# REPORT

**WULGURU TECHNICAL SERVICES PTY LTD**
ABN:

**Wirralie Gold Mine**
**Concept Closure Methodology and Water Balance Model**

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TAILINGS.WATER.WASTE.

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# 1 INTRODUCTION

## 1.1 Background

Australian Solomons Gold Pty Ltd (Solomons) owns and operates the Wirralie Gold Mine (WGM) site under EPML00772413 and took over the site in late 2013. The mine has had several operating owners over the years, including multiple owner changes from 1987 to 1993 before a break in operations. The mine operated again from 1999 to 2001, before being placed into care and maintenance in 2002. Rehabilitation efforts were initiated in 1993 and again in 2001 to targeted areas within the site, such as the waste rock dumps, final voids, the Tailings Storage Facility (TSF), process and ancillary areas. Operations by Solomons plan to process up to 400,000 tonnes of ore per annum over a minimum 10 year life of mine. This volume of processing is on a significantly reduced scale when compared to past mining campaigns. Refer **Appendix A** which illustrates the mine site layout plan.

Solomons have commissioned Wulguru Technical Services (WTS) to provide assistance with the completion of the Progressive Rehabilitation Closure Plan (PRCP) and Estimated Rehabilitation Cost (ERC) submitted (reference no. 101/0008112). As part of the PRCP and ERC requirements, ATC Williams (ATCW) have been engaged by WTS to develop a Mine Concept Closure and Water Balance Model for the WGM site.

## 1.2 Scope of Works

The scope of this report includes a Water Balance Model (WBM) and conceptual closure phase construction methodology. The WBM aims to assess the potential water storage performance of pits over the post-closure phase. This is to identify if there is any potential for pit spillage that may cause unwanted discharge of contaminated water to the surrounding downstream environment. All site pits are proposed to be retained as residual voids, including Pit A (PA), Pit B (PB), Northern Pit (NP) and Deep Lead Pit (DLP). Refer to **Appendix A** and **Figure 002.**

The concept closure methodology aims to outline conceptual works and/or site requirements to enable the successful rehabilitation of the mine site. The closure methodology identifies high level surface water management requirements such as erosion and sediment controls and water storage to inform staging of the rehabilitation works. .

## 1.3 Legal and Regulatory Requirements

### 1.3.1 Progressive Rehabilitation Closure Plan

A Progressive Rehabilitation and Closure Plan (PRCP) **[9]** for the site is a requirement of the Environmental Protection Act (EPA) 1994 **[10]**, and is an integral requirement of EA holders when applying for a new site-specific mining activity. The PRCP aims to:

- Require the holder of an EA to plan for how and where activities will be carried out on land in a way that maximises the progressive rehabilitation of the land to a stable condition
- Provide for the condition to which the holder must rehabilitate the land before the EA may be surrendered

This is in response to the state's Mined Land Rehabilitation Policy (MLRP) which aims to provide certainty to rehabilitation outcomes and timings amongst mining companies through implementation of binding, time-based milestones for PRC actions. As per MLRP, mined disturbed lands are deemed to be rehabilitated if the land is safe, stable, does not cause environmental impact, and is able to sustain the post-mining land use approved in the PRCP **[9]**.

### 1.3.2 Relevant EA Requirements

The WGM site is approved under the Environmental Authority (EA) permit number EPML00772413. This assessment aims to mitigate any unwanted discharge of mine contaminated waters to

downstream waterways, and the following EA condition relates to release of waters (however noting that the EA would be surrendered post-closure):

> *(C1-1) Receiving waters affected by the release of process water or storm water contaminated by the mining activities or both must be monitored at the locations and frequencies defined in Schedule C – Table 1 and comply with the contaminant limits defined in Schedule C – Table 2.*

The following EA condition site is relevant to the rehabilitation of the regulated pits and dams:

*Rehabilitation Landform Criteria*

> *(F1-1) All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with Schedule F-Table 1.*

*Schedule F – Table 1*

| Disturbance Type | Projective Surface Area (ha) | Post-mine Land Description | Post-mine Land Classification |
|---|---|---|---|
| *Tailings Dam** | *72* | *Open Pasture* | *VII* |
| *Infrastructure* | *69* | *Open Pasture* | *VII* |
| *Waste Dump* | *22* | *Low Hill* | *VII* |
| *Exploration* | *19* | *Open Pasture* | *VII* |
| *Open Cut Pit* | *19* | *Open Void* | *VIII* |
| *Stockpile Area* | *14* | *Open Pasture* | *VII* |
| *Village* | *12* | *Low Hill* | *VII* |
| *Borrow Pit* | *8* | *Open Pasture* | *VII* |
| *Processing Plant* | *7* | *Open Pasture* | *VII* |
| *Runoff Dam* | *5* | *Water Storage* | *VIII* |
| *ROM Pad* | *3* | *Low Hill* | *VII* |

*Note that the Tailings Dam is also noted as a Tailings Storage Facility (TSF) in this report.

*Residual Void Outcome*

> *(F2-1) Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.*

*Dams containing hazardous waste*

> *(F3-1) The construction or operation of any dam containing hazardous waste within operational land with*

## 1.4 Report Summary and Structure

The water contained with the site pits is assumed to have the potential to cause contamination of downstream waters if released. Therefore, the water balance assessment detailed in **Section 4**

demonstrate that the pits are unlikely to spill and therefore are not expected to cause any adverse effects to the surrounding environment and downstream waterways in the post-closure phase. This assumes that the spillway of the Northern Pit is re-directed to the central Pit A to reduce the risk of downstream spills from the Northern Pit.

The closure methodology outlines high level surface water management requirements and likely temporary erosion and sediment control measures. It is proposed to stage the rehabilitation works as two main Stages nominated below:

- Stage 1 – Rehabilitation of mine infrastructure areas, and eastern extent of the TSF.
- Stage 2 – Rehabilitation of the remaining western extent of the TSF.

Staging allows for more effective temporary erosion and sediment control by splitting up the rehabilitation works into two main work areas. Stage 1 aims to rehabilitate the eastern extent of the TSF by using the western extent (Stage 2) as a temporary water and sediment storage area. Once Stage 1 has achieved suitable vegetation cover, Stage 2 can be rehabilitated with the use of a temporary High Efficiency Sediment (HES) basin for erosion and sediment control. The HES basin can also provide water storage for Stage 2 irrigation to encourage vegetation establishment. It is proposed to re-locate the TSF spillway further east to allow the rehabilitation staging, however, this is dependant on detailed site survey which was not available at the time of this report.

The associated mine infrastructure areas and TSF are proposed to be rehabilitated to a Post-Mining Land Use (PMLU) as a Class VII land use (land not suitable for cultivation and only careful pastoral use) as per Schedule F – Table 1 of the EA. Class VII land use areas are to rehabilitated with vegetation and minimal changes to the topography. For all areas that drain to the TSF, no sediment basin would be required during the Stage 1 rehabilitation phase. The existing water storages within the site (TSF and runoff dam) would be adequate to contain sediment laden runoff (to be confirmed through future implementation of the site's operational water management plan) and can be used as irrigation water for vegetation establishment. There are some minor catchments as identified on **Figure 002**, that discharge directly downstream and therefore may need individual erosion and sediment control via bunding or temporary sediment basins whilst rehabilitation works are undertaken.

The pits are to be left as residual voids and form Non-use Management Areas (NUMA) under a Class VIII land use (unsuited to agricultural use or grazing areas). The runoff dam is to be left as a stock water source, also under a Class VIII land use.

The report structure is as follows:

**Section 2:** Provides a brief description of the project site and the regional climate.

**Section 3:** Presents an overview of the outcomes of the desktop contaminant source study.

**Section 4:** Presents the site water balance model and results.

**Section 5:** Outlines a brief overview of the recommended closure methodology to be undertaken at mine closure.

**Section 6:** States the conclusions and recommendations.

# 2 PROJECT SITE

## 2.1 Background

As described in the Plan of Operations **[4]** report by Northern Resource Consultants Pty Ltd (NRC), historical mining operations have occurred intermittently at the WGM site since the late 1980's. Operations mainly involved the extraction of run-of-mine (ROM) ore from four separate pits. A mining campaign from 1999 to 2001 reinstated and upgraded the previous 1.5 mtpa treatment plant, before the mine was placed into care and maintenance. In both 1993 and 2001, the site was significantly rehabilitated within the following operational areas:

