JELLINBAH MINE

Jellinbah Mine Water Management Plan




May 2020

M61000_027

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M61000_027 JELLINBAH MINE WMP					
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1. INTRODUCTION

Jellinbah Mine (the Site) is an open-cut coal operation in the Bowen Basin with approval to produce up to 7.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) pulverised coal injection (PCI) and thermal coal. Mining activities at Jellinbah Coal Mine are approved under Environmental Authority EPML00516813 (DEHP, 2019).

Conditions C30 to C32 of the Environmental Authority (EA) outline the requirements for the development and annual review of a Water Management Plan for the Site. Engeny was commissioned by Jellinbah Mine to review and update the Water Management Plan developed by Engeny Water Management (2018).

1.1 Water Management Plan Objectives

As prescribed in Condition 31 of the EA, the key objectives of the WMP are:

- Determine the source and nature of potential contaminants.
- Development of a site water balance model.
- Development of a site water management system.
- Identify potential impacts to receiving environments.
- Define management actions to minimise the risks of environmental harm to receiving environments.
- Outline contingency procedures for emergencies.

1.2 Legislative Requirements

Jellinbah Coal Mine is required to prepare a WMP as per conditions C30 and C31 of the Site's Environmental Authority (EPML00516813).

The over-arching legislation that applies to the management of water at Jellinbah Mine includes:

- *Environmental Protection Act 1994* (Qld).
- *Environmental Protection Regulation 2008* (Qld).
- *Mineral Resources Act 1989* (Qld).
- *Mineral Resources Regulation 2003* (Qld).
- *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (Qld).

- *Water Act 2000* (Qld).
- *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

1.3 Standards and Guidelines

Key standards and guidelines that have been used to inform the preparation and implementation of this WMP include:

- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Online Platform (ANZECC 2018).
- *Best Practice Erosion and Sediment Control* (IECA 2018).
- *Establishing draft environmental values, management goals and water quality objectives* (DEHP 2013a).
- *Guideline for Preparation of Water Management Plans for Mining Activities* (DEHP 2012b).
- *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (DEHP 2016c).

1.4 Supporting Documentation

The following documents should be read in parallel with this Water Management Plan:

- *Environmental Authority EPML00516813 Jellinbah Mine* (DEHP, 2019).
- *Erosion and Sediment Control Plan* (AARC, 2018).
- *Receiving Environment Monitoring Program* (REMP) *Jellinbah Coal Mining Project* (Ison Environmental Planners, 2010) and the annual progress reports by AARC.

The Erosion and Sediment Control Plan (ESCP) is a requirement of Condition C38 of the EA. The goal of the plan is the minimisation of erosion, release of sediment to receiving waters and contamination of receiving waters. The ESCP addresses the management of runoff from undisturbed or rehabilitated land, while the Water Management Plan focuses on the management of mine-affected water.

1.5 Project Data

The following data was used for development of the updated WMP. All data was supplied by Jellinbah Mine unless otherwise specified.

- Plains LiDAR dated June 2019.
- Central LiDAR dated June 2019.
- Mackenzie North LiDAR dated June 2019.
- LiDAR for Jellinbah South dated June 2016 (area inactive).
- Aerial imagery dated April 2020.
- Latest storage curves, including updated survey for Max Pit, Son of Max, E Road Dam and Plains South Pit and dams as well as Mackenzie North Mine Water dam.
- Water quality monitoring data (August 2014 – June/July 2019).
- Pump and pipeline capacities and arrangements.
- Climate data from the SILO climate database facility hosted by the Department of Science, Information Technology, and Innovation (DSITI).
- IQQM stream flow data for Mackenzie River (DSITI).
- Management plans and regulated structure documentation.

2. SITE DESCRIPTION

2.1 Background and Current Operations

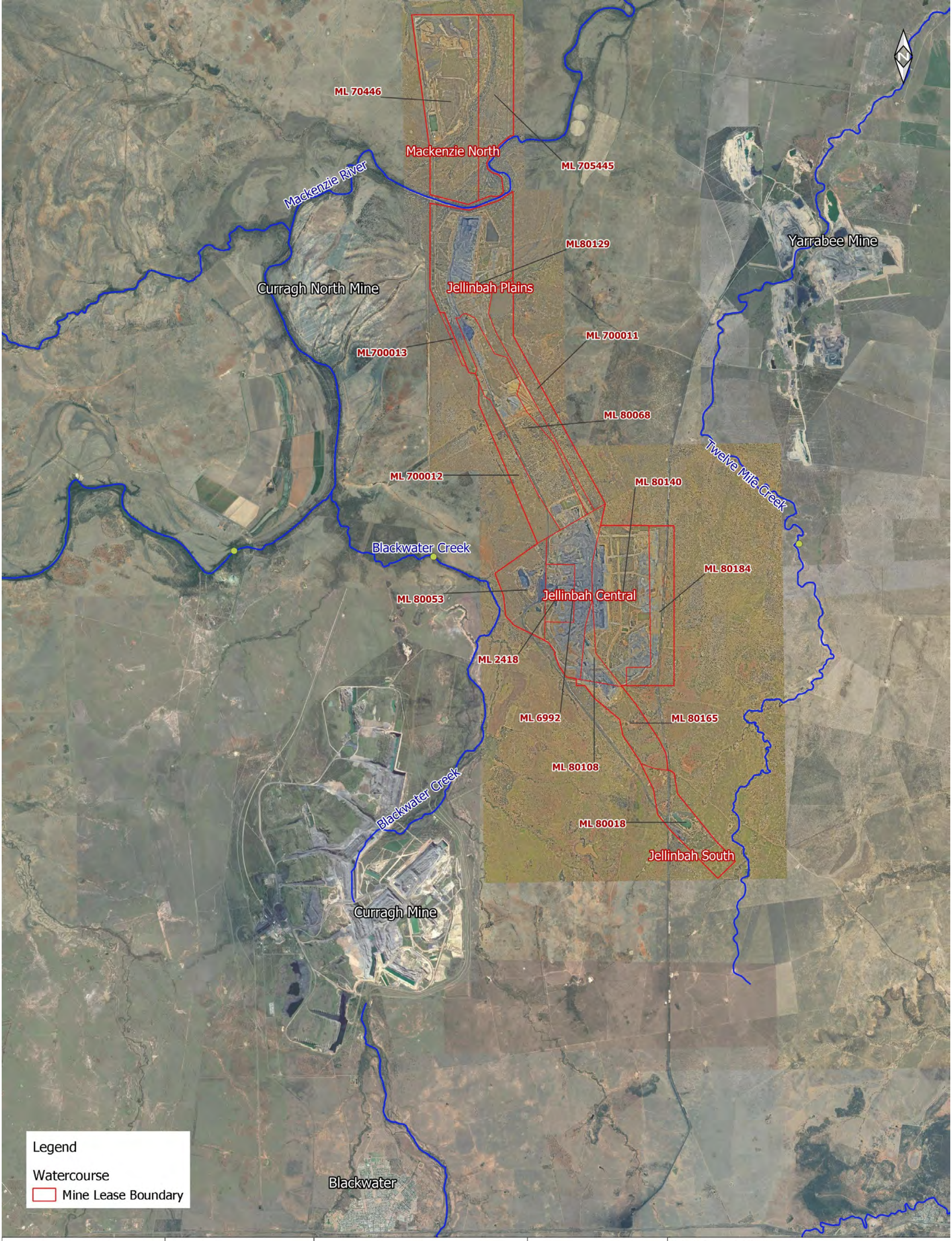
Jellinbah Coal Mine is located approximately 25 km north of the township of Blackwater in central Queensland. Refer to the site locality plan, Figure 2.1. The Jellinbah Coal Mine consists of five (5) distinct operating areas, referred to as the Central, Central South, South, Plains and Mackenzie North sites. Current operations involve open cut coal mining in the Central and Plains areas with Mackenzie North operations ramping up in 2019; South pit was mined up until 2003 and then used for the storage of excess mine affected water. Dewatering of the Plains South Pit has occurred and mining in the pit has resumed with spoil being dumped on both the eastern and western sides of the pit

Current coal production is around 5.0 Mtpa; 2.2 Mtpa at Central, 2.4 Mtpa at Plains and 0.4 Mtpa at Mackenzie North (from April 2020). Coal is hauled from mining areas along a dedicated haul road to the Boonal Loadout Facility on the Capricorn Highway, east of Blackwater.

The main operations are at the Central site, including workshops, offices and the coal wash plant. The coal seam dips to the east and the pits are progressing to the east. Out of pit overburden emplacements have been developed to the east of the Central pits, while operational pits are being progressively backfilled from the west. The CPP, wash plant, ROM areas and workshops are located further west. Runoff containment dams and a tailings dam have been constructed around the processing area.

The Plains coal seam dips to the east and the pit is progressing in a northerly direction towards Mackenzie River. Backfilling operations are occurring at the southern end of the pit with coal production to cease in 2020. The Plains area has a ROM area, including a crusher, from which coal transported directly to the Boonal Loadout Facility. If necessary, a small amount of Plains coal may be transported to the Central CPP for washing.

Mining operations in Mackenzie North include an open cut pit progressing to the south towards Mackenzie River and a crusher, from which coal is transported either to Central CPP for washing or directly to Boonal Loadout Facility. The Mackenzie North Pit commenced pre-stripping in late 2019 and is expected to commence coal haulage in 2020.



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Map Projection: Tranverse Mercator
Horizontal Datum: GDA 1994
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

		JELLINBAH MINING PTY LTD
DATE	13/05/2020	Jellinbah Mine Water Management Plan Site Locality Plan
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	A3	Figure 2.1 A

2.2 Receiving Waterways

2.2.1 Twelve Mile Creek

Twelve Mile Creek is located to the east of the mine lease area and flows in a northerly direction before discharging into the Mackenzie River 60 km from Jellinbah South (downstream of the Bingegang Weir). Overflows from water storages in Jellinbah South discharge to a tributary of Twelve Mile Creek.

Twelve Mile Creek is an ephemeral waterway and stock may have access to this waterway downstream of the mine lease. Twelve Mile Creek flows through the centre of the neighbouring Yarrabee Coal Mine approximately 20 km downstream of Jellinbah South.

2.2.2 Blackwater Creek

Blackwater Creek is located to the west of the mine lease area and flows in a north-westerly direction before discharging into the Mackenzie River 10 km north-west of Jellinbah Central (upstream of the Bingegang Weir). Overflows from water storages in Jellinbah Central will discharge to one of two unnamed tributaries of Blackwater Creek. Mine water release to Blackwater Creek are only allowed in accordance with the conditions in the Jellinbah Mine EA.

Blackwater Creek is an ephemeral waterway and stock may have access to this waterway downstream of the mine lease.

2.2.3 Mackenzie River

The Mackenzie River is the receiving waterway for Twelve Mile Creek and Blackwater Creek, and as such any water discharged from the Jellinbah Coal Mine site will enter the Mackenzie River. Water storages at Jellinbah Plains and Mackenzie North discharge directly to the Mackenzie River in extreme events. Mine water release to the Mackenzie River is only allowed in accordance with the conditions in the Jellinbah Mine EA.

The Mackenzie River has a significant number of water extraction points located both upstream and downstream of the confluences with the Blackwater Creek and Twelve Mile Creek. Water extracted from the Mackenzie River is primarily used for agricultural purposes, however also includes riparian, stock and domestic entitlements.

The Nogoa-Mackenzie Water Supply Scheme releases water from Fairbairn Dam into the Mackenzie River via the Nogoa River for agricultural, urban and industrial use. There are major industrial and urban water supply off-takes downstream of the confluence of Blackwater Creek and Mackenzie River.

Bingegang Weir is located on Mackenzie River, downstream of Jellinbah Plains and the confluence with Blackwater Creek and upstream of the confluence of Twelve Mile Creek. As such the Bingegang weir may be impacted by the release of mine affected water from Jellinbah Central and Jellinbah Plains. The Bingegang Weir supplies water to the towns of Middlemount and Dysart along with a number of mines in the region. The Bingegang Weir

is located 60 km downstream of the confluence with Blackwater Creek and 30 km downstream from Jellinbah Plains.

2.3 Climate

Jellinbah Mine has a sub-tropical climate, dominated by a wet humid summer and dry winter. Long-term climate data for Jellinbah Mine was obtained from the SILO climate database facility hosted by the Department of Science, Information Technology, and Innovation (DSITI). A SILO Patched Point Data climate series was obtained for the New Caledonia Station (35132), which is located about 5 km from Jellinbah Mine. Table 2.1 presents a summary of this data.

Average annual rainfall is 572 mm. Average pan evaporation at Jellinbah Mine is 171 mm/month, varying from 96 mm/month in June to 236 mm/month in December.

Table 2.1 Average Climate Data Statistics

Month	Mean Rainfall (mm)	Mean Maximum Temperature (°C)	Mean Minimum Temperature (°C)	Mean Pan Evaporation (mm)
Jan	95.3	33.7	21.6	229
Feb	82.7	32.9	21.4	186
Mar	59.3	31.9	20.1	194
Apr	29.5	29.4	16.5	153
May	29.8	26.1	12.3	118
June	30.0	23.3	9.4	96
July	24.7	23.0	7.8	104
Aug	17.6	25.0	9.4	131
Sept	21.8	28.2	12.8	171
Oct	39.9	30.8	16.5	209
Nov	54.6	32.4	18.9	222
Dec	86.7	33.7	20.7	236
Annual	**572**	**-**	**-**	**2049**

2.4 Geology

Jellinbah Mine falls on the eastern flank of the Comet Ridge of the Bowen Basin, at the north-western end of the Jellinbah Zone. The coal seams at Jellinbah Mine dip to the east.

The coal is at least 10 m deep at its shallowest location and increases as the seam dips by between 2 degrees and 20 degrees.

The initial overburden layers are made up of clays and sands before reaching siltstones and mudstones that are above the coal layers. Removal of most material is by blasting then loading and hauling with truck and excavator equipment. The overburden material has been classified as non-acid forming.

2.5 Groundwater

Minimal groundwater has been encountered at the Jellinbah Central site, however significant groundwater inflows have been experienced at Plains Pit, when mining activities reached the quaternary alluvium in the floodplain. Plains Pit is located in close proximity to the Mackenzie River with mine progression intercepting the alluvials located in the southern floodplain.

Prior to the 2011 flood event, the alluvium around Jellinbah Plains was largely unsaturated. Based on these conditions, analytical estimation of potential groundwater inflows predicted that less than 0.2 ML/day could enter the Jellinbah Plains mine area (AGE 2006). Following the 2011 flood event, the alluvial groundwater system was recharged from floodplain inundation and conditions along the river bed likely changed (i.e. scouring of clay in areas and deposition of clay in others).

A groundwater assessment was conducted by AGE (2013) following the 2011 flood event. This predicted groundwater inflows of 5.4 to 7.6 ML/day in 2019. After reviewing recorded pumping data from Plains Pit to Environmental Dam for FY18/19 (Thiess Mining), the groundwater inflow rate to Plains Pit was estimated to be 4.6 ML/day. This value was based on data recorded during the dry season and considered recorded seepage data from Environmental Dam.

3. CONTAMINANT SOURCES

Surface water runoff from mine landforms and disturbed areas can potentially contain a variety of contaminants including sediment, heavy metals, hydrocarbons and soluble salts. Potential contaminant sources identified across Jellinbah Mine include:

- Coal Handling and Processing Plant (CHPP).
- Tailings and rejects storage facilities.
- Overburden dumps.
- ROM and stockpile areas.
- Haul roads and access roads.
- Pit voids.
- Water containment and sediment dams.
- Pre-strip areas.

A summary of the potential contaminant sources, flow paths and destinations are summarised in Table 3.1.

This Water Management Plan addresses the overarching management of water across the Plains, Central, South and Mackenzie North mining areas, focussing on managing water in distinct categories including:

- Mine Affected Water – Water that contains contaminants which have been generated as a result of the interaction with groundwater as well as extraction and processing of coal, such as soluble salts, dissolved metals and hydrocarbons.
- Sediment Water – Rainfall runoff in which the only contaminants are dissolved or suspended sediments.
- Clean Water – Rainfall runoff generated from areas not impacted by activities associated with the approved mining.

Table 3.1 Contaminant Source Summary

Source	Transport Mechanisms	Site Containment	Receiving Waterway	Potential Contaminants
CHPP	Surface runoff	Water containment dams	Blackwater Creek	Sediment, heavy metals, coal fines, soluble salts, processing reagents (i.e. flocculent / magnetite), fuels, oils and grease
Overburden Dumps	Surface runoff	Pit voids Water containment dams	Blackwater Creek, Mackenzie River	pH raising materials Sediment, dissolved metals present in weathered sediments and soluble salts
ROM and Stockpile Areas	Surface runoff	Pit voids Water containment dams	Blackwater Creek, Mackenzie River	Sediment, coal fines, soluble salts and acid forming material
Haul roads and access roads	Surface runoff	Water containment dams	Blackwater Creek, Mackenzie River, Twelve Mile Creek	Sediment, soluble salts, fuels, oils, grease (total petroleum hydrocarbons) and coal (coarse or fines)
Pit Void	Pumping of pit runoff to water containment dams	Pit voids Water containment dams	Groundwater	Alkaline or sodic soils and heavy metals, coal fines and pH altering materials
Water Containment Dams	Seepage through floor of dams Pumping within mine water system Overflows during heavy rainfall Loss of containment (failure)	Pit voids, if containment dam capacity is limited	Blackwater Creek, Mackenzie River, Twelve Mile Creek	Elevated pH, sediment, dissolved metals, coal fines, soluble salts and hydrocarbons

The Erosion and Sediment Control Plan (AARC, 2018) details the management of sediment water. The Jellinbah Coal Mine area is dominated by highly dispersive soils of strongly structured alluvial clays and soils of sandy texture. These soils are easily erodible with high fines content. Runoff from areas undisturbed by mining activities is expected to have high suspended solids content. Sediment dams assist in allowing sediment to settle out of the water prior to discharging to natural water courses. Jellinbah have been managing this issue successfully during the mine life without problems to date.

The Jellinbah Mine Site Wide Consequence Category Assessment (Engeny 2017) identifies water management infrastructure which are classified as regulated structures. These structures have been identified as posing a risk to environmental values within the receiving waterways and as such are required to be designed and operated in specific manner. Regulated structures are managed under specific conditions within the EA and include requirements for annual inspection, operational plans and water storage limitations.

The Jellinbah Mine Receiving Environment and Monitoring Program (REMP) prepared by AARC was developed to assess and document the condition of the surface waters in the receiving environment. Annual REMP reviews undertaken to date have not identified any adverse impacts to the receiving surface water environment, suggesting the current water management system is adequately managing contaminant sources associated with Jellinbah Mine.

