AngloGold Ashanti Australia Ltd

Sunrise Dam Gold Mine

Licence L8579/2011/2 Amendment Application Supporting Document - CTD TSF Stage 12

April 2025

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1 INTRODUCTION

1.1 Background

AngloGold Ashanti Australia Limited (AGAA) operates the Sunrise Dam Gold Mine (SDGM/Project) in the Eastern Goldfields of Western Australia. SDGM is an open pit and underground mining operation with gold bearing ore processed onsite through a conventional carbon in leach (CIL) process plant. The site is located approximately 55 km south of Laverton.

Under Part V of the *Environmental Protection Act 1986*, AGAA operates under Prescribed Premises Licence L8579/2011/2 with categories 5, 6, 52, 54, 57 and 64 (**Error! Reference source not found.**). SDGM's operations are located on M39/1116 and L38/176 which form the premise boundary of L8579/2011/2 (

Figure 1).

Table 1: Prescribed Premises Categories at SDGM

Category	Nominal Throughput or Limit
5 – Processing or beneficiation of metallic or non-metallic ore	5,500,000 tpa
6 - Dewatering	5,000,000 tpa
52 - Electrical power generation	48 MW
54 - Sewage facility	250 m^3/day
57 – Used tyre storage	1,000 tyres
64 - Class II putrescible landfill site	10,000 t/year

Since 1999, tailings at SDGM have been deposited in the Centrally Thickened Discharge Tailings Storage Facility (CTD TSF). This application seeks approval to raise the CTD TSF embankment to increase tailings storage capacity. The CTD TSF and the works conducted under this Licence Amendment will occur on tenement M39/1116.

1.2 CTD TSF

The CTD TSF is located approximately 2 km south east of the SDGM Processing Plant. Unlike a traditional paddock or valley fill TSF, the CTD discharges thickened tailings from a central causeway via a series of spigots, creating a convex, inverted cone. The central tailings cone is higher than the perimeter embankments, which serve as drainage collection berms. As the tailings settle, supernatant runs off the surface where the majority evaporates, and the balance collects around the edge of the facility. Supernatant and incidental rainfall that collects at the outer embankments of the CTD then flows clockwise (westward) towards the decant ponds located immediately adjacent to the Stormwater Storage Pond (SSP).

Supporting infrastructure for the CTD TSF includes:

- a network of seepage interception trenches (Northern, Southern and Eastern and Stage 10 seepage interception trenches),
- three recovery production bores (CTDRB1, CTDRB2 and CTDRB3),
- the Eastern Diversion Levee and
- the Northern and Southern Diversion Drains. An overview of the facility is shown in Figure 2.

Over its 26 years of operation, the CTD TSF has experienced a number of capacity increases (Stage 1-Stage 11), culminating in the present application seeking approval for Stage 12.

- 1999 – Stage 1 initial CTD embankment constructed.
- 2001 – Stage 2 included extension of the crescent shaped perimeter starter embankment to form a circular perimeter embankment.
- 2003 – Stage 3 comprised a downstream raise of the western perimeter embankment to, an extension of the deposition causeway and an increase in height.
- 2005 – Stage 4 comprised a lateral expansion of the facility by up to 160 m on its eastern flank and a combined upstream and downstream raise of the remainder of the perimeter embankment and a raise of the discharge causeway. The stormwater storage pond capacity was also increase by raising the stormwater storage pond (SSP) embankments.
- 2008 – Stage 5 comprised a combination of downstream and centreline raising of part of the perimeter embankment and raising of the discharge causeway.
- 2009 – Stage 6 comprised a centreline raise of the discharge causeway.
- 2010 – Stage 7 comprised a centreline raise of the discharge causeway.
- 2012 – Stage 8 comprised a raise of the causeway.
- 2013 – 2015 – Stage 9, comprised a partial hybrid raise (downstream raise south of the causeway and upstream raise north of the causeway) of the perimeter embankment by an The original lined decant pond within the SSP area was replaced with a larger pond.
- 2017 – 2018 – Stage 10, comprised the perimeter expansion of the CTD TSF to the south-east which included an extension of the SSP.
- 2017 – 2018 – Stage 11 was an upstream raise of the existing perimeter embankment (pre-stage 10 expansion).

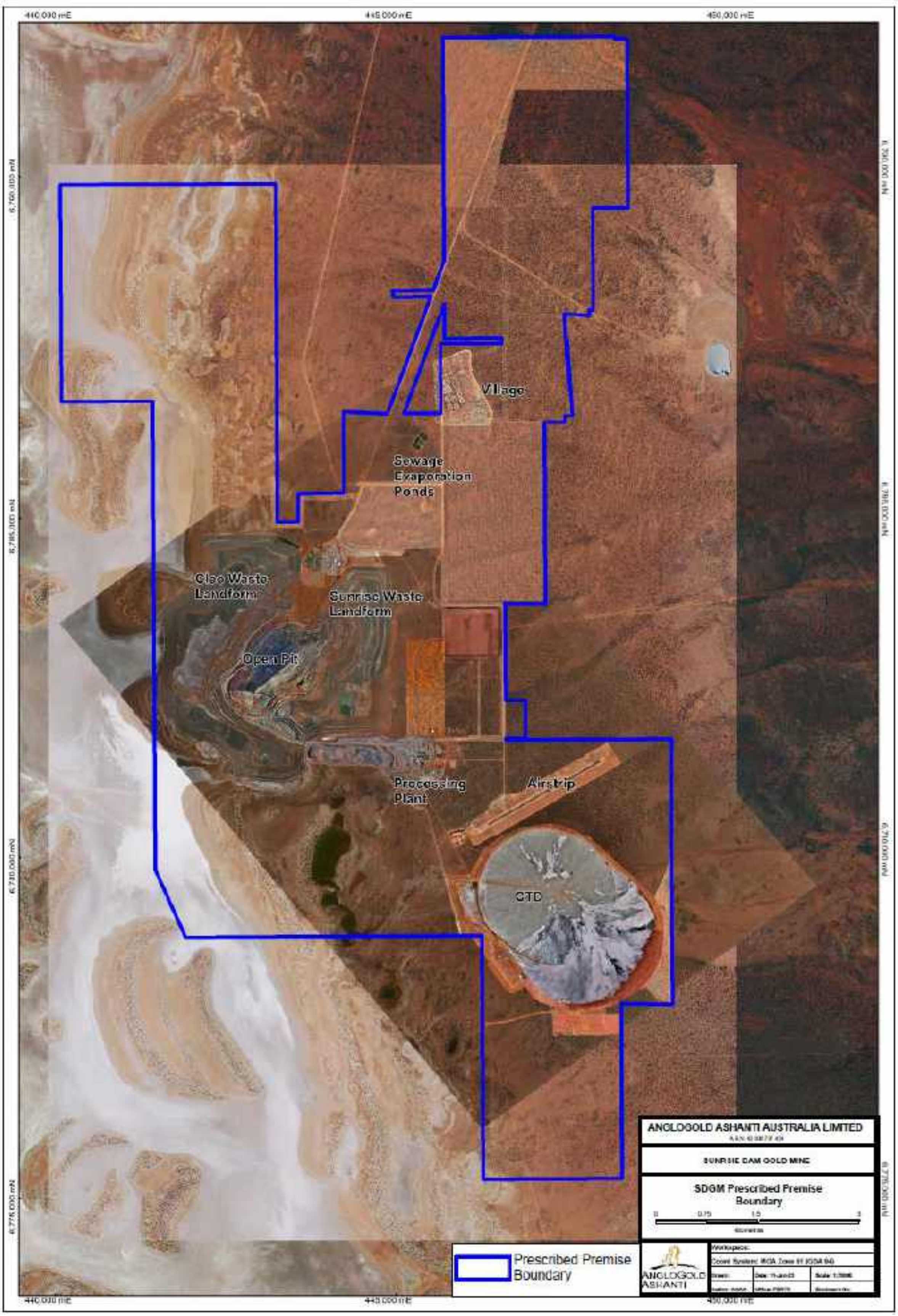


Figure 1 Prescribed Premises Boundary

Figure 2 SDGM Site Layout and CTD TSF Key Features

2 PROPOSED ACTIVITIES

The CTD TSF operates under Licence L8579/2011/2. This Licence Amendment application seeks to increase tailings storage at the CTD TSF by conducting a raise of the existing outer perimeter embankment in the southern half of the facility (the current Stage 10 embankment). The perimeter embankment will be raised by a total of up to 2 m to 6 m high in two sub-stages. As stage 12 of the CTD TSF is an embankment raise rather than an area extension, minimal clearing is required for the CTD TSF facility. Clearing will be required to expand the borrow pit area for construction materials, works around the perimeter of the CTD TSF, and other infrastructure.

3 CTD TSF STAGE 12 EMBANKMENT RAISE

3.1 CTD TSF Embankment Raise

The primary change for Stage 12 of the CTD TSF involves a downstream raise of the southern (Stage 10) perimeter embankment around the CTD TSF from 406-410 mRL to 409-415 mRL. It is currently planned to conduct the embankment raise via two sub-stages, Stage 12A and Stage 12B.

Overall, the upstream batter of the embankment raise will be 1V: 2H whereas the downstream batter will be 1V:3H.

The CTD TSF Stage 12 embankment raise is designed to connect directly with the existing north and south abutments of the original CTD TSF (the original circular shape has since been elongated by the Stage 10 expansion) and slopes at approximately 0.1 % from the north to the south abutment (Figure 3).

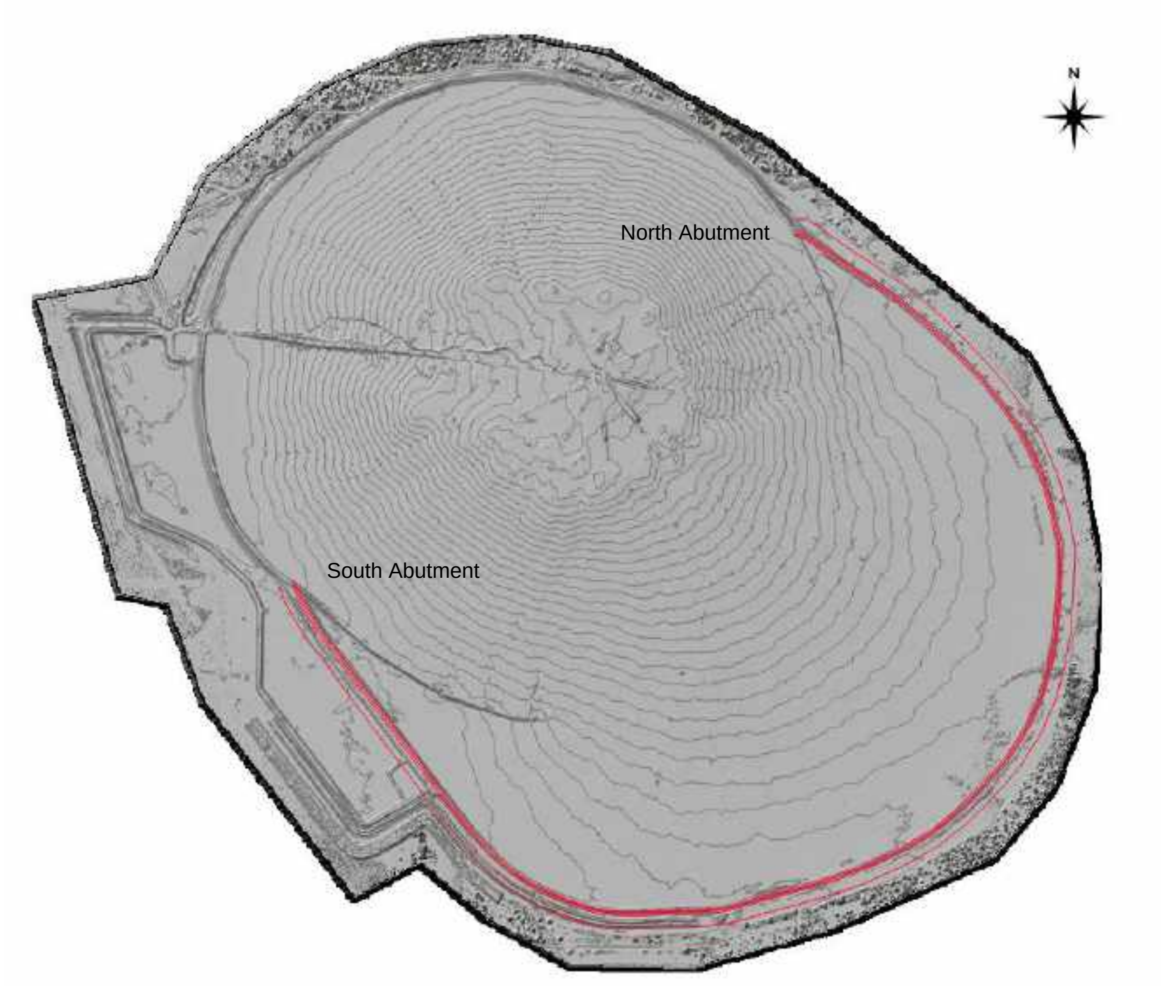


Figure 3: Location of CTD TSF Stage 12 Embankment Raise. Proposed Stage 12 Raise Extent Shown in Red

In practical terms, the CTD TSF Stage 12 embankment raise will be increased by a total height of between 2 m and 6 m depending on location over two sub-stages (as shown in Figure 4), using standard downstream construction practices.

3.2 Proposed Amendments to Licence L8579/2011/2

The current licence does not have construction conditions regarding the CTD TSF as the facility has been constructed to its permitted limits. AGAA proposes the following insertions in Condition 11 and Table 5 of Licence L8579/2011/2 (Licence format as at April 2025).

