in Table 2 of the EA are exceeded). • All reports and analysis data to be submitted to WaTERS Database within 28 days of cessation of release.
Temporary Interference with Waterways	• Temporarily destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations must be undertaken in accordance with Department of Environment and Resource Management Guideline - Activities in a Watercourse, Lake or Spring associated with Mining Activities. This guideline stipulates that the authority holder must perform a self-assessment on the proposed activity to determine the likely impacts and define control measures. • If adequate control measures are not able to be implemented then an application for a Water License to interfere with a waterway must be submitted to the administering authority.
Dams and Structures	• Each regulated structure must be inspected by an RPEQ Engineer annually. The holder of the Environmental Authority within 20 business days of the receipt of the annual monitoring report, BMC must provide the Administering Authority a copy of the recommendations section of the Annual Inspection Report, any applicable actions taken in response to the recommendations. • If following receipt of the recommendations and applicable actions the Administering Authority requests a full copy of the report from the holder a copy of the report needs to be provided to the Administering Authority within 10 days (as per Condition G25).

Report type	Requirement
REMP Report	• A report outlining all findings, monitoring results, interpretations of the REMP. This would include an assessment of background water quality, a comparison of water quality against water quality objectives and the suitability of discharge limits.

Event Response & Reporting

In the event of emergencies, incidents or exceptions, all reasonable actions must be taken by Operations to minimise environmental harm, or the risk thereof. If required, the HSE Department must also notify the Administrating Authority as per EA conditions.

Emergency response shall be conducted in accordance with the ***SWCM Incident Management Manual*** and spills shall be contained and cleaned up in accordance with ***SWCM Hydrocarbons and Spill Management Procedure***.

Reporting of events shall occur as per the ***Coal HSEC Reporting Standard***.

Complaint Management

Complaints shall be managed in accordance with EA Conditions H1 and H2.

References

Reference	Title
BHP Portal – BLD	Our Requirements: Environment and Climate Change
BHP Portal – BLD	Coal Risk Management Framework
BHP Portal – BLD	Coal HSEC Reporting Standard
iPick	BMC-SWC-HSEC-MAN0001 Incident Management Manual (IMM)
iPick	SWC-HSEC-P008 Working Near a Body of Water or Other Liquid
iPick	SWCM Hydrocarbons and Spill Management Procedure
SWC Document Control	SWCM Sediment and Erosion Management Plan (SEMP)
SWC Document Control	SWCM REMP Design Report
SWC Document Control	SWCM Environmental Monitoring Procedure
SWC Document Control	SWCM Water Release RACI
iPick	SWCM Severe Weather Management
EHP Guideline	Preparation of Water Management Plans for Mining Activities
EHP	Water Quality Sampling Manual
EHP Guideline	Environmental Values, Water Quality Guidelines and Water Quality Objectives for Fitzroy Basin Waters
Environmental Authority	Environmental Authority EPML00712313 SWC Mine (dated 13 September 2016)

Terms and Definitions

Term/Acronym	Definition
BoM	Australian Bureau of Meteorology
Discharge	Uncontrolled discharges via spillway or dam overflow.
Release	Active initiation of release via pipe or pump
Shall	The word 'shall' is to be understood as mandatory.
Should	The word 'should' is to be understood as non-mandatory, advising or recommended.
WMP	Water Management Plan

Version Management

Version	Date	Section	Revised By	Approved By
1	04/08/2008	All – Created	A Cooke	
2	04/07/2010	Full Review	A Alsemgeest	D Champion
3		Controlled	D Dickson	D Champion
4	14/11/2010	Include BHPB GLD Reference	A Alsemgeest and J Buller	D Champion
5	11/10/2011	Complete Revision	T. Smalley	P Jeston
6	16/08/2012	Complete Revision	T. Smalley	P. Jeston
7	09/10/2012	Minor Amendments	P. Jeston	P. Jeston
8	28/09/2012	Revision	K.Smith	K.Smith
9	24/03/2014	Revision	J. McCudden	K.Smith
10	30/06/2015	Revision	N Poole	N Poole
11	30/09/2016	Minor Amendments	J Schumacher	Sean England
12	14/09/2017	Revision	J Schumacher	Sean England
13	November 2017	Minor Amendments	J Schumacher	Sean England
14	March 2018	Minor Amendments	J Schumacher	Sean England
15	April 2018	Minor Text Amendments	J Schumacher	Sean England

Appendix 1 Water Schematic