3.1 Saline Drainage

Water that has been in contact with coal or interburden has a tendency to have elevated levels of salinity. This includes runoff from processing areas and pit water. These waters are managed via separation from any clean catchment runoff through the use of pumping and dedicated mine water storage dams throughout the site. This water is predominantly recycled or evaporated. The average water quality of stored contents in mine affected water dams ranges from 4,890 to 12,350 µS/cm over the last five years (Section 5). All mine affected storages were included in the water balance model.

3.2 Acid Rock Drainage

As outlined in Section 2.4, the mining area is predominantly made up of layers of mudstone, siltstone, sandstone and coal. Overburden is generally between 10 m to 150 m thick. These materials are generally not acid forming and there has been no indication of acid drainage from any dump areas or within pits at Jellinbah Mine to date. As such no specific strategies have been developed to manage acid drainage. Water monitoring programs as well as the REMP will identify any future change that may require attention. Water quality monitoring results to-date indicate slightly alkaline runoff from pits and overburden (see Section 6).

4. WATER MANAGEMENT SYSTEM

The water management system at Jellinbah Mine comprises of storages which serve the following purposes:

- Pit dewatering.
- Containment of tailings.
- Storage of mine affected water.
- Collection of spoil and rehabilitated runoff.
- Controlled release of mine affected water.
- Water truck filling points.
- Active and inactive mine pits.
- Sediment control.

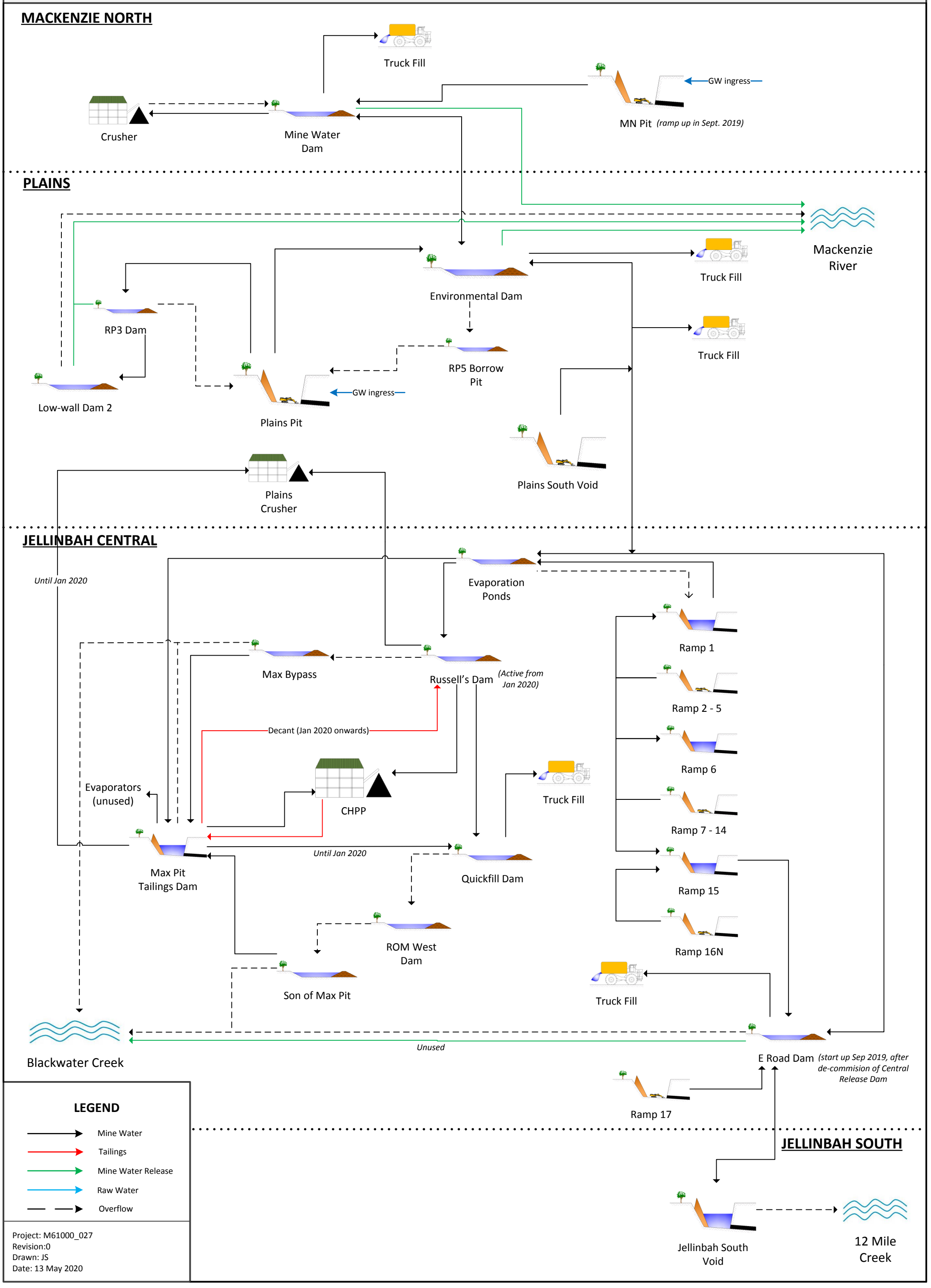
A water management system schematic was developed for Jellinbah Mine and is presented as Figure 4.1. Figure 4.2 to Figure 4.5 shows maps of the site water management infrastructure including MAW storages, sediment dams, pipelines, drains and levees.

The majority of mine affected water at the Jellinbah Mine is stored in Plains South Void, Jellinbah South Void and large dams constructed within the mine lease area, such as Plains Environmental Dam, Max Pit Tailings Dam and Mackenzie North Mine Water Dam.

The water management system also includes an interconnecting pipe network with associated pumps which allow mine affected water to be transferred between water storage structures across the site.

Under the current mining operations coal tailings from the CPP are contained in the Max Pit Tailings Dam. The tailings decant is recycled to Russell's Dam for site water consumption at CPP. In the future Russell's Dam will be used for storing tailings and replace the supply to Central CPP and Plains crusher from Max Pit.

Figure 4.1 - Jellinbah Mine Water Management System Schematic



ML 70446

ML 705445

MN Overflow Dam

Mackenzie North MWD

MACKENZIE NORTH

Mackenzie River

Legend

- Watercourses
- ML Boundary
- MAW Catchment

Infrastructure

- MAW Storage
- Sediment Dam
- Clean Water Pipeline
- MAW Pipeline
- Tailings Pipeline
- MAW Drain
- Sediment Drain
- Clean Water Drain

0 300 600

Scale in metres (1:15,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: GDA 1994
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

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Jellinbah Mine Water Management Plan
Water Management Infrastructure
Mackenzie North

A3 | Figure 4.2 | D

ML 70446

Mackenzie River

Environmental Dam

RP5 Borrow Pit

RP3 Dam

ML80129

PLAINS

Lowwall Dam 2

Overflow Dam 2

Overflow Dam 1

OOP Main Dam

Workshop Dam

ML 700011

ML700013

ML 80068

Clean Water Dam

Plains South Void

PLAINS SOUTH

Truckfill Dam

ML 700012

CENTRAL NORTH

Legend

- Watercourses
- ML Boundary
- MAW Catchment

Infrastructure

- MAW Storage
- Sediment Dam
- Clean Water Pipeline
- MAW Pipeline
- Tailings Pipeline
- MAW Drain
- Sediment Drain
- Clean Water Drain

0 500 1,000

Scale in metres (1:25,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: GDA 1994
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

		JELLINBAH MINING PTY LTD
DATE	21/05/2020	Jellinbah Mine Water Management Plan Water Management Infrastructure Plains
DRAWN	JS	
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	A3	Figure 4.3 D

Evap Ponds
ML 700011
ML80129
ML 80068
ML 700012
ML 6992
108 Dam
CENTRAL
Russell's Dam
Max Bypass
Max Pit
ML 80053
Quickfill Dam
ML 2418
ML 80140
ROM West Dam
Son of Max Pit Dam
ML 80184
E Road Dam
South West Dam
South Dam
ML 80108
ML 80165

Legend

- Watercourses
- ML Boundary
- MAW Catchment

Infrastructure

- MAW Storage
- Sediment Dam
- Clean Water Pipeline
- MAW Pipeline
- Tailings Pipeline
- MAW Drain
- Sediment Drain
- Clean Water Drain

Jellinbah

ENGENY WATER MANAGEMENT

0 440 880

Scale in metres (1:22,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: GDA 1994
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

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Jellinbah Mine Water Management Plan
Water Management Infrastructure
Central

A3 | Figure 4.4 | C

ML 80018

SOUTH

Jellinbah South Void

N

Legend

- Watercourses
- ML Boundary
- MAW Catchment

Infrastructure

- MAW Storage
- Sediment Dam
- Clean Water Pipeline
- MAW Pipeline
- Tailings Pipeline
- MAW Drain
- Sediment Drain
- Clean Water Drain

Jellinbah

ENGENY WATER MANAGEMENT

0 200 400

Scale in metres (1:10,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: GDA 1994
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 55

		JELLINBAH MINING PTY LTD
DATE	20/05/2020	Jellinbah Mine Water Management Plan Water Management Infrastructure South
DRAWN	JS	
JOB NO.	M61000_027	
		A3 Figure 4.5 C

4.1 Water Management Objectives

Table 4.1 summarises the types of water on site and the management strategy employed for each type.

Table 4.1 Overall Water Management Strategies

Type of Water	Definition	Management Strategy
Clean Runoff	Runoff from all areas that are not affected by coal or operational facilities.	Drains and dams are used to keep clean water separate and ultimately divert clean catchment runoff to receiving waterways.
Sediment Runoff	Runoff in which the only contaminants are dissolved or suspended sediments.	Runoff with a sediment load is directed through sediment dams to minimise solid content prior to exiting the site.
Mine Affected Water	Includes any water that comes into contact with coal stockpiles, coal pads, plant areas, pit areas and coal seam groundwater. Typically, elevated salinity.	Objective is to keep this water separate from the other water types, recycle and evaporate as much as possible and discharge as per EA release conditions.
Raw Water	The site has a license to supplement water supply by pumping from Mackenzie River. This water is untreated and mainly used for vehicle wash down.	Minimise consumption where possible – constrained by 300 ML/yr extraction license.
Potable Water	Water for drinking and sanitation purposes.	Water is trucked to site as required.

The design and details of the clean water runoff and sediment runoff systems is outlined in the Sediment and Erosion Control Plan (AARC, 2018).

4.2 Water Management Infrastructure

4.2.1 Mine Water Storages

Table 4.2 presents a summary of all mine water management storages and pits.

Table 4.2 Water Management Storages

Site	Storage/Pit	Capacity (ML)	18 Sept 2019 Inventory (ML)	Catchment Area (ha)	Water Management Details
PLAINS	Plains Pit	100 (in-pit sump capacity)	3	328.3	Receives runoff from spoil and groundwater ingress at the base of the pit and up the northern wall. Dewatered to Environmental Dam and RP3 Dam.
	Environmental Dam	1,602	978	27.6	Turkey's nest dam that receives pit water and provides water to truckfill for dust suppression. Authorised EA release point to Mackenzie River.
	Lowwall Dam 2	18	14	9.1	Receives alluvial water from Plains pit advanced dewatering trenches, and acts as storage expansion to RP3 DAM. Potential to release via authorised EA point through pipeline
	RP5 Borrow Pit	55[2]	0[2]	86.1	Receives overflows from Environmental Dam.
	RP3 Dam	32[2]	0[2]	38.7	Receives alluvial water from Plains pit advanced dewatering trenches. Potential to release via authorised EA point through levee to Mackenzie River.
	Plains South Void	0 (active)	105	72.9	Previously received pit water via Plains Main OOP Dam. Current being dewatered to Environmental Dam and Central.
CENTRAL	Central Pits	1,711[1]	98	698	All central pits are ultimately dewatered to E Road Dam or the Evaporation Ponds. Ramp 1, 6 and 15 are used for intermediate water storage.
	Ramp 17	100	0	94.3	Ramp 17 is pumped to E Road Dam.
	Evaporation Ponds	116	28	24.3	Pit water stored in ponds with large surface area to maximise evaporative loss. Sends water to Max Pit Tailings Dam or north to Environmental Dam. Can also dewater to E Road Dam if needed.

Site	Storage/Pit	Capacity (ML)	18 Sept 2019 Inventory (ML)	Catchment Area (ha)	Water Management Details
	E Road Dam	112	50	4.1	Replacement of Central Release Dam in September 2019. Receives pumping from Jellinbah South Void, Evaporation Ponds and Ramp 17. Supplies truckfill demand for dust suppression on site.
	Russell's Dam	288	0	4.2	Replacement for Marks Dam and currently under construction. In future will supply demands to Central CPP and Plains crusher with Max pit solely receiving Tailings and pumping decant water to Russell's Dam.
	Max Bypass	88	0	76.1	Receives overflows from Russell's Dam and local runoff. Transfers mine affected water to Max Pit Tailings Dam via valve operated pipes.
	Max Pit Tailings Dam	889	236	30.8	Tailings from wash plant, pit water from Evaporation Ponds and runoff from Son of Max Pit Dam. Receives water from Max's bypass. Main source of recycled water until Russell's Dam is operational.
	Quickfill Dam	10	10	2.3	Mine affected waste from workshop and nearby ROM areas. Main fill point for water trucks. Filled by pumping from tailings dam/Russell's Dam.
	ROM West Dam	53[2]	0[2]	93.0	Mine affected runoff from coal ROM areas.
	Son of Max Dam	129	940	40.5	Collects overflows from ROM West Dam, wash plant drains, pump station and some rehabilitated spoil. Pumped to Max Pit. Overflows to a sediment dam and Blackwater Creek.
	108 Dam	252	0	73.2	Receives runoff from the surrounding haul road and spoil areas.
SOUTH	Jellinbah South Void	3,510	2,304	37.7	Old mining void used to store excess water from Central. Linked via pipeline to E Road Dam.
MACKENZIE NORTH	Mine Water Dam	683	322	16.9	Turkey's Nest Dam receiving water from Environmental Dam and Mackenzie North Pit. Overflows to smaller dam located in the north of Mackenzie North Crusher and is the main fillpoint for water trucks.

Site	Storage/Pit	Capacity (ML)	18 Sept 2019 Inventory (ML)	Catchment Area (ha)	Water Management Details
Total		9,408	4,242	1,684	-

[1] *Storage capacity of Ramp 1, 2, 6, 9 and 15 combined as per Monthly Dam Volumes sheet.*

[2] *Estimated using LiDAR.*

4.2.2 Pumps and Pipelines

The overall pumping strategy and transfer options are illustrated in the Mine Water Management Schematic (Figure 4.1). All key water transfer pipelines at Mackenzie North, Plains, Central and South are shown in Figure 4.2, Figure 4.3, Figure 4.4 and Figure 4.5 respectively.

At Central, pits are dewatered by relocatable pumps from active pits to the water storage pits at Ramps 1, 6 and 15. All pit water at Central is ultimately pumped to Central Release Dam which will be replaced by E Road Dam in 2019. This storage can pump mine water to Max Pit Tailings Dam, which acts as tailings storage in combination with Russell's Dam as decant water storage in the future. There are submersible pumps at Russell's Dam, which will supply water to the Plains crusher, Quickfill Dam and the Central CPP. Tailings from the CPP are then returned to Max Pit. There are two evaporation canons at Max Pit used to reduce site water inventory which have been unused due to ongoing dry weather conditions. Central will be connected to Jellinbah South via E Road Dam, which is replacing Central Release Dam in September 2019, and the Plains site via the Evaporation Ponds.

Plains Pit is dewatered to Environmental Dam, and to RP3 Dam and Lowwall Dam 2 (alluvial dewatering only). Ultimately the objective at Plains is maximise release from Environmental Dam and dewater Plains South Void for mining of Central North.

Mackenzie North Mine Water Dam can receive water from and dewater to Environmental Dam as required by site and is the main fillpoint for water trucks in Mackenzie North. In the future Mackenzie North Pit will be operational and dewater to Mackenzie North Mine Water Dam.

4.2.3 Flood Mitigation Measures

The Jellinbah mine site has Blackwater Creek to the west and the Mackenzie River to the North. The South and Central sites are elevated above any potential flooding from these two watercourses. The Plains site encroaches on the flood zone of the Mackenzie River.

During extreme flood events of the Mackenzie River, water would break the banks and extend over the floodplain to the north and south of the main river channel. This area includes the proximity of the Plains Pit. A levee has been constructed around the north of Plains Pit to protect the operations from Mackenzie River flooding. The Jellinbah Plains levee is approximately 8,130 m in length and has been designed to provide the mining area with 1:1000 AEP flood immunity from the Mackenzie River.

4.2.4 Clean Water Diversions

Drains have been designed and constructed to divert water away from operational areas to reduce the volume of mine-affected water generated on the site. These drains direct non-mine affected water (clean and sediment water) away from the site, through sediment dams (where necessary) and into natural waterways. The major clean water diversions across Jellinbah Mine are illustrated on Figure 4.3 and Figure 4.4.

4.2.5 Mine Water Release Infrastructure

Jellinbah Mine has nominated mine water release points (RPs) specified within the site Environmental Authority (EPML00516813) from which mine water can be discharged to either Blackwater Creek or Mackenzie River. The EA specifies monitoring points (MPs) where water quality must be monitored, and mine water can only be released during natural flow events in accordance with receiving waterway flow triggers. Receiving waterway flows are measured at the gauging stations at MP1 and MP3.

Figure 4.6 presents the locations of all relevant RPs and MPs and Table 4.3 summarises the EA conditions under which mine affected water can be released into receiving waterways.

Table 4.3 Mine Water Release Conditions (Table C4 of the EA)

Receiving Waterway	Release Point	Gauging Station	Condition	Receiving Water Flow Criteria (m^3/s)	Max Release (m^3/s)	Release Point EC Limit (µS/cm)	Release Point Sulphate Limit (mg SO_4^{2-}/L)
Blackwater Creek	RP1 RP2	MP1	Low	< 2[1]	0.50	700	250
			Medium 1	> 2	0.16	3500	350
			Medium 2	> 5	0.40	3500	350
			High	> 10	0.44	6000	500
Mackenzie River	RP3 RP4 RP5	MP3	Low 1	> 1	0.43	310	250
			Low 2	> 10	0.11	3,000	500
			Medium 1	> 50	0.32	2,500	500
			Medium 2	> 50	0.26	3,500	600
			High 1	> 120	0.37	10,000	750
			High 2	> 250	0.51	15,000	1000

Note 1: Discharge allowed for up to 28 days after natural flow events that exceed 2 m^3/s.

Jellinbah Mine EA also includes enhanced release conditions from nominated RPs as summarised in Table 4.4. The enhanced release conditions allow mine affected water to be released at a maximum combined RP (RP3 and RP5) flowrate of 2,700 L/s to Mackenzie River.

The EA specifies continuous monitoring of Electrical Conductivity at MP5 under enhanced conditions and that mine water releases must be capable of immediately ceasing or reducing discharge. Enhanced mine water releases must cease when Electrical Conductivity at MP5 exceeds 400 µS/cm, as specified in condition C51 of the EA.