Table 2: Proposed Changes to Table 5 of Licence L8579/2011/2

Column 1 Infrastructure	Column 2 Specifications
CTD TSF Southern Perimeter Embankment raises from 406-410 mRL to 409-415 mRL	Stage 12A embankment raise to elevations between 409-414 mRL Stage 12B embankment raise to elevations between 410-415 mRL

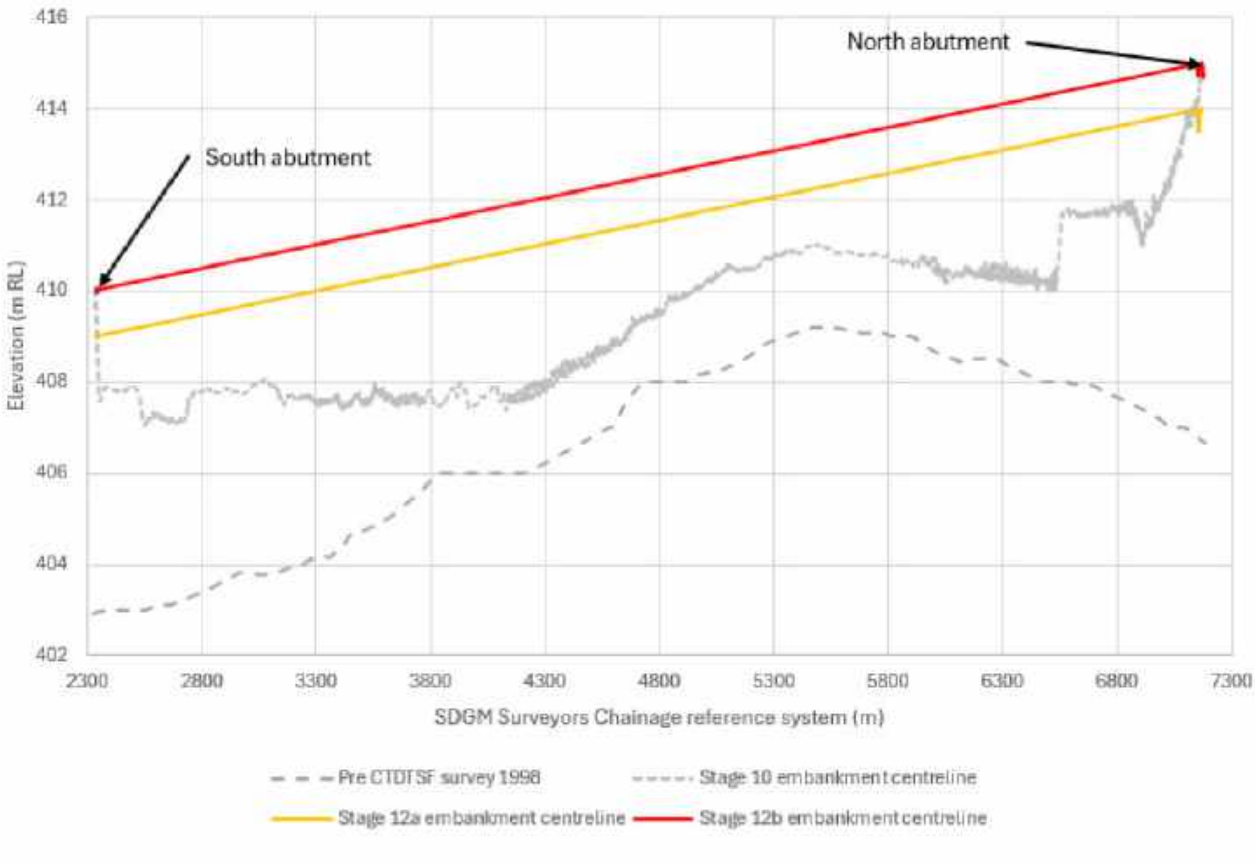


Figure 4: Long Section Showing Milestone Heights of the CTD TSF Stage 12A & 12B Embankment Raises

Whilst the overall CTD TSF Stage 12 embankment raise will increase the tailings storage capacity at the CTD TSF by approximately ~15 Mm^3 (or ~24 Mt) of tailings, the differences between Stage 12A and Stage 12B are presented in Table 3. The overall CTD TSF storage capacity is summarised in Table 4.

Table 3: CTD TSF Stage 12A and Stage 12B Parameters

Item	Stage 12A	Stage 12B	Stage 12 Total
Expected Southern Embankment Crest Elevation (mRL)	409 to 414	410 to 415	409 to 415
Tailings Storage Volume (m^3)	12,056,111	2,870,840	14,926,951
Expected Life of Design (assuming 4.1 Mtpa)	4.9 years (approximately 1,750 days)	1.1 years (approximately 420 days)	6.0 years (approximately 2,180 days)

Table 4 Storage Capacity Summary

Design Stage	Storage Capacity		
	Volume (Mm^3)	Tonnage (Mt)	Years
Existing (Dec 1999 – Mar 2026)	52.99	94.74	26.3
Stage 12A	12.06	19.89	4.9
Stage 12B	2.87	4.74	1.1
Stage 12 Total	14.93	24.63	6.0
Total End Stage 12	67.92	119.37	32.3

Notes:
Existing denotes existing facility through to the expected full capacity of Stage 10/11
Values calculated using a deposition rate of 4.1 Mtpa and a tailings density of 1.65 t/m^3

To maximise use of construction materials, the embankment design utilises four grades of material:

- Zone 1 Embankment Fill Material - low-permeability fill used as the primarily construction material for the embankment construction works.
- Zone 3 Safety Windrow Material – fill material used to construct the safety windrows (windrow construction material can comprise Zone 1 recovered as part of the embankment trimming works).
- Zone 4 Wearing Course Material – gravel sheeting used to provide the wearing course to support all weather vehicular access.
- Zone 5 Erosion Protection – coarse, durable waste rock for SSP spillway modification.

Prior to placement of fill, the embankment footprint will be tyned, watered, and proof compacted. The moisture conditioned fill material will be placed in horizontal layers not exceeding 300 mm thickness and compacted to a minimum density ratio of 95% Standard Maximum Dry Density (SMDD) using a pad foot or grid roller. Compaction control tests on placed fill will be undertaken using nuclear densometer and standard compaction tests at a minimum frequency of 1 test per 1,000 m^3.

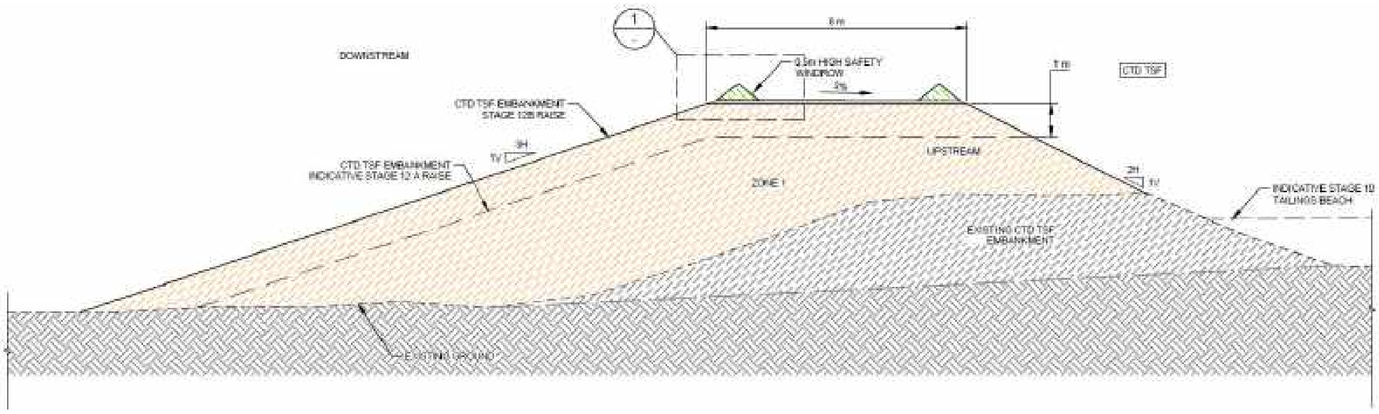


Figure 5: Typical Downstream Raise Construction Profile for CTD TSF Stage 12A and 12B

3.3 Stormwater Storage Pond Amendments

Whilst the Stormwater Storage Pond (SSP) does not require raising, updated hydrological modelling suggests minor modifications are required to ensure the SSP spillway can permit passage of a 0.1% AEP flood event, conservatively assuming pre-flood pond level elevation is at the spillway invert level. To achieve this, the SSP embankment crest will be regraded to a uniform crest elevation and a gravel wearing course layer of 100 mm nominal thickness will also be placed on the embankment crest to provide all weather access, resulting in a design crest elevation of 405.7 mRL. The spillway elevation will be increased by 100 mm to 405.2 mRL.

3.4 Other Infrastructure Upgrades and Activities Related to the CTD TSF

Several other minor upgrades are planned to be completed in association with the Stage 12 CTD embankment raise. These include:

- Extension of the existing Eastern Diversion Levee by 160 m to the north to control potential stormwater bypassing the levee (Figure 6). Diversion levee construction will utilise zone 1 material which will be placed, conditioned and compacted.
- Connection of the Stage 10 seepage interception trench with the southern seepage interception trench (Figure 7). Recent numerical groundwater modelling indicates connection of the two trenches provides improved capacity to control groundwater levels by intercepting groundwater over a greater section of the western CTD TSF perimeter. This will require excavation in the area between the two trenches on the western side of the CTD TSF.

3.5 Borrow Pit Extension

To facilitate construction of CTD TSF Stage 12 embankment raise, an extension to the borrow pit east of the CTD TSF is required (shown in Figure 6). This is regulated by DEMIRS and is not a prescribed activity under Part V of the *Environmental Protection Act 1986*.

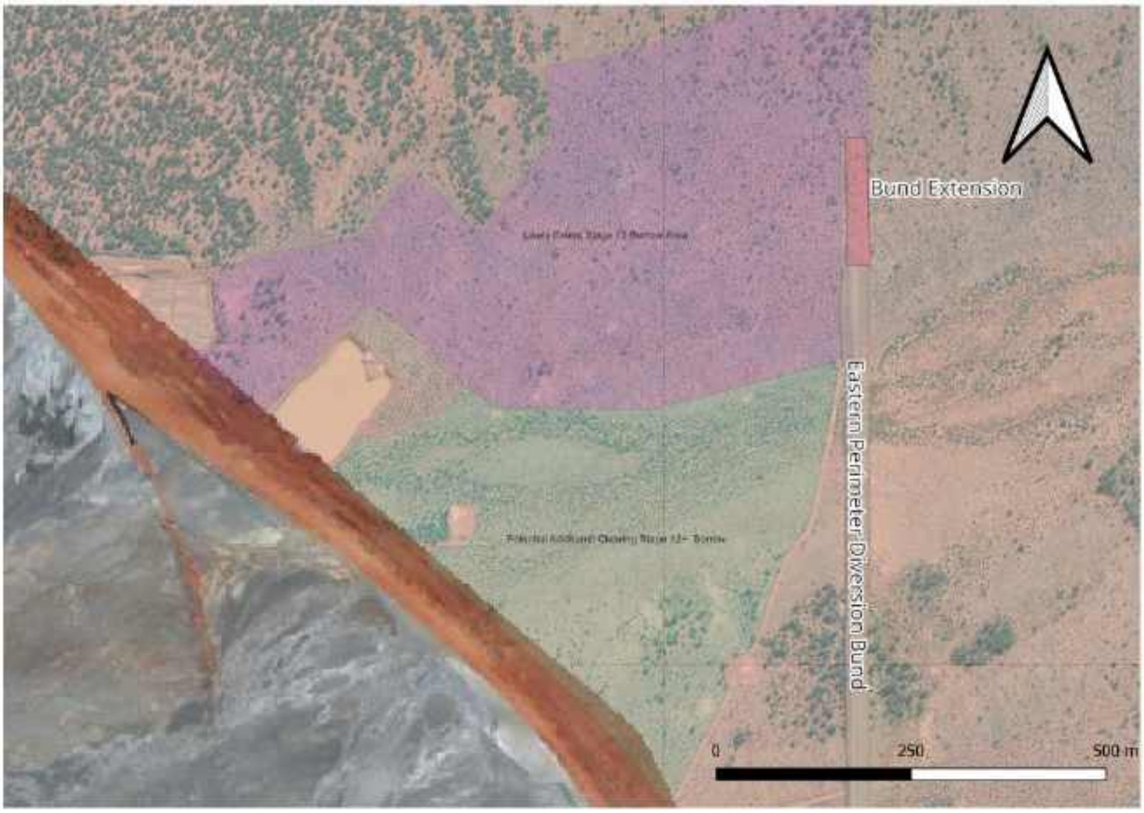


Figure 6: Proposed Extension of the Eastern Diversion Levee

Figure 7: Proposed Linkage of the Southern Seepage Interception Trench with the Stage 10 Seepage Interception Trench

3.6 Summary of Design Features for the CTD TSF Embankment Raise

Design features discussed in Section 3 are summarised in Table 5.

Table 5: Key Design Features for the CTD TSF Stage 12 Embankment Raise

TSF Design Feature	Detail
Embankment Crest Level	409-415 mRL (total Stage 12)
Crest Width and Slope	8 m 2% towards upstream crest
Estimated Storage Capacity	Additional ~15 Mm^3 (or 24.6 Mt) of tailings storage to a maximum 119.4 Mt
Freeboard Total Operational/Vertical	At least 0.8 m around the Stage 12 perimeter embankment Stormwater Storage Pond (0.5 m freeboard).
Embankment Overall Slopes Perimeter Embankment (Upstream) Perimeter Embankment (Downstream)	1V:2H 1V:3H
Embankment Construction	Zone 1 Embankment Fill Material - low-permeability fill used as the primarily construction material for the embankment construction works. Zone 3 Safety Windrow Material – fill material used to construct the safety windrows (windrow construction material can comprise Zone 1 recovered as part of the embankment trimming works). Zone 4 Wearing Course Material – gravel sheeting used to provide the bearing course to support all weather vehicular access. Zone 5 Erosion Protection – coarse, durable waste rock for SSP spillway modification.
Operational Emergency Spillway	Spillway between CTD TSF and Stormwater Storage Pond designed to pass the maximum flow from a 1 in 1,000 year storm. Required spillway size is 200 m with a spillway invert level 0.5 m below the embankment crest.
Design Storm Storage Allowance	Stormwater Storage Pond designed to contain at least a 1 in 100 year 72 hour rainfall event
Earthquake Loading Operating Basis Earthquake (OBE) Safety Evaluation Earthquake (SEE) Post Closure	0.0186 g (0.1% AEP) 0.0415 g (0.01% AEP) Maximum Credible Earthquake
Minimum Factor of Safety Long-term Drained Short-term Undrained (no potential loss of containment) Post peak (post-seismic)	1.5 1.3 1.05-1.10
TSF Consequence Hazard Ratings DMIRS ANCOLD GISTM	HIGH Category 1 High A (Dam Failure) and Significant (Spill) Very High

4 STAKEHOLDER CONSULTATION AND APPROVALS

Key elements of the receiving environment (or receptors) are discussed here to inform the environmental values which are potentially at risk of being impacted by stage 12 of the CTD TSF.

4.1 Consultation

4.1.1 DWER Part V

AGAA held a meeting with DWER representatives Christine Pustkuchen, Manager Resource Industries - DWER, and Adam Davini, Environmental Officer - DWER, on 31 October 2024 to discuss the Stage 12 embankment raise of the CTD TSF. Key points raised by DWER include:

- DWER advised a Licence Amendment would be appropriate for the CTD TSF.
- If required and appropriate, DWER will consider requests for prioritisation of Licence Amendment applications.
- DWER current assessment timelines vary dependent on project. AGAA should allow 90 business days for the CTD assessment.
- Groundwater impacts, in particular mounding, will be the focus of the CTD TSF Licence amendment assessment.
- DWER will only authorize embankment raises which will be executed within a 3 – 5 year period.
- DWER anticipate the CTD TSF application with be sent for internal technical review by a hydrogeologist.

4.1.2 DEMIRS

AGAA held a meeting with DEMIRS representatives Rachel Parker, Acting Team Leader Goldfields and Ana Mesquita, Environmental Officer, on 30 January 2025 to discuss the Stage 12 embankment raise of the CTD TSF. Key points raised by DEMIRS include:

- DEMIRS advised water management at the CTD TSF is required to be addressed in the mining proposal.
- DEMIRS recommended that CTD TSF closure trials be planned and commenced in the near-term.
- DEMIRS requested the mining proposal contain all information required as per DEMIRS mining proposal guidelines and preparation of a TSF design report.
- Submission of a stand-alone mining proposal for the CTD TSF will be acceptable, based on the potential for AGAA to have two mining proposals under assessment simultaneously.
- DEMIRS suggested AGAA consider using the MDCP Standard Outcomes and Risk Assessment even if it is mining proposal format.
- Post meeting via email correspondence, DEMIRS confirmed that where a mining proposal is submitted and still under assessment by DEMIRS at the time the MDCP framework goes live (~ April/May), the mining proposal will be taken to be a MDCP and an Approvals Statement issued following assessment and approval of activities.