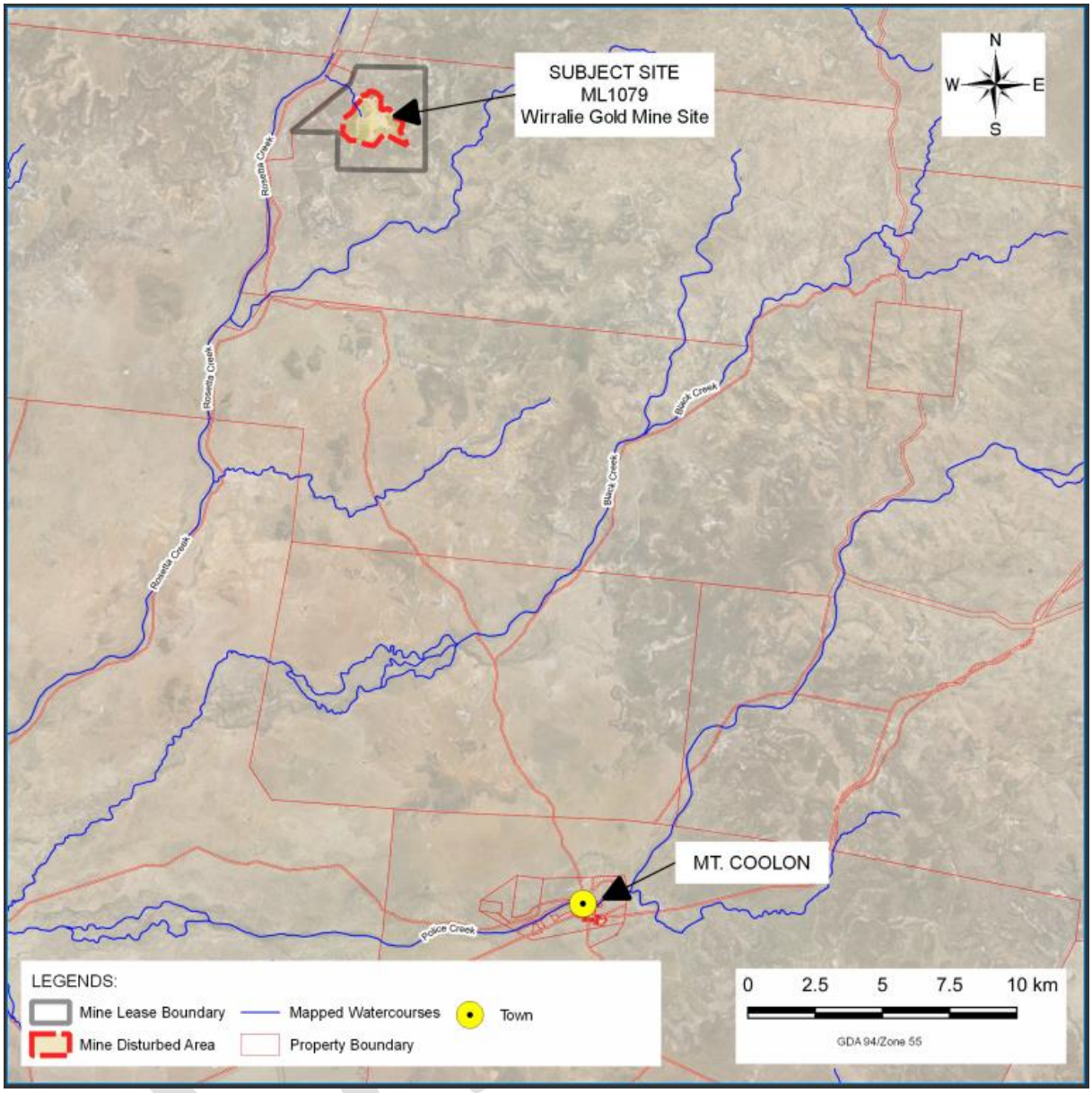
- Waste rock dumps, backfilled voids, and stockpile areas.
- Final voids.
- Tailings dam (rehabilitation trials).
- Process areas.
- Ancillary areas (including ROM, exploration facilities, landfill, air-strip, accommodation village).

The proposed mining operation by Solomons is a significantly smaller operation, with an annual processing rate of 400,000 tpa. It is also proposed to operate within the previous infrastructure and mining operation footprint, and thus, no additional clearing or disturbance is required.

## 2.2 Site Location

WGM site operates within mine lease ML1079 located in the central Queensland region. The bounding allotment is described as Lot 3272 on SP237696, approximately 30.3 km north-northwest of the Mount Coolon township, approximately 200 km west of Mackay. **Appendix A** and **Diagram 1** illustrates the general site layout and overall site locality of the mine site.

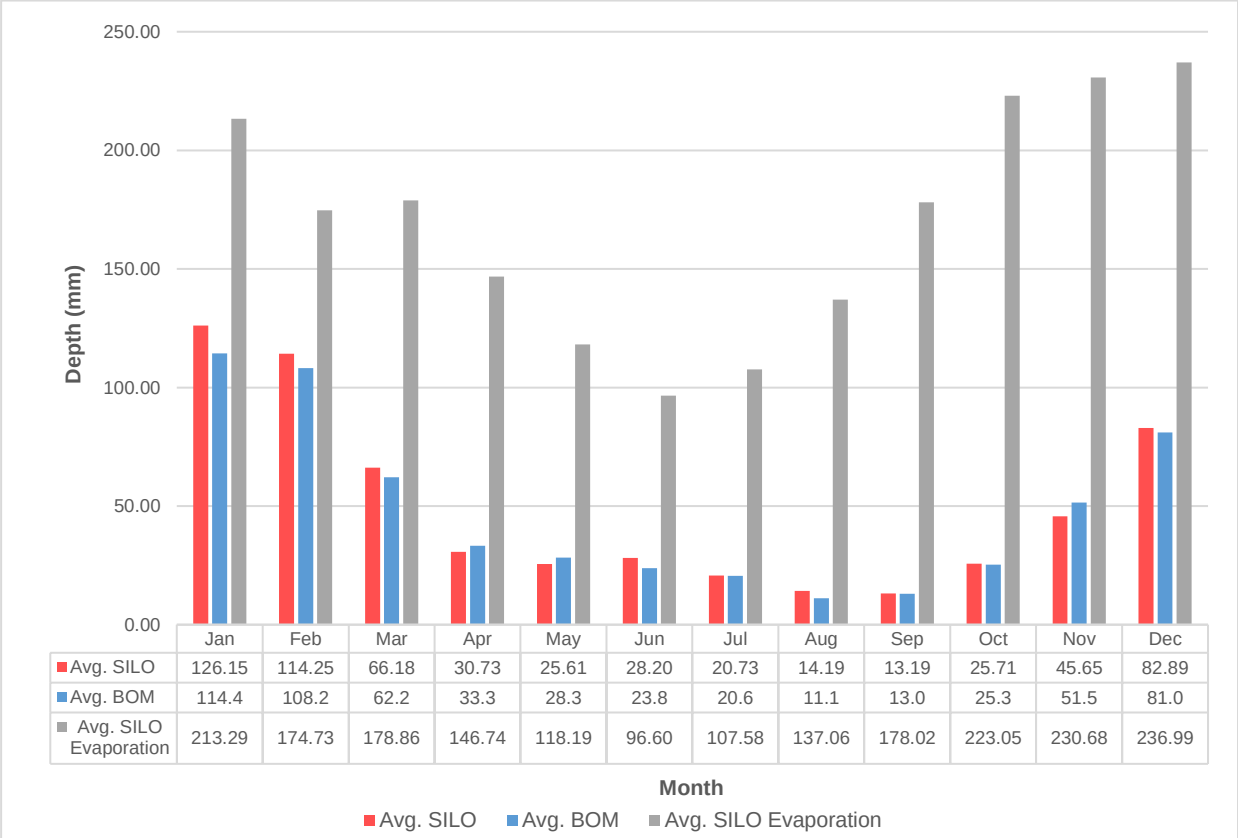
**DIAGRAM 1: SITE LOCALITY MAP**




## 2.3 Climate

The WGM site is located in central Queensland region which has a sub-tropical climate and annual rainfall average of 577 mm. The climate is driven by a wet season during the warmer months of December to March, and a mostly dry season for the remaining months of the year. Monthly rainfall statistics were sourced from BOM's **[1]** available data at the Mt. Coolon Hotel station from 1913 to 2004. Point location SILO data **[8]** from 1889 to 2020 for rainfall and evaporation was also extracted for the site. **Graph 1** illustrates the BOM and SILO climate statistics.

**GRAPH 1: SITE CLIMATE DATA**




| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Avg. SILO | 126.15 | 114.25 | 66.18 | 30.73 | 25.61 | 28.20 | 20.73 | 14.19 | 13.19 | 25.71 | 45.65 | 82.89 |
| Avg. BOM | 114.4 | 108.2 | 62.2 | 33.3 | 28.3 | 23.8 | 20.6 | 11.1 | 13.0 | 25.3 | 51.5 | 81.0 |
| Avg. SILO Evaporation | 213.29 | 174.73 | 178.86 | 146.74 | 118.19 | 96.60 | 107.58 | 137.06 | 178.02 | 223.05 | 230.68 | 236.99 |

Sources: BOM **[3]** Station: Mt. Coolon Hotel (Station No. 034006); **[4]** SILO Data Drill **[8]**

## 2.4 Topography and Hydrology

The WGM site comprises undulating to hilly terrain with sparse to medium dense vegetation surrounding the storage pits and dams. The southern extent of the mine appears to be located along an existing ridgeline that runs west to east. The levels within the site ranges from approximately RL 292 m along the ridgeline, to RL 270 m within the site. The lowest elevation of RL237 m is at the bottom of Pit A. The mining area is mostly disturbed due to the pits, TSF, processing areas, waste rock dump, and associated roads/pads. Currently, runoff within the site is directed to the site pits, TSF, and runoff dam via bunds and drainage diversions. Some minor catchment areas as identified on **Figure 002** appear to discharge directly downstream and likely need erosion and sediment control measures to be installed as part of the operational water management plan.

Any overtopping flows from the site water storages would discharge to the north to the local unnamed flow paths, before joining with Rosetta Creek. A flow diversion bund is located along the eastern extent of disturbance to divert natural catchment flows to the north-west.

Rosetta Creek discharges south and joins with Police Creek some 40 km downstream of the site, before flowing into Suttor River and then discharging into Lake Dalrymple (formed by Burdekin Dam) some 100 km downstream of the site. Flow from the Burdekin Dam eventually discharges through the Ayr and into the Coral Sea some 300 km from WGM.

Regional flood hazard overlay extents have been addressed in a separate technical memorandum by ATCW (reference 121130-01M001.revA), and demonstrates that the flood extents are well clear of the WGM site voids.

**Note that no detailed site survey was available at the time of this report and coarse satellite data was adopted for the assessment. Due to the poor-quality elevation data available for the site, the details presented in report are high-level only and require confirmation with detailed site survey data.**

## 2.5 Hydrogeology

No hydrogeology information was available at the time of this assessment. The site pits have been left untouched for an extended period, and it is therefore assumed that the standing water level represents the approximate groundwater level. No seepage from the pits has been modelled or would be expected due to the geology of the pits.

# 3 DESKTOP CONTAMINANT SOURCE STUDY

## 3.1 Objective

A desktop Contaminant Source Study (CSS) has been conducted for the site and is summarised in the following sections. The objective of the CSS is to identify potential sources of contaminants within the site for the rehabilitation works and post-closure scenario that could be detrimental to the downstream environment if released.

The findings in the following sections are founded on past reporting information from historic site investigations. As part of the current PRCP site investigations, a detailed geochemistry analysis is currently being undertaken. Initial advice from this investigation is presented in the below dot points and generally aligns with historic information.

- Waste Rock Dumps have come back NAF, low Salinity (<300µS/cm) and with arsenic enrichment (<100 mg/ kg).
- Tailings Storage Facility has NAF, salinity low-mod (median 1,175 µS/cm) and with arsenic and mercury enrichment (<300 mg/ kg and <10 mg/kg respectively).

This section should be updated following completion of the latest geochemistry investigation.