Table 4.4 Enhanced Mine Water Release Conditions (Table C9 of the EA)

Receiving Waterway	Release Point	Gauging Station	Receiving Water Flow Criteria (m^3/s)	Max Release Rate (for all combined RP flows) (m^3/s)	Release Point Enhanced EC Limit (µS/cm)	Release Point Enhanced Sulphate Limit (mg SO_4^{2-}/L)
Mackenzie River	RP3 RP5	MP4 MP5	> 10	2.7	8,000	286[1]

Note 1: Sulphate limit determined from site specific relationship between EC and Su[phate for 8,000 µS/cm.

Mackenzie North MWD
MP5
RP4
Mackenzie North
Mackenzie River
MP4
RP5
MP3
RP3
Environmental Dam
Jellinbah Plains
Twelve Mile Creek
Mackenzie River
MP1
RP1
Jellinbah Central
RP2
MP2

Legend
- Release Point
- Monitoring Point
- Mine Lease Boundary
- Watercourses

0 1100 2200

Scale in metres (1:53000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Vertical Datum: Australia Height Datum
Grid: Map Grid of Australia, Zone 56

DATE	25/09/2019
DRAWN	JS
JOB NO.	M61000_021

JELLINBAH MINING PTY LTD

Jellinbah Mine Water Management Plan
EA Release and Monitoring Points

A3 | Figure 4.6 | A

Water release infrastructure has been constructed at Jellinbah Mine and is summarised in Table 4.5.

Table 4.5 Controlled Mine Water Release Infrastructure

Storage	Release Point	Receiving Waterway	Storage Capacity (ML)	Release Infrastructure	Release Capacity (L/s)
Environmental Dam	RP5	Mackenzie River	1,602	3 x DN450 HDPE pipes with manual valves at upstream IL of 124.22 mAHD	1,800[1]
Mackenzie North MWD	RP4	Mackenzie River	683	Release Valve in Pipeline to Environmental Dam	200

Note 1: The outlet structure elevation restricts the release of stored water below 725 ML. Mine water release rates vary dependant on the stored water level. The rate of 1,800 L/s is reached at the spillway level of 127.6 m AHD.

For enhanced release conditions, the maximum release rate from Environmental Dam is limited to a maximum discharge rate of 2,700 L/s or the release pipe capacity depending on which is lower. Currently, the pipeline capacity results in a maximum discharge rate of 1,800 L/s.

Under normal release conditions the release is limited to an allowable discharge rate of 510 L/s under the high flow conditions documented in the EA.

Site records indicate a total of 498 ML was released from Environmental Dam and 56 ML of alluvial water was released from RP3 Dam in FY18/19. This resulted in a total release volume of 554 ML to Mackenzie River in FY18/19.

5. SITE WATER BALANCE

5.1 Overview

The site water balance model allows the performance of the water management system to be simulated for a range of potential future climate scenarios. Key performance indicators include; mine water accumulation, containment performance and impact to mining operations (e.g. accumulation in pits).

5.2 Water Inflows

5.2.1 Rainfall

Long-term climate for Jellinbah Mine was obtained from the SILO climate database facility hosted by the Department of Science, Information Technology, and Innovation (DSITI). A SILO Patched Point Data climate series was obtained for the New Caledonia Station (35132), which is located about 5 km from Jellinbah Mine. The variation in annual rainfall totals is presented in Figure 5.1 and indicates a median site rainfall of 560 mm.

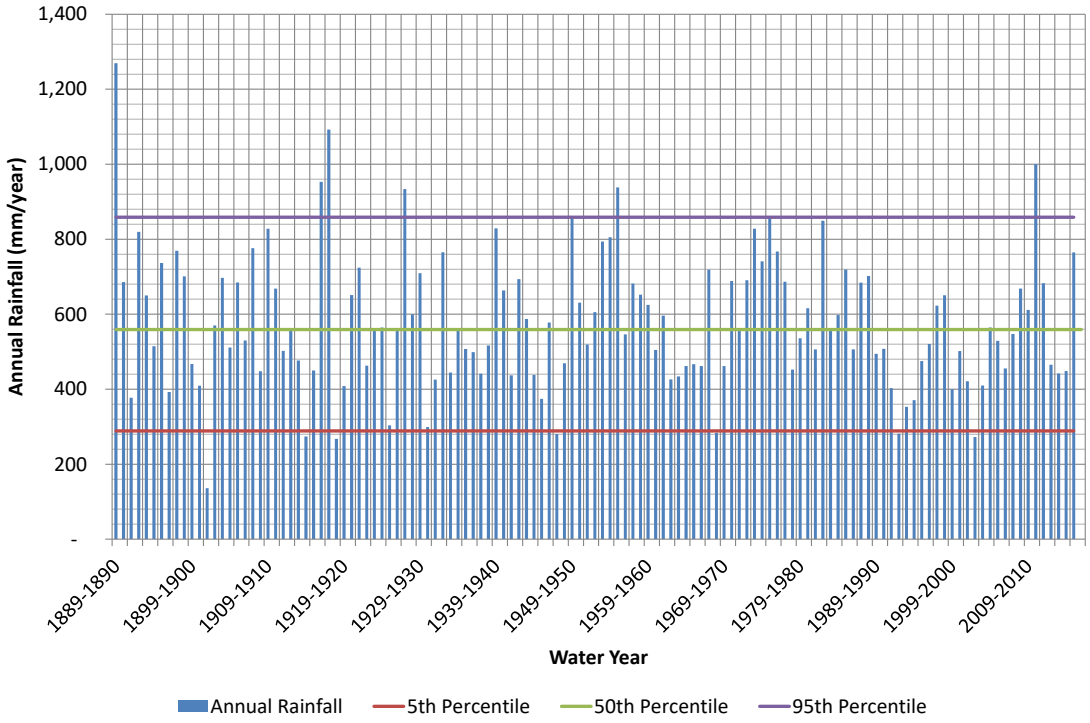

Figure 5.1 Annual Rainfall Totals

5.2.2 Catchment Runoff

Catchment runoff has been simulated using the Australian Water Balance Model (AWBM). A schematic representation of the AWBM model is provided in Figure 5.2. The model represents the catchment using three surface stores to simulate partial areas of runoff. The water balance of each surface store is calculated independently of the others. The model

calculates the water balance of each partial area at daily time steps. At each time step, rainfall is added to each of the three surface stores and evapotranspiration is subtracted from each store. If the value of water in the store exceeds the capacity of the store, the excess water becomes runoff. Part of this runoff becomes recharge of the baseflow store if there is a baseflow component to the stream flow.

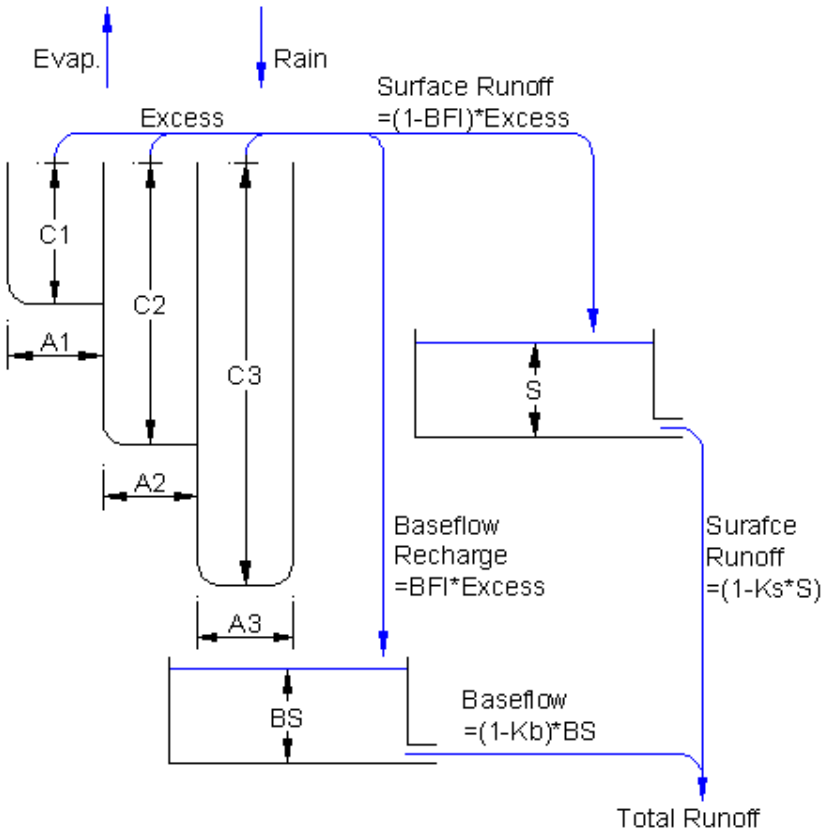

Figure 5.2 AWBM Schematic

AWBM natural land use catchment runoff parameters have been adopted from parameters calibrated to the Blackwater Streamflow Gauging Station owned by DNRM at Curragh (Station Number 130108). The gauging station commenced in August 1972 and closed in May 2009.

Daily rainfall data for the Blackwater Creek AWBM calibration was determined as a catchment average of rainfall data (SILO Patched Point Data) from the BoM rainfall stations at Blackwater Water Treatment Plant (035290), Blackwater Post Office (035009), Ardurad (035003) and Tannyfoil (035111). Morton potential evapotranspiration data was extracted from the Blackwater Post Office (035009) SILO Patched Point Data.

The calibration of the AWBM model involved the prediction of stream flows in Blackwater Creek for the period of adopted stream flow gauging data. The predicted stream flows were compared against the stream gauging data and the AWBM model parameters were adjusted to provide a reasonable comparison between the gauged and modelled stream

flow characteristics. The final calibrated AWBM model parameters are summarised in Table 5.1.

Table 5.1 Calibrated AWBM Model Parameters for Blackwater Creek Catchment

Parameters	Inputs		
Partial Area Fractions	A1 = 0.134	A2 = 0.433	A3 = 0.433
Surface Store Capacities	C1 = 25 mm	C2 = 95 mm	C3 = 230 mm
Baseflow Parameters	BFI = 0.03	Kb = 0.98	Ks = 0.50

The gauged and modelled daily flow duration curves for Blackwater Creek at Curragh are shown in Figure 5.3. The figure shows that Blackwater Creek has a significant baseflow component with flows exceeding 0.1 ML/d approximately 75% of the time. The calibrated parameters produce a curve that matches the gauged curve well for flows above 0.1 ML/d. The discrepancy at the tail end of the curve was unable to be corrected and is considered insignificant due to the very small volume of flow that this represents (modelled flows below 0.1 ML/day represent approximately 0.02% of the total volume over the twenty-year period of simulation).

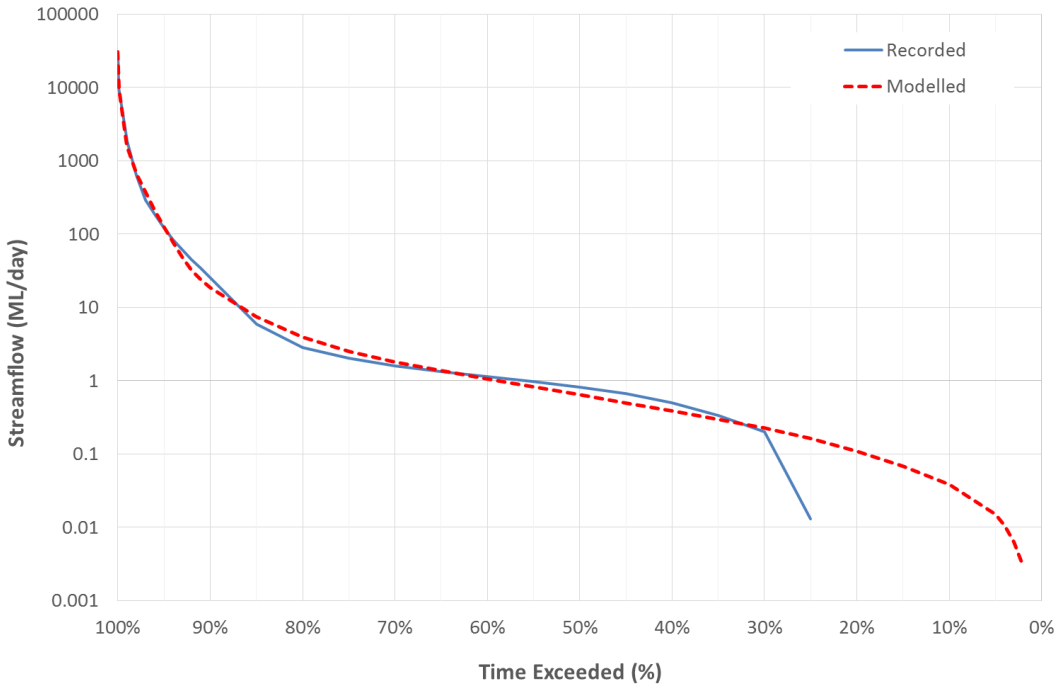

Figure 5.3 Modelled Flow Duration Curve for Blackwater Creek at Curragh

The modelled cumulative stream flow volume during the period 1st June 1972 to 30th September 2008 is displayed in Figure 5.4. The modelled and gauged stream flows appear to show similar runoff volumes for single events as well as total stream flow volume during over the calibration period.

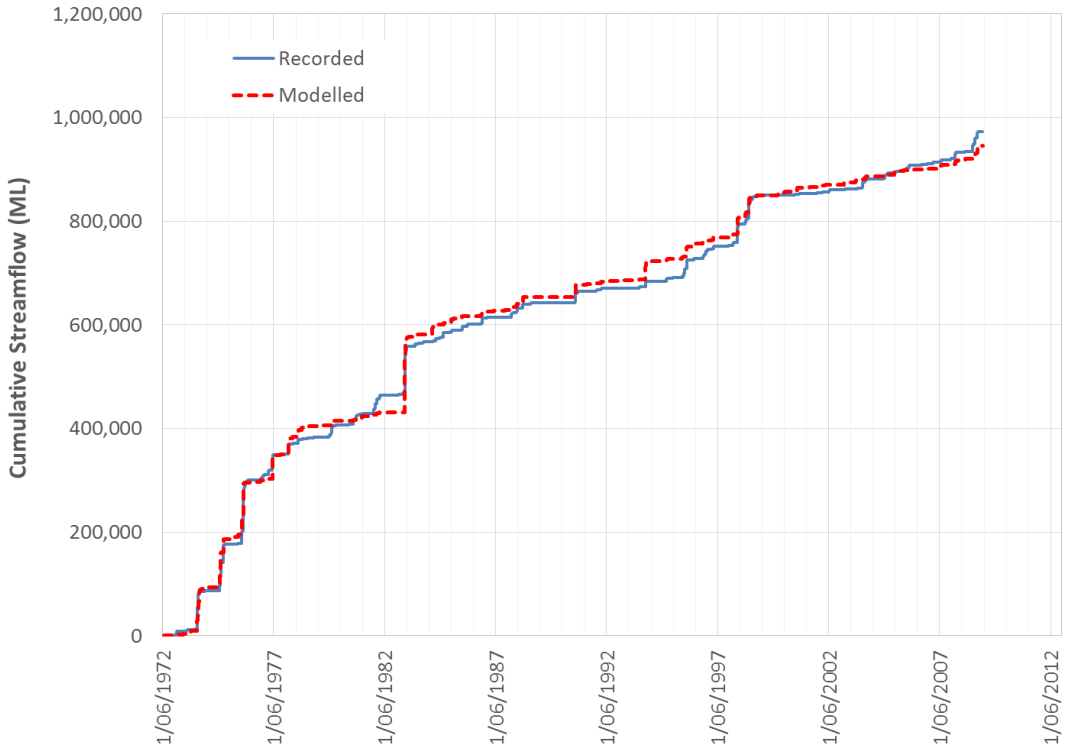

Figure 5.4 Modelled Cumulative Stream Flows for Blackwater Creek at Curragh

The AWBM calibration parameters for the Blackwater Creek catchment are considered to produce similar stream flow characteristics to the gauged stream flow data. These parameters were adopted for the simulation of flows in Blackwater Creek, and runoff from natural land use areas on site.

All other AWBM land use catchment runoff parameters were adopted from parameters developed for nearby mine sites. The adopted AWBM parameters are shown in Table 5.2 along with the resulting average annual runoff coefficient. Table 5.3 presents a summary of the amount of each land use throughout the site catchments. The site has an overall average annual runoff coefficient of 14.3%.

Table 5.2 Adopted AWBM Runoff Parameters

Parameter	Natural	Spoil	Hardstand & Pits	Rehabilitated Spoil	Coal Stockpile
C1 (mm)	25.0	20.0	10.0	11.0	1.0
C2 (mm)	95.0	80.0	25.0	60.0	5.5
C3 (mm)	230.0	160.0	50.0	130.0	0.0
A1	0.134	0.134	0.134	0.134	0.134
A2	0.433	0.433	0.433	0.433	0.433
A3	0.433	0.433	0.433	0.433	0.433
BFI	0.03	0.70	0.10	0.00	0.35
Kb	0.98	0.80	0.60	0.60	0.60
Ks	0.50	0.10	0.10	0.00	0.10
Average Soil Store (mm)	144	107	34	84	5
Average Annual Runoff Coefficient	5.0%	6.5%	19.5%	9.5%	46.4%

Table 5.3 Site Land Type Breakdown

	Natural	Spoil	Hardstand & Pits	Rehabilitated Spoil	Coal Stockpile
Total Area (ha)	302.3	392	992.7	191.3	26.7
Proportion (%)	15.8%	20.6%	52.1%	10%	1.5%

5.2.3 Groundwater Inflows

Groundwater inflows were estimated to be approximately 4.6 ML/day, based on recorded pumping data from Plains Pit to Environmental Dam and inclusive of water seepage estimates for Environmental Dam (see Section 2.5).

5.2.4 Raw Water Supply

Jellinbah Mine has an annual permit for water extraction from the Mackenzie River. This water is used at both the Central and the Plains workshops, primarily for machine and vehicle wash down. The total water extraction of 180 ML over the last four quarters FY18/19 was primarily allocated to vehicle washdown and no additional raw water was taken into the mine water system.

5.3 Water Demands and Losses

5.3.1 Evaporation

Lake evaporation rates for Jellinbah Mine have been extracted from the SILO Patched Point Data described above and are summarised in Figure 5.5. Average daily lake evaporation varies from 2.6 mm/day in June to 6.8 mm/day in December.