At the time of submission of this Licence Amendment, a mining proposal is being prepared for submission to DEMIRS to enable parallel processing.

5 RECEIVING ENVIRONMENT

Key elements of the receiving environment (or receptors) are discussed here to inform the environmental values which are potentially at risk of being impacted by the Stage 12 embankment raise of the CTD TSF.

5.1 Setting, Location and Other Users

SDGM is located on the southern portion of the Archaean Laverton Tectonic Zone, within the Yilgarn Block of Western Australia. The regional geology is defined by a deep profile of transported (aeolian, alluvium, colluvium) and laterised soils and palaeochannel deposits above weathered and fractured Archean bedrock.

The area is within the Eastern Murchison subregion of the Murchison Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (Thackway and Cresswell, 1995). This subregion is characterised by internal drainage and extensive areas of elevated red desert sandplains with some breakaway complexes and minimal dune development. Salt lake systems feature within the region and are associated with occluded palaeodrainage systems. Vegetation is predominantly mulga woodland, rich in ephemerals, hummock grassland, saltbush shrublands and *Tecticornia* shrublands (Cowan 2001).

SDGM is situated on the Mt Weld Pastoral Station (owned by Gold Fields Limited), as the only overlapping land use. The nearest town is Laverton ~50 km north of SDGM. Immediately west of SDGM is Lake Carey, a large salt lake. The CTD TSF itself is approximately 3 km east of the shore of Lake Carey. The nearest active mine sites are the Mt Weld Rare Earths Mine (28 km north-northeast of SDGM) and the Granny Smith Gold Mine (33 km north).

5.2 Hydrogeology

SDGM lies within the proclaimed Goldfields Groundwater Area. The regional stratigraphy consists of at least four distinct lithological groups, namely:

- Quaternary aeolian, alluvium and lake deposits;
- Cenozoic laterite weathering profile;
- Cenozoic alluvial/colluvial deposits; and
- Archaean basement.

The surface formations have undergone significant weathering and diagenetic alteration throughout the Cenozoic Era, developing a deep lateritic profile. The predominantly gneissic Archaean basement was once incised by ancient NNE draining streams, which are now buried beneath at least 30 m of Cenozoic alluvium and clayey colluvium deposits. The basement and Cenozoic deposits have in turn been subjected to millions of years of continuous lateritic weathering, which has created a gently undulating semi-arid terrain with generally low relief.

Regionally identified aquifers include:

- Superficial formations of variably cemented ferruginous pisolitic gravel and coarse sand beds to hardcap.
- Transported palaeochannel sands and gravel.

- Fractured zones in highly and moderately weathered Archaean bedrock which underlies all areas.
- Saprolite and massive fresh rock aquitards in the profile with infrequent fracture zones provide limited linkage between the superficial and fractured rock aquifers.

The largest and most productive aquifers are the fractured transitional zone and deeper palaeochannel deposits.

Overprinting the groundwater setting at SDGM are the following events impacting groundwater levels:

- Open pit and underground dewatering and the subsequent cone of depression.
- Tailings deposition into TSF1 between 1998 and 2000.
- Tailings deposition into CTD TSF since 2000 resulting in groundwater mounding.
- The operation of multiple borefields, of most relevance to the CTD TSF is the recently commissioned (2022) Bravo borefield ~ 2.5 km north of the CTD TSF.

5.2.1 Baseline Groundwater Conditions

Prior to construction of the CTD TSF, groundwater recharge was driven by a combination of rainfall from within and up-gradient of the site and throughflow from up-gradient areas to the northeast. The inferred flow direction is generally from east to west. Interpreted baseline groundwater level contours for the CTD TSF area are displayed on Figure 8. Locally, minor influences of permeable paleochannel sediments have been included in the interpretation.

Regionally, the depth to groundwater decreases with proximity to Lake Carey. West of the CTD TSF and close to Lake Carey, the shallow depth to groundwater permits the significant discharge of groundwater and accumulation of salt within groundwater via evapotranspiration. Baseline groundwater salinity levels beneath and surrounding the CTD TSF varied from brackish (approximately 1,200 mg/L TDS) at the groundwater table (CTDMB27C in 2005) to approximately 126,000 mg/L TDS within the bedrock (CTDMB11A in 1999). These salinities are the result of natural salt accumulation processes linked to recharge, throughflow rates and proximity to regional discharge sites such as Lake Carey (AGAA, 2024).

5.2.2 Aquifer Recharge

Groundwater levels in the vicinity of the CTD TSF and Sunrise Dam as a whole are most sensitive to large rainfall and surface flooding events. Large rainfall events in 2011, 2017 and 2024 resulted in historic high groundwater levels which then slowly recede over subsequent years (AGAA, 2024; Figure 9). For context, 111 mm of rainfall recorded on 17 February 2011 was the equivalent of a 1 in 50 year 24 hour event (WSP 2023a).

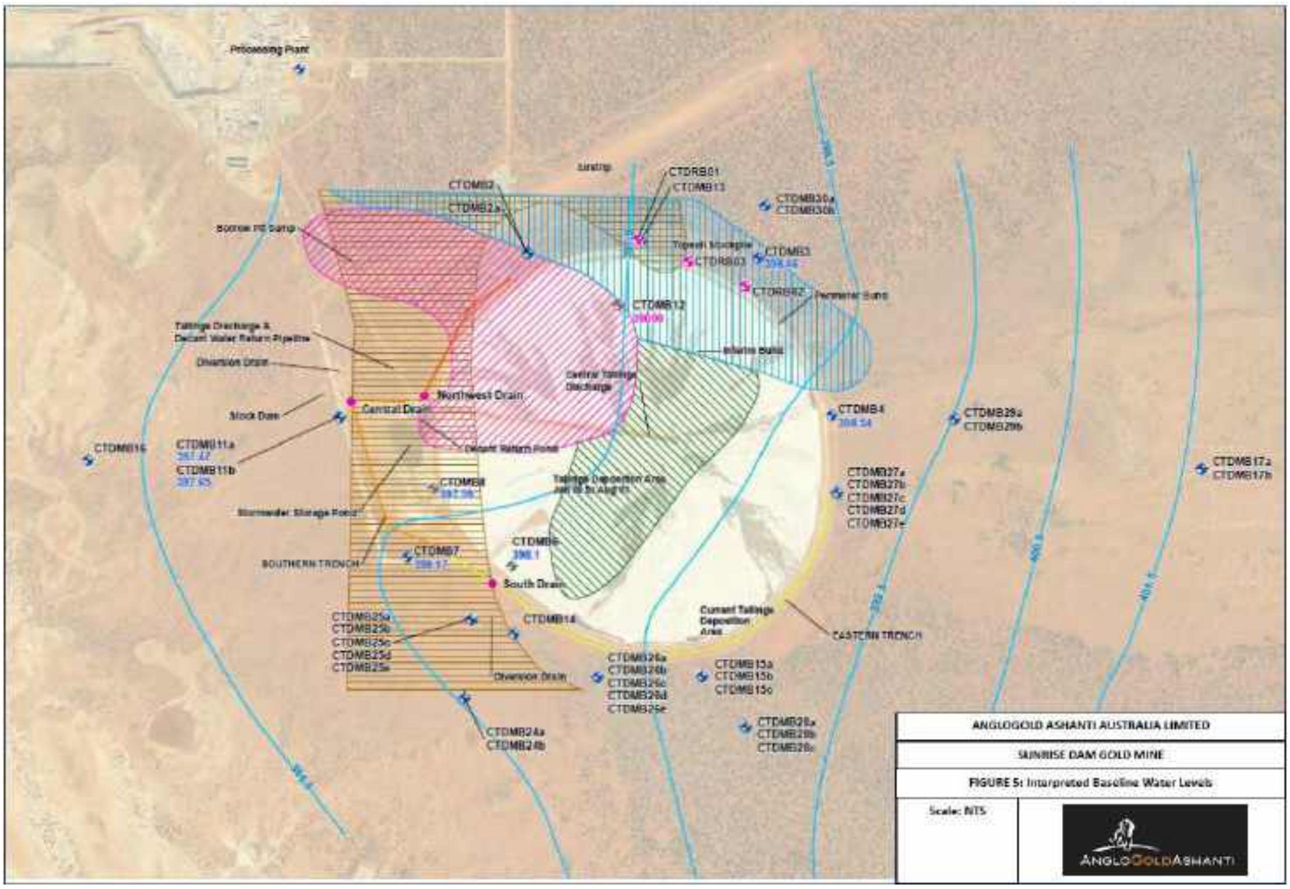


Figure 8: Baseline Groundwater Contours Around the CTD TSF

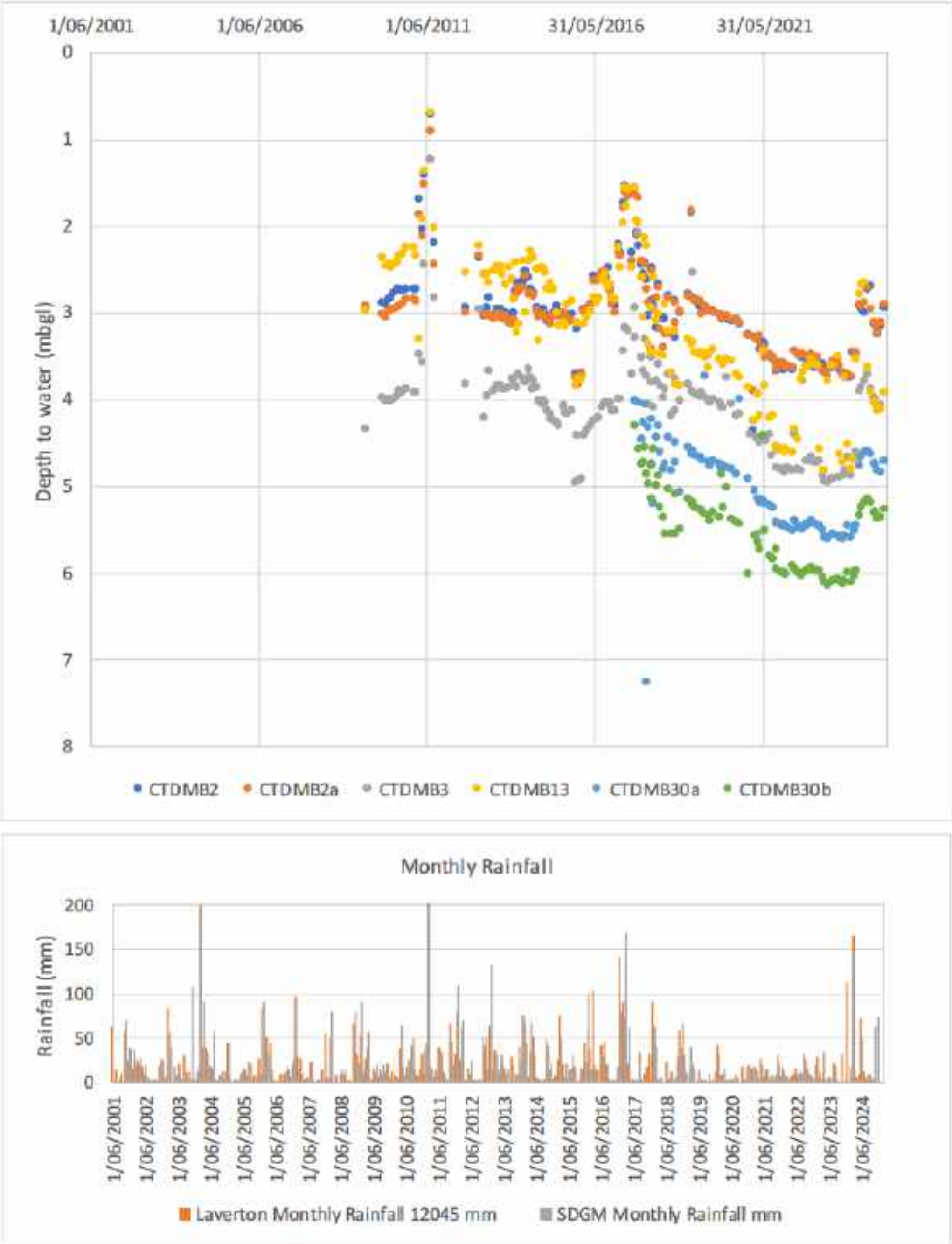


Figure 9 Historic Rainfall Hydrographs and Monitoring Bore Groundwater Levels Near the CTD TSF

5.3 Surface Hydrology

SDGM is located on the north-eastern foreshore of Lake Carey, within the Lake Carey Catchment which has a catchment area of 113,900 km^2. This catchment forms part of the broader Salt Lake Basin No. 024 (total catchment area 441,000 km^2). The drainage system of this basin comprises three large and broad, sub-parallel, southeast trending drainage systems variously referred to as salt-lake drainage systems, palaeorivers or palaeodrainages.

These palaeodrainages have very low gradients and at intervals contain small to very large playa lakes such as Lake Carey (with an area of approximately 1,000 km^2). During occasional intense rainfall events the lakes may fill, and in very rare events some may overflow, link-up, and discharge on to the Nullarbor Plain through Ponton Creek.

Creeks and drainages located within the SDGM operational area are ephemeral in nature. However, flows will occur episodically during the summer months, when the potential exposure to high intensity cyclonic or tropical depression related rainfall is greatest.

The closest public drinking water source area is the Laverton Water Reserve and Catchment Area, approximately 55 km north of the premises boundary.

5.3.1 Local Hydrology

The SDGM catchment area has been delineated into seven sub-catchments based on a combination of natural topography, engineered drainage measures and identified outlets to Lake Carey. SDGM's upstream catchment is estimated to cover 80.6 km^2. The sub-catchment extents are illustrated on Figure 10.

There are two sub-catchments reporting to the CTD TSF (CTD North and CTD South).

The lower portion of the CTD North sub-catchment is defined by the CTD northern perimeter diversion and runway southern perimeter drain. Runoff from this area reports to culverts located at the CTD facility gate and flows around the CTD north perimeter diversion to discharge overland into Lake Carey.

Run off from the CTD South sub-catchment is intercepted by the CTD southern perimeter diversion bund (not shown on Figure 10), which diverts flow westwards via a shallow drainage channel to a floodway across the Bindah road and onward, overland towards Lake Carey.

The diversion channels have been designed for a 1% annual exceedance probability (AEP) with a peak flow estimate of 55.0 m^3/s (Carrick Consulting, 2018). The Eastern Diversion Levee was constructed to a height of 2.0 m with a minimum base width of 10.0 m. The locations of the surface water management structures are shown on Figure 11.