## 3.2 Receiving Environment

### 3.2.1 Regulatory Context

Schedule C of the EA (EPML0072413) outlines Water related conditions and was used as a basis for the CSS and the proposed rehabilitated site water management. Table 1 of Schedule C within the EA illustrates the required receiving water monitoring locations and minimum frequencies, as is reproduced in **Table 1**. Furthermore, the receiving water contaminant limits at the monitoring locations must not exceed those outlined in **Table 2.**

**TABLE 1: WATER MONITORING LOCATIONS AND FREQUENCIES**

| Monitoring Point | AMG North | AMG East | Monitoring Frequency |
|---|---|---|---|
| SW1 – Tailings Dam spillway | 7663974 | 526752 | Monthly when flowing |
| SW2 – Tailings dam runoff dam | 7664998 | 526747 | Monthly when flowing |
| Tailings dam ponded water | 7664832 | 527793 | Six Monthly |
| SW4 – Rosetta Creek | 7665490 | 524242 | Monthly when flowing |
| SW5 – Sugar Bag Creek | 7665405 | 526557 | Monthly when flowing |
| Sugar Bag Creek (Release Point 1) | 7665700 | 526350 | Opportunistic rising stage sample at 1.8 m |
| Drainage to Pit (Release Point 2) | 7665094 | 527800 | Monthly when flowing |

**TABLE 2: WATER CONTAMINANT LIMITS**

| Quality Characteristic | Trigger Levels | Limit Type | Release Limit |
|---|---|---|---|
| pH | | Range | 6-9 |
| Total Dissolved Solids | mg/L | Maximum | 4000 |
| Sulfate | mg/L | Maximum | 1000 |
| Arsenic | mg/L | Maximum | 0.5 |
| Cadmium | mg/L | Maximum | 0.01 |
| Copper | mg/L | Maximum | 0.5 |
| Lead | mg/L | Maximum | 0.1 |
| Mercury | mg/L | Maximum | 0.002 |
| Molybdenum | mg/L | Maximum | 0.05 |
| Selenium | mg/L | Maximum | 0.02 |
| Zinc | mg/L | Maximum | 20 |
| WAD Cyanide | mg/L | Maximum | 0.2 |

### 3.2.2 Environmental Values and Beneficial Users

Schedule 1 of the Environmental Protection (Water) Policy 2007 (EPP Water) is subordinate legislation to the Environmental Protection Act 1994 (EPA) **[10]**, and documents waterways where the legislation applies. The applicable waterways are to be enhanced or protected and the legislation specifies relevant Environmental Values (EVs) and water quality objectives (WQOs). Review of Schedule 1 indicates that the mine site does not currently have defined environmental values. Notwithstanding, generalised assessment under the EPP Water can be based on the determined nature of the receiving environment.

The Wirralie site is situated in a rural landscape that has historically been subjected to low-density grazing. Using EPP Water, EV's can be identified that are relevant to the receiving environment and which has been assumed to be characterised as "slightly disturbed waters", and a slightly to moderately disturbed ecosystem. The context for EV's for this ecosystem is characterised under the EPP Water as follows:

> "*the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators*".

Further to the above, the following additional surface water EV's are considered:

- Stock water; and
- Irrigation.

## 3.3 Water Quality Monitoring

Water quality monitoring of the stored water within the TSF was conducted in 2016 and at the spillway in 2014 (as described by NRC **[7]**). The findings demonstrated that the water mostly meets ANZECC Livestock Drinking Water Guidelines, with the exception of Sulphate and Total Dissolved Solids

exceedances in 2014. The results are illustrated in **Table 3**. No other water quality tests were available at the time of this report.

**TABLE 3 – RECEIVING WATER CONTAMINANT LIMITS**

| Quality Characteristic | Unit | TSF Spillway (2014) | TSF Ponded Water (2016) | ANZECC Limits |
|---|---|---|---|---|
| pH | pH Units | 7.1 | 7.1 | - |
| Total Dissolved Solids Dried at 175-185°C | mg/L | **9100** | 2000 | 5000 |
| Zinc, Zn | mg/L | <0.01 | 0.007 | - |
| Sulfur as Sulfate, SO_{4} | mg/L | **4300** | 900 | 1000 |
| Molybdenum, Mo | mg/L | 1400 | <0.005 | - |
| Arsenic, As | mg/L | 0.014 | 0.006 | - |
| Copper, Cu | mg/L | 0.80 | 0.004 | - |
| Cadmium, Cd | mg/L | <0.003 | 0.0007 | - |
| Lead, Pb | mg/L | 0.0065 | <0.001 | - |
| Selenium, Se | mg/L | <0.003 | 0.003 | - |
| Mercury | mg/L | 0.014 | <0.00005 | - |
| Total Zinc | mg/L | <0.01 | 0.007 | 20 |
| Total Molybdenum | mg/L | 0.014 | <0.005 | 0.15 |
| Total Arsenic, As | mg/L | 0.81 | 0.009 | 0.5-5 |
| Total Cadmium, Cd | mg/L | 0.0069 | 0.007 | 0.01 |
| Total Copper, Cu | mg/L | <0.003 | 0.005 | 1 (Cattle) |
| Total Lead, Pb | mg/L | <0.003 | <0.001 | 0.1 |
| Total Selenium, Se | mg/L | 0.014 | 0.004 | 0.02 |
| Total Mercury | mg/L | <0.00005 | <0.001 | 0.002 |
| Weak Acid Dissociable Cyanide | mg/L | <0.004 | <0.004 | - |

## 3.4 Saline, Metalliferous and Acid Rock Drainage

A historical geochemical study by Woodward-Clyde (1998) **[11]** was conducted as part of a previously proposed (but unsuccessful) expansion, prior to the site being placed into care and maintenance. As described by NCR **[7]**, the results of this study indicated that:

- The chromium, molybdenum and lead levels in some samples were elevated, however considered low for a mineralised system. These were considered consistent with background levels of the system and likely to be indistinguishable from background.
- Arsenic levels in the waste rock are elevated above trigger levels and suggest surface dumping of waste rock would require capping and management of surface runoff. Levels in material tested from the B pit (Pit B) ranged from 30-198 ppm.

- Sulphur levels ranged from 0.001 to 1.34%, indicating low levels of sulphur in the totally oxidised material and some partly oxidised materials. Waste from Pit B ranged from 0.01 to 0.02% sulphur content, <0.02% is considered to have low acid forming characteristics.

As part of the proposed operations, NCR **[7]** stated that a waste characterisation program is to be undertaken. This would involve a program of progressive sampling and characterisation of the waste rock to identify any acid producing potential and metal concentrations of the waste rock. The waste rock characterisation involves characterisation samples being taken for laboratory analysis at a minimum of 1 sample per 100,000 t of waste rock produced. This program aims to effectively predict any potential environmental effects of the in-pit disposal strategy so that these can be mitigated.

This waste characterisation program will be important for the rehabilitation strategy and must consider the proposed PRCP that will be in place. Any changes that may impact the rehabilitation methodology may need updates to the overall PRCP.

## 3.5 Tailings Dam Material

A geochemical investigation by EGI in 2002 **[5]**, is described in NCR **[7]**, and indicates the following:

- The net acid producing potential (NAPP) for surface salts ranged from 17 to 95 kg H2SO4/t, with NAGpH values ranging 7.2 to 8.4, although most of the sulfur in the samples occurred as non-reactive salts and are therefore non-acid forming (NAF). The NAPP for depth profiled tailings samples ranged from 0 to 8 kg H2SO4/t, with NAGpH values ranging 6.1 to 6.7. This material is expected to be relatively barren of acid generation and therefore have a low acid forming potential.
- Multi-elemental scans performed on the tailings indicate elevated arsenic concentrations above ANZECC guidelines. Mercury, antimony and selenium were enriched however in most samples this was below ANZECC guidelines. Silver was enriched in some of the samples tested.

## 3.6 Potential Contaminant Sources

Based on NCR **[7]** and the geochemistry report **[5],** the potential contaminants identified within the site are presented in **Table 4**:

**TABLE 4: POTENTIAL CONTAMINANT SOURCES**

| Potential Contaminant Source | Likely Contaminants | Comments |
|---|---|---|
| Run-of-Mine (ROM) Pad | Suspended solids | To be rehabilitated |
| Waste Rock Dump (WRD) | Suspended solids, metals | Non-acid forming materials and already rehabilitated |
| Tailings Dam | Suspended solids, Sulphate, Total Dissolved Solids, Mercury, Antimony and Selenium, metals | Water quality monitoring undertaken in 2016. To be capped and rehabilitated |
| Pits | Suspended solids, Sulphate, Total Dissolved Solids, Arsenic, metals | Assumed to be contaminated and WBM to demonstrate low risk of spilling |
| Admin Area/Offices | Suspended solids | To be rehabilitated |

# 4 WATER BALANCE MODEL

## 4.1 Objectives

The key objective of the Water Balance Model (WBM) is to assess the water storage performance of the pits within the site for the post-closure period. This assessment will inform if any mitigation measures are required for the post-closure scenario.

## 4.2 Data and Assumptions

### 4.2.1 Climate Data

The rainfall data adopted for the model was sourced from SILO **[8]** which is an enhanced database for Australian climate data and has available data dating back to 1889. It is hosted by the by the Science Delivery Division of the Department of Science, Information Technology, Innovation and the Arts (DSITIA) which also provides other daily meteorological datasets such as evaporation and evapotranspiration data suitable for modelling purposes.

### 4.2.2 Climate Change

The water balance outcomes are primarily influenced by long-term climate conditions, and climate change has not been explicitly modelled as part of this assessment. It is noted that projected climate change scenarios suggest the following factors that would potentially impact the WBM results:

- Intensity of Individual Events
  - Extreme rainfall and weather events are projected to increase in intensity, as described in Australian Rainfall and Runoff **[1]**
- Long Term Climate Conditions
  - An increase in average temperatures is projected in the majority of climate models, implying an inferred increase in evaporation and decrease in rainfall. Specific guidance for modelling these climate sequences is not currently available **[1]**.

Although there is general agreeance that in some degree the above climate changes are likely to occur within the next century, there is high uncertainty in the magnitude of expected changes. Assessing the many possible climate change scenarios within this WBM would require an extensive assessment beyond the scope of this report.

### 4.2.3 Catchment Delineation and Site Survey

No site survey was available at the time of this report, and therefore this assessment is based only on available satellite survey data **[6]** that is a coarse resolution. An updated assessment following a detailed site survey should be conducted to confirm the catchment delineation and pit storage curves. The assumed operational catchment delineation is illustrated in **Figure 002**, attached to this report.