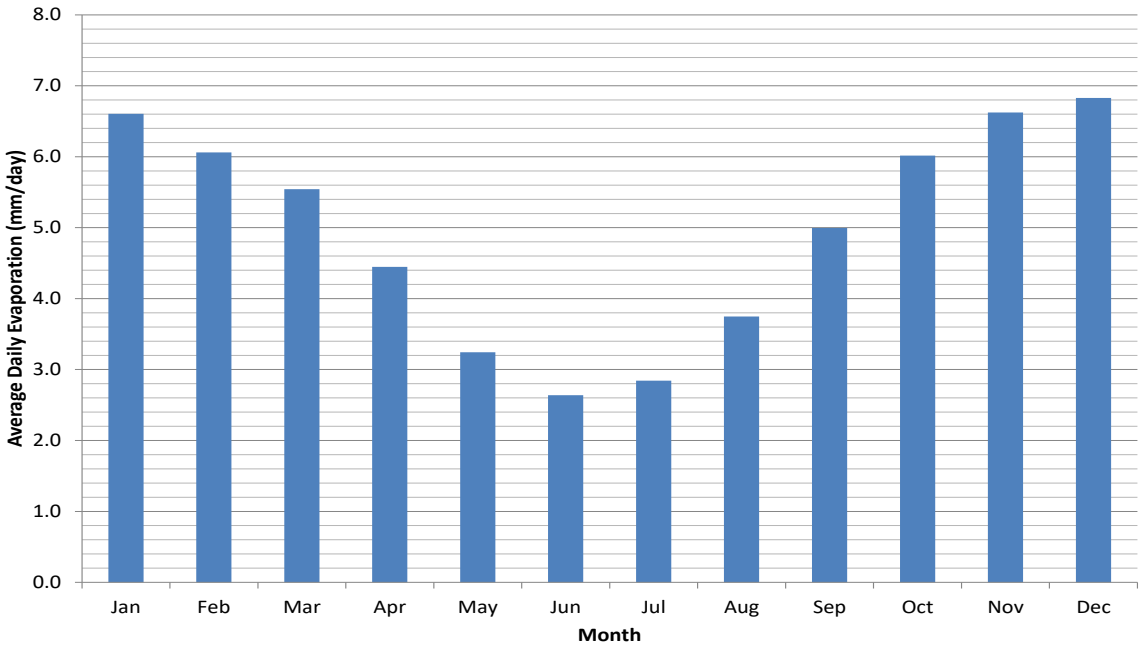

Figure 5.5 Average Daily Lake Evaporation

5.3.2 Operational Water Consumption

Water consumption rates for mine operation (i.e. dust suppression, plant use, etc.) are summarised in Table 5.4. As indicated by the table, operational water consumption currently accounts for a net outflow from the system of approximately 2 GL/year.

All values are based on site pumping records and estimates. Evaporators are still functional however currently not in use due to ongoing dry weather conditions.

Water is consumed primarily through dust suppression, at a total rate of 248 L/t of coal production. Dust suppression rates reported at other mine sites in the Bowen Basin range from 75L/t to 275L/t, with an average of 150 L/t.

Table 5.4 Jellinbah Mine Water Consumption Summary (FY19/20)

Consumption	Water Source	Net Consumption (ML/yr)
CHPP	Max Pit Tailings Dam	552
Plains Crusher	Max Pit Tailings Dam	95
Dust Suppression	Quickfill Dam E Road Dam Environmental Dam Mackenzie North MWD	1,240
Washdown & other losses	Mackenzie River	180

5.3.3 Water Release Capacity

The release constraints outlined in the Environmental Authority and the site water release infrastructure are detailed in Section 4.2.5. The water balance model incorporates enhanced release conditions as per EA (2019) Table C9 from Environmental Dam.

A long-term daily stream flow data series for the Mackenzie River at Bedford Weir stream flow gauge (130111A), which is located approximately 20 km upstream of Jellinbah Plains, was obtained from the calibrated IQQM model used for water resource planning (provided by DSITI). The data set provides a daily flow series for a period of 119 years (1889 – 2007 inclusive) and has been used to assess potential for controlled discharge of mine affected water from Environmental Dam.

Since construction in March 2017, water stored in Environmental Dam has had an average EC of 5,780 µS/cm (ranging from 5,160 to 6,210 µS/cm). EC measurements of water stored in Plains South Void ranged from 6,420 to 6,570 µS/cm in 2018, however no monitoring data was available for 2019 due to low water levels. Based on observed salinity levels, it is expected that Environmental Dam will be able to release via the enhanced release conditions.

The Central Release Dam was previously able to release from site. E Road Dam however will not be releasing any mine affected water after replacing Central Release Dam.

Mackenzie North Mine Water Dam (MWD) has the capacity to release from a valve in the main transfer pipeline to Environmental Dam.

5.4 Water Balance Model Development

A water balance model for Jellinbah Mine has been developed using the GoldSim software. GoldSim is an industry standard computer program for carrying out dynamic, probabilistic simulations of systems and processes (e.g. hydrological assessments of mine site water balances).

5.4.1 Purpose

The model aims to provide a basis for:

- Assessment of the risk of excess mine water accumulation and water supply shortfalls impacting upon mine operations.
- Estimation of overflow risk from water storages and flows in receiving waterways.
- Estimation of controlled releases at EA release points of mine-affected water.
- Assessment of operational strategies for effective mine water management across the life of the mine.

5.4.2 Description

The water balance model operates on a daily time step and simulates the quantity and quality of water within water storages and operational pits, as well as waterways that have the potential to receive discharges of mine-impacted surface water during large rainfall events.

Key aspects of the model include:

- The model can be used to simulate 118 years of historical data (i.e. SILO climate data and IQQM stream flow data).
- The water balance model includes a coupled salt balance to estimate TDS within each storage and receiving waterway.
- TDS is converted to EC within the model based on an assumed conversion factor of 1 mg/L TDS = 1.49 µS/cm EC in accordance with the *Australian Drinking Water Guidelines* (NHMRC, 2013).
- The various mine water inflows and outflows described in Section 5.2 and 5.3 respectively are simulated in the model.
- The model simulates the existing mine water infrastructure including storages, pumps and pipelines and water releases as described in Section 4.

- Water storage characteristics are simulated using the latest storage curves representing volume-area and volume-level relationships.

- The potential for mine water release is estimated based upon the simulated flow of receiving waterways at the nominated gauging stations in accordance with current EA conditions. Limits and capacity of the water release infrastructure described in Section 4.2.5 were incorporated into this release logic.

5.5 Water Balance Model Results

The water balance model for the Jellinbah Mine has been used to assess the performance of the water management system. The water balance model was simulated for 1 water year using 118 realisations of historical climate data to assess the system performance under a range of climate conditions (dry and wet). The following sections summarise key system performance indicators over a water year.

5.5.1 Overview

Figure 5.6 shows the total mine water inventory forecast from 18 September 2019 to 17 September 2020. The initial mine water inventory is 4,242 ML (as per Table 4.2). The site is in a deficit of 281 ML in the median climate scenario.

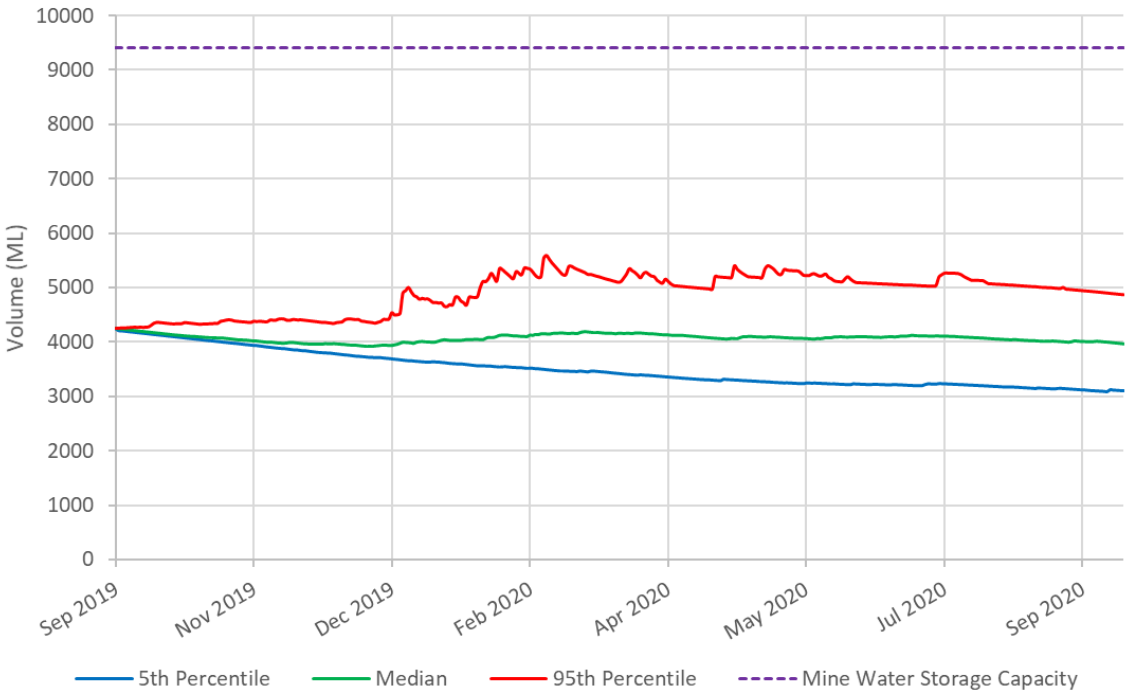

Figure 5.6 Mine Water Inventory Forecast

In the 95th percentile climate scenario, the site accumulates a net 624 ML over the next year, and reaches a maximum volume of 5,595 ML – equal to 60% of the total site mine water capacity of 9,408 ML. This indicates that any overflows from the site would therefore not be a result of a lack of mine water storages capacities but rather a result of transfer limitations between storages. More detail is provided in Section 5.5.3.

5.5.2 System Inflow and Outflows

Figure 5.7 presents the mean annual inflows of water to the mine water management system under the median climate scenario. Figure 5.8 shows the mean annual outflows of mine water, evaporator operation and Environmental Dam discharge maximised as governed by the site operational TARP.

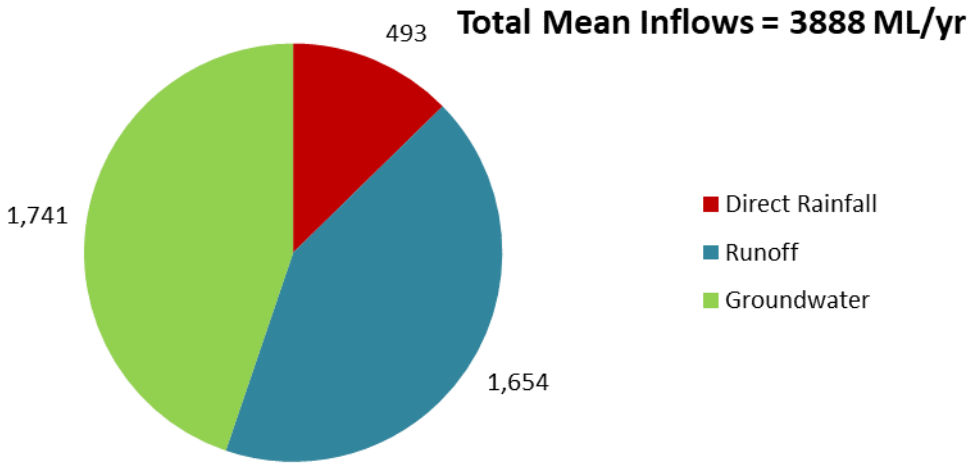

Figure 5.7 Mean Annual Mine Water Inflows (ML/yr)

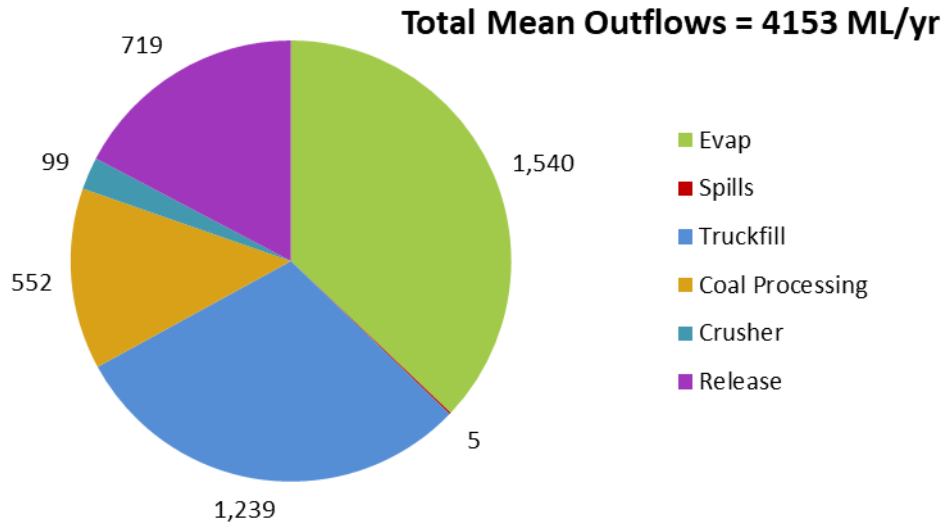

Figure 5.8 Mean Annual Mine Water Outflows (ML/yr)

Groundwater ingress at Plains Pit makes up 45% of site water inflow on average. The Plains Site is at water surplus due to this water take, while Central is at a deficit as a result of operational water consumption. Overall, the site model indicates a mean net water decline of 265 ML/yr.

5.5.3 Uncontrolled Release Risks

Modelling results indicate that Son of Max Pit Dam has a 5% annual overflow risk, and that when these spills occur, EC values of approximately 3,000 µS/cm are expected due to dilution. This spill occurs due to direct catchment inflows to ROM West Dam and Son of Max Pit Dam. The remainder of mine affected water storages did not spill under any of the climate realisations. Dam failure poses a higher environmental risk and this was assessed in the *Jellinbah Mine Site Wide Consequence Category Assessment* (Engeny, 2017).

5.5.4 Controlled Release Potential

Table 5.5 presents the results for total controlled release of mine-affected water from Jellinbah Mine. The model results demonstrate the limited potential for mine water releases due to EA release water quality limits and Mackenzie River flow limits.

Table 5.5 Controlled Mine Water Release Potential (ML/yr)

Storage	≤10th Percentile	Median (50th Percentile)	80th Percentile	90th Percentile	95th Percentile
Environmental Dam	0	272	1303	1,915	2,268
Mackenzie North Mine Water Dam	0	42	152	221	263

Jellinbah Mine has recently updated their release conditions to include the enhanced release conditions under which combined releases from both Environmental Dam and Mackenzie North MWD can occur.

6. WATER MONITORING AND RELEASE PLANS

Ongoing water quality monitoring is undertaken so data can be collected and analysed to assist in the management of water on the mine site. On-site storage water quality is tested on a quarterly basis. Conductivity, pH, sulphate, fluoride and a range of dissolved metals are all measured. Table 6.1 summarises the key water quality results over the last three years of water quality testing for all mine-affected storages and various clean or sediment water storages.

In summary, water that is exposed to coal for a substantial period of time is generally high in salinity and sulphates. The large mine water storages on-site, Jellinbah South Void, Plains South Void and Plains Environmental Dam, typically have ECs in the range of 4,000 to 7,900 µS/cm. The highest contaminant levels occur in the dams at Central, which receive runoff from coal stockpile and processing areas. There are no significant levels of other contaminants such as heavy metals, except in LCR Dam and Jellinbah South Dam, where high concentrations of aluminium have been observed. This is likely a result of low water levels (concentration) as these storages are inactive. All other dams have metal concentrations consistently below the EA trigger levels.

Receiving waterway quality is also routinely monitored. Requirements and trigger levels at the designated monitoring points are outlined in the site EA. Results from downstream water monitoring is presented in the annual REMP progress reports by AARC, and procedures were outlined in the original REMP report produced by Ison Environmental Planners (2010).

Release requirements are outlined in Conditions C1 to 16 in the EA, and downstream flow requirements and release contaminant trigger levels. Appendix A presents the Mine Water Release Procedure developed by Jellinbah Mine, including DEHP notification procedures for controlled and uncontrolled releases.

Table 6.1 Key Site Water Quality Monitoring Results (Aug 2014 to Aug 2019)

Site	Storage Name	ID	EC			Sulphate			pH		
			Min	Average	Max	Min	Average	Max	Min	Average	Max
Plains	Plains Dirty Water Dam	KW31	1,300	8,060	19,000	71	300	630	6.9	7.7	8.3
	Plains Clean Water Dam	KW32	530	1,861	3,900	7	54	134	3.1	7.7	9.4
	OOP Main (HW Dam)	KW40	6,000	12,956	25,000	36	104	200	6.8	8.6	9.3
	Overflow Dam	KW41	3,200	13,265	36,000	23	280	2,000	8.4	8.7	9.3
	Plains Environmental Dam	RP5 Dam	5,110	6,158	7,930	128	203	278	8.1	8.5	8.7
	Comiskey Void	Plains South Pit	6,340	6,445	6,570	291	298	310	8.6	8.9	9.0
	Lowwall 1	Plains LW 1	1,490	1,913	2,430	33	47	64	7.9	8.2	8.4
	Lowwall 2	Plains LW 2	739	1,466	2,510	14	56	118	8.3	8.5	8.7
Central	108 Dam	KW02	907	4,880	24,000	44	189	598	7.8	8.5	9.0
	Workshop Dam	KW05	1,300	1,300	1,300	41	41	41	7.1	7.1	7.1
	South West Dam	KW08	830	1,382	2,200	23	69	116	7.6	8.5	9.2
	Quickfill Dam	KW11	7,500	12,340	16,000	210	612	1,050	8.2	8.6	9.1
	ROM West Dam	KW12	1,700	5,482	17,000	91	432	1,360	3.3	8.2	9.0

Site	Storage Name	ID	EC			Sulphate			pH		
			Min	Average	Max	Min	Average	Max	Min	Average	Max
	Son of Max Pit Dam	KW13	2,300	4,898	8,600	88	333	550	8.3	8.7	9.6
	Max Pit	KW14	7,300	12,187	16,000	210	602	1,030	6.4	8.4	8.8
	Max Bypass Dam	KW15	1,800	12,009	37,800	52	628	3,020	8.1	8.6	9.5
	Russell's Dam	KW21	2,500	11,848	20,600	81	475	1,250	7.8	8.5	9.0
	Central Release Dam	South Pit Dam	6,100	12,350	18,000	77	572	1,120	6.7	8.5	9.3
	Farm Dam	Farm Dam	310	3,269	7,400	5	134	363	2.7	8.3	10.0
	R4 HW Dam	R4 HW Dam	890	1,659	3,500	13	19	26	7.2	8.0	9.0
South	Jellinbah South Dam	KW23	94	1,191	2,850	4	28	104	2.8	7.8	9.1
	Jellinbah South Void	KW25	4,520	6,655	7,750	100	302	526	8.0	8.8	9.1
	LCR Dam	KW42	71	249	500	4	9	19	7.0	8.0	8.4
Mackenzie North	MN Mine Water Dam	MN01	6,970	7,385	7,800	244	258	271	8.6	8.7	8.7

Note 1: Dam constructed in March 2017 and first water quality data recorded in September 2017.