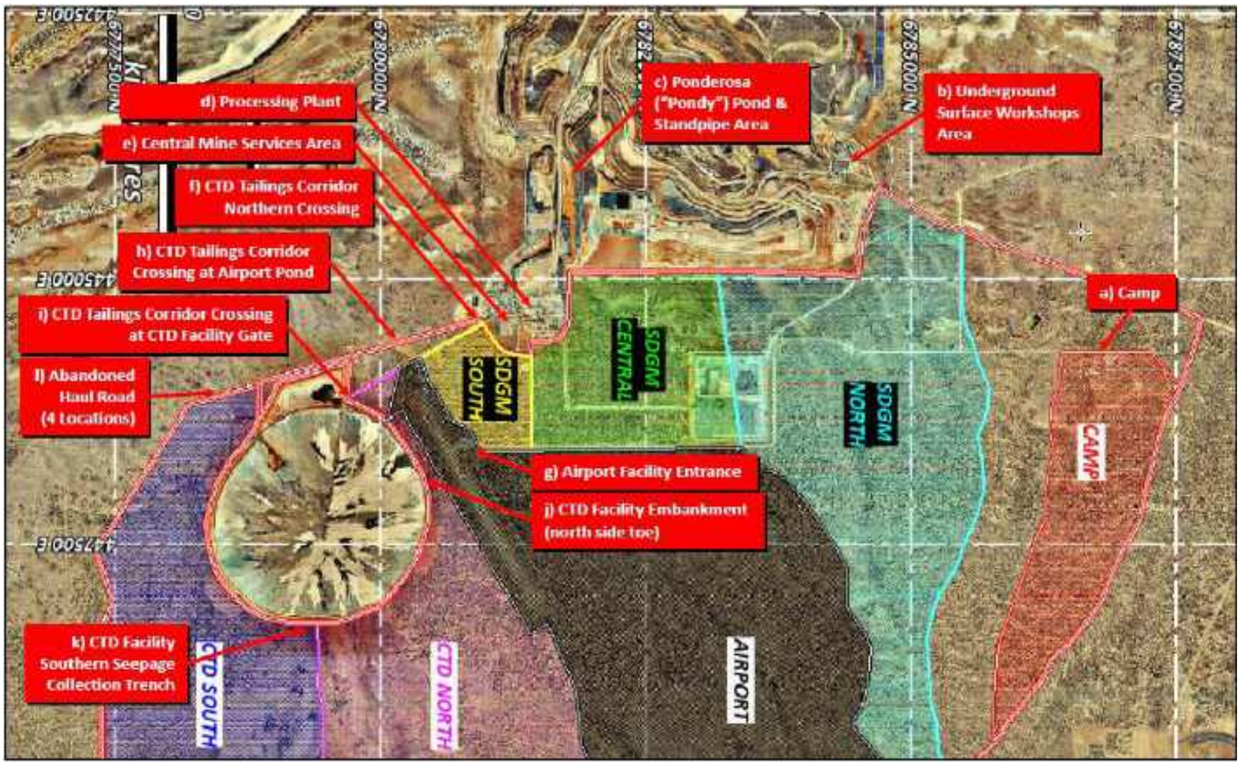


Figure 10: Surface Water Catchments at SDGM

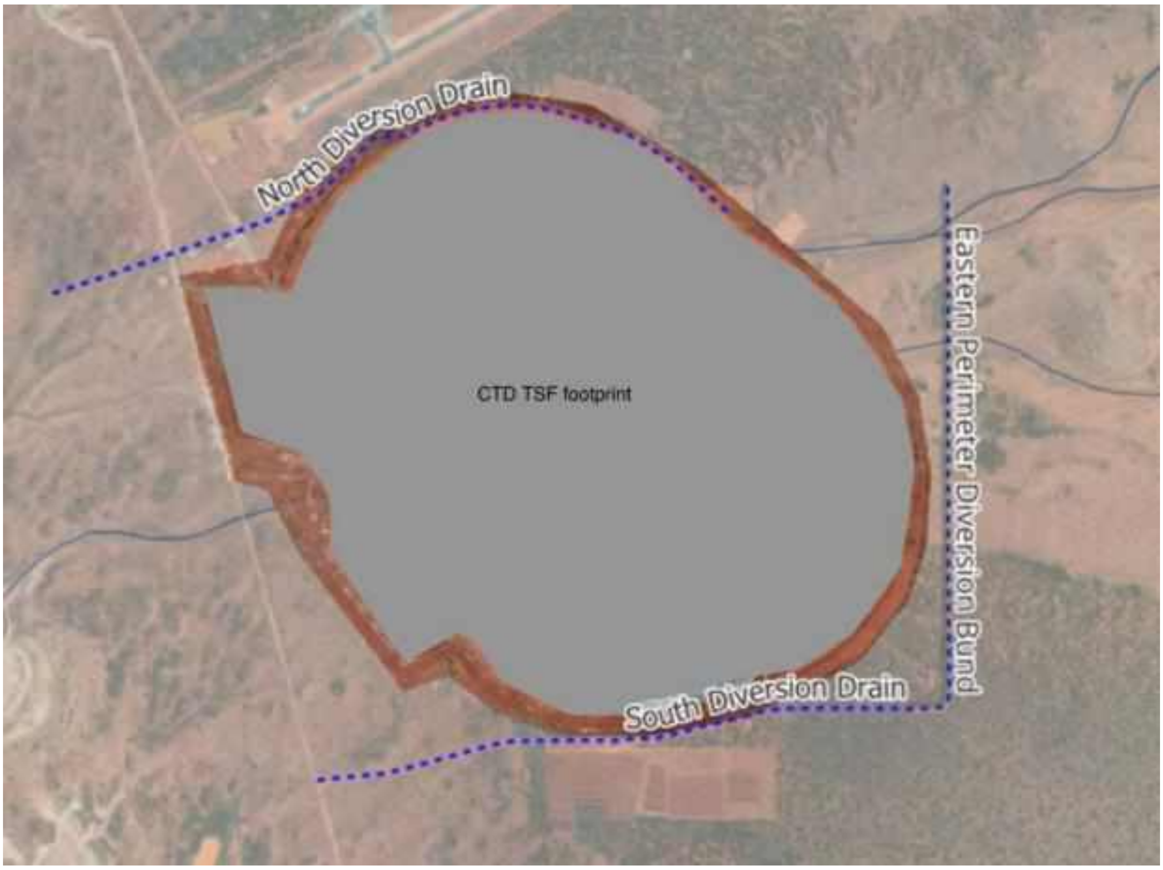


Figure 11: Surface Water Management Infrastructure CTD TSF

5.4 Flora and Vegetation

SDGM lies within Beard's (1990) Austin Botanical District that is characterised by Mulga Low Woodlands and has numerous salt flats surrounding salt lakes, vegetated by halophytes and samphires (*Tecticornia* sp.).

5.4.1 Flora

Across vegetation surveys at SDGM, 425 species have been recorded in the greater SDGM area (Mattiske Consulting Pty Ltd 2022). The most commonly represented families were the Chenopodiaceae (85 taxa), Fabaceae (64 taxa), Asteraceae (58 taxa), Poaceae (44 taxa) and Scrophulariaceae (37 taxa). In 2022, Mattiske Consulting Pty Ltd refreshed baseline survey data and filled gaps to provide continuous coverage across SDGM tenure and beyond.

No Threatened plant taxa pursuant to the *Biodiversity Conservation Act* 2016 or the *Environment Protection and Biodiversity Conservation Act* 1999 have been recorded at SDGM (Mattiske Consulting Pty Ltd 2022). The Priority 1 species *Tecticornia mellarium* has been recorded in vegetation associations C3, C5 and C9, near the edges of Lake Carey. Further work by AGAA has found this species is much more extensive on islands across Lake Carey (e.g. Mattiske Consulting Pty Ltd 2018). This taxon is relatively restricted in distribution within the SDGM survey areas to the fringes of Lake Carey. The Priority 3 taxon *Melaleuca apostiba* has been recorded in areas of vegetation association M2, less than 1 km south of the mining area and on either side of Bindah Rd approximately 4 km south of the CTD TSF (Mattiske Consulting Pty Ltd 2018). Further afield it is recorded as ranging approximately 250 km, from as far north as Lake Wells to areas just south of Lake Carey, frequently along the edges of salt lakes in sandy soil. Given the CTD TSF is away from the edges of Lake Carey, and with the absence M2 vegetation association, *M. apostiba* is unlikely to occur within the application area.

5.4.2 Vegetation

The latest vegetation mapping compiled by Mattiske Consulting Pty Ltd (2022) for the area surrounding SDGM includes 36 vegetation associations, comprising:

- Sixteen Acacia woodlands;
- Two Eucalyptus woodlands;
- Two Melaleuca woodlands;
- Two shrublands; and
- Fourteen chenopod associations.

Around the CTD TSF are six vegetation associations and cleared land, as shown in **Figure 12**.
These are:

- A2: Open Low Woodland to Woodland of *Acacia aneura* var. *aneura, Acacia aneura* var. *intermedia* and *Acacia ayersiana* over *Acacia ramulosa* var. *ramulosa, Acacia tetragonophylla, Eremophila latrobei* subsp. *latrobei, Eremophila* spp*., Maireana triptera, Solanum lasiophyllum.*
- A3: Low mixed Woodland of *Acacia aneura, Acacia tetragonophylla, Exocarpos aphyllus, Hakea preissii, Pittosporum angustifolium, Santalum spicatum* over *Eremophila*

?metallicorum, Cratystylis subspinescens, Eremophila latrobei subsp. *glabra* over *Maireana sedifolia, Eremophila scoparia, Senna artemisioides* subsp. *filifolia* and other mixed shrubs.
- A12: Low Woodland of *Acacia ayersiana, Acacia ramulosa* var. *linophylla, Acacia aneura* over *Acacia burkittii, Acacia tetragonophylla,* over *Sida calyxhymenia, Maireana sedifolia, Eremophila latrobei* subsp. *glabra, Dodonaea lobulata, Maireana pyramidata* over *Scaevola spinecens*.
- C1: Shrubland of Chenopod species with occasional emergent *Acacia ayersiana* and *Acacia aneura* var. *aneura* over *Acacia kalgoorliensis* and *Hakea preissii* in clay loam soils.
- C2: Shrubland of *Hakea preissii, Acacia tysonii, Eremophila miniata, Pimelea microcephala* subsp. *microcephala, Exocarpos aphyllus* and *Pittosporum angustifolium* over *Atriplex vesicaria, Maireana aphylla, Rhagodia drummondii, Cratystylis subspinescens* and *Senna artemisioides* subsp. *filifolia* in clay loam soils
- E1: Low Open Woodland of *Eucalyptus horistes, Brachychiton gregorii, Acacia aneura* var. *aneura, Acacia aneura* var. *conifera, Acacia tetragonophylla* over *Duboisia hopwoodii, Eremophila longifolia, Eremophila margarethae* over *Maireana* spp., *Ptilotus obovatus.*

No Threatened Ecological Communities (TECs) pursuant to the WA *Biodiversity Conservation Act 2016* (BC Act) or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) occur at SDGM. No Priority Ecological Communities (PECs) listed by the Department of Biodiversity, Conservation and Attractions (DBCA) occur at SDGM (Mattiske Consulting Pty Ltd 2022).

Vegetation associations at SDGM are well represented within the Austin Botanical District and therefore not considered to be significant on a regional scale. Associations with values such as priority flora or otherwise have relative local significance include:

- Acacia woodland A5 may have relative significance due to its association with the dunes that form a locally unique landform. This woodland is characterised by *Eucalyptus striaticalyx* and *Casuarina pauper* on gypsiferous dunes and appears in small, isolated populations.
- *Melaleuca* woodlands M1 and M2 may have relative significance because *Melaleuca* woodlands and shrublands are uncommon throughout the region. M2 may also be considered to be of local significance as it contains *Melaleuca apostiba* (Priority 3).
- Chenopod associations C3, C5 and C9 have some local significance due to the prevalence of *Tecticornia mellarium* (Priority 1) in these associations, immediately adjacent to Lake Carey. However, further work by AGAA across Lake Carey suggests *T. mellarium* is widespread along the Lake Carey riparian zone.

None of these vegetation associations occur adjacent to the CTD TSF.

The condition of the vegetation surveyed within SDGM in 2022 was assessed at each survey site using the condition rating scale of Trudgen (1988). Overall, the condition of the vegetation ranged from completely degraded (mining activities, transport, and cattle degradation) to good (areas bordering tracks and drill lines) to excellent (no exploration or drill tracks encroach, typically at least 20 m distance from tracks.

5.4.3 Vegetation Health Monitoring

Condition 22 of Licence L8579/2011/2 requires AGAA to undertake annual vegetation and soil condition monitoring in the vicinity of the CTD TSF. The 2024 annual monitoring report (Stantec, 2024) found that overall, vegetation condition around the CTD TSF had improved from a previous downward trend as a result of the regional drought conditions that were reversed during the large 2024 rainfall events.

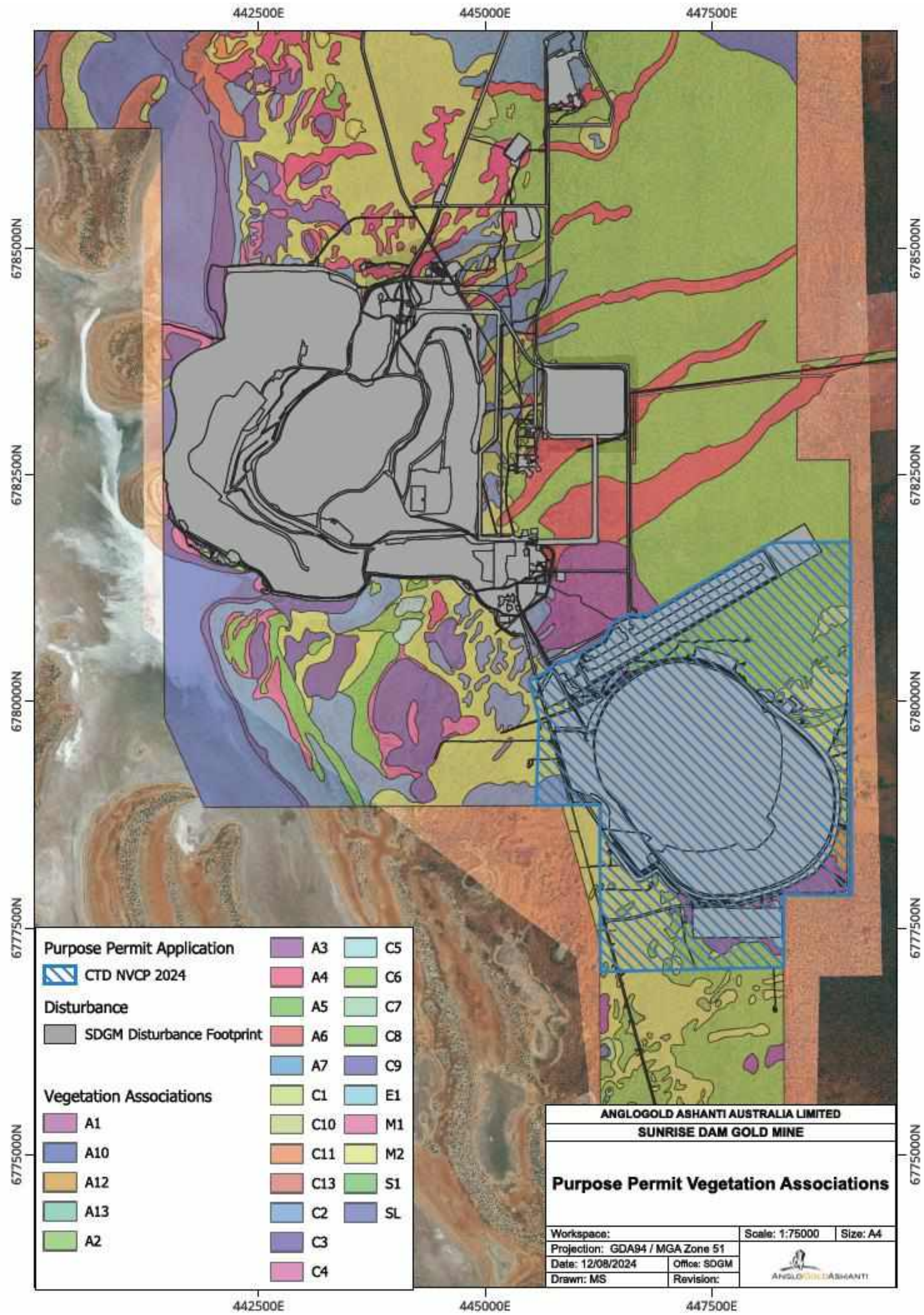


Figure 12: Vegetation Associations at SDGM

5.5 Fauna

Three major (Level 2 equivalent) vertebrate fauna studies have been conducted at SDGM, two by Ninox in 1994 and 2005, and one in September 2022 by Kingfisher Environmental Consulting (Kingfisher; 2022).