### 4.2.4 Storage Conditions

Primary water balance inputs for site storages are outlined in **Table 5**, estimated from the available satellite elevation data**.** Noting that North Pit did not appear to have a consistent storage curve and drains into Pit A. Pit A and North Pit were therefore combined as a single storage due to the irregular geometry of North Pit.

**Due to the poor quality elevation data available for the site, the WBM results presented in report are a high-level estimate only and require confirmation with detailed site survey data.**

**TABLE 5: SITE STORAGE CAPACITIES**

| Storage | Spillway Elevation | Max Storage Capacity (ML) | Initial Water Level |
|---|---|---|---|
| **Pit A and North Pit** | RL 267.0m | 1539 | RL 235.7m |
| **Pit B** | RL 278.0m | 77.42 | RL 266.2m |
| **Deep Lead Pit** | RL 258.5m | 497.10 | RL 221.1m |

No current water level data or groundwater inflows were available for the pit storages due to the lack of site data (refer to **Section 4.2.3**). Initial water levels were based off aerial imagery and elevation data, and were assumed to be at the groundwater equilibrium. It is assumed the pits will be at the approximate groundwater level at the start of the post-closure scenario.

The pit storage curves presented in **Figure 1** to **Figure 3** were generated using the satellite elevation data described in **Section 4.2.3.**

**FIGURE 1: COMBINED PIT A & NORTHERN PIT STORAGE CURVE**

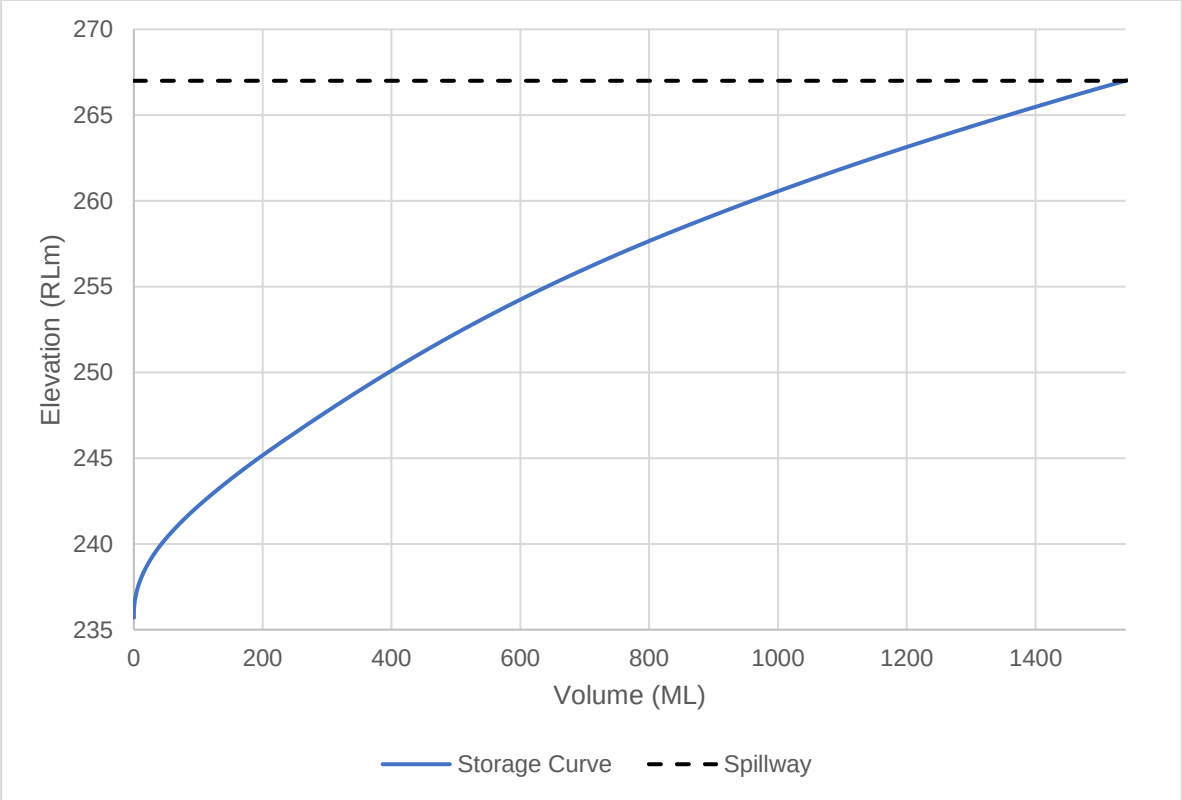


**FIGURE 2: PIT B STORAGE CURVE**

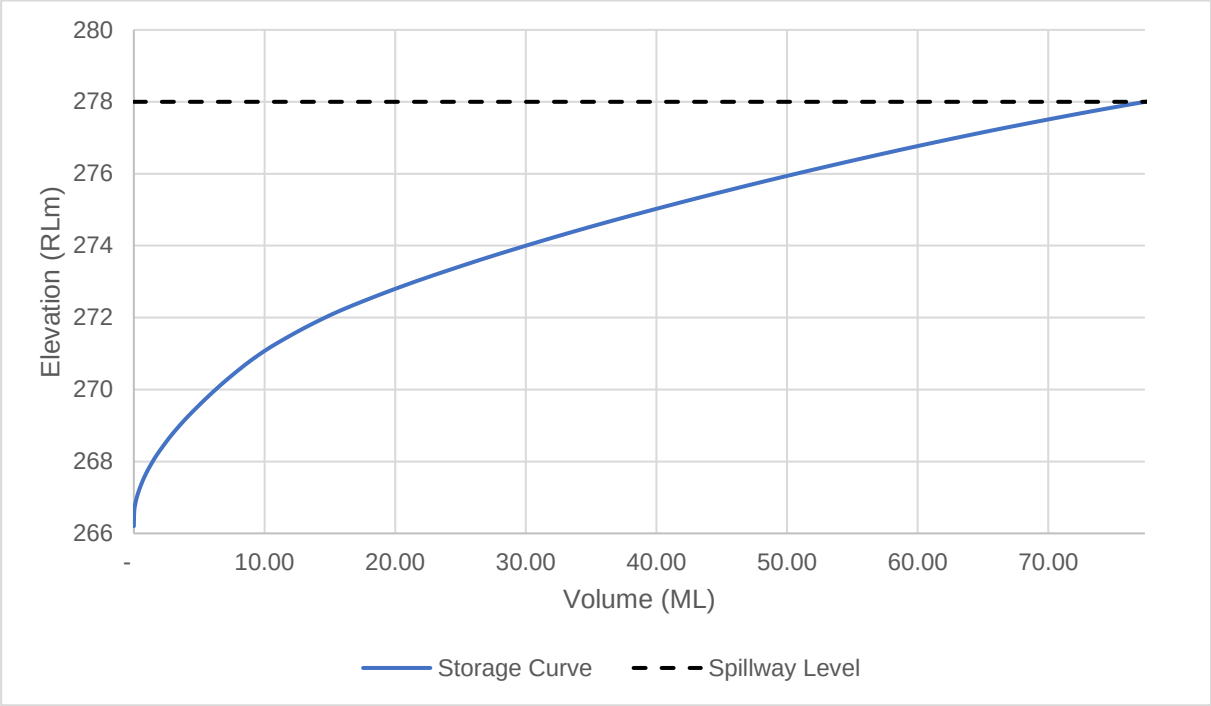
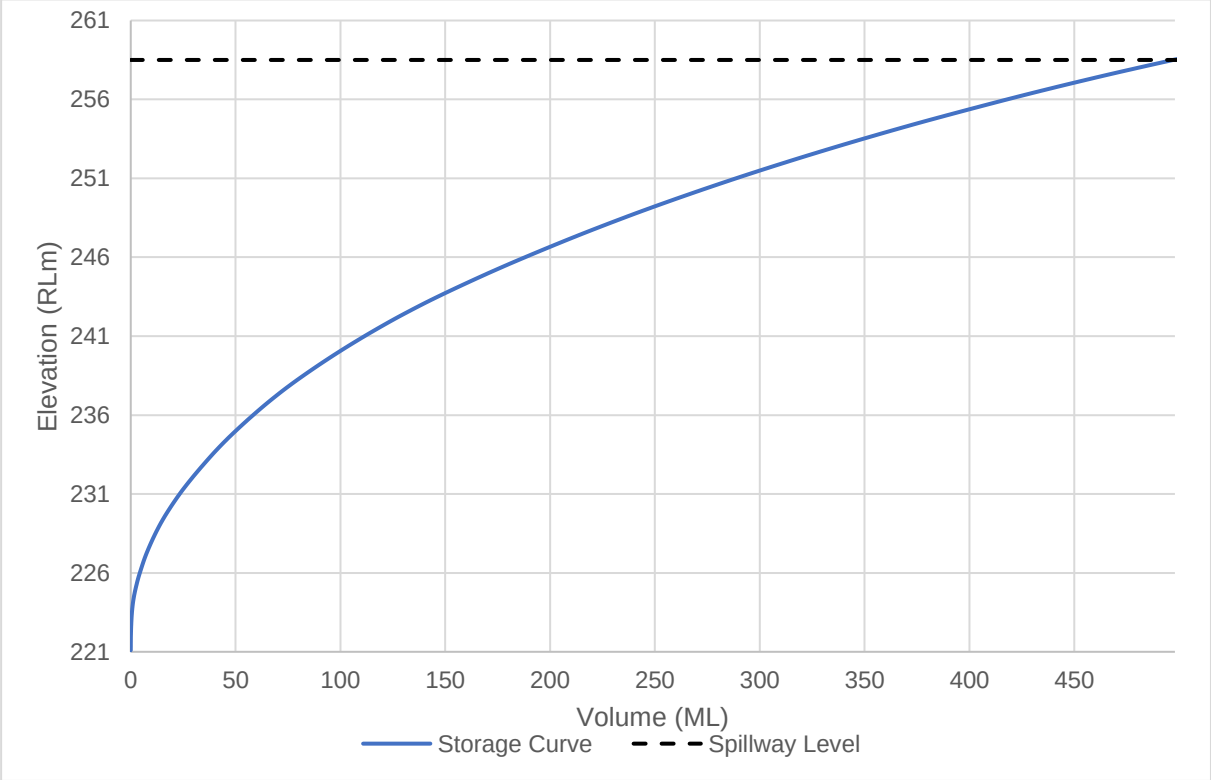