Note 2: Two measurements only; alluvial water transferred to Longwall Dam in July 2018.

Note 3: Three measurements only, starting in January 2018.

Note 4: 1 measurement only, in June 2016. Dam has otherwise been kept empty.

7. EMERGENCY AND CONTINGENCY PLANNING

7.1 Emergency Response

The Jellinbah 'Emergency Response Plan' (HMP-003) outlines the roles and responsibilities upon activation, responding to and recovering from crisis and emergency situations that occur on the Jellinbah site. The purpose of the Emergency Response Plan is to reduce the risk of human life loss and injury, infrastructure damage and environmental harm during an unplanned or emergency event. Jellinbah Mine must notify DEHP within forty-eight (48) hours of an emergency. The notification shall include a brief description of the event and the time of activation of the Emergency Response.

Emergency contact details are also contained in the Jellinbah Emergency Response Plan' (HMP-003).

It should be clearly noted that this section does not override broader emergency planning protocols for the Jellinbah Mine but is included only to provide specific guidance in response to water related emergencies.

The key mine water release contingency measure adopted at Jellinbah Mine is the pumping of high risk storages to available mine water storages, Jellinbah South Void or open pits, in preferential order. This should be implemented when:

- The mine operator anticipates an uncontrolled release that is not likely to meet the release conditions; or
- At any point during a release, monitoring determines that the release conditions are not being achieved and the release strategy cannot be quickly adjusted to achieve compliance.

7.2 Trigger Action Response Plans (TARPs)

Operational plans have been developed for each regulated structure on site. Refer to the Operations Plans developed by Engeny (2017) for *Max Pit Tailings Dam, Central Release Dam, Jellinbah Plains Levee and Mackenzie North Levee*, and the *Plains Environmental Dam Operational Plan* produced by UDP (2017). These operational plans outline operating levels, monitoring procedures and emergency procedures for each structure.

The Trigger Action Response Plans (TARPs) presented in Appendices B to E prescribe action plans and responsibilities for responding to identified structure defects or deficiencies which could be early warning signs of an elevated or imminent risk of failure. TARPs for Max Pit Tailings Dam are presented in Appendix B, and Plains Levee in Appendix C. Appendix D presents TARPS for all other mine water storages. Note that DEHP notification is required for the two regulated release dams, Central Release Dam and Environmental Dam.

The TARPS represent a structure failure risk continuum defined as follows:

- Green: Normal operating conditions (no action required).
- Yellow: Alert (Operational response actions defined in TARP).
- Orange: Elevated risk of failure (Operational response actions defined in TARP).
- Red: Imminent risk of failure (Emergency Response actions defined in TARP).
- Black: Dam failure (Emergency Response actions defined in TARP).

8. WATER MANAGEMENT PLAN REVIEW

Review of the WMP is to occur annually or sooner if relevant changes to operations, planned operations or the EA occur. In accordance with EA Condition C32, the WMP must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must:

- Assess the plan against the requirements under EA condition C31.
- Include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year.
- Identify any amendments made to the WMP following the review.

9. QUALIFICATIONS

a. In preparing this document, including all relevant calculation and modelling, Engeny Water Management (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

b. Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

c. Engeny reserves the right to review and amend any aspect of the works performed including any opinions and recommendations from the works included or referred to in the works if:

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   (ii) Engeny considers it prudent to revise any aspect of the works in light of any information which becomes known to it after the date of submission.

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e. This document is for the use of the party to whom it is addressed and for no other persons. No responsibility is accepted to any third party for the whole or part of the contents of this report.

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g. This report does not provide legal advice.

10. REFERENCES

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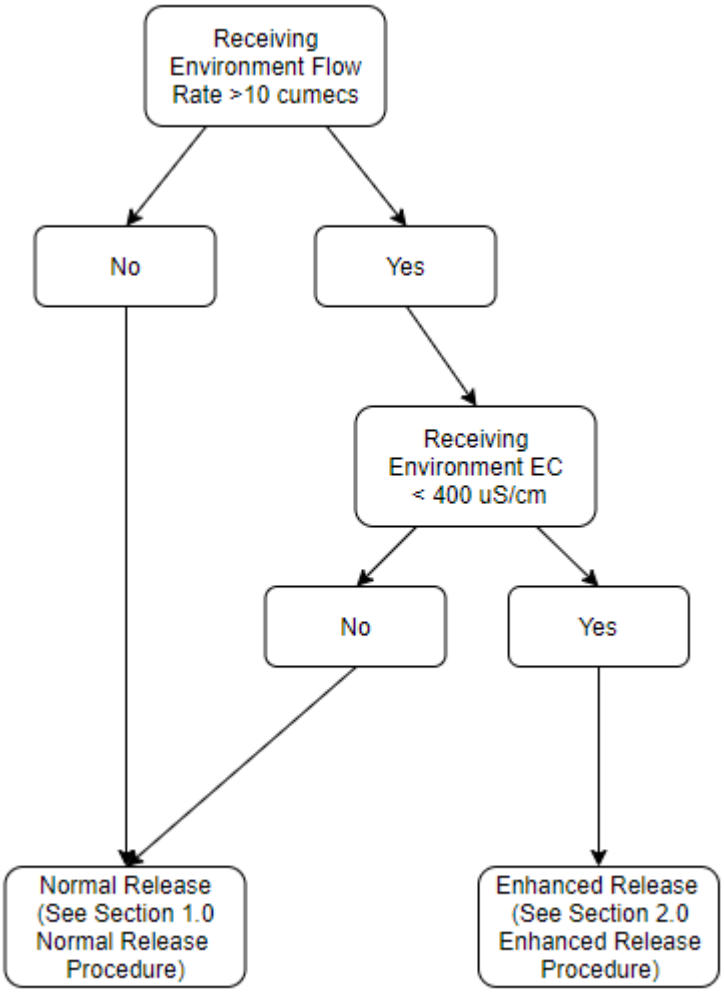
APPENDIX A

Water Release Procedure

Jellinbah Release Determination Flowchart



1.0 Jellinbah Normal Release Procedure

Jellinbah Mine Site: Normal Water Release Procedure

This procedure is applicable to the release of mine-affected water from the Jellinbah Mine site to Blackwater Creek or the Mackenzie River.

Scope

The procedure refers only to the release of water from Jellinbah's mine-affected water system, as defined in the current Site Water Management Plan.

The following events constitute a release of mine-affected water and should be managed in accordance with this procedure:

- Pumping from any mine affected water storage on the Jellinbah Mine to a designated release point for release to Blackwater Creek or the Mackenzie River; and

- Runoff from the mine-affected system leaving the site through any release point (RP1, RP2, RP3, RP4 or RP5).

Release from the clean water system is managed by sediment retention ponds and is not subject to the requirements of this procedure.

Requirements for Release

The Environmental Authority (EPML00516813) provides for release of water from the Jellinbah Mine site in accordance with the following requirements:

Authorised Release Points

Release of mine affected water, controlled or otherwise, should only occur at one or more of the release points listed in Table 1 below.

Upstream and downstream monitoring locations, which must be monitored during a release event, are provided in Table 2.

The locations of release and monitoring points for the Mackenzie River and Blackwater Creek are shown in maps in Attachment A.

Table 1 Release Points

Release Point (RP)	Easting (MGA GDA94, Zone 55	Northing (MGA GDA94, Zone 55)	Mine Affected Water Source and Location	Monitoring Point	Receiving Waters Description
RP 1	697440	7413330	Max Dam Bypass	Bluff / Jellinbah Road	Blackwater Creek
RP 2	697985	7410730	South Dam Bypass	Bluff /Jellinbah Road	Blackwater Creek
RP 3	694940	7425570	Plains Bypass	Plains Bypass Channel	Mackenzie River
RP 4	696360	7428060	Mackenzie North WMS	End-of-pipe at RP 4	Mackenzie River
RP 5	696387	7425862	Plains MAW dams	Plains Bypass Channel	Mackenzie River

Table 2 Receiving Water Monitoring Points

Monitoring Points	Receiving Waters Location Description	Easting (GDA94)	Northing (GDA94)
Upstream Background Monitoring Points			
MP2	Blackwater Creek (1,360 m upstream of RP2)	695630	7410000
MP4	Upstream Mackenzie River	694538	7426005
Downstream Monitoring Points			
MP1	Blackwater Creek (1,500 m downstream of RP1)	694760	7413420
MP5	Downstream Mackenzie River	697281	7428227

Release Water Quality and Flow Conditions

The release of mine-affected water, controlled or otherwise, should only occur where the water quality meets the following contaminant limits listed in **Table 3**. In addition to these limits, variable release limits for sulphate and electrical conductivity (EC) also apply. Sulphate and EC release limits are detailed in **Table 4**.

Table 3 Mine Affected Water Release

Quality Characteristic	Release Limits	Monitoring Frequency	Comment
Electrical Conductivity (uS/cm)	Release limits specified in Table C4 for variable flow criteria.	Daily during release (the first sample must be taken within 2 hours of commencement of release)	
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)		
Turbidity (NTU)	Blackwater Creek Low flow (<2 m^3/s): 1,885 High flow (>2 m^3/s): 2,900		Turbidity is required to assess ecosystems impacts and can provide instantaneous results
	Mackenzie River All flows: 1,000		
Suspended Solids (mg/L)	N/A		Suspended solids are required to measure the performance of sediment and erosion control measures.
Sulphate (SO_4^{2-}) (mg/L)	Release limits specified in Table C4 for variable flow criteria		Drinking water environmental values from NHMRC 2006 guidelines OR ANZECC

The release of mine-affected water, controlled or otherwise, should only occur during natural flow events (in the receiving waterway) in accordance with the criteria in **Table 4**.

Table 4 Rules for Releases during Flow Events (Table C4)

Receiving Waters	Release Point	Gauging Station	EAST (GDA94)	North (GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for Discharge (m^3/s)		Maximum Release Rate [1]	EC Release Limits µS/cm	Sulphate Release Limits SO_4^{2-} mg/L
Blackwater Creek	RP1 RP2	MP1	694760	7413420	Continuous (minimum daily)	Low Flow*	<2 m^3/s for a period of 28 days after natural flow events that exceed 2 m^3/s	0.5 m^3/s	<700 µS/cm*	250 mg/L
						Medium Flow	>2 m^3/s	0.16 m^3/s	<3,500 µS/cm	350 mg/L
							>5 m^3/s	0.40 m^3/s	<3,500 µS/cm	350 mg/L
						High Flow	>10 m^3/s	0.44 m^3/s	<6,000 µS/cm	500 mg/L
Mackenzie River	RP3 RP4 RP5	MP5	697281	7428227	Continuous (minimum daily)	Low Flow	>1 m^3/s	0.43 m^3/s	<310 µS/cm	250 mg/L
							>10 m^3/s	0.11 m^3/s	<3,000 µS/cm	500 mg/L
						Medium Flow	>50 m^3/s	0.32 m^3/s	<2,500 µS/cm	<500 mg/L
								0.26 m^3/s	<3,500 µS/cm	<600 mg/L
						High Flow	>120 m^3/s	0.37 m3/s	<10,000 µS/cm	<750 mg/L
							>250 m^3/s	0.51m3/s	<15,000 µS/cm	<1,000 mg/L

Notes: 1. For all combined RP flows. Concurrent release from multiple release points should not exceed the maximum release rate for the Mackenzie River. 2. Plains Environmental Dam has 3 outlet pipes, each releasing 0.66m3/sec when the dam is full (0.5m3/sec when water is just above the pipes). The valve(s) will have to be partly opened to comply with the maximum combined release rate as approved in the EA

Investigation Trigger Levels

The EA provides Trigger Levels that, if triggered, may result in the need to undertake further investigation and reporting.

Table 5 below provides the trigger levels for the release water quality. **Table 6** provides the trigger levels for the downstream receiving water sites.

Should an exceedance of either trigger level be recorded, the notification and reporting procedure should be followed.

Table 5 Release Contaminant Trigger Levels

Quality Characteristic	Trigger Level (µg/L)	Monitoring Frequency
Aluminium	55	Commencement of release and thereafter weekly during release
Arsenic	13	
Cadmium	0.2	
Chromium	1	
Copper	2	
Iron	300	
Lead	4	
Mercury	0.2	
Nickel	11	
Zinc	8	
Boron	370	
Cobalt	90	
Manganese	1,900	
Molybdenum	34	
Selenium	10	
Silver	1	
Uranium	1	
Vanadium	10	
Ammonia	900	
Nitrate	1,100	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	100	
Fluoride (total)	2,000	
Sodium	180,000	

Table 6 Receiving Waters Trigger Levels ***(Aust. Drinking water guidelines, 2004)***

Quality Characteristic	Trigger Level		Monitoring Frequency
	Mackenzie River	Blackwater Creek	
pH	6.5 – 8.5	6.5 – 9	Daily during releases
EC (µS/cm)	>400	>1,000	
Turbidity (NTU)	n/a	Low flow (<2 m^3/s): 1,885 High flow (>2 m^3/s): 2,991	
Suspended Solids (mg/L)	690		
Sulphate (mg/L)	250		
Sodium (mg/L)	180*****		

Procedure for Normal Release

The following procedure should be implemented when:

- The mine operator intends to make a controlled release by pumping water through the release points; or
- In the event that an uncontrolled release is anticipated (e.g. when the site is at capacity and heavy rainfall is predicted).

Prior to Release

1. Real time (10 minute) flow conditions in the receiving environment should be checked prior to release to determine flow (m^3/s) in the receiving environment. Flow data can be checked for Blackwater Creek and the Mackenzie River at the following website:

   https://portal.alsglobal.com/web.htm

   Username: Jellbah

   Password: water

   Note where automated gauging indicates water level is below 10 m, insufficient flow is available for a reading and data are invalid.

   The rate of authorised release is dependent on the flow in the receiving environment. This is presented as Discharge (cumecs) on the above website**. Table 4** describes the authorised release rates under different flow conditions in the waterway.

2. Prior to release, the quality of the water intended for discharge should be tested for pH, EC and Turbidity using the hand held meter. Results should be compared to the release limits in **Table 3** and **Table 4**. Note: monitoring of release water quality should occur at the designated monitoring point associated with each release point Table 1.

3. If existing water quality data is available for the intended release, suspended solids and sulphate levels should be compared to the release limits in **Table 3** and **Table 4**. Note: release limits will apply at the designated monitoring point associated with each release point Table 1.

4. The authorised rate of release is determined by both the flow in receiving environment and the EC and sulphate concentration (if available) of the intended release water, as described in **Table 3**.

   a. Controlled release of mine affected water should be pumped at less than the maximum determined rate of release (based flow in the waterway, EC of the release water and sulphate concentration in the release water if available).

   b. When uncontrolled discharge of mine affected water is anticipated, an assessment of the likely discharge rate should be made and compared to the maximum determined rate of release (determined from flow in the waterway, EC of the release water and sulphate concentration in the release water if available).

5. Where water quality of the expected release does not comply with **Table 3** or **Table 4**, options for blending with clean water prior to release should be implemented. In the event that blending is not possible or release limits are not achievable by blending, contingency measures should be implemented.

6. Following determination of authorised discharge volumes, release can occur through the authorised release points. The following 'procedure during release' should be followed from this point.

During Release – At Release Point

The following section details the requirements for monitoring of release water at the release point.

1. On commencement of release (within 2 hours) and daily during release, release water quality should be tested in situ for the following parameters using a hand-held meter at the designated monitoring point associated with each release point :

Within 2 hours / daily	• pH • Turbidity	• EC	Table 3 Table 4

Results should be compared to the release limits in **Table 3** and **Table 4**.

2. On commencement of release (within 2 hours) and routinely during release, release water samples should be collected and sent to an authorised laboratory for testing of the following parameters:

Within 2 hours / daily	• Suspended solids	• Sulphate	Table 3 Table 4
Within 2 hours / weekly	• Aluminium • Arsenic • Cadmium • Chromium • Copper • Iron • Lead • Mercury • Nickel • Zinc • Boron • Cobalt • Manganese	• Molybdenum • Selenium • Silver • Uranium • Vanadium • Ammonia • Nitrate • Petroleum hydrocarbons (C6-C9) • Petroleum hydrocarbons (C10-C36) • Fluoride (total) • Sodium	Table 5

Note: Both filtered and unfiltered metals samples should be collected for analysis

Suspended solids and sulphate samples should be collected daily. Filtered and unfiltered metals samples should be collected weekly. Results should be compared to the release limits in **Table 3** and **Table 4** and the release trigger levels in **Table 5**.

3. The rate and quality of the discharge should be reviewed based on all available monitoring and flow data regularly during release event. If possible, flow rate and quality of the release should be adjusted to ensure compliance with **Table 4** at all times. If at any point in time release limits cannot be achieved contingency measures should be implemented.

4. Release water quality data should be compared to the trigger levels in **Table 5** as soon as results are received from the laboratory.

a. If release water trigger levels are exceeded, mine operators should compare the downstream water data to both the release trigger levels and upstream water data.

b. If downstream water quality is exceeds both the trigger levels and upstream data, an investigation should be initiated.

5. If at any time environmental harm is observed as a result of the release, contingency measures should be implemented.

During Release – At Upstream / Downstream Monitoring Points

The following section details the requirements for monitoring of upstream and downstream water at the locations in **Table 2**.

1. Daily during release, receiving water quality should be tested in situ for the following parameters using a hand-held meter at the monitoring point:

Daily	• pH • Turbidity	• EC	Table 6

Continuous pH, EC and turbidity data recorded at the upstream and downstream gauging stations (accessible via the ALS portal) should be used where possible. Otherwise, in situ measurements should be recorded at the upstream and downstream monitoring points.

On commencement of release (within 2 hours) and / or routinely during release, receiving water samples should be collected and sent to an authorised laboratory for testing of the following parameters:

Daily	• Suspended solids • Sulphate	• Sodium	Table 6
Within 2 hours / weekly	• Aluminium • Arsenic • Cadmium • Chromium • Copper • Iron • Lead • Mercury • Nickel • Zinc • Boron • Cobalt • Manganese	• Molybdenum • Selenium • Silver • Uranium • Vanadium • Ammonia • Nitrate • Petroleum hydrocarbons (C6-C9) • Petroleum hydrocarbons (C10-C36) • Fluoride (total) • Sodium	Table 5

In situ measurements of pH, EC and turbidity should be collected daily where gauging data is not available. Daily samples must also be sent for laboratory analysis of suspended solids, sulphate and sodium. Results should be compared to the release trigger levels in **Table 6**.

Weekly samples must be sent for laboratory analysis of dissolved and total metals, listed above. Results should be compared to the release trigger levels in **Table 5**.

2. Receiving water quality data should be compared to the receiving water trigger levels in **Table 6** as soon as results are received from the laboratory.

    a. If receiving water trigger levels are exceeded, mine operators should compare the downstream water data to the upstream receiving water data.

    b. If downstream water quality is exceeds the upstream data, an investigation should be initiated.