Kingfisher surveyed the entirety of SDGM in 2022 and identified a potential for 272 vertebrate fauna species to occur. From the 2022 study, a total of 193 vertebrate fauna taxa is expected, consisting of 105 bird species, 20 native mammal species, 9 introduced mammal species, 4 amphibian species and 55 reptile species.

No species listed as critically endangered or endangered were recorded or are expected to occur within areas near the CTD TSF.

The Peregrine Falcon (*Falco peregrinus*), which is listed as Other Specially Protected fauna under the *Biodiversity Conservation Act 2016* (Wildlife Conservation (Specially Protected Fauna) Notice 2018) has been recorded at SDGM. This is a highly mobile species with a large range which can accommodate high levels of disturbance. It is unlikely to breed in vegetation surrounding the CTD TSF due to the lack of suitable nesting sites (tall trees or rocky outcrops).

The Malleefowl (*Leipoa ocellata*), is classified as vulnerable under the *Biodiversity Conservation Act 2016* (Wildlife Conservation (Specially Protected Fauna) Notice 2018). The species was recorded approximately 12 km southeast of the CTD TSF, in the vicinity of the Fuji-Wilga borefield. No suitable breeding habitat was found within the survey area and the evidence of Malleefowl (tracks) was recorded outside breeding season when Malleefowl forage widely across a range of habitat areas.

Priority 4 listed species Brush Tailed Mulgara and Long-tailed Dunnart were recorded during the 2022 survey. A small area of Brush Tailed Mulgara habitat occurs at the southern end of the CTD

TSF, whilst a larger area of habitat occurs north of the aerodrome (

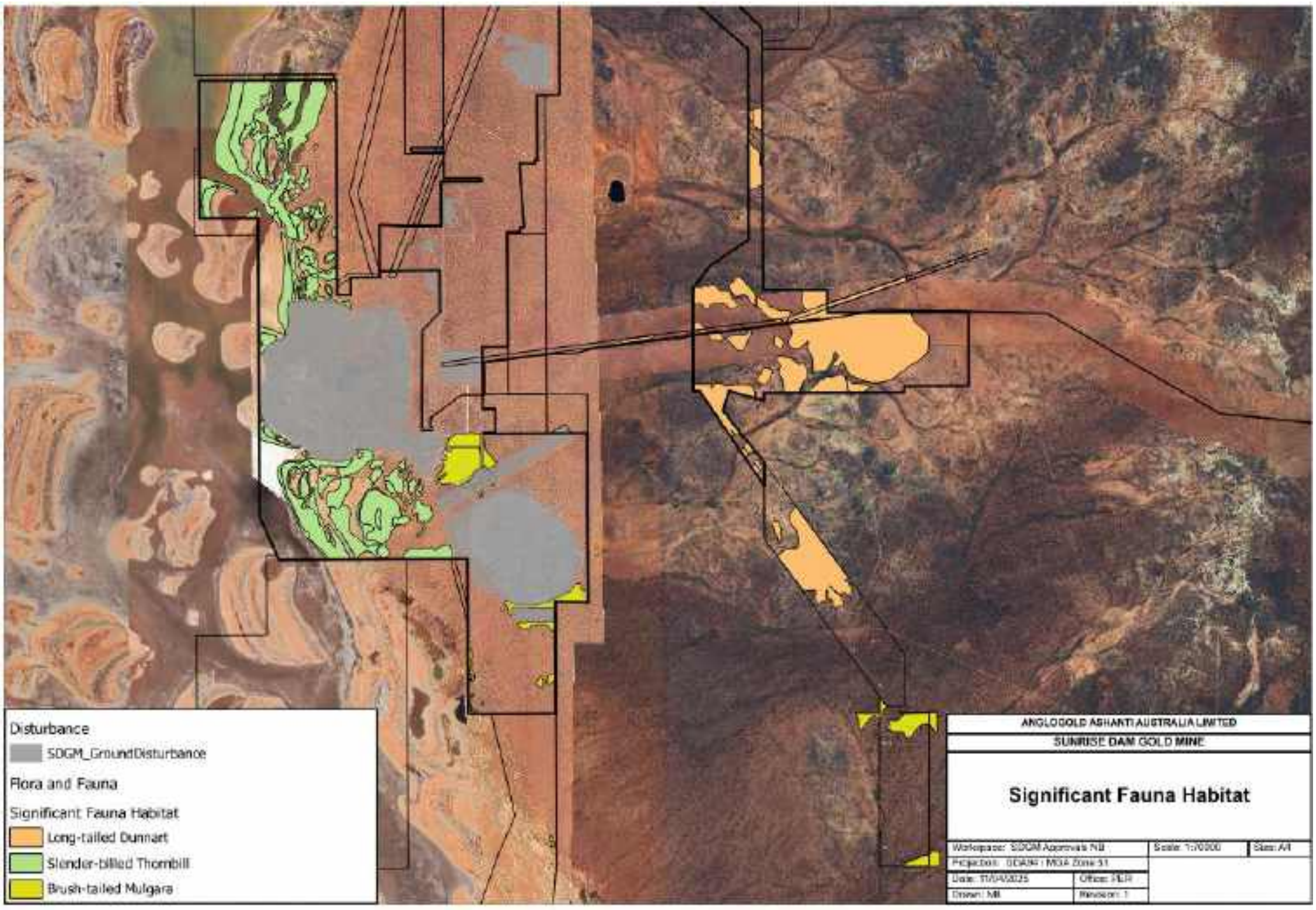


Figure 13). The Brush Tailed Mulgara habitat primarily coincides with the A3 vegetation association and Kirgella land system. There is an extensive area of Kirgella land system east of the CTD TSF, outside of AGAA tenure, and was thus not surveyed by (Kingfisher 2022). Long tailed Dunnart habitat is located around the Fuji-Wilga borefield some 12 km southeast of the CTD TSF.

A consistent theme throughout past fauna studies has been no habitats of regional significance occur within the project area, due to widespread common vegetation communities being present. Kingfisher Environmental Consulting identified five habitats to be of relative importance within the total survey area.

- *Casuarina* Woodland on gypsiferous rises. These occur on gypsiferous dunes fringing Lake Carey and on islands. This habitat supports southern temperate adapted reptile species at the arid extreme of their range. The habitat also contains tree hollows proving breeding opportunities for parrots, bats and raptors.
- Hills and rocky rises with *Acacia* shrublands. This habitat occurs in the borefields ~10 km east of SDGM in the Leonora land system in vegetation associations C12, A15, A16, S2 and parts of A2. Long-tailed Dunnarts, Wooley's Pseudantechinus and Goldfield's Crevice-skink are supported by this habitat.
- Samphire shrubland fringing Lake Carey. This habitat comprising dense mature samphire shrublands provides habitat for the Slender-billed thornbill.
- Salt Lakes (Lake Carey) as habitat to EPBC Act migratory birds and other bird species; and

- Sandplains supporting *Triodia basedowii* hummock grasslands. This habitat occurs between the process plant and aerodrome, south of the CTD TSF and in the Fuji Wilga borefield. The fauna assemblage present includes the Brush Tailed Mulgara.

Of these habitats, the 'Sandplains supporting hummock grasslands' is the only habitat of relative significance to be present in close proximity to the CTD TSF (immediately south) and also occurs to the north of the SDGM aerodrome and in the Fuji Wilga Borefield. As the additional downstream construction footprint for Stage 12 is minimal, it will predominantly fall within existing perimeter roadways and other existing clearing footprints and thus negligible clearing within this habitat will be required.

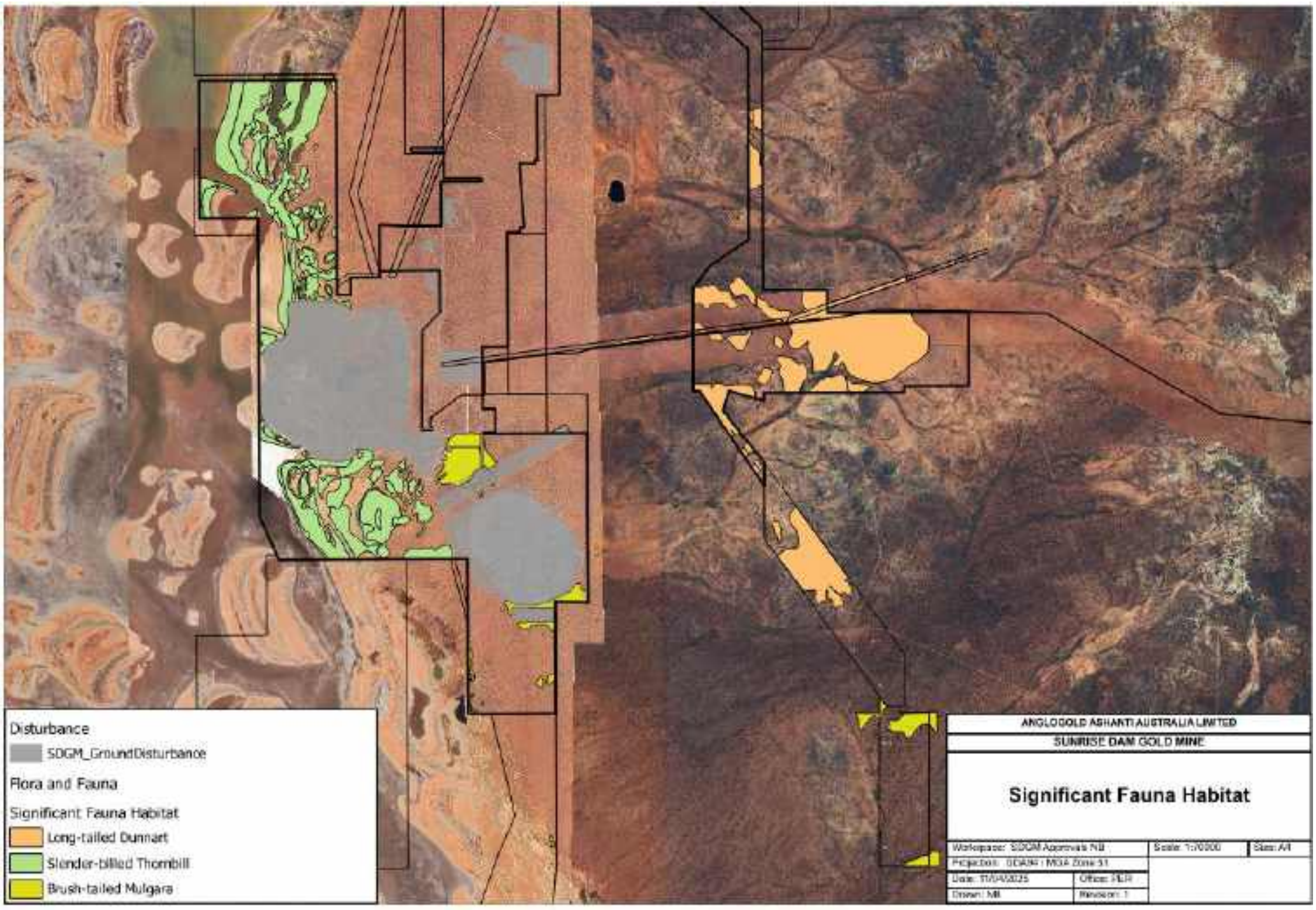


Figure 13: Conservation Significant Fauna Habitat at SDGM

6 SOURCE

6.1 Materials Characterisation

For the purpose of this document, tailings characterisation focusses on geochemistry as a potential source to impact the environment. Other characterisation analyses for geotechnical purposes (e.g., density, consolidation, sedimentation, particle size distribution) are provided in sections 4.4 and 4.5 of the CTD TSF design document (WSP 2025).

Graeme Campbell and Associates (1995 and 2002) found tailings produced at SDGM were non-acid forming (NAF). A follow-up geochemical characterisation study was conducted in 2014 (MBS Environmental, 2014) on 78 tailings samples from varying positions within the CTD TSF. Properties of tailings samples include:

- Uniform pH and EC in all samples (average pH of 8 and hypersaline EC of 1,196 mS/m).
- Although average oxidisable S was 0.95%, high ANC values of tailings samples 112 to 192 kg/t, made all tailings NAF, of which two thirds were classified as acid consuming.
- The key element of environmental significance present was arsenic with lesser amounts of molybdenum, selenium and antimony. Total arsenic concentrations ranged from 191 to 890 mg/kg compared to a nominal earth average soil concentration of 25 mg/kg and a maximum of 16 mg/kg observed in soils sampled for cover material studies.
- The elements with the greatest Global Abundance Index (GAI) in the tailings were: arsenic, molybdenum, antimony and to a much lesser extent selenium. Arsenic was the primary leachable element found, other than major salts, with 1:5 soil:water extracts containing between 0.025 and 0.129 mg/L arsenic (mean 0.054 mg/L compared to the ANZECC livestock drinking water guideline of 0.5 mg/L). Given the low concentrations, arsenic was seen as being immobile and not impacting groundwater. Traces of molybdenum and antimony were also detected in the water extract.
- Tailings were saturated in gypsum. When coupled with high salinity, tailings will be non-dispersive and trafficable when dry.

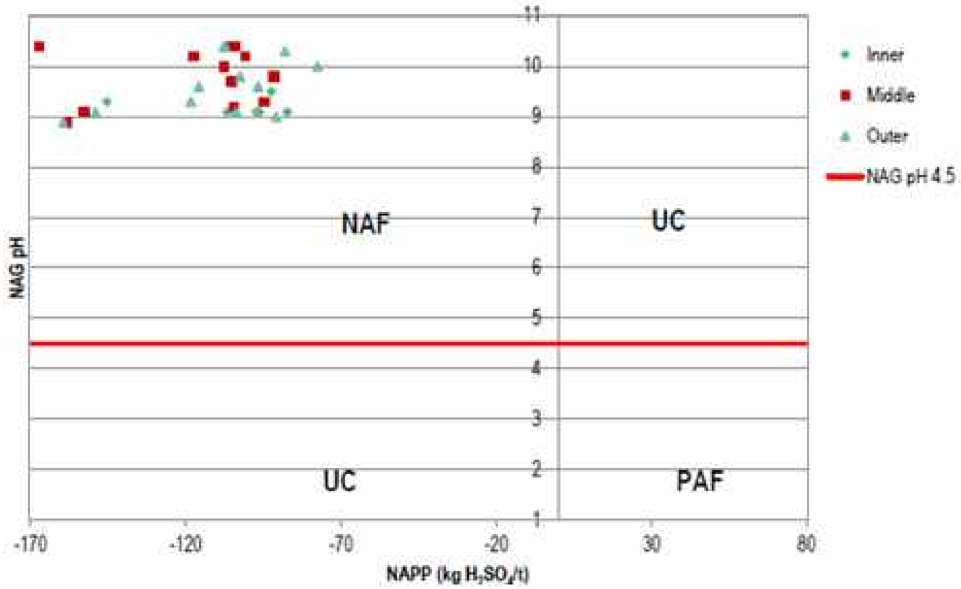


Figure 14: AMIRA Plot for CTD TSF Samples Regressing NAPP Against NAG pH

As part of CTD TSF Stage 12 investigations, geochemical testing was conducted on a slurry tailings sample and 15 samples of tailings recovered from various locations and depths on the CTD TSF in 2024. The testing parameters included:

- Acid Base Accounting (ABA)
- Net Acid Generation (NAG)
- Multi-Element Analysis
- Mineralogy Analysis via Quantitative X-Ray Diffraction (XRD)
- Deionized (DI) water leach testing
- NAG Liquor Analysis

Sulfide sulfur present (~0.8%) was predominantly pyrite. Acid neutralization capacity (ANC) was very high (114 kg H_2SO_4/t), likely attributed to the presence of carbonate minerals (calcite and dolomite). With resultant negative net acid production potential (NAPP) and alkaline NAG pH results (pH 9 - 11) (as shown in the AMIRA plot in Figure 15), all tailings samples were classified as non-acid forming (NAF) consistent with previous data from the CTD TSF.