**FIGURE 3: DEEP LEAD PIT STORAGE CURVE**

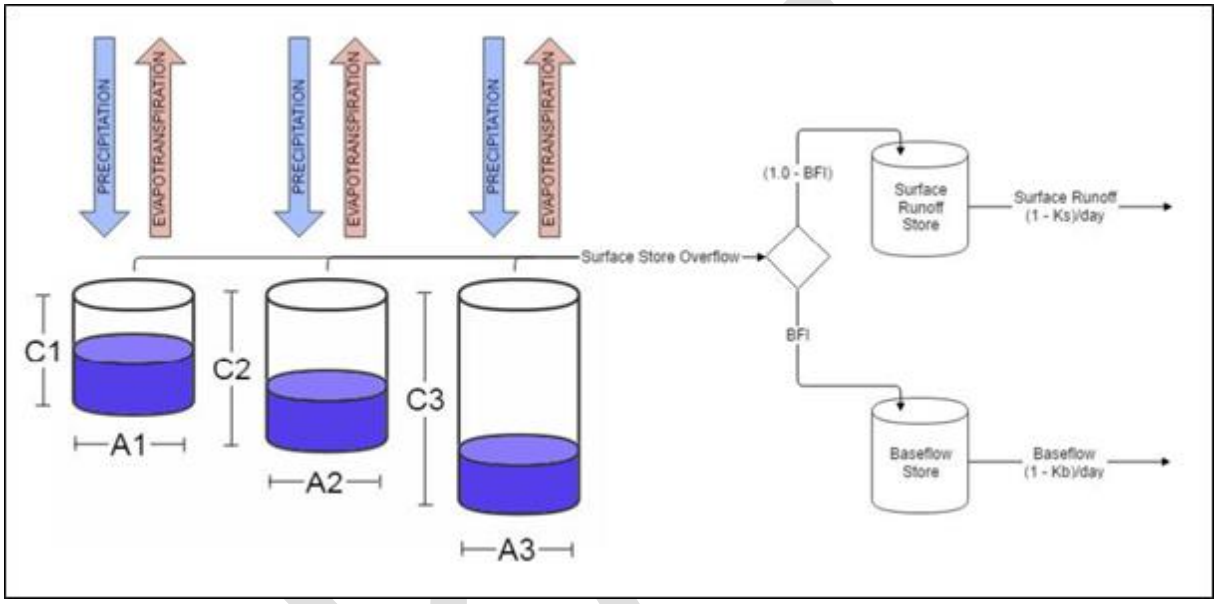


## 4.3 Model Development

### 4.3.1 Inflows and Adopted Runoff Model

Stormwater runoff estimations in the WBM were undertaken using the Australian Water Balance Model (AWBM). The AWBM is a surface runoff model that routes rainfall through a series of surface stores with defined depths, subtracting daily evapotranspiration rates to represent soil and surface conditions in site catchments **[2]**. The AWBM is an antecedent rainfall model, which considers the wetting and drying process that occurs over time. The model can represent a range of runoff conditions, based upon seasonal and climatic differences over the calendar year. A schematic of the AWBM model structure is depicted in **Diagram 2**.

**DIAGRAM 2: AWBM SCHEMATIC**




Source: Boughton, 2004 **[2]**

Where:

| | |
|---|---|
| C1 – C3 | = Surface Storage Capacities |
| A1 – A3 | = Partial Areas Represented by Surface Storages |
| BFI | = Baseflow Index |
| $K_b$ | = Daily Baseflow Recession Constant |
| BS | = Current Volume in Baseflow Store |
| $K_S$ | = Daily Surface Flow Recession Constant |
| S | = Current Volume in Surface Store Routing |

The catchment types and AWBM model parameters adopted are summarised in **Table 6.** Model parameters have been selected based on experience with similar water balance model studies and AWBM recommendations. No site data was available for calibration of catchment parameters.

**TABLE 6: AWBM MODEL PARAMETERS**

| AWBM Parameters | Split Areas (sum=1.0) | | | Storage Capacities (mm) | | | Ks (day-1) | BFI | Kb (day-1) |
|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | C1 | C2 | C3 | | | |
| **Natural** | 0.3 | 0.35 | 0.35 | 12 | 120 | 250 | 0 | 0.1 | 0.8 |
| **Hardstand** | 1 | - | - | 5 | - | - | 0 | 0 | - |
| **Waste** | 0.2 | 0.8 | - | 10 | 50 | - | 0 | 0 | - |
| **Open Cut** | 0.1 | 0.9 | - | 5 | 20 | - | 0 | 0 | - |
| **Tailings** | 0.2 | 0.8 | - | 5 | 50 | - | 0 | 0 | - |

Runoff calculated from the AWBM formed the only inflow to the pit storages. Groundwater was assumed to stay at a constant level for each pit.

#### 4.3.2 Outflows and Transfer Systems

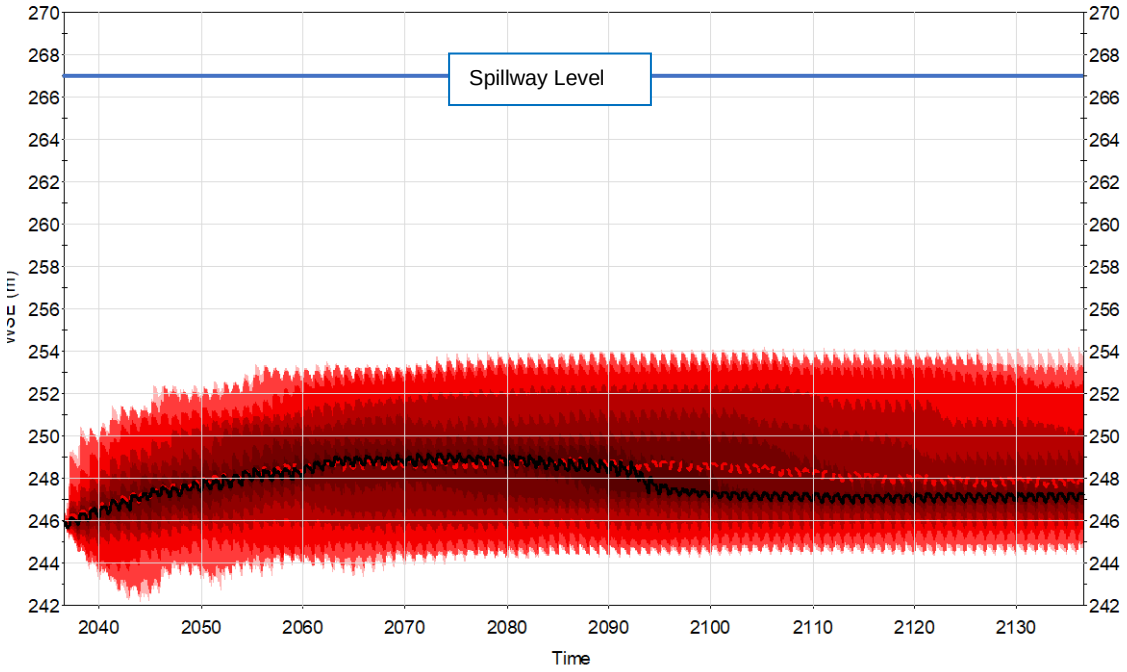
No outflows were modelled for the site other than natural evaporation. One transfer logic was included to divert potential spillage from Pit B to Pit A, which can be constructed as part of the closure phase earthworks.

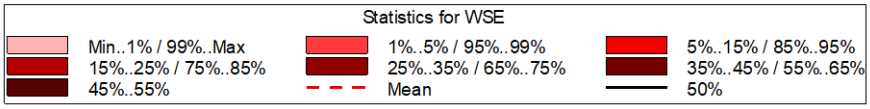
## 4.4 Water Balance Results

Outputs from the water balance modelling for each of the modelled storages are presented in **Graph 2** to **Graph 4.** Each graph provides a plot of maximum water elevation versus the model duration for each of the storages, presented as a combined plot for:

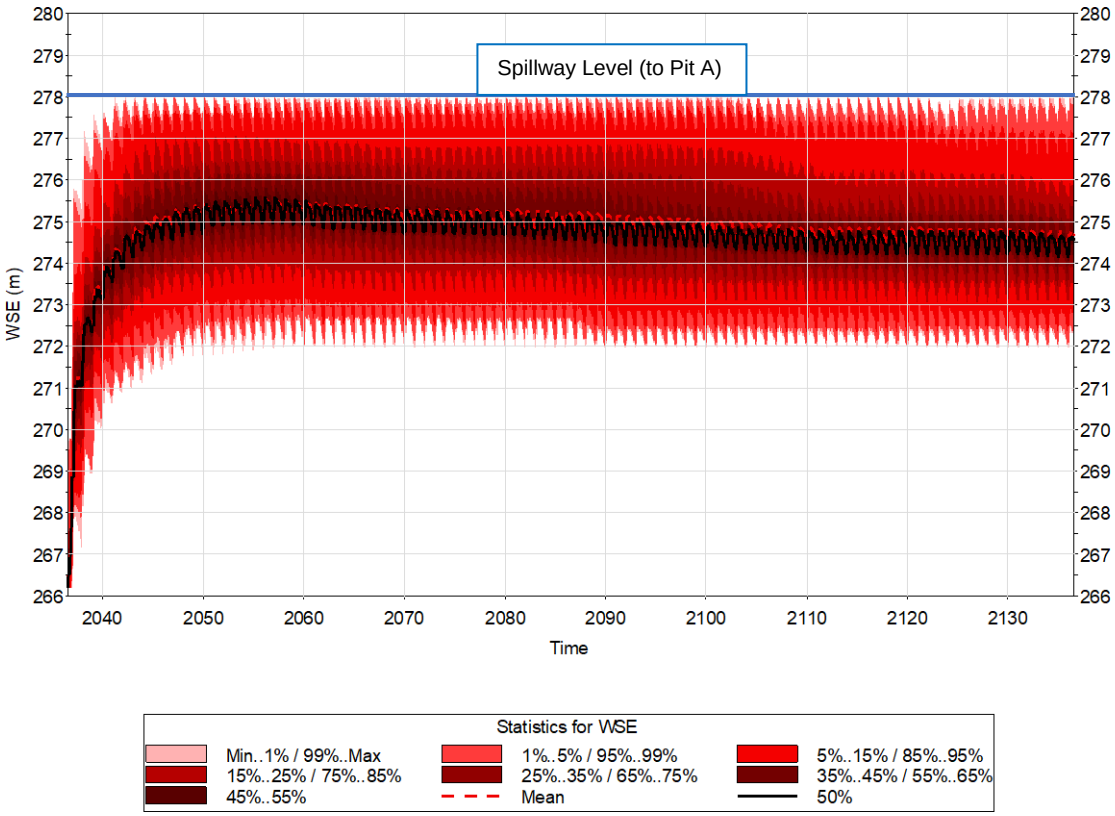
- Mean and median;
- Upper and lower bounds; and
- 5%, 25%, 75% and 95% (percentiles).