3. If at any time environmental harm is observed as a result of the release, contingency measures should be implemented.

Notification and Reporting Requirements

The Environmental Authority sets out notification and reporting requirements for the following circumstances:

- Commencing a release;
- Ceasing a release;
- Exceeding release limits (refer to **Table 3** and **Table 4**); and
- Exceeding release trigger levels (refer to **Table 5**).

These notification requirements apply to all releases, controlled or otherwise, from the Jellinbah Mine site.

Other reporting requirements, including investigations into environmental harm, must be provided with Jellinbah's Annual Return (submitted annually in June).

Authorised Release Notification – Commencement

DES must be notified via WaTERS as soon as practicable, and no later than **24 hours**, after commencing release. Notification must include the submission of written advice including:

a) release commencement date / time;

b) expected release cessation date / time;

c) release point(s);

d) release volume (estimated);

e) receiving water(s) including the natural flow rate; and

f) any details (including available data) regarding likely impacts on the receiving water(s).

Authorised Release Notification – Cessation

DES must be notified via WaTERS as soon as practicable, and no later than **24 hours**, after cessation of the release. In addition, within **28 days** of the release, the following written information must be provided:

a) release cessation date / time;

b) natural flow volume in receiving water;

c) volume of water released;

d) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume);

e) all in-situ water quality monitoring results; and

f) any other matters pertinent to the water release event.

Note: pausing a release for less than 24 hours is not considered cessation of release.

Exceedance Notification – Release Limits

If any of the contaminant limits in **Table 3** or **Table 4** are exceeded during a release, written notice must be provided to DES via WaTERS within **24 hours** of receiving the results.

In addition, within a further **28 days**, the following information should be provided to DES:

a) the reason for the release;

b) the location of the release;

c) all water quality monitoring results;

d) any general observations;

e) all calculations; and

f) any other matters pertinent to the water release event.

Exceedance Notification – Release Trigger Levels

DES must be notified via WaTERS within **14 days** of receiving the results, where:

- A result exceeds the release trigger levels (**Table 5**); and
- The downstream results (collected from the monitoring points in **Table 2**) exceed both the release trigger levels and the upstream results.

Emergency or Incident Notification

As soon as practicable after becoming aware of any emergency or incident which results in the unauthorised release of contaminants the administering authority must be notified of the release by telephone or in writing.

The notification should include the following information:

a) the holder of the environmental authority;

b) the location of the emergency or incident;

c) the number of the environmental authority;

d) the name and telephone number of the designated contact person;

e) the time of the release;

f) the time the holder of the environmental authority became aware of the release;

g) the suspected cause of the release;

h) the environmental harm caused, threatened, or suspected to be caused by the release; and

i) actions taken to prevent any further release and mitigate any environmental harm caused by the release.

Contingency Measures

The contingency measures should be implemented when:

- The mine operator anticipates an uncontrolled release that is not likely to meet the release conditions; or
- At any point during a release, monitoring determines that the release conditions are not being achieved and the release strategy cannot be quickly adjusted to achieve compliance.

Jellinbah Plains Contingency

The following contingency measures apply at the Jellinbah Plains site:

- Pumping of at risk mine-affected water storages to one or more of the open pits at Plains.

Jellinbah Central Contingency

The following contingency measures apply at the Jellinbah Central site:

- Pumping of at risk mine-affected water storages to one or more of: Plains South Void, the Max Pit (Tailings Dam), Marks Dam, or another mine-affected water storage with available capacity.

2.0 Jellinbah Enhanced Release Procedure

Jellinbah Mine Site: Enhanced Water Release Procedure

This procedure is applicable to the enhanced release of mine-affected water from the Jellinbah Mine site to the Mackenzie River.

Scope

The procedure refers only to the enhanced release of water from Jellinbah's mine-affected water system, as defined in the current Site Water Management Plan.

The following events constitute the enhanced release of mine-affected water and should be managed in accordance with this procedure:

- Pumping from any mine-affected water storage fitted with a real-time (release) monitoring gauge on the Jellinbah Mine to a designated release point (RP3 or RP5) for release to the Mackenzie River; and

Release from the clean water system is managed by sediment retention ponds and is not subject to the requirements of this procedure.

Requirements for Release

The Environmental Authority (EPML00516813) provides for enhanced release of water from the Jellinbah Mine site in accordance with the following requirements:

Authorised Release Points

Enhanced release of mine affected water, controlled or otherwise, must only occur at one or more of the release points detailed in **Table 7** below.

Upstream and downstream monitoring locations, which must be monitored using real-time monitoring gauges during an enhanced release event, are provided in **Table 8**.

The locations of release and monitoring points for the Mackenzie River are shown in the map in Attachment A.

Table 7 Mine Affected Water Release Points, Sources and Receiving Waters

Release Point (RP)	Easting (MGA GDA94, Zone 55	Northing (MGA GDA94, Zone 55)	Mine Affected Water Source and Location	Monitoring Point	Receiving Waters Description
RP 3	694940	7425570	Plains Bypass	Plains Bypass Channel	Mackenzie River
RP 5	696387	7425862	Plains MAW dams	Plains Bypass Channel	Mackenzie River

Table 8 Receiving Water Upstream Background Sites and Downstream Monitoring Points

Monitoring Points	Receiving Waters Location Description	Easting (GDA94)	Northing (GDA94)
Upstream Background Monitoring Points			
MP4	Upstream Mackenzie River	694538	7426005
Downstream Monitoring Points			
MP5	Downstream Mackenzie River	697281	7428227

Enhanced Release Water Quality and Flow Conditions

The enhanced release of mine-affected water, controlled or otherwise, should only occur during natural flow events (in the receiving waterway) where the receiving water flow criteria meets the following criteria listed in **Table 9.**

The enhanced release of mine-affected water, controlled or otherwise, must not exceed the release limits listed in **Table 9,** when measured at the mine affected water storages releasing to the release points specified in **Table 7**. If exceeded, release of mine-affected water must cease, and contingency measures implemented.

Table 9 Enhanced Contaminant Release Limits

Quality Characteristic	Maximum Release Rate (for all combined RP flows)	Receiving Water Flow Criteria	Enhanced Release Limit	Monitoring Frequency
Electrical Conductivity (µS/cm)	2.7 m^3/s	>10m^3/s	8,000µS/cm	Continuous (minimum hourly)
pH (pH Unit)			6.5 – 9.3	
Sulphate (SO_4^{2-}) (mg/L)			286mg/L[1]	Daily during release (the first sample must be taken within 2 hours of commencement of release)
Turbidity (NTU)			1,000	
Suspended Solids (mg/L)			N/A[2]	

Note:

[1]Sulphate limit determined from site specific relationship between EC and Sulphate for 8,000µS/cm.

[2]Limit for suspended solids can be omitted if turbidity limit is included. Limit for turbidity not required if suspended solids included. Both indicators should be measured in all cases.

Downstream Cease Release Limit

In addition to the release limits outlined above, a specific **cease release limit of 400 µS/cm** applies to Electrical Conductivity (EC) when measured at the downstream monitoring point (MP5) in **Table 8.** This limit is specified in condition C51 of the Jellinbah EA.

Investigation Trigger Levels

The EA provides Trigger Levels that, if triggered, may result in the need to undertake further investigation and reporting.

Table 10 below provides trigger levels for the release water quality. Table 11 provides the trigger levels for the downstream receiving water sites.

Should an exceedance of either trigger level be recorded, the notification and reporting procedure should be followed.

Table 10 Release Contaminant Trigger Investigation Levels

Quality Characteristic	Trigger Level (µg/L)	Comment on Trigger Level	Monitoring Frequency
Aluminium	55	*For aquatic ecosystem protection, based on SMD guideline*	Commencement of release and thereafter weekly during release
Arsenic	13		
Cadmium	0.2		
Chromium	1		
Copper	2	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Iron	300	*For aquatic ecosystem protection, based on low reliability guideline*	
Lead	4	*For aquatic ecosystem protection, based on SMD guideline*	
Mercury	0.2	*For aquatic ecosystem protection, based on LOR for CV FIMS*	
Nickel	11	*For aquatic ecosystem protection, based on SMD guideline*	
Zinc	8		
Boron	370		
Cobalt	90	*For aquatic ecosystem protection, based on low reliability guideline*	
Manganese	1,900	*For aquatic ecosystem protection, based on SMD guideline*	
Molybdenum	34	*For aquatic ecosystem protection, based on low reliability guideline*	
Selenium	10	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Silver	1		
Uranium	1		
Vanadium	10		
Ammonia	900	*For aquatic ecosystem protection, based on SMD guideline*	
Nitrate	1,100	*For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN*	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		

Quality Characteristic	Trigger Level (µg/L)	Comment on Trigger Level	Monitoring Frequency
Fluoride (total)	2,000	*Protection of livestock and short term irrigation guideline*	
Sodium	180,000	*Australian Drinking Water Guidelines (2004)*	

Table 11 Receiving Waters Trigger Levels ***(Aust. Drinking water guidelines, 2004)***

Quality Characteristic	Trigger Level	Monitoring Frequency
	Mackenzie River	
pH	< 6.5 or > 8.5	Continuous (minimum hourly)
EC (µS/cm)	>400 µS/cm	
Turbidity (NTU)	n/a	Daily during release (the first sample must be taken within 2 hours of commencement of release)
Suspended Solids (mg/L)	690	
Sulphate (mg/L)	250	
Sodium (mg/L)	180***** (Australian Drinking Water Guidelines, 2004)	

Procedure for Release

The following procedure should be implemented when:

- The mine operator intends to make an enhanced release by pumping water through release points RP3 and RP5 in accordance with the enhanced release conditions;

Prior to Release

1. Real time (minimum hourly) flow and EC conditions in the receiving environment should be checked prior to commencement of an enhanced release to ensure there is sufficient flow in the receiving environment (Mackenzie River flow > 10 m^3/s and EC < 400 µS/cm). Receiving environment flow and EC data can be checked for the Mackenzie River at the following website:

   https://portal.alsglobal.com/web.htm

   Username: Jellbah

   Password: water

   Note where automated gauging indicates a receiving water level below 10 m, insufficient flow is available for a reading and data are invalid.

   The rate of release from the mine-affected water storages to release points **RP3** and **RP5** is dependent on the flow and EC in the receiving environment.

   It is also important to notify potentially affected stakeholders within the receiving environment of an enhanced release (See *Potentially Affected Stakeholders* in the Notification and Reporting Requirements Section).

2. Prior to enhanced release, the quality of the water intended for discharge should also be examined using the real-time monitoring gauges fitted at control points on mine affected water storages releasing to release points **RP3** and **RP5**. Real-time EC and pH results for the applicable mine-affected storages should be compared to the release limits in **Table 9**. Data from the real-time monitoring gauges fitted at control points on mine affected water storages releasing to release points **RP3** and **RP5** can be found at the same website specified in Step 1 above.

3. If existing sulphate and turbidity data is available for the mine affected water storages releasing to release points **RP3** and **RP5**, then it should also be compared to the release limits in **Table 9**.

4. The appropriate rate for enhanced release is dependent on EC recorded downstream in the receiving environment (at **MP5**). Enhanced release of mine-affected water should be pumped from an appropriate storage at a rate that ensures EC in the receiving environment (at **MP5**) does not exceed 400 µS/cm.

5. Where water quality within one or both of the mine-affected water storages releasing to release points **RP3** and **RP5**, does not comply with the release limits in **Table 9**, options for only releasing from one mine-affected water storage or for blending with clean water prior to release should be implemented. In the event that neither of these options is not possible and/or release limits are not achievable, contingency measures should be implemented.

6. Following determination of suitable discharge volume, release can occur through the authorised release points RP3 and RP5. The following ‘procedure during release’ should be followed from this point.

During Release – At Release Point

The following section details the requirements for monitoring of enhanced release water at the release point.

1. On commencement of enhanced release, the following parameters in release water quality should be monitored continuously (minimum hourly) at the control points on mine affected water storages releasing to release points **RP3** and **RP5**.

Continuous / (minimum hourly)	• EC • pH	**Table 9**

   Results should be compared to the release limits in **Table 9**.

2. On commencement of enhanced release (within 2 hours) and routinely during release, release water samples should be collected from storages and sent to an authorised laboratory for testing of the following parameters:

Within 2 hours / daily	• Turbidity (NTU)	• Sulphate ($SO\text{-}_4^{2-}$)	**Table 9**
Within 2 hours / weekly	• Aluminium • Arsenic • Cadmium • Chromium • Copper • Iron • Lead • Mercury • Nickel • Zinc • Boron • Cobalt • Manganese	• Molybdenum • Selenium • Silver • Uranium • Vanadium • Ammonia • Nitrate • Petroleum hydrocarbons (C6-C9) • Petroleum hydrocarbons (C10-C36) • Fluoride (total) • Sodium	**Table 10**

   Note: Both filtered and unfiltered metals samples should be collected for analysis

   Sulphate and turbidity samples should be collected daily. Filtered and unfiltered metals samples should be collected weekly. Results should be compared to the release limits in **Table 9** and the release trigger levels in **Table 10**.

3. The release rate and quality of the discharge should be monitored and reviewed constantly throughout an enhanced release event, using all available real-time monitoring data from the gauges at the mine-affected water storages releasing to **RP3** and **RP5** and upstream (**MP4**) and downstream (**MP5**) in the receiving environment. Release flow rate and quality should be adjusted to ensure compliance with the release limits **Table 9**, and the downstream EC cease release limit of 400 µS/cm at all times. If at any point in time release or downstream limits cannot be achieved the release should cease immediately.

4. Release water quality data should be compared to the trigger levels in **Table 10** as soon as results are received from the laboratory.

    i. If release water trigger levels are exceeded, mine operators should compare the downstream water data to both the release trigger levels and upstream water data.

    ii. If downstream water quality exceeds both the trigger levels and upstream data, an investigation should be initiated.

5. If at any time environmental harm is observed as a result of the release, the release should be ceased and contingency measures should be implemented.

During Release – At Upstream / Downstream Monitoring Points

The following section details the requirements for monitoring of upstream and downstream water at the locations in **Table 8**.

1. Receiving water quality should be monitored continuously (minimum hourly) during enhanced release, at the receiving water quality gauging station points, **MP4** and **MP5**, as specified in **Table 8** for the following parameters:

Continuous / (minimum hourly)	• Receiving Water Flow	• EC • pH	**Table 11**

Continuous receiving water monitoring data should be compared to the release trigger levels in **Table 11**.

Note: The enhanced release of mine affected water must cease **if EC exceeds 400µS/cm** when measured at monitoring point **MP5** as specified in **Table 8.** Continuous data collected by the real-time receiving water monitoring gauges is accessible via the ALS portal.

2. On commencement of release (within 2 hours) and / or routinely during release, receiving water samples should be collected and sent to an authorised laboratory for testing of the following parameters:

Within 2 hours / daily	• Suspended solids (mg/L) • Sulphate (SO_4^{2-})	• Sodium	**Table 11**
Within 2 hours / weekly	• Aluminium • Arsenic • Cadmium • Chromium • Copper • Iron • Lead • Mercury • Nickel • Zinc • Boron • Cobalt • Manganese	• Molybdenum • Selenium • Silver • Uranium • Vanadium • Ammonia • Nitrate • Petroleum hydrocarbons (C6-C9) • Petroleum hydrocarbons (C10-C36) • Fluoride (total) • Sodium	**Table 10**

In situ measurements of suspended solids, sulphate, sodium should be collected daily. Daily results should be compared to the release trigger levels in **Table 11**.

Weekly samples must be sent for laboratory analysis of dissolved and total metals, listed above. Results should be compared to the release trigger levels in **Table 10**.

3. Receiving water quality data should be compared to the receiving water trigger levels in **Table 11** as soon as results are received from the laboratory.

    a) If receiving water trigger levels are exceeded, mine operators should compare the downstream water data to the upstream receiving water data.

    b) If downstream water quality exceeds the upstream data, an investigation should be initiated.

4. If at any time environmental harm is observed as a result of the release, contingency measures should be implemented.

Notification and Reporting Requirements

The Environmental Authority sets out notification and reporting requirements for the following circumstances:

- Notifying potentially affected stakeholders
- Commencing a release;
- Ceasing a release;
- Exceeding release limits (refer to **Table 9**); and
- Exceeding release trigger levels (refer to **Table 10**).

These notification requirements apply to all enhanced releases, controlled or otherwise, from the Jellinbah Mine site.

Other reporting requirements include any investigations into environmental harm, which must be provided with Jellinbah's Annual Return (submitted annually in June), and an annual independent assessment of the effectiveness of the on-site water management practices (submitted annually in August).

Authorised Release Notification – Potentially Affected Stakeholders

All potentially affected stakeholders must be notified on commencement (within **2 hours** or another timeframe as agreed to in writing with the relevant potentially affected stakeholder) of enhanced release of mine-affected water to the receiving environment. Notification must be in the form agreed to by the potentially affected stakeholder. Notification must include the following information unless otherwise agreed to by the potentially affected stakeholder:

a) Release commencement date/time;

b) Release location (release point/s);

c) Release rate;

d) Receiving waters for the release;

e) Receiving water flow rate;

f) Water quality of the release including salinity and pH; and

g) Estimated duration of release

Authorised Release Notification – Commencement

DES must be notified via WaTERS as soon as practicable, and no later than **24 hours**, after commencing release. Notification must include the submission of written advice including:

a) Release commencement date / time;

b) Expected release cessation date / time;

c) Release point(s);

d) Release volume (estimated);

e) Receiving water(s) including the natural flow rate; and

f) Any details (including available data) regarding likely impacts on the receiving water(s).

Authorised Release Notification – Cessation

DES must be notified via WaTERS as soon as practicable, and no later than **24 hours**, after cessation of the release. In addition, within **28 days** of the release, the following written information must be provided:

a) release cessation date / time;

b) natural flow volume in receiving water;

c) volume of water released;

d) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume);

e) all in-situ water quality monitoring results; and

f) any other matters pertinent to the water release event.

Note: pausing a release for less than 24 hours is not considered cessation of release.

Exceedance Notification – Release Limits

If any of the contaminant limits in **Table 9** are exceeded during a release, DES must be notified via WaTERS within **24 hours** of receiving the results.

In addition, within a further **28 days**, the following information should be provided to DES:

a) the reason for the release;

b) the location of the release;

c) all water quality monitoring results;

d) any general observations;

e) all calculations; and

f) any other matters pertinent to the water release event.

Exceedance Notification – Release Trigger Levels

DES must be notified via WaTERS within **14 days** of receiving the results, where:

- A result exceeds the release trigger levels (**Table 5**); and
- The downstream results (collected from the monitoring points in **Table 8**) exceed both the release trigger levels and the upstream results.

Emergency or Incident Notification

As soon as practicable after becoming aware of any emergency or incident which results in the unauthorised release of contaminants the administering authority must be notified of the release by telephone or email (CRMining@ehp.qld.gov.au).