Paste pH measurements indicated alkaline conditions (pH 8.3 – 8.7), while paste electrical conductivity (EC) indicated saline conditions (16,000 - 25,800 µS/cm).

As for previous analyses, geochemical enrichment (GAI ≥3) in arsenic, molybdenum, sulfur, antimony, and to a lesser degree selenium was indicated. Tellurium, and tungsten were also enriched. Most other screened metal(loid) concentrations were near background levels, with the exceptions of silver (GAI=1-3), bismuth (GAI=1-3), chromium (GAI=1), lead (GAI=1), and rhenium (GAI=1-2).

AGAA is a signatory of the International Cyanide Management Code. SDGM's tailings use water that is typically hypersaline, resulting in hypersaline decant water, which is unpalatable for fauna ingestion.

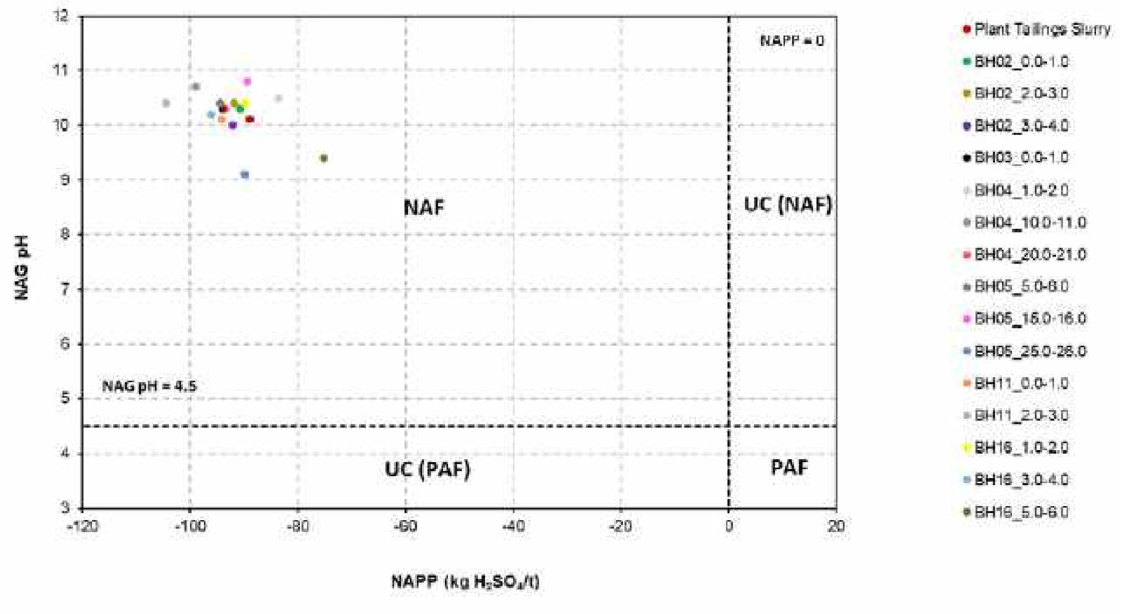


Figure 15: AMIRA Plot for CTD TSF Samples Taken During 2024

6.2 Groundwater Performance

The CTD TSF has a large network of monitoring bores in place (Figure 16). Groundwater monitoring performance is discussed below.

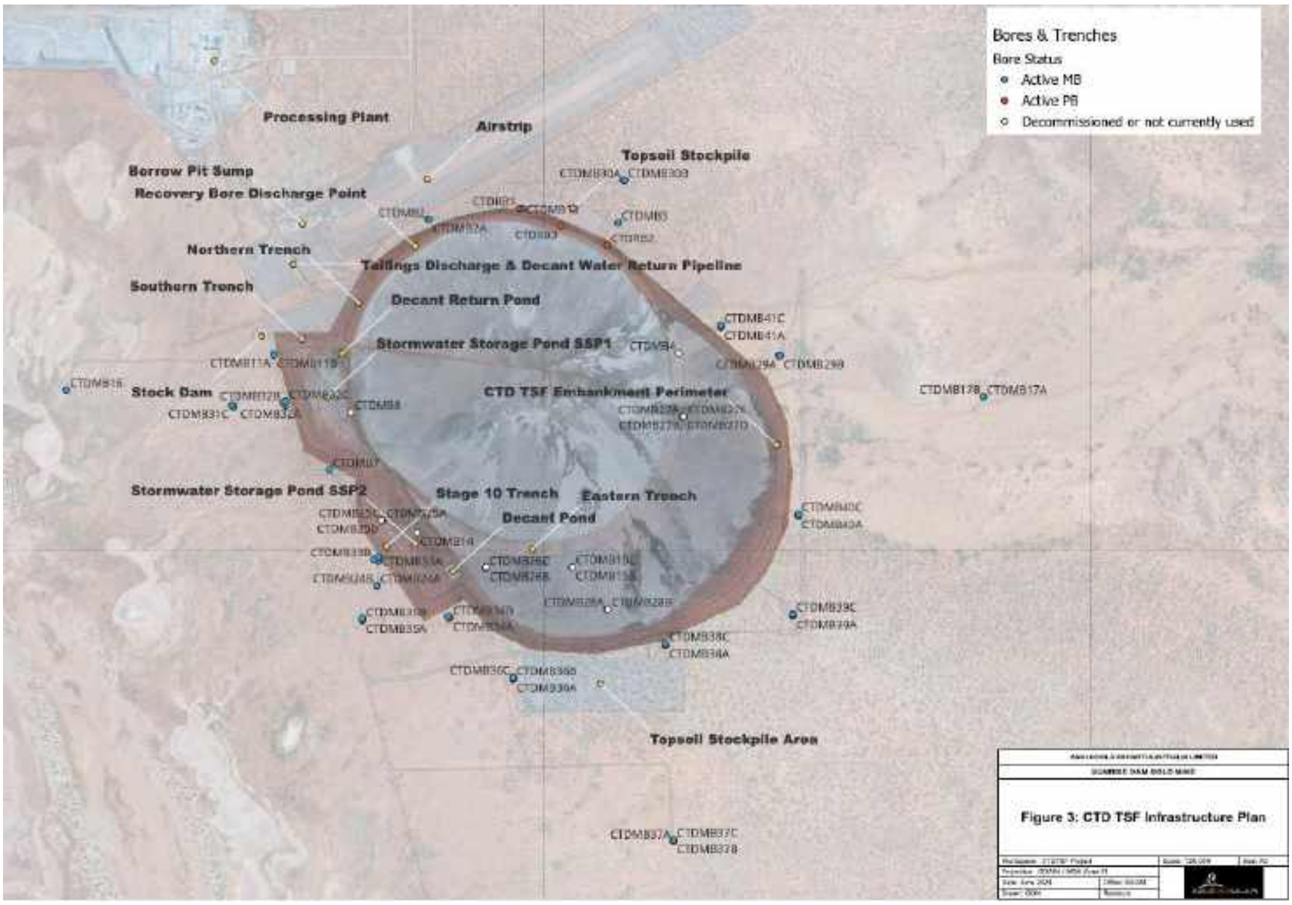


Figure 16: Groundwater Monitoring Bores Location Map

6.2.1 Groundwater Levels

The CTD TSF is situated in a naturally shallow groundwater environment, owing to its close proximity to Lake Carey. Depth to water decreases east to west towards Lake Carey. Interpreted baseline groundwater level contours for the CTD TSF area are displayed on Figure 8. Locally, minor influences of permeable paleochannel sediments have been included in the interpretation.

Baseline groundwater levels ranged between 399.5 mRL east of the CTD TSF to 397.5 m west of the CTD TSF with contours having a north-south orientation, indicating a westerly groundwater towards Lake Carey (**Error! Reference source not found.**).

Over the ensuing 26 years of operation, the greatest fluctuations in groundwater levels have been driven by large rainfall events such as 2011, 2017 and 2024 (Figure 9), whereby groundwater levels have risen at times to within 1 m of ground level. Despite this, groundwater levels have demonstrated a declining trend since 2010 by between 1 and 2.5 m (Figure 9), punctuated by temporary rises induced by the abovementioned high rainfall events.

To minimise seepage contribution to groundwater recharge AGAA has implemented several seepage management controls including:

- Northern seepage interception trench (northwest drain) August 2003
- Southern seepage interception trench (central drain) October 2003
- Eastern seepage interception trench (south drain) January 2006
- Stage 10 seepage interception trench late 2019
- CTDRB3 (wind turbine bore) March 2008 with a generator added in 2013
- CTDBR2 (solar bore 2) October 2008
- CTDBR1 (solar bore 1) April 2010.

As of April 2024, groundwater levels ranged between 401 and 406 mRL east of the CTD TSF and ~399 mRL west of the CTD TSF (Figure 17 to **Error! Reference source not found.**). The reason for ranges is that the contour orientation has altered with the groundwater mound at its highest in the southeastern corner of the CTD TSF and shallowest in the northwestern corner of the CTD TSF (i.e. closest to the Cleo/Sunrise pit and Bravo borefield drawdown influence; Figure 17). The lowest groundwater elevation is at CTDMB16 which is the furthest west from the CTD TSF (and closest to Lake Carey).

Since the groundwater highs experienced in April 2024, groundwater levels resumed their downward trend with the exception of the southeastern corner of the CTD TSF where tailings deposition has not fully covered the CTD TSF floor within the expanded footprint of the Stage 10 expansion. In this area, groundwater level trends have ranged between slight downward to slight upward movement. Continued tailings deposition will cover the remaining area (approximately 10 ha at beginning of January 2025), where localised ponding, transient seepage and groundwater level increase occurred following significant rainfall in Q1 2024. Hydrogeological modelling (SRK, 2025) indicates that once this area is covered in tailings, potential seepage in this area of the CTD TSF will decrease significantly due to the low hydraulic conductivity of consolidated tailings. Groundwater levels are simulated to continue to decrease during the operation of Stage 12 and following closure of the facility. The model predicts that continued operation of the CTD TSF will have little impact on maximum groundwater levels, which are most sensitive to large rainfall events (WSP 2025).

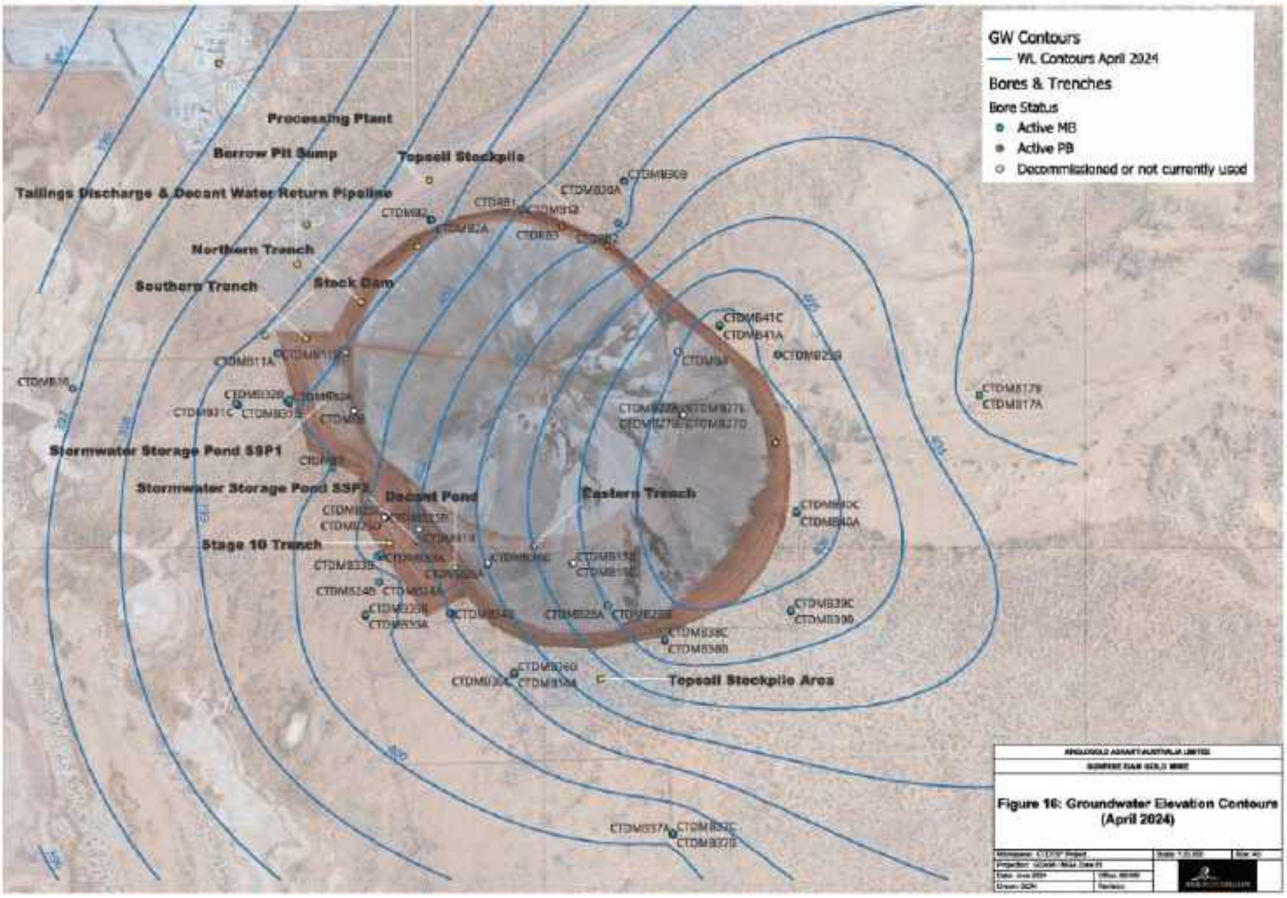


Figure 17: Groundwater Contours Around the CTD TSF (April 2024)

6.2.2 Groundwater Quality

Baseline groundwater quality around the CTD TSF is broadly saline to hypersaline, with the nearest environmental receptors being Lake Carey, an ephemeral hypersaline salt lake and vegetation surrounding the CTD TSF.