## GRAPH 2: COMBINED PIT A AND NORTH PIT MODELLED MAXIMUM WATER ELEVATION



## GRAPH 3: PIT B MODELLED MAXIMUM WATER ELEVATION



**GRAPH 4: DEEP LEAD MODELLED MAXIMUM WATER ELEVATION**

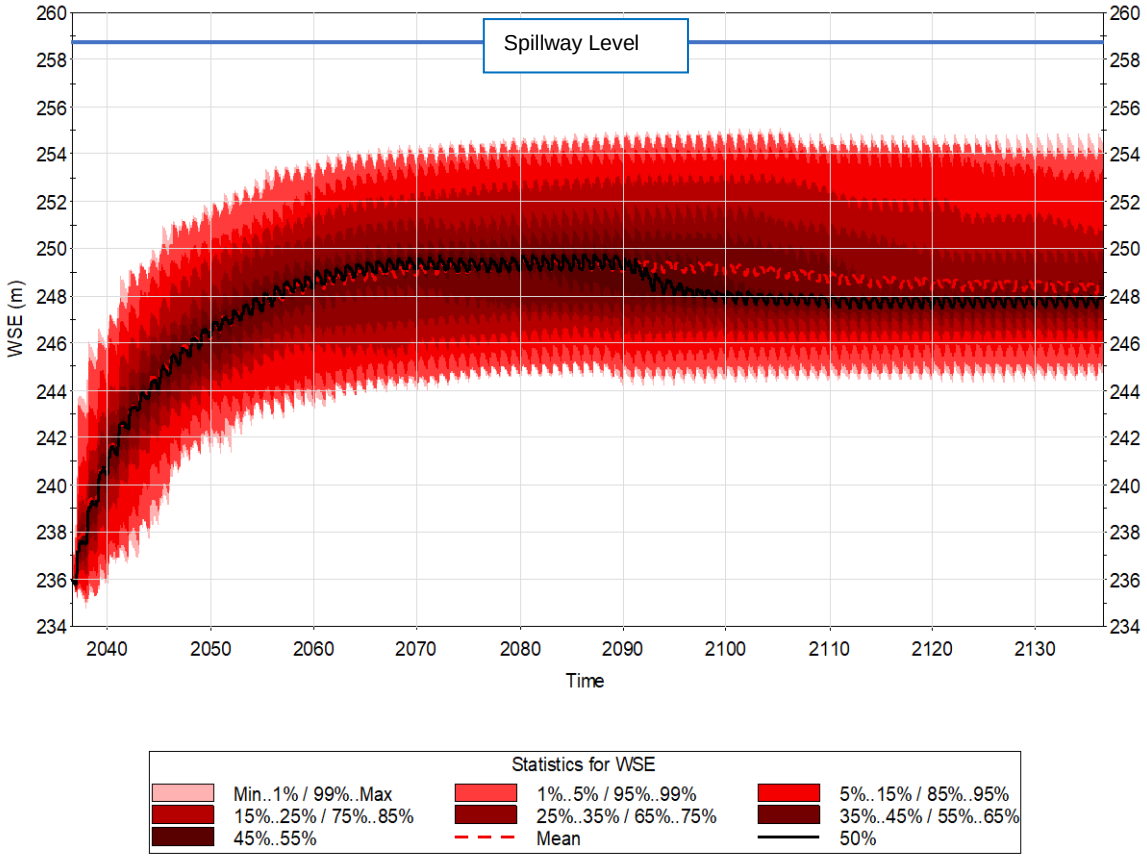



**TABLE 7: SPILL PROBABILITIES**

| Storage | Spill Probability (to 2130) |
|---|---|
| **Pit A and North Pit** | <1% |
| **Pit B** | <1% |
| **Deep Lead Pit** | <1% |

## 4.5 Performance Implications

Each pit appears to gradually increase in storage before fluctuating around a relatively consistent water level. This is due to the small contributing catchments to each pit, and the high evaporation rates for the region. It was found through the initial model development that Pit B had a slightly greater than 1% chance of spilling due to the existing spillway level and irregular geometry of the pit. The model was therefore adjusted to have a transfer logic from Pit B to Pit A if Pit B reaches the spillway level to reduce the risk of spilling. This can be achieved by re-locating Pit B's spillway to discharge into Pit A as part of rehabilitation earthworks. Refer to **Figure 002**, that illustrates the concept spillway location. This proposal results in a less than 1% chance of any of the site pits spilling to the downstream environment.

## 4.6 Key Assumptions

Due to the lack of site data, several assumptions had to be made in order to develop the WBM. The key assumptions are listed in **Table 8**.

**TABLE 8: KEY ASSUMPTIONS**

| Data | Recommendation |
|---|---|
| **Elevation Data** | Detailed site survey to be conducted to confirm pits storages, site contours, catchment delineations etc. WBM to be revised once adequate data is available. |
| **Groundwater Level** | To be estimated via monitoring bores and pit water levels and WBM to be revised once adequate data is available. |
| **Water Quality** | Pit water and monitoring locations to be recorded at regular intervals. WBM may need updates to confirm assumptions. |
| **AWBM Parameters** | On-site water management and runoff to be monitored where possible to allow calibration of WBM parameters. WBM may need updates to confirm assumptions. |

# 5 CLOSURE METHODOLOGY

## 5.1 Background

A conceptual closure plan has been developed by ATCW which informed the WBM undertaken (refer **Section 4)** and includes proposed drainage measures to be incorporated into the rehabilitation works. Generally, it is proposed that the closure mining catchments maintain a similar hydrology to that of the pre-mining scenario. The eastern post-mining catchments (Catchment A1-4) once rehabilitated will reduce the overall catchment area by approximately 30 ha as the residual voids are not proposed to discharge downstream. The post-mining western catchments (Catchment B1-2) will also slightly reduce (~12 ha) the overall catchment area when compared to the assumed pre-mining conditions. However, given the large catchment of the downstream Rosetta creek, it is expected that this will result in only minor localised changes to volumetric flow and stream velocities and is not of significance.

The following sections outline the indicative closure phase plan for the mine site, and generally is in accordance with the NRC **[7]** proposed rehabilitation methodology. Land-uses proposed are outlined in Schedule F – Table 1 of the site's EA and reproduced in **Section 1.3.2**.

The closure methodology outlines high level surface water management requirements and likely temporary erosion and sediment control measures. It is proposed to stage the rehabilitation works as two main Stages nominated below:

- Stage 1 – Rehabilitation of mine infrastructure areas, and eastern extent of the TSF.
- Stage 2 – Rehabilitation of the remaining western extent of the TSF.

Staging allows for more effective temporary erosion and sediment control by splitting up the rehabilitation works into two main work areas. Stage 1 aims to rehabilitate the eastern extent of the TSF by using the western extent (Stage 2) as a temporary water and sediment storage area. Once Stage 1 has achieved suitable vegetation cover, Stage 2 can be rehabilitated with the use of a temporary High Efficiency Sediment (HES) basin for erosion and sediment control. The HES basin can also provide water storage for Stage 2 irrigation to encourage vegetation establishment. It is proposed to re-locate the TSF spillway further east to allow the rehabilitation staging, however, this is dependant on detailed site survey which was not available at the time of this report.

The associated mine infrastructure areas and TSF are proposed to be rehabilitated to a Post-Mining Land Use (PMLU) as a Class VII land use (land not suitable for cultivation and only careful pastoral use) as per Schedule F – Table 1 of the EA. Class VII land use areas are to rehabilitated with vegetation and minimal changes to the topography. For all areas that drain to the TSF, no sediment basin would be required during the Stage 1 rehabilitation phase. The existing water storages within the site (TSF and runoff dam) would be adequate to contain sediment laden runoff (to be confirmed through future implementation of the site's operational water management plan) and can be used as irrigation water for vegetation establishment. There are some minor catchments as identified on **Figure 002**, that discharge directly downstream and therefore may need individual erosion and sediment control via bunding or temporary sediment basins whilst rehabilitation works are undertaken.

The pits are to be left as residual voids and form Non-use Management Areas (NUMA) under a Class VIII land use (unsuited to agricultural use or grazing areas). The runoff dam is to be left as a stock water source, also under a Class VIII land use.

## 5.2 Site Infrastructure Areas – Stage 1 Rehabilitation Areas

### 5.2.1 Process Area (assumed adjacent to the Admin Area)

The processing area is approximately 6.2 ha, and decommissioning of plant is to be undertaken including removal of all infrastructure. Localised re-grading may be required to fill in excavations and achieve free-draining grades. Rehabilitation through vegetation establishment is to be conducted to all disturbed areas. Runoff to be directed to the TSF storage area for water capture and sediment storage (refer **Section 5.3**). Land-use to be Class VII - Open Pasture.

### 5.2.2 Product Stockpile Area (stockpile locations vary across the site)

The product stockpile area is approximately 16 ha, with 14 ha being previously rehabilitated. Closure phase works are to rehabilitate any disturbed areas through vegetation establishment, in addition to locally re-grading batters to an erosion resistant slope (if required). Rehabilitation works may require removal of surface material up to 0.5 m deep, for disposal to Pit A due to potential low-level contamination **[7]**. The scattered 2 ha of stockpiled material areas can be placed on existing cleared areas, with the aim to bring the stockpiled areas back to pre-stockpile levels and to be vegetated. Land-use to be a PMLU, Class VII - Open Pasture.