The notification should include the following information:

a) the holder of the environmental authority;

b) the location of the emergency or incident;

c) the number of the environmental authority;

d) the name and telephone number of the designated contact person;

e) the time of the release;

f) the time the holder of the environmental authority became aware of the release;

g) the suspected cause of the release;

h) the environmental harm caused, threatened, or suspected to be caused by the release; and

i) actions taken to prevent any further release and mitigate any environmental harm caused by the release.

Contingency Measures

The contingency measures should be implemented when:

- The mine operator anticipates an uncontrolled release that is not likely to meet the release conditions; or
- At any point during an enhanced release, monitoring determines that the release conditions are not being achieved and the release strategy cannot be quickly adjusted to achieve compliance; or
- At any point during an enhanced release the instrument availability of continuous monitoring systems required at the upstream and downstream monitoring points (See **Table 8**) drops below 80%; or

- At any point during an enhanced release the instrument availability of continuous monitoring systems required at the control points on the mine-affected water storages releasing to release points **RP3** and **RP5** (See **Table 7**) drops below 90%.

Jellinbah Plains Contingency

The following contingency measures apply at the Jellinbah Plains site:

- Cease enhanced release
- Pumping of at risk mine-affected water storages to one or more of the open pits at Plains.

Attachment A: Maps of Water Monitoring Sites and Release Points

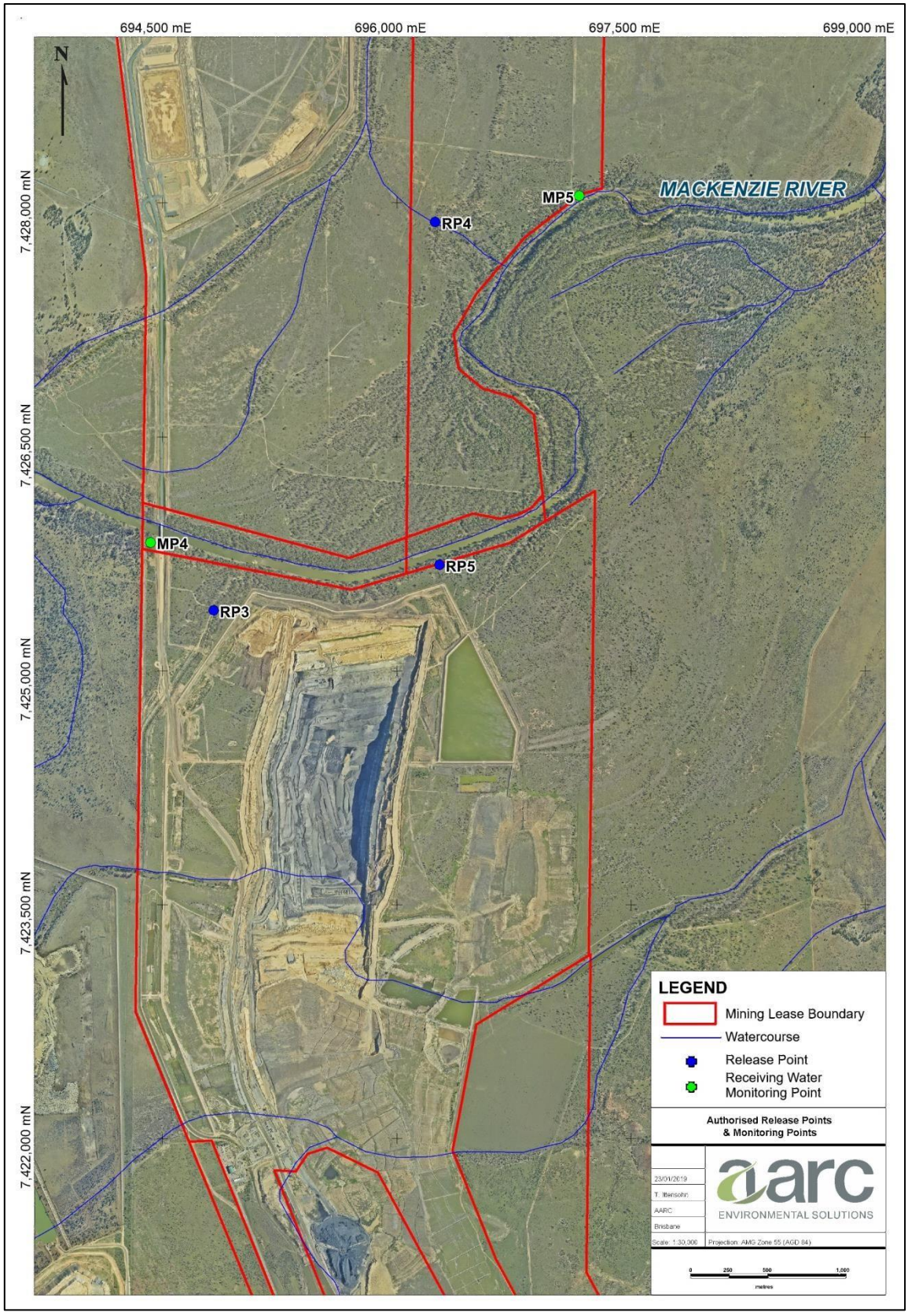


Figure 1 Release and Monitoring Points – Mackenzie River

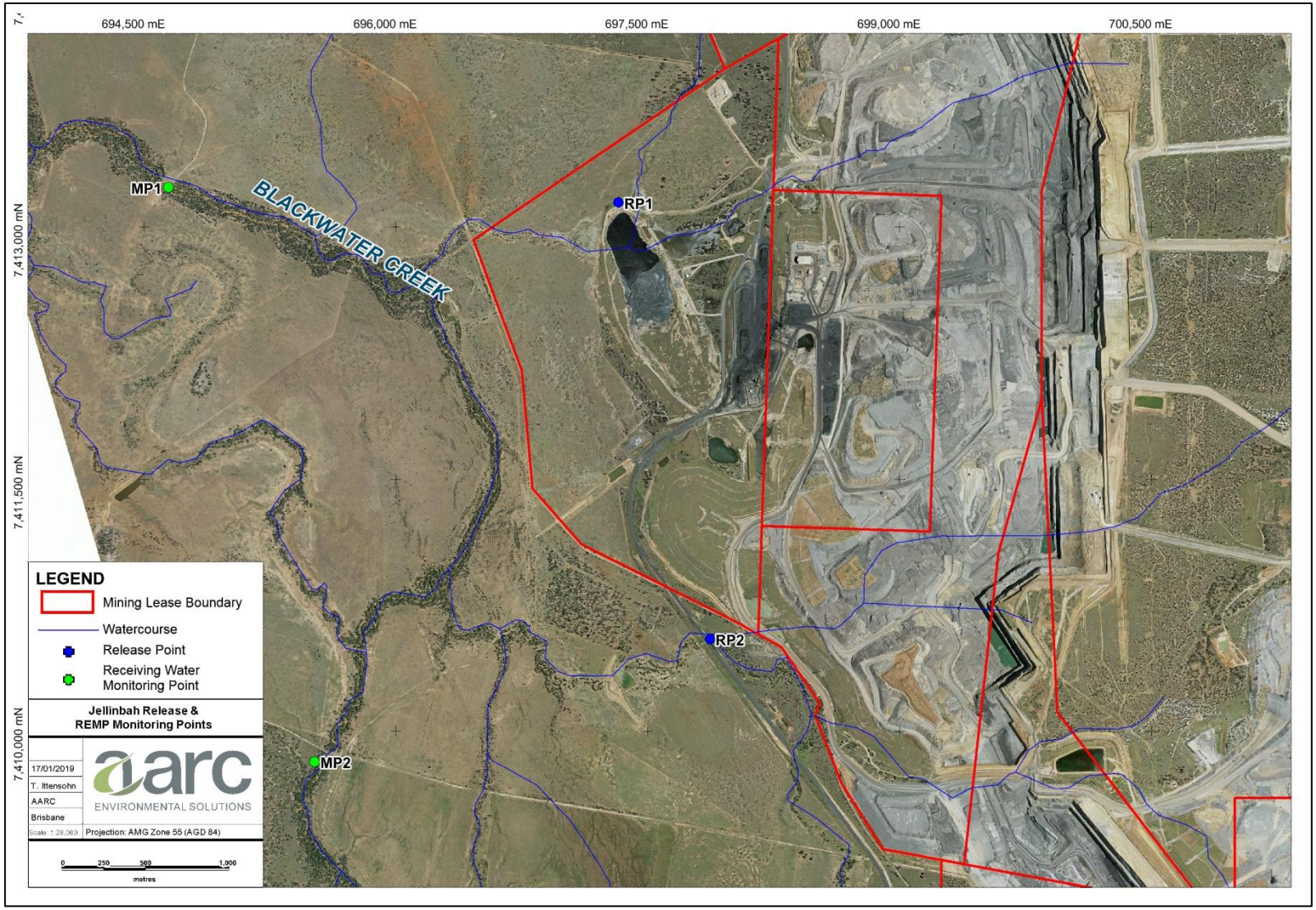


Figure 2 Release and Monitoring Points – Blackwater Cr

Attachment B: Water Release Site Communication Protocol

COMMUNICATION: WATER RELEASE EVENT

Roles

- Jellinbah Manager Mine Services (**MMS**)
- Jellinbah Mining Superintendent (Projects) (**MSP**)
- Thiess Manager Mining (**TMM**)

SMS Notification - Low flow event alert from ALS to recipients.

Thiess to advise MMS & MSP via ***SMS*** of intentions to prepare for release.

Principal to prepare internal reporting protocol. Upon completion, MMS to advise TMM via ***phone call*** to begin release, followed up with ***email*** to Stakeholder Group of confirmation.

Thiess to begin Low Flow release and advise the Stakeholder Group via ***email*** of steps taken as per template.
MMS to acknowledge receipt via return email.

Cease Flow Event (<10 m^3/s).

Thiess to stop release and advise the Stakeholder Group via ***email*** of steps taken as per template.
MMS to acknowledge receipt via return

High flow event (inclusive of enhanced release conditions – limit of

MMS to advise TMM via ***phone call*** to begin release, followed up with ***email*** to Stakeholder Group of confirmation.
TMM to acknowledge receipt via return email.

Thiess to begin High Flow release as per procedure and advise the Stakeholder Group via ***email*** of steps taken as per template.
MMS to acknowledge receipt via return email.

Should the release method change at any time to suit conditions Thiess to advise the Stakeholder Group via ***email*** of steps taken as per template.
MMS to acknowledge receipt via return email.

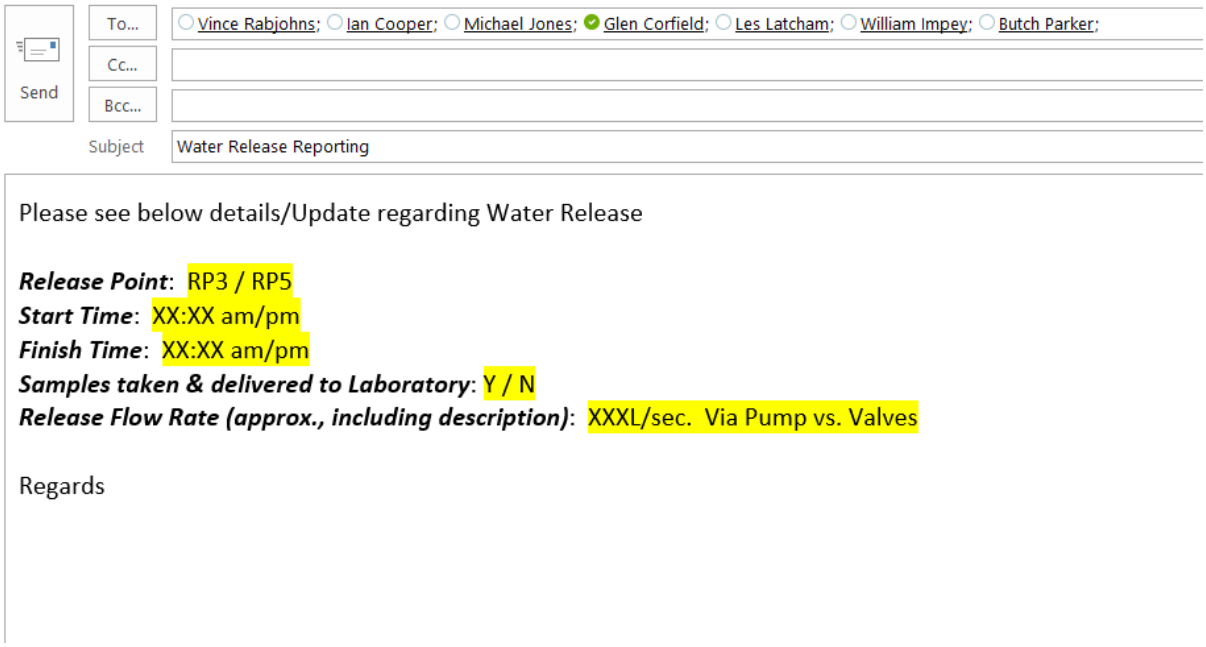
Email Proforma:

To: Vince Rabjohns <vrabjohns@jellinbah.com.au>; Ian Cooper <icooper@jellinbah.com.au>; Michael Jones <mjones@jellinbah.com.au>; Glen Corfield <gcorfield@jellinbah.com.au>; Les Latcham <llatcham@thiess.com.au>; William Impey <wimpey@thiess.com.au>; Butch Parker <dparker1@thiess.com.au>

Subject: Water Release Reporting

Please see below details/Update regarding Water Release
Release Point: RP3 / RP5
Start Time: XX:XX am/pm
Finish Time: XX:XX am/pm
Samples taken & delivered to Laboratory: Y / N
Release Flow Rate (approx., including description): XXXL/sec. Via Pump vs. Valves

Example Below:



APPENDIX B

TARPs – Max Pit Tailings Dam

TARP 1 – Embankment Seepage

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No significant change to monitored Seepage Flow Rates and Seepage Areas	New Seepage Area Identified at the embankment toe Previously Identified Seepage Area / Extent increases by >25% Previous Seepage Flow Rate increases by > 25%	New seepage area identified elevated above the embankment toe Increase in cloudy appearance of seepage water Previous seepage area / flow rate increases by > 50%	Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer site inspection and geotechnical assessment, or: Rapid increase in rate or cloudy appearance of seepage (piping failure has started)	Dam Failure
Electrical Engineering Manager	• Ensure TSF dewatering pumps are operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Pump down decant pond as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
CHPP Superintendent	• Ensure TSF is operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Cease tailings deposition into TSF.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • In consultation with Manager Mine Services and Dams Engineer develop a short term tailings and water storage contingency plan.
Mine Services Supervisor	• Ensure TSF is operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Cease all water transfers into TSF. • Pump down decant pond as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Conduct monthly inspections and audits of TSF.	• Notify CHPP Superintendent. • Increase frequency of dam monitoring inspections from monthly to weekly. • Determine when conditions have sufficiently stabilised to return to normal operating conditions. • Establish contact with RPEQ dam engineer and notify them of the situation.	• Immediately notify CHPP Superintendent & General Manager. • Immediately arrange for Dam Engineer to inspect site. • Communicate hazard to all departments with personnel downstream of the dam. • Increase frequency of dam monitoring inspections from weekly to daily. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Determine, in consultation with Dam Engineer, need to change dam operational plan / reduce water level. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Raise emergency call – notify General Manager. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimise risk of failure. • Notify DEHP of imminent dam failure risk. • Instruct decant pond to be pumped down as low as possible. • Instruct cessation of tailings deposition into TSF.	• Immediately notify DEHP in event of dam failure. • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect embankment once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Dams Engineer and CHPP Superintendent develop a short term tailings and water storage contingency plan. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No significant change to monitored Seepage Flow Rates and Seepage Areas	New Seepage Area Identified at the embankment toe Previously Identified Seepage Area / Extent increases by >25% Previous Seepage Flow Rate increases by > 25%	New seepage area identified elevated above the embankment toe Increase in cloudy appearance of seepage water Previous seepage area / flow rate increases by > 50%	Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer site inspection and geotechnical assessment, or: Rapid increase in rate or cloudy appearance of seepage (piping failure has started)	Dam Failure
RPEQ Dams Engineer	• Conduct annual dam safety inspection.	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Manager Mine Services and CHPP Superintendent develop a short term tailings and water storage contingency plan. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 2 – Embankment Erosion and Instability

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No visible cracks No visible bulges / slumping Rill erosion < 0.5 m Surveyed embankment movement <15 mm since previous survey or <50 mm since initial benchmark survey	Visible cracks Rill erosion 0.5 m to 1.5 m embankment movement >15 mm since previous survey or >50 mm since initial benchmark survey	Local scale (bench downstream slope) bulges / slumping Major crack/s Rill erosion > 1.5 m deep Surveyed embankment movement > 50 mm since previous survey or > 100 mm since initial benchmark survey	Global scale (entire downstream slope) bulges / slumping or Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and geotechnical assessment.	Dam Failure
Electrical Engineering Manager	• Ensure TSF dewatering pumps are operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Pump down decant pond as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
CHPP Superintendent	• Ensure TSF is operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Cease tailings deposition into TSF.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • In consultation with Manager Mine Services and Dams Engineer develop a short term tailings and water storage contingency plan.
Mine Services Supervisor	• Ensure TSF is operated in accordance with this operations plan.	• N/A	• Change operational procedure if advised by Manager Mine Services.	• Cease all water transfers into TSF. • Pump down decant pond as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No visible cracks No visible bulges / slumping Rill erosion < 0.5 m Surveyed embankment movement <15 mm since previous survey or <50 mm since initial benchmark survey	Visible cracks Rill erosion 0.5 m to 1.5 m embankment movement >15 mm since previous survey or >50 mm since initial benchmark survey	Local scale (bench downstream slope) bulges / slumping Major crack/s Rill erosion > 1.5 m deep Surveyed embankment movement > 50 mm since previous survey or > 100 mm since initial benchmark survey	Global scale (entire downstream slope) bulges / slumping or Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and geotechnical assessment.	Dam Failure
Manager Mine Services	• Conduct monthly inspections and audits of TSF.	• Notify CHPP Superintendent. • Increase frequency of dam monitoring inspections from monthly to weekly. • Establish contact with RPEQ dam engineer and notify them of the situation. • Raise work order for repair of rill erosion if no engineered design is considered necessary.	• Immediately notify CHPP Superintendent & General Manager. • Immediately arrange for Dam Engineer to inspect site. • Communicate hazard to all departments with personnel downstream of the dam. • Increase frequency of dam monitoring inspections from weekly to daily. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Determine, in consultation with Dam Engineer, need to change dam operational plan / reduce water level. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Raise emergency call – notify General Manager. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimise risk of failure. • Notify DEHP of imminent dam failure risk. • Instruct decant pond to be pumped down as low as possible. • Instruct cessation of tailings deposition into TSF.	• Immediately notify DEHP in event of dam failure. • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect embankment once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Dams Engineer and CHPP Superintendent develop a short term tailings and water storage contingency plan. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.
RPEQ Dams Engineer	• Conduct annual dam safety inspection.	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Manager Mine Services and CHPP Superintendent develop a short term tailings and water storage contingency plan. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 3 – High Water Level

Triggers	Operations Plan			EAP		
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Flood Failure – Overtopping)**	**Return to Normal**	**Black: Dam Failure**
	Water Level < MRL	Water Level > MRL & water level is static.	Water level > MRL, water level is rising and further rainfall forecast	Flow over spillway Embankment toe or embankment adjacent to spillway severely eroded due to spillway discharge.	Overflows have ceased Water level is receding	Dam Failure
Electrical Engineering Manager	• N/A	• Ensure decant pumps are operating. If pumps are inoperable, raise notification to repair - follow up on maintenance schedule. • Organise maintenance to repair decant pumps (if inoperable).	• Pump down decant pond as low as possible.	• Pump down decant pond as low as possible.	• Pump down decant pond as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
CHPP Superintendent	• N/A	• Cease tailings deposition into TSF. • In consultation with the Manager Mine Services determine when conditions have sufficiently stabilised.	• Ensure tailings deposition into TSF remains ceased.	• Ensure tailings deposition into TSF remains ceased.	• Ensure tailings deposition into TSF remains ceased until advised otherwise by Manager Mine Services.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • In consultation with Manager Mine Services and Dams Engineer develop a short term tailings & water storage contingency plan.
Mine Services Supervisor	• N/A	• Cease water transfers into TSF. • Ensure spillway is clear of debris.	• Ensure water transfers into TSF remain ceased.	• Ensure water transfers into TSF remain ceased.	• Ensure water transfers into TSF remain ceased until advised otherwise by Manager Mine Services.	• Refer to Jellinbah Emergency Response Plan (HMP-003).