Groundwater quality trends adjacent to the CTD TSF have experienced a slow increase in salinity over time, punctuated by periods of reduced salinity after high rainfall events in 2011, 2017 and 2024. Overall water quality is between 70,000 uS/cm and 150,000 uS/cm (or 49,000 to 105,000 mg/L). Where groundwater salinity has increased, it has been mostly limited to shallow groundwater bores close to the CTD TSF, whereas bores away from the CTD TSF or at greater depths have been largely unaffected by the CTD TSF.

From vegetation monitoring around the CTD TSF, the combination of groundwater levels and hypersaline groundwater quality has not resulted in an impact to vegetation. The 2024 vegetation monitoring around the CTD TSF found that overall, vegetation condition around the CTD had improved from a previous downward trend that was a result of the regional drought conditions. Stantec (2024) observed that understorey vegetation parameters had improved beyond values previously recorded at all transects excluding CTD09, where parameters improved to a similar values recorded in 2020, whereas upper storey parameters remained stable. This reaffirms that to date, rainfall cycles have a greater impact on the environment than the CTD TSF.

6.3 Dust

The CTD TSF has been exposed to 11 previous construction phases of either land clearing for an outward extension of the CTD TSF or a raise of the perimeter embankment to increase capacity. The short term potential for dust generation during past construction works has not resulted in adverse impacts to vegetation receptors. Throughout its operating life, operational dust on the CTD TSF, dust has rarely presented an issue through a combination of wet tailings deposition and salt crusting of the tailings surface inhibiting the occurrence of dust generation. AGAA conducts vegetation monitoring around the CTD TSF annually.

6.4 Tailings and Return Water Pipelines

Tailings and decant return water are pumped between the CTD TSF in a pipeline corridor. With hypersaline tailings and hypersaline decant return water, either pipeline is a potential source to the environment if a spill or leak was to occur.

There is no change to the existing tailings or decant water return pipelines associated with the CTD TSF Stage 12 embankment raise.

7 IMPACT ASSESSMENT (PATHWAY)

In consideration of the receptors in section 5 and sources in section 6, an assessment has been made of the environmental pathways at risk of resulting in an impact. The following pathways have been identified:

- Saline seepage containing cyanide impacting other groundwater users.
- Saline seepage containing cyanide impacting vegetation.
- Oxidation of tailings in the CTD TSF generates acidic leachate affecting other groundwater users.
- Release of tailings or return water outside of containment bunding following pipeline rupture impacting soil and vegetation.
- Flooding external to the CTD TSF perimeter causes erosion to the embankment and sediment deposition to native vegetation.
- Overtopping of the CTD TSF impacting soil and vegetation
- Overtopping of the CTD TSF SSP in a severe storm resulting in a mixture of decant water and incident stormwater being released to the environment and ultimately Lake Carey.
- Ingestion of water containing cyanide by birds or bats resulting in mortalities.
- Access to the decant pond or SSP by ambulatory fauna resulting in potential fauna mortalities.
- Dust generated from the CTD TSF affecting native vegetation.

7.1 Impacts from Seepage

To inform potential impacts from seepage, AGAA has undertaken comprehensive groundwater modelling for CTD TSF Stage 12 (SRK 2025). Modelling was conducted to reflect different climatic (rainfall) scenarios (High rainfall [SC1], Current climate [SC2], Low rainfall [SC3] and Closure [SC4]). Use was made of recent site experience from the 2024 storm events where groundwater levels at the CTD TSF were strongly influenced by high rainfall recharge (Figure 9**Error! Reference source not found.**).

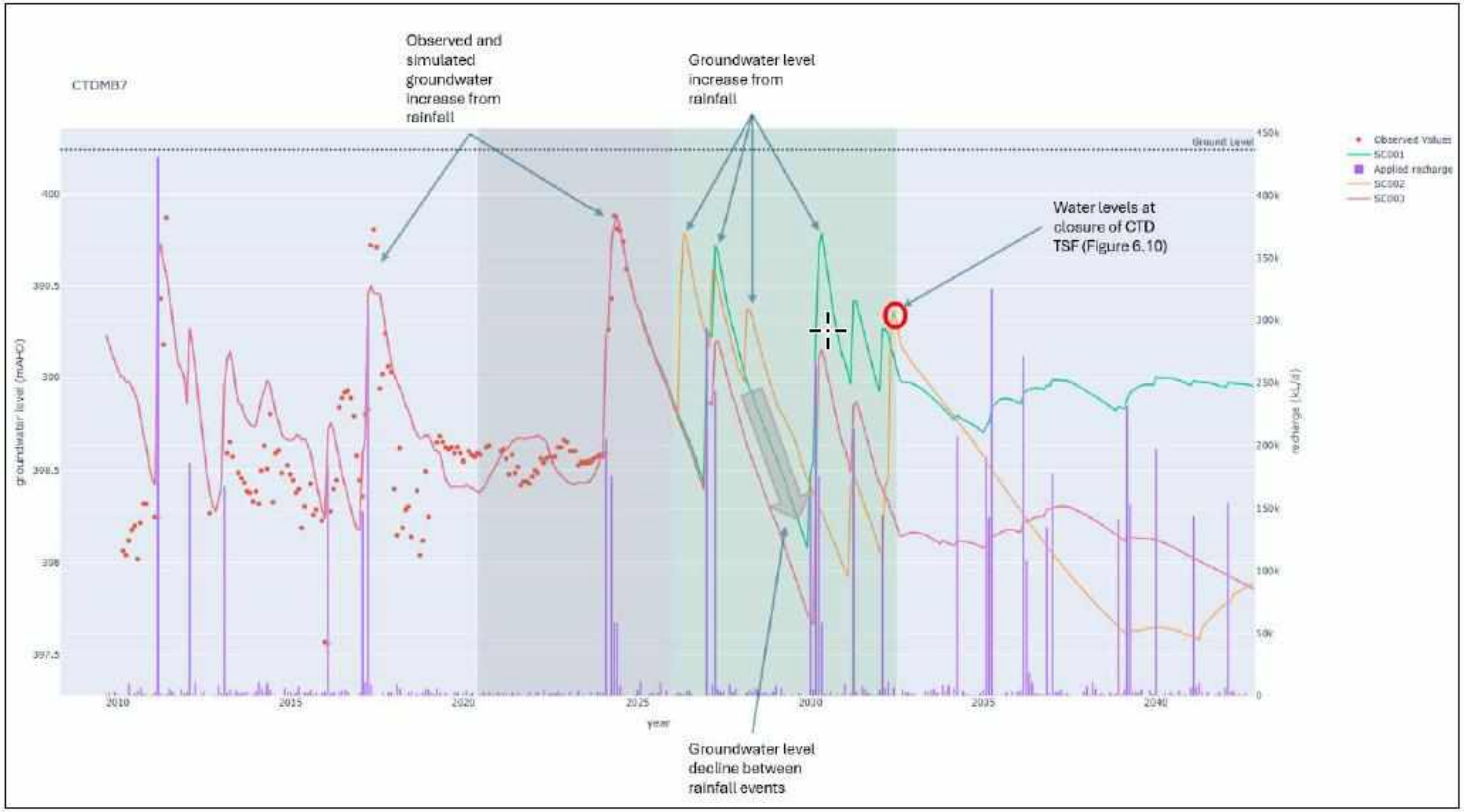
All predictive scenarios simulated a continuation of the decline in water levels following the peak in early 2024 caused by high rainfall recharge. Continued tailings deposition will cover the remaining area yet to receive tailings deposition (approximately 10 ha at beginning of January 2025), where localised ponding, transient seepage and groundwater level increase occurred following significant rainfall in early 2024. Hydrogeological modelling (SRK, 2025) indicates once this area is covered in tailings, potential seepage in this area of the CTD TSF will decrease significantly and groundwater levels are predicted to decrease throughout Stage 12 operation and following closure of the facility. This is due to the low permeability of the tailings, reducing transmission of seepage to groundwater. Tailings themselves are only saturated in the lower 1-3 m of tailings within areas under active deposition. The model predicts that operation of the CTD TSF will have little impact on maximum groundwater levels, which are most sensitive to large rainfall events (WSP 2025).

Predicted depth to groundwater on the western side of the CTD TSF in all scenarios is a combination of the existing hydrogeological regime associated with Lake Carey and recharge following large rainfall events. Water levels in the south and southeast can also remain high (but surface ponding in this area can be managed by use of a mobile pump when required). The future groundwater levels presented for 2030 in the wet climate scenario after an applied high rainfall event is slightly less than the peak observed in April 2024, i.e. groundwater levels in simulations will not exceed April 2024 based on the applied rainfall events. Groundwater levels come within 0.5 m of the surface on the fringes of Lake Carey (within clay pans and topographic lows in alluvial channels and dunes) during an applied high rainfall event in 2030. This is considered a natural variation caused by high rainfall recharge and is reflective of the existing hydrogeological regime adjacent to Lake Carey. Groundwater levels in all other scenarios are less than those present in the wet scenario peak.

Groundwater predictions aimed to be conservative by over predicting responses to rainfall and the depth to water grids presented in Figure 18 to Figure 22 particularly on the western side of the CTD TSF (Figure 18). Importantly, all future simulations have groundwater levels remaining below the current peaks even when similarly large storm events as the early 2024 period were applied (several large storms in the space of three months).

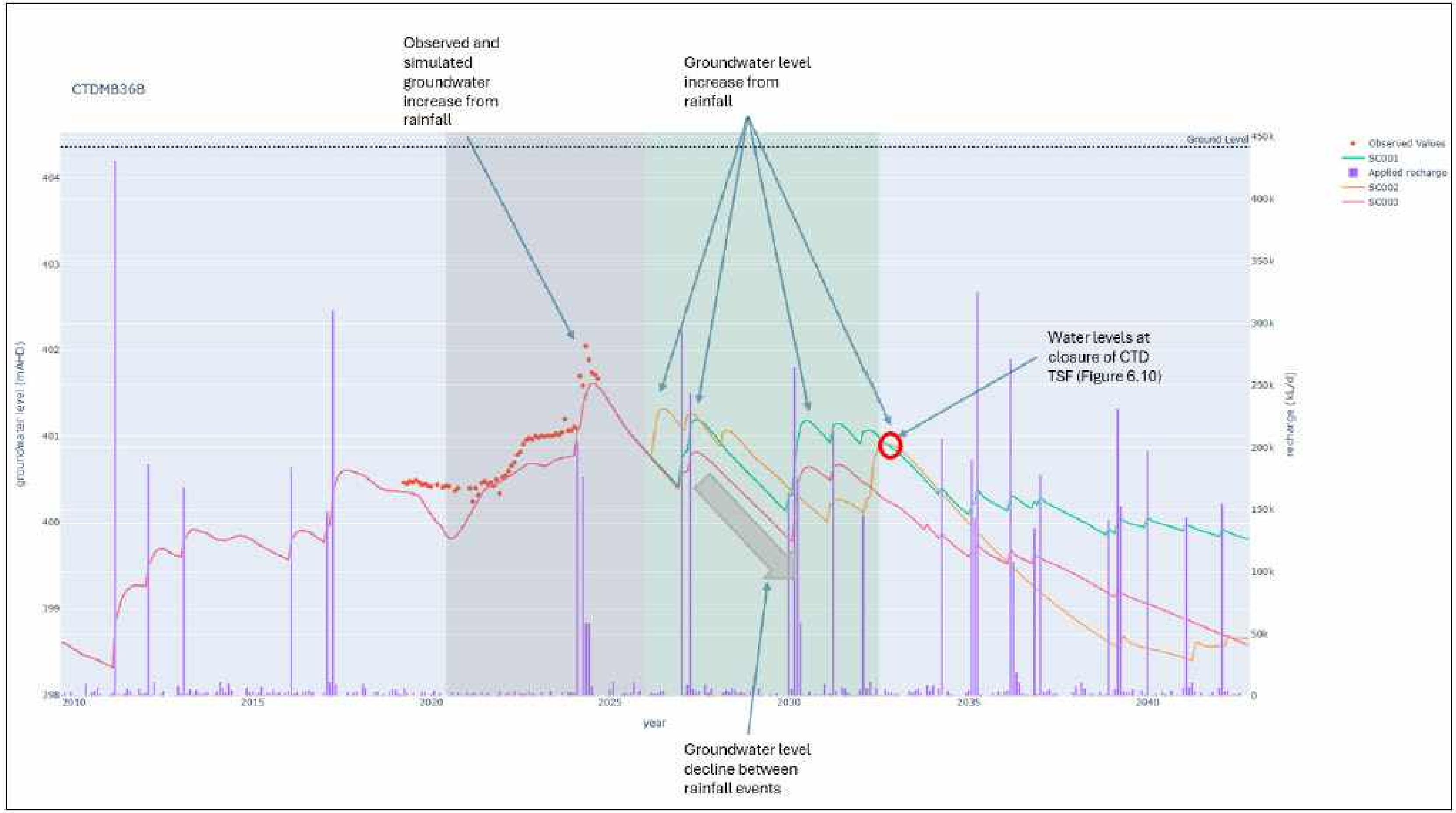
As experienced by the 2024 storm events and predicted in groundwater modelling, where the CTD groundwater regime is subject to repeat high rainfall events, the potential exists for groundwater levels in CTD monitoring bores to rise near to surface.

To mitigate this risk, AGAA is proposing to extend the existing seepage recovery trench on the western side of the CTD TSF. The proposed trench extension will connect the existing Stage 10 seepage interception trench with the southern seepage interception trench to create a continuous interception trench. Expansion of the seepage recovery trench and operation at higher pump recovery rates following large rainfall events is predicted to reduce the peak groundwater level rise.