### 5.2.3 ROM Pad

The ROM pad consists of approximately 100,000 $m^3$ of inert mine overburdern over an area of 3 ha. As stated by NCR **[7],** the ROM pad material is stable, and competent oxidised material extending to an approximate 5 m above surface. This material can be used for rehabilitation/capping of problematic site areas. The pad area itself requires re-grading to blend-in as a low hill and reduce erosion potential to the batter slopes before being rehabilitated through vegetation establishment. Runoff to be directed to the TSF storage area for water capture and sediment storage until suitable vegetation cover is achieved (refer **Section 5.3**). Land-use to be a PMLU, Class VII – Low Hill.

### 5.2.4 WRD

The waste rock dump has been previously rehabilitated and therefore is not expected to require any further rehabilitation works at the closure phase of the mine. However, during the next year (within 2022) of operations, it is recommended that mine operations undertake a new vegetation and establishment regime across the WRD to achieve a targeted vegetation surface cover of around 70%. Land-use to be a PMLU, Class VII – Low Hill.

### 5.2.5 Admin Areas, Abandoned Village, and other associated infrastructure pads

The admin, abandoned village, and associated infrastructure areas are to be decommissioned and rehabilitated through vegetation establishment, with minimal level changes proposed. Localised filling may be required to excavated areas, and/or to achieve free-draining grades prior to the surfaces being rehabilitated. Localised erosion and sediment control may be required during the rehabilitation works. Where possible, runoff is to be directed to the TSF storage area for water capture and sediment storage until suitable vegetation cover is achieved (refer **Section 5.3**). Land-use to be a PMLU, Class VII – Open Pasture, and Low Hill (Village).

## 5.3 Tailings Dam and Heap Leach Pad

The Tailings Dam (or TSF) including the heap leach pad, covers an area of approximately 72 ha and is to be classified as a PMLU, Class VII – Open Pasture land-use. Current fall on the TSF allows water to pond at the western end of the TSF, covering approximately 25 ha of area. The heap leach pad area covers an area of approximately 5 ha. Previous rehabilitation trials to the TSF surface cover an of 3.5 ha area within the southern portion of the overall TSF area. NCR **[7]** state that the tailings are considered consolidated, and suitable for earthworks. As mentioned in **Section 3.5**, the tailings are considered to have a low risk of acid forming potential. However, the material is saline and contains relatively soluble arsenic concentrations that may be of concern to rehabilitation **[7]**. The recommendation by **[7]**, is that a cover layer over the tailings is required to isolate the risks associated with arsenic levels.

One of NCR **[7]** suggestions is that the TSF could be left as a semi-permeant wetland due to the relatively consistent water level witnessed. However, a wetland on the TSF is not recommended by ATCW due to the following factors:

- It is not desirable to store water on the TSF due to likely spilling/overtopping and risks of dam erosion.
- It is not desirable to store water on the TSF due to likely seepage through the tailings and dam embankment.

- The wet and drying from water level fluctuations of the tailings material may erode the surface and expose underlying soils.

It is recommended that the TSF surface is capped and graded to achieve free-draining fall to the downstream environment. Rehabilitation works would benefit from splitting up the TSF catchment area and potentially re-locating the spillway. This would allow a north-south split (via bunding) throughout the rehabilitation works to separate the TSF areas into a western and eastern catchment. The eastern catchment (Stage 1) should be rehabilitated first, with the western catchment (Stage 2) being used as a water and sediment storage area to capture runoff from the disturbed areas. Following Stage 1 achieving suitable vegetation cover, Stage 2 can be rehabilitated and a temporary High Efficiency Sediment (HES) basin would likely be required to temporarily capture Stage 2 dirty water runoff during the rehabilitation works. The existing spillway could be decommissioned and cut in further east towards the natural Sugar Bag Creek line if levels allow adequate fall to this location.

Detailed design details are to be confirmed following an accurate and detailed survey pick-up. Furthermore, the cap design shall be addressed separately as part the detailed design and is likely subject to further rehabilitation trials. Detailed design of the surface grading will also need to be consider long-term settlement of the tailings to determine minimum grades.

## 5.4 Runoff Dam

The runoff dam is to be left as a water storage for stock water under a Class VIII – Water Storage land-use. Minor rehabilitation of embankment batters may be required to achieve vegetation cover.

## 5.5 Residual Voids (Pit A, Pit B, North Pit, Deep Lead Pit)

All pits are to be left as residual voids in the closure phase scenario as the WBM indicates there is a low likelihood (<1%) of spilling to the downstream environment provided the spillway of Pit B is re-directed to Pit A. Rehabilitation of the pits would require local spillway earthworks and installing safety measures due to being significant hazards. The pits are to be classified as a Class VIII – Open Void land-use, and is a NUMA.

Furthermore, the residual voids are clear of the regional flood extents as per the technical memorandum by ATCW (reference 121130-01M001.revA). Bunding along the eastern extent of the voids must be maintained post-closure to divert the natural flow to the east away from the pits.

# 6 CONCLUSIONS AND RECOMMENDATIONS

Solomons primarily owns and operates the Wirralie Gold Mine (WGM) site under EPML00772413 and took over the site in late 2013. Mining operations are proposed to be re-commenced, and Solomons have commissioned Wulguru Technical Services to provide assistance with the required Progressive Rehabilitation Closure Plan (PRCP) and Estimated Rehabilitation Cost (ERC). As part of the PRCP and ERC requirements, ATC Williams (ATCW) have been engaged by WTS to develop a concept closure plan methodology and a Water Balance Model (WBM) for the post-closure scenario.

The results of the WBM indicates that the four residual voids are not likely to spill (<1% chance) to the downstream environment, with the model run for over 100 years. This is provided the spillway of Pit B is diverted into Pit A as a mitigation measure. It should be made clear that the elevation data used in the WBM is coarse satellite data and may not provide an accurate representation of the site features and/or pit storage curves. The outcomes of this WBM are therefore high-level and a detailed site survey is required to confirm the modelling results. No climate change scenarios were modelled as part of the WBM.

A conceptual closure plan methodology was developed and the rehabilitation requirements were identified. This plan proposes to undertake rehabilitation in two stages. The concept closure plan proposes to decommission infrastructure areas and plant/machinery in order rehabilitate the areas and achieve vegetation growth with minimal changes to the site topography as part of Stage 1. The Tailings Storage Facility requires minor capping due to the saline nature of the material and relatively soluble arsenic concentrations. It is proposed to split the TSF catchment into two, Stage 1 will involve the rehabilitation of approximately half the TSF catchment area whilst allowing for temporary erosion and sediment control and water storage within the Stage 2 area. Stage 2 would then require re-locating the existing spillway location and potentially re-grading some of the tailings surface to achieve free-draining fall to the outlet. A HES Basin is likely required to capture dirty runoff during the rehabilitation works and enable water storage for irrigation to support vegetation growth. A semi-permanent wetland over the tailings surface is not supported.

The WBM and concept closure plan methodology presented in this report are generally in accordance with the Department of Environment and Science PRCP guidelines. It is recommended that the concept measures outlined in this report are adopted for future detailed designs and further investigations.

## REFERENCES


**[1]** Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors). *Australian Rainfall and Runoff: A Guide to Flood Estimation*. Commonwealth of Australia. 2019

**[2]** Boughton, W.J. *The Australian water balance model*. Environmental Modelling & Software. Vol. 19. pp.943-956. 2004

**[3]** Bureau of Meteorology (BOM). Design Rainfall Data System (2016). Accessed online: http://www.bom.gov.au/water/designRainfalls/revised-ifd. August 2021.

**[4]** Department of Environment and Heritage Protection (DEHP). Environmental Authority (EA) EPML00772413. September 2016.

**[5]** Environmental Geochemistry International (EGI). *Environmental Geochemical Assessment of the Wirralie Tailings Storage*. Prepared for Wirralie Mines Pty Ltd. 2002

**[6]** InterMap Elevation Data Suite. Satellite Elevation Data. Accessed August 2021.

**[7]** Northern Resource Consultants (NRC). *Wirralie Gold Project Plan of Operations.* Solomons Gold Pty Ltd. September 2016.

**[8]** Queensland Government. SILO Climate Data (2021). Accessed online: https://www.longpaddock.qld.gov.au/silo/view-point-data/. August 2021

**[9]** Queensland Government (2021), 'Progressive rehabilitation and closure plans (PRC plans)', Department of Environment and Science

**[10]** Queensland Government (1994), 'Environmental Protection Act'

**[11]** Woodward-Clyde Pty Ltd. *Wirralie Gold Mine – Preliminary Mine Waste Study*. Prepared for Ross Mining NL by Woodward-Clyde Pty Ltd. 1998