Triggers	Operations Plan			EAP		
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Flood Failure – Overtopping)**	**Return to Normal**	**Black: Dam Failure**
	Water Level < MRL	Water Level > MRL & water level is static.	Water level > MRL, water level is rising and further rainfall forecast	Flow over spillway Embankment toe or embankment adjacent to spillway severely eroded due to spillway discharge.	Overflows have ceased Water level is receding	Dam Failure
Manager Mine Services	• Conduct monthly inspections and audits of Tailings Storage Facility. • Ensure TSF operated in accordance with this Operations Plan.	• Notify DEHP that MRL level has been reached as per EA conditions. • Notify General Manager. • Instruct cessation of tailings deposition and water transfer into TSF. • Communicate hazard to all Departments with personnel downstream of the dam. • Increase monitoring frequency from monthly to weekly. • Establish contact with RPEQ dam engineer and notify them of the situation. • Monitor weather forecast for large rainfall events.	• Notify General Manager. • Ensure tailings and water transfers to TSF remain ceased. • Increase monitoring frequency from weekly to daily.	• Ensure affected area downstream is evacuated. • Raise emergency call – notify General Manager. • Immediately notify DEHP in event of uncontrolled dam discharge as per EA conditions.	• Compile Release Report. • Notify DEHP as per EA conditions. • Immediately arrange for Dams Engineer to inspect site following a release event. • Raise Emergency Call – notify General Manager, if advised of imminent risk by Dams Engineer. • Advise General Manager of evacuation zone (downstream of Max Pit Tailings Dam). • Conduct post spillway overflow dam inspection. • Determine in consultation with Dams Engineer, the need to isolate the embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dams Engineer. • Determine in consultation with Dams Engineer, when/if conditions have sufficiently stabilised to return to normal operating conditions.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect dam once conditions have stabilised. • In consultation with Dams Engineer develop a dam stabilisation and remediation plan. • In consultation with Dam Engineer and CHPP Superintendent develop a short-term tailings & water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.

Triggers	Operations Plan			EAP		
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Flood Failure – Overtopping)**	**Return to Normal**	**Black: Dam Failure**
	Water Level < MRL	Water Level > MRL & water level is static.	Water level > MRL, water level is rising and further rainfall forecast	Flow over spillway Embankment toe or embankment adjacent to spillway severely eroded due to spillway discharge.	Overflows have ceased Water level is receding	Dam Failure
RPEQ Dams Engineer	• Conduct annual dam safety inspection.	• N/A	• N/A	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works etc.).	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Manager Mine Services and CHPP Superintendent develop a short term tailings & water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 4 – Seismic Embankment Instability (Sunny Day Failure)

Triggers	Operations Response Plan	Emergency Response Plan	
	Orange: Elevated Risk of Failure	**Red: Imminent Risk of Failure (Sunny Day Failure – Seismic)**	**Black: TSF Failure**
	Earthquake with magnitude > 5 within region and felt at site.	TSF Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and assessment following Seismic Event.	TSF Failure.
Electrical Engineering Manager	• N/A	• N/A	• Refer to Jellinbah Emergency Response Plan (HMP-003).
CHPP Superintendent	• N/A	• Cease tailings deposition into TSF.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Mine Services Supervisor	• N/A	• Cease water transfers into TSF.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Immediately arrange for Dam Engineer to inspect site. • Communicate hazard to all departments with personnel within the TSF area. • Monitor weather forecast, increase inspection frequency during rainfall events. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, if conditions are sufficiently stable to return to normal operating conditions.	• Notify DEHP of imminent dam failure risk. • Raise emergency call – notify General Manager. • Advise General Manager of evacuation zone (downstream of Max Pit Tailings Dam). • Instruct cessation of tailings deposition and water transfer into TSF. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimize risk of failure.	• Immediately notify DEHP in event of TSF failure. • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect TSF once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Dam Engineer and CHPP Superintendent develop a short-term tailings & water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.
RPEQ Dams Engineer	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Manager Mine Services and CHPP Superintendent develop a short term tailings & water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

APPENDIX C

TARPs – Plains Levee

TARP 1 – Embankment Erosion and Instability

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Levee Failure Imminent**	**Black: Levee Failure**
Triggers	No visible cracks. No visible bulges / slumping. Rill erosion < 0.5 m.	Visible cracks. Rill erosion 0.5 m to 1.5 m.	Local scale (bench downstream slope) bulges / slumping Major crack/s. Rill erosion > 1.5 m deep.	Global scale (entire downstream slope) bulges / slumping; or Levee Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and geotechnical assessment.	Levee Failure.
Mine Projects Manager	• Conduct routine inspections and audits of the levee.	• Notify Manager Mine Services. • Increase frequency of levee inspections to weekly.	• Immediately notify Manager Mine Services. • Increase frequency of levee inspections to daily. • Isolate embankment from vehicle and pedestrian access as directed.	• Immediately notify Manager Mine Services.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Review inspection and audit reports for the levee.	• Determine when conditions have sufficiently stabilised to return to normal operating conditions.	• Immediately arrange for Dam Engineer to inspect levee. • Advise General Manager of evacuation zone (Jellinbah Plains Mining Area). • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Raise emergency call – notify General Manager. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimise risk of failure. • Notify DEHP of imminent dam failure risk.	• Immediately notify DEHP in event of levee failure. • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect levee once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.
RPEQ Dams Engineer	• Conduct annual dam safety audit.	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 2 – Seismic Embankment Instability (Sunny Day Failure)

	Operations Response Plan	Emergency Response Plan	
Triggers	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Seismic)**	**Black: Levee Failure**
	Earthquake with magnitude > 5 within region and felt at site.	Levee Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and assessment following Seismic Event.	Levee Failure.
Mine Projects Manager	• Increase inspection frequency during rainfall events as directed. • Isolate embankment from vehicle and pedestrian access as directed.	• N/A	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Immediately arrange for Dam Engineer to inspect site. • Communicate hazard to all departments with personnel within the levee area. • Monitor weather forecast, direct Mine Projects Manager to increase inspection frequency during rainfall events. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, if conditions are sufficiently stable to return to normal operating conditions.	• Notify DEHP of imminent dam failure risk. • Raise emergency call – notify General Manager. • Advise General Manager of evacuation zone (Jellinbah Plains Mining Area). • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimize risk of failure.	• Immediately notify DEHP in event of levee failure. • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect levee once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.
RPEQ Dams Engineer	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

APPENDIX D

TARPs – Mine Water Storages

TARP 1 – Embankment Seepage

	Operations Response Plan			Emergency Response Plan	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No significant change to monitored Seepage Flow Rates and Seepage Areas No seepage present	New Seepage Area Identified at the embankment toe Previously Identified Seepage Area / Extent increases by >25% Previous Seepage Flow Rate increases by > 25%	New seepage area identified elevated above the embankment toe Increase in cloudy appearance of seepage water Previous seepage area / flow rate increases by > 50%	Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer site inspection and geotechnical assessment, or: Rapid increase in rate or cloudy appearance of seepage (piping failure has started)	Dam Failure
Mine Services Supervisor	• Ensure dam operated in accordance with this operations plan.	• Notify Manager Mine Services.	• Immediately notify Manager Mine Services. • Prevent access to the area if advised. • Change operational procedure if advised by Manager Mine Services. • Maintain / restore dam water level below MAOL.	• Pump down dam water level to as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Conduct monthly inspections and audits of the dam.	• Notify Mine Services Supervisor. • Increase frequency of dam inspections from monthly to weekly. • Determine when conditions have sufficiently stabilised to return to normal operating conditions.	• Immediately notify Mine Services Supervisor. • Immediately arrange for Dam Engineer to inspect dam. • Increase frequency of dam inspections from weekly to daily. • Communicate hazard to all departments with personnel downstream of the dam. • Co-ordinate water quality monitoring of seepage water to confirm source. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Determine, in consultation with Dam Engineer, need to change dam operational plan / reduce water level. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Raise emergency call – notify General Manager. • **Notify DEHP of imminent dam failure risk (regulated structures only).** • Advise General Manager of evacuation zone. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimise risk of failure.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • **Immediately notify DEHP in event of dam failure (regulated structures only).** • Arrange for Dams Engineer to inspect dam once conditions have stabilised. • In consultation with Dams Engineer develop a dam stabilisation and remediation plan. • In consultation with Mine Services Supervisor and Dam Engineer develop a short term water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.

	Operations Response Plan			Emergency Response Plan	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Static)**	**Black: Dam Failure**
Triggers	No significant change to monitored Seepage Flow Rates and Seepage Areas No seepage present	New Seepage Area Identified at the embankment toe Previously Identified Seepage Area / Extent increases by >25% Previous Seepage Flow Rate increases by > 25%	New seepage area identified elevated above the embankment toe Increase in cloudy appearance of seepage water Previous seepage area / flow rate increases by > 50%	Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer site inspection and geotechnical assessment, or: Rapid increase in rate or cloudy appearance of seepage (piping failure has started)	Dam Failure
RPEQ Dams Engineer	• Conduct annual dam safety audit.	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop a dam stabilisation and remediation plan. • In consultation with Manager Mine Services and Mine Services Supervisor develop a short term water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 2 – Embankment Erosion and Instability

	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Black: Dam Failure**	**Black: Dam Failure**
Triggers	No visible cracks No visible bulges / slumping Rill erosion < 0.5 m Surveyed embankment movement <15mm since previous survey or <50mm since initial benchmark survey	Visible cracks Rill erosion 0.5 m to 1.5 m embankment movement >15 mm since previous survey or >50 mm since initial benchmark survey	Local scale (bench downstream slope) bulges / slumping Major crack/s Rill erosion > 1.5 m deep Surveyed embankment movement > 50 mm since previous survey or > 100 mm since initial benchmark survey	Global scale (entire downstream slope) bulges / slumping or Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and geotechnical assessment.	Dam Failure
Mine Services Supervisor	• Ensure dam is operated in accordance with this operations plan.	• Notify Manager Mine Services.	• Immediately notify Manager Mine Services. • Change operational procedure if advised. • Maintain / restore dam water level below MAOL. • Prevent access to the area if advised.	• Pump down dam water level to as low as possible.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Conduct monthly inspections and audits of the dam.	• Notify Mine Services Supervisor. • Increase frequency of dam inspections from monthly to weekly. • Determine when conditions have sufficiently stabilised to return to normal operating conditions.	• Immediately notify Mine Services Supervisor. • Immediately arrange for Dam Engineer to inspect dam. • Increase frequency of dam inspections from weekly to daily. • Communicate hazard to all departments with personnel downstream of the dam. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Determine, in consultation with Dam Engineer, need to change dam operational plan / reduce water level. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Raise emergency call – notify General Manager. • Advise General Manager of evacuation zone. • **Notify DEHP of imminent dam failure risk (regulated structures only).** • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimise risk of failure.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • **Immediately notify DEHP in event of dam failure (regulated structures only).** • Arrange for Dams Engineer to inspect dam once conditions have stabilised. • In consultation with Dams Engineer develop a dam stabilisation and remediation plan. • In consultation with Mine Services Supervisor and Dam Engineer develop a short term water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.

Triggers	Operations Plan			EAP	
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Black: Dam Failure**	**Black: Dam Failure**
	No visible cracks No visible bulges / slumping Rill erosion < 0.5 m Surveyed embankment movement <15mm since previous survey or <50mm since initial benchmark survey	Visible cracks Rill erosion 0.5 m to 1.5 m embankment movement >15 mm since previous survey or >50 mm since initial benchmark survey	Local scale (bench downstream slope) bulges / slumping Major crack/s Rill erosion > 1.5 m deep Surveyed embankment movement > 50 mm since previous survey or > 100 mm since initial benchmark survey	Global scale (entire downstream slope) bulges / slumping or Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and geotechnical assessment.	Dam Failure
RPEQ Dams Engineer	• Conduct annual dam safety audit.	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop a dam stabilisation and remediation plan. • In consultation with Manager Mine Services and Mine Services Supervisor develop a short term water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 3 – High Water Level

Triggers	Operations Response Plan			Emergency Response Plan		
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Flood Failure – Overtopping)**	**Return to Normal Operating**	**Black: Dam Failure**
	Water Level < MAOL	Water Level > MAOL but below spillway & water level is static.	Water level > MAOL, water level is rising and further rainfall forecast	Flow over spillway Embankment toe or embankment adjacent to spillway severely eroded due to spillway discharge.	Overflows have ceased Water level is receding	Dam Failure
Mine Services Supervisor	• Ensure dam operated in accordance with this operations plan.	• Notify Manager Mine Services. • Ensure dewatering pumps are operating. If pumps are inoperable, raise notification to repair - follow up on maintenance schedule. • Organise maintenance to repair decant pumps (if inoperable). • Ensure spillway is clear of debris.	• Immediately notify Manager Mine Services. • Prevent Access to the Area.	• Immediately notify Manager Mine Services.	• Notify Manager Mine Services.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Conduct monthly inspections of Dam.	• Notify General Manager. • Communicate hazard to all Departments with personnel downstream of the dam. • Monitor weather forecast for large rainfall events.	• Immediately notify General Manager. • Increase inspection frequency from monthly to daily. • Note: DEHP do not need to be notified in the event of an MAOL exceedance.	• Raise emergency call – notify General Manager. • Advise General Manager of evacuation zone. • **Notify DEHP of imminent dam failure risk (regulated structures only).**	• Immediately arrange for Dams Engineer to inspect site following release event. • Raise Emergency Call - notify General Manager, if advised of imminent risk by Dams Engineer. • Conduct post spillway overflow dam inspection. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, when / if conditions have sufficiently stabilised to return to normal operating conditions.	• Refer to Jellinbah Emergency Response Plan (HMP-003). • **Immediately notify DEHP in event of dam failure (regulated structures only).** • Arrange for Dams Engineer to inspect dam once conditions have stabilised. • In consultation with Dams Engineer develop a dam stabilisation and remediation plan. • In consultation with Mine Services Supervisor and Dam Engineer develop a short term water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.

Triggers	Operations Response Plan			Emergency Response Plan		
	Green: Normal Operating	**Yellow: Alert**	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Flood Failure – Overtopping)**	**Return to Normal Operating**	**Black: Dam Failure**
	Water Level < MAOL	Water Level > MAOL but below spillway & water level is static.	Water level > MAOL, water level is rising and further rainfall forecast	Flow over spillway Embankment toe or embankment adjacent to spillway severely eroded due to spillway discharge.	Overflows have ceased Water level is receding	Dam Failure
RPEQ Dams Engineer	• Conduct annual dam safety audit.	• N/A	• N/A	• N/A	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.).	• Conduct site inspection. • In consultation with Manager Mine Services develop a dam stabilisation and remediation plan. • In consultation with Manager Mine Services and Mine Services Supervisor develop a short term water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.

TARP 4 – Seismic Embankment Instability (Sunny Day Failure)

	Operations Response Plan	Emergency Response Plan	
Triggers	**Orange: Elevated Risk of Failure**	**Red: Imminent Risk of Failure (Sunny Day Failure – Seismic)**	**Black: Dam Failure**
	Earthquake with magnitude > 5 within region and felt at site.	Dam Failure Imminent – Based on outcomes of RPEQ Dams Engineer inspection and assessment following Seismic Event.	Dam Failure.
Mine Services Supervisor	• N/A	• Cease water transfers into TSF.	• Refer to Jellinbah Emergency Response Plan (HMP-003).
Manager Mine Services	• Immediately arrange for Dam Engineer to inspect site. • Communicate hazard to all departments with personnel within the dam area. • Monitor weather forecast, increase inspection frequency during rainfall events. • Determine, in consultation with Dam Engineer, the need to isolate embankment from vehicle and pedestrian access. • Implement remedial works if advised by Dam Engineer. • Determine, in consultation with Dam Engineer, if conditions are sufficiently stable to return to normal operating conditions.	• Raise emergency call – notify General Manager. • Advise General Manager of evacuation zone. • Contact Dams Engineer to seek advice regarding potential short term remediation options to minimize risk of failure. • **Notify DEHP of imminent dam failure risk (regulated structures only).**	• **Immediately notify DEHP in event of dam failure (regulated structures only).** • Refer to Jellinbah Emergency Response Plan (HMP-003). • Arrange for Dams Engineer to inspect dam once conditions have stabilised. • In consultation with Dams Engineer develop an embankment stabilisation and remediation plan. • In consultation with Dam Engineer and Mine Services Supervisor develop a short-term water management strategy. • In consultation with Emergency Response Leader and Dams Engineer assist / help coordinate clean-up and rehabilitation plan.
RPEQ Dams Engineer	• Conduct site inspection and geotechnical assessment. • Advise Manager Mine Services of recommended actions to reduce risk of failure (e.g. additional investigations, operational changes, monitoring requirements, remedial works, etc.). • Develop appropriate remediation design if needed.	• Advise of any available short-term remediation solutions to minimize risk of failure.	• Conduct site inspection. • In consultation with Manager Mine Services develop an embankment stabilisation and remediation plan. • In consultation with Manager Mine Services and Mine Services Supervisor develop a short term water management strategy. • In consultation with Emergency Response Leader and Manager Mine Services assist / help coordinate clean-up and rehabilitation plan.