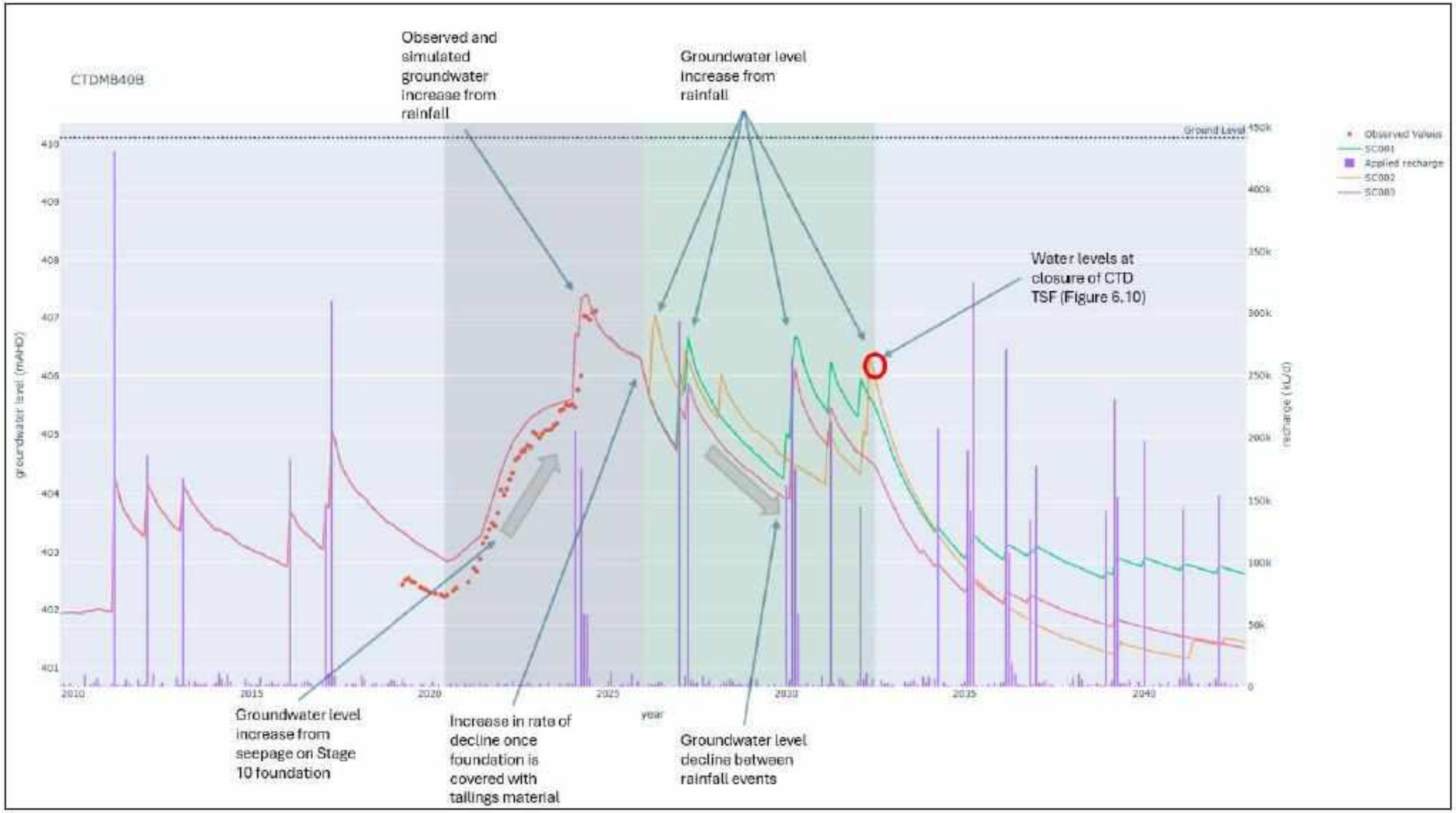
Notes: Calibration period is included with observed values, grey shading represents deposition onto foundation, green shading represents continued deposition after foundation is covered. Applied recharge for SC001 only

Figure 18: Hydrographs of Actual and Predicted Water Levels West of the CTD TSF (Wet Climate Scenario - CS1)



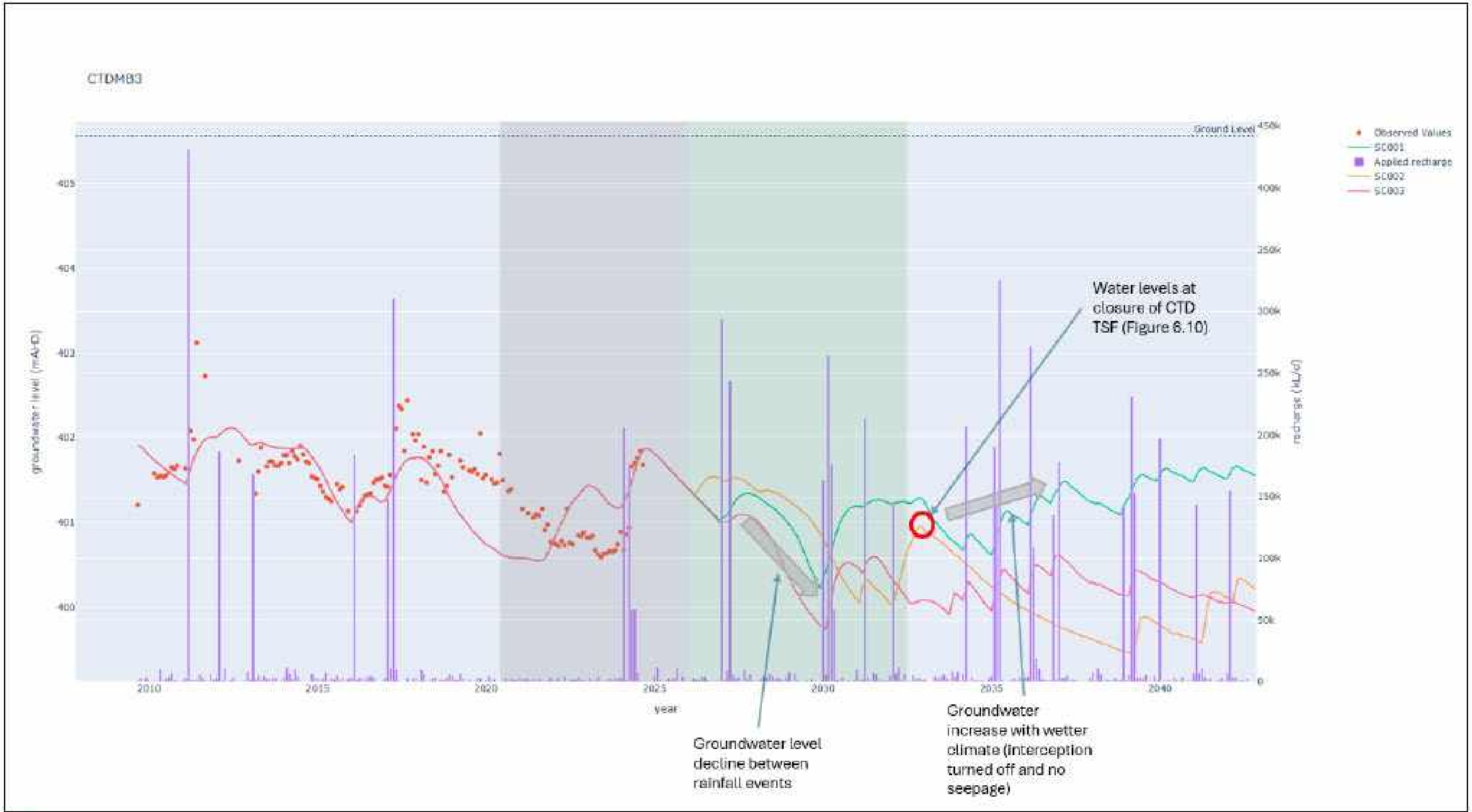
Notes: Calibration period is included with observed values, grey shading represents deposition onto foundation, green shading represents continued deposition after foundation is covered. Applied recharge for SC001 only

Figure 19: Hydrographs of Actual and Predicted Water Levels Southwest of the CTD TSF (Wet Climate Scenario - CS1)



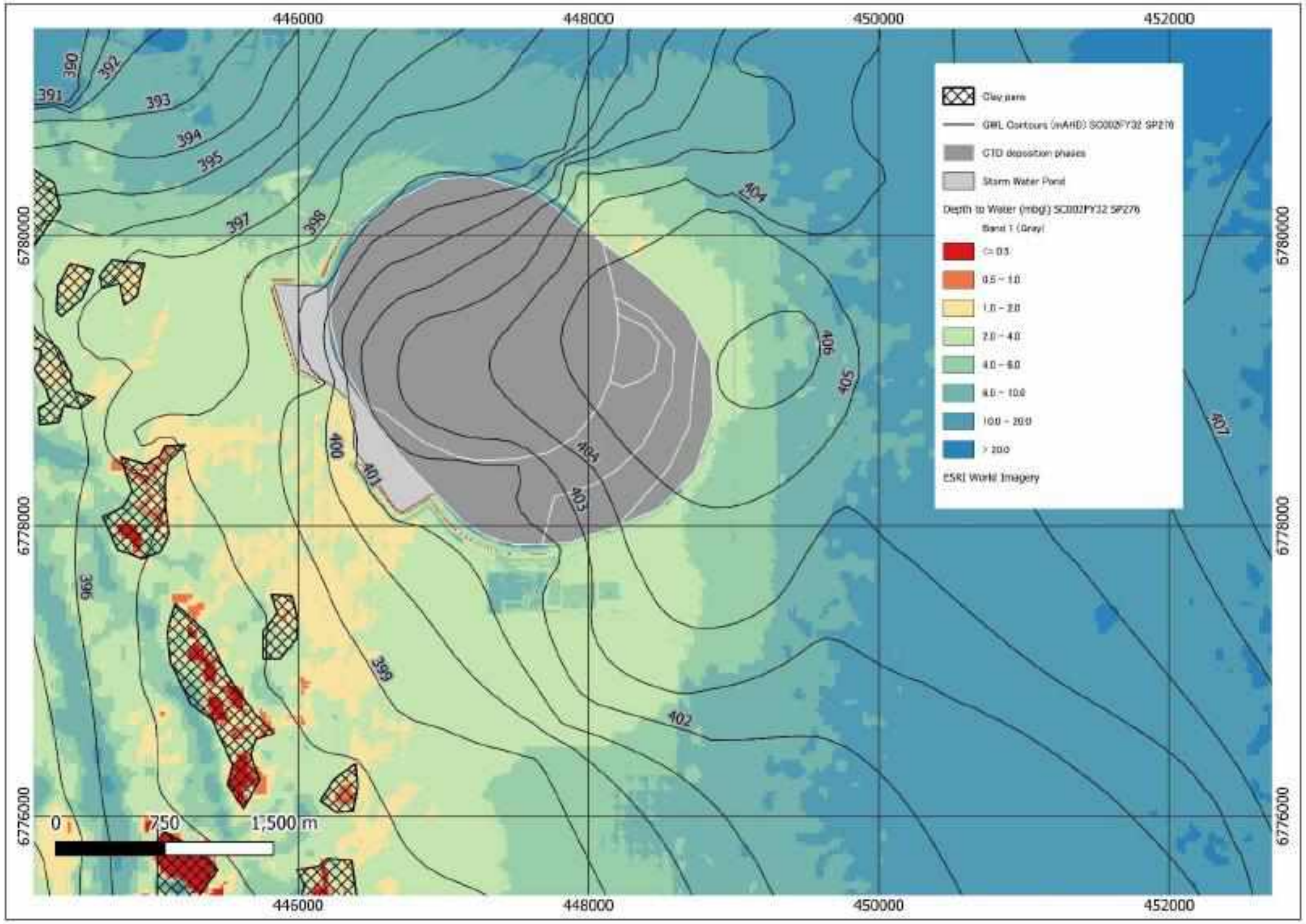
Notes: Calibration period is included with observed values, grey shading represents deposition onto foundation, green shading represents continued deposition after foundation is covered. Applied recharge for SC001 only

Figure 20: Hydrographs of Actual and Predicted Water Levels Southeast of the CTD TSF (Wet Climate Scenario - CS1)



Notes: Calibration period is included with observed values, grey shading represents deposition onto foundation, green shading represents continued deposition after foundation is covered. Applied recharge for SC001 only

Figure 21: Hydrographs of Actual and Predicted Water Levels Northeast of the CTD TSF (Wet Climate Scenario - CS1)



Notes: Low depths to water on the immediate fringe of the CTD TSF display groundwater levels in the seepage interception trenches. The low depth to water on the fringes of Lake Carey and clay pans caused by natural groundwater recharge.

Figure 22: Depth to Water Around the CTD TSF at Closure (June 2032) under Current Climate Scenario (CS2)

Key findings from the groundwater modelling were:

- Groundwater levels around the CTD TSF are driven by rainfall and in particular large storm events causing rapid groundwater recharge due to the hydrogeological regime associated with Lake Carey, increasing groundwater levels regardless of the existing TSF or the increased Stage 12 capacity.
- None of the simulated climate scenarios predict groundwater levels higher than those experienced in April 2024 following a succession of large storms.
- In terms of CTD TSF generated seepage, seepage losses will reduce once the foundation of the CTD TSF in the south east corner has been covered in tailings. This is due to the low permeability of the tailings, reducing transmission of seepage to groundwater.
- Seepage rates are not expected to increase from tailings deposition following the raise in embankment height and increased tailings thickness. This is due to the unique deposition and facility arrangement and slurry deposition with thin layering, promoting evaporation and desiccation of tailings (described in section 1.2). This is further evidenced by recent geotechnical investigations finding the tailings within the CTD TSF are largely unsaturated (WSP, 2025).

7.1.1 Seepage Impacting Groundwater Users

There are no beneficial users of hypersaline groundwater in near proximity of the CTD TSF. The closest beneficial users of hypersaline groundwater are Mt Weld Rare Earths Mine (~28 km) and Granny Smith Gold Mine (~33 km) from SDGM. Whilst the Red October (~11 km) and Butcher Well (~18 km) Gold Mines are closer to SDGM, neither are operational, nor have processing operations at the location of the mine. Both mines have previously been licenced to abstract water for dewatering (rather than consumption).

The closest beneficial user of superficial low salinity water is the Mt Weld Pastoral Company Pty Ltd stock bore (South Extension Bore) is located near the Fuji Wilga borefield and is 9 km southeast and up-hyrdraulic gradient of the CTD TSF.

No beneficial groundwater users will be affected by implementation of the CTD TSF Stage 12 embankment raise.

There is no credible source-pathway-receptor (SPR) linkage between seepage from stage 12 of the CTD TSF and other groundwater users.

7.1.2 Seepage Impacting Vegetation

This pathway involves seepage from the CTD TSF impacting vegetation via a rise in groundwater levels. From section 6.2.2, groundwater quality is hypersaline around the CTD TSF, presenting a risk to vegetation via a rise in groundwater levels. With the rise in groundwater levels in 2024, CTD TSF vegetation monitoring observed that understorey vegetation parameters had improved beyond values previously recorded at all transects excluding CTD09, where parameters improved to a similar values recorded in 2020. In the upper storey, parameters remained stable (Stantec 2024).

The April 2024 peak groundwater levels have not impacted vegetation and are predicted to recede over time, but have the potential to be recharged by large storm events. Thus, the risk of impact from Stage 12 of the CTD TSF is no greater than the current risk at the CTD TSF. Aside from the storm events in early 2024, groundwater levels at most locations around the CTD TSF have been reducing or stable over a number of years (as shown in Figure 9).

Whilst modelling for the predicative scenarios identify groundwater levels will not exceed those of early 2024, a limited but credible pathway exists for vegetation to be affected by salinity of groundwater. However, for the pathway to provide a linkage to impact requires past groundwater levels to be exceeded even if caused by catchment rainfall recharging groundwater.

To further mitigate against the risk of groundwater level rise, AGAA has elected to install additional seepage protection at the CTD TSF by excavating a seepage trench between the Stage 10 seepage interception trench and the southern seepage interception trench. This not only closes a gap in seepage interception on the western side of the CTD TSF but also allows for more efficient collection and recovery of seepage.

There is a potential SPR linkage of seepage impacting groundwater levels and in turn affecting vegetation. However, modelling has shown groundwater levels around the CTD TSF are determined by its proximity to Lake Carey and recharge from large storm events rather than seepage. To further de-risk this, AGAA are proposing to bolster seepage interception capabilities on the western side of the facility. With additional seepage management controls, the likelihood of a SPR linkage is greatly reduced.

7.1.3 Oxidation of Tailings Generating Acidic Leachate

Section 6.1 describes the history of geochemical testing of tailings at SDGM and its consistent NAF properties.

There is no credible pathway for SDGM's tailings to generate acid and therefore this SPR linkage is incomplete.

7.2 Impact from Pipeline Rupture

Release of tailings or return water following pipeline rupture impacting soil and vegetation is a credible pathway for impact, which has existing conditions within Licence L8579/2011/2. However, the configuration of the tailings or return water lines between the process plant and CTD TSF are not being changed by this Licence Amendment and therefore do not require changing.

7.3 Impact from Flooding External to the CTD TSF Perimeter

In a flooding scenario, surface water from the upper catchments erodes the CTD TSF embankment, resulting in