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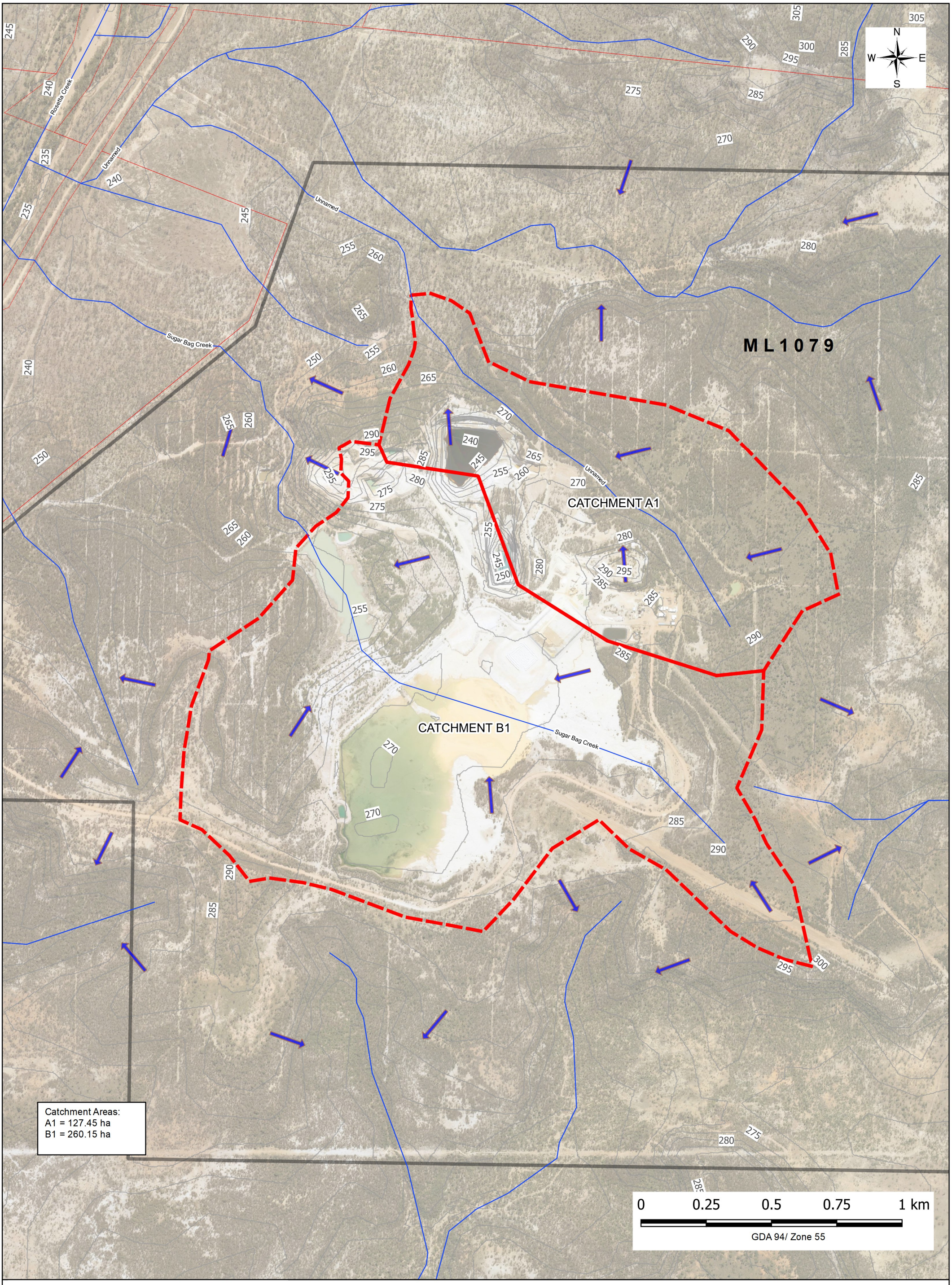
# FIGURES




LEGEND

- Pre-Mining Catchments
- Flow Directions
- Mapped Watercourses
- Mine Lease Boundary
- Satellite Contours (5m)

WIRRALIE GOLD MINE

ASSUMED PRE-MINING CATCHMENT PLAN

ATC WILLIAMS

**FIGURE 001**

121130-01

DATE: 2021-09-29

\\atcscmvpfps01\Synergy\Projects\121\121130 Wirralie Gold Mine\01 PRCP ERC

OVERFLOW FROM PIT B TO BE DIVERTED TO PIT A VIA NEW SPILLWAY. TO BE RE-CONSTRUCTED AT THE EASTERN EXTENT OF PIT B . EXISTING PIT B SPILLWAY TO BE DECOMMISSIONED

EXISTING BUND AROUND PIT A & NORTH PIT TO BE MAINTAINED TO DIVERT EXTERNAL CATCHMENT FLOWS

MINOR CATCHMENT AREA NOT DISCHARGING TO SITE PITS/WATER STORAGES. REQUIRES TEMPORARY EROSION AND SEDIMENT CONTROL AS PART OF REHABILITATION WORKS

MINOR CATCHMENT AREA NOT DISCHARGING TO SITE PITS/WATER STORAGES. REQUIRES TEMPORARY EROSION AND SEDIMENT CONTROL AS PART OF REHABILITATION WORKS

ROM PAD

ADMIN AREA & PROCESSING

HEAP LEACH PAD

INDICATIVE TEMPORARY STAGE 2 HES BASIN WHILST WESTERN TSF IS REHABILITATED. STAGE 1 TO HAVE ALREADY ACHIEVED SUITABLE VEGETATION COVER

POSSIBLE NEW SPILLWAY FOR TSF

STAGE 1:
TSF AREA AND SITE INFRASTRUCTURE AREAS TO BE REHABILITATED PRIOR TO STAGE 2

STAGE 2:
AREA OF TSF REHABILITATION TO BE USED FOR WATER AND SEDIMENT STORAGE FROM STAGE 1 UNTIL STAGE 1 ACHIEVES SUITABLE VEGETATION COVER

EXISTING SPILLWAY

TSF TO BE SPLIT INTO TWO CATCHMENTS FOR REHABILITATION WORKS VIA BUNDING. BUND TO BE DECOMISSIONED FOLLOWING ACHIEVING SUITABLE VEGETATION COVER TO THE TSF

ML1079

Site Features:
PA - Pit A
PB - Pit B
NP - Northern Pit
DLP- Deep Lead Pit
RD - Run-off Dam
TSF- Tailing Storage Facility

Catchment Areas:
A1 = 16.0 ha
A2 = 5.72 ha
A3 = 10.9 ha
A4 = 96.75 ha
B1 = 160 ha
B2 = 88.50 ha

EA Monitoring Points:
SW1 Tailings Dam Spillway
SW2 Tailings Dam Runoff Dam
TDPW Tailings Dam Ponded Water
SW5 Sugar Bag Creek
SBC Sugar Bag Creek (Release Pt 1)
DTP Drainage to Pit (Release Pt 2)

0 0.25 0.5 0.75 1 km

GDA 94/Zone 55

LEGEND

Catchment Areas
Mine Lease Boundary
Flow Directions
Mapped Watercourses
EA Monitoring Points
Satellite Contours (5m)
Spillway
HES Basin
Flow Diversion Bund

WIRRALIE GOLD MINE

SITE & CONCEPT CLOSURE PLAN

ATC WILLIAMS

**FIGURE 002**

121130-01

DATE: 2021-09-29

\\atcscmvpfps01\Synergy\Projects\121\121130 Wirralie Gold Mine\01 PRCP ERC

# APPENDICES

# APPENDIX A – MINE SITE LAYOUT FIGURES

524000 525000 526000 527000 528000 529000

7667000 7666000 7665000 7664000 7663000

2SM82

3570PH2142

3272SP237696

1SM837228

1SM837228

3272SP237696

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## CADASTRE

### Legend

- Wirralie Mining Lease
- Cadastre Whitsunday Shire

Credits:
Mine Lease boundary and QLD Cadastre
© State of Queensland (Department of Natural Resources and Mines) 2016.

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 180 360 720
Meters

N

Scale: 1:18,000 at A3

Northern Resource CONSULTANTS

Document Path: \\Nrc-desktop1tb_gis\GIS Projects\SolomonsNRC_data\WirralieMaps_mxd\160922_Wirralie_Cadastre.mxd

524000 525000 526000 527000 528000 529000

7667000 7666000 7665000 7664000 7663000

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## REHABILITATION OCTOBER 2001

### Legend

- Wirralie Mining Lease

**Rehabilitation Status**

- Contoured - No topsoil
- Never Disturbed
- Previously rehabilitated - ACM
- Topsoil Stockpile
- Topsoil by Delta
- Safety Bund

Credits:
Mine Lease boundary
© State of Queensland (Department of Natural Resources and Mines) 2016
Imagery supplied by Client 30/09/2010

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 180 360 720
Meters

N

Scale: 1:18,000 at A3

Northern Resource CONSULTANTS

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524000 525000 526000 527000 528000 529000

7667000 7666000 7665000 7664000 7663000

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## REMNANT VEGETATION

### Legend

- Wirralie Mining Lease
- Watercourse

Remnant Vegetation

Status

- Endanagered-dominant
- Endangered-subdominant
- Of Concern - dominant
- Of Concern - subdominant
- Least Concern

Credits:
Mine Lease boundary
© State of Queensland (Department of Natural Resources and Mines) 2016
Imagery supplied by Client 30/09/2010

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 180 360 720
Meters

N

Scale: 1:18,000 at A3

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524000 525000 526000 527000 528000 529000

7667000 7666000 7665000 7664000 7663000

Pit A
Pit B
North Pit
Deeplead Pit
ROM
Admin Offices
Runoff Dam
Rehabilitated WRD
TSF
Village

Document Path: \\Nrc-desktop\1tb_gis\GIS Projects\SolomonsNRC_data\WirralieMaps_mxd\160922_Wirralie_Site Infrastucture.mxd

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## SITE INFRASTRUCTURE

### Legend

- Wirralie Mining Lease
- Site Infrastructure
- Rehabilitated Areas
- Topsoil Stockpiles
- Rehabilitation - Safety Bund

Credits:
Mine Lease boundary
© State of Queensland (Department of Natural Resources and Mines) 2016
Imagery supplied by Client 30/09/2010

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 180 360 720
Meters

N

Scale: 1:18,000 at A3

Northern Resource CONSULTANTS

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7667000 7666000 7665000 7664000 7663000

2SM82

260 250 250 270 280 260 250 260 270 280 290 290 300 310 300 290 290 300 300 270 290 270

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## TOPOGRAPHY AND WATERCOURSES

### Legend

- Wirralie Mining Lease
- Elevation contours (10m intervals)
- Watercourses

Credits:
Mine Lease boundary
© State of Queensland (Department of Natural Resources and Mines) 2016
Imagery supplied by Client 30/09/2010

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 180 360 720
Meters

N

Scale: 1:18,000 at A3

Northern Resource CONSULTANTS

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527000
527500
528000
7664500
7664000

Runoff Dam
Rehabilitated WRD
Process Plant
Admin Offices
Heap Leach
TSF
Semi Permanent Indundation
Permanent Wetland
Rehabilitation Trials

# SOLOMONS GOLD

## WIRRALIE GOLD MINE MOUNT COOLON

## TAILING STORAGE FACILITY OVERVIEW

## Legend

- Site Infrastructure

**Tailing Storage Facility Overview**

- TSF - 42Ha
- Heap Leach - 5Ha
- Rehabilitation Trials - 3.5Ha
- Semi Permanent Indundation - 5Ha
- Permanent Wetland - 25Ha

Credits:
Imagery supplied by Client
30/09/2010

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator
Datum: GDA 1994
Date: 22-Sep-16

0 45 90 180
Meters

N

Scale: 1:4,500 at A3

Northern Resource CONSULTANTS

Document Path: \\Nrc-desktop\nb_gis\GIS Projects\Solomons\NRC_data\Wirralie\Maps_mxd\160922_Wirralie_TSF Overview.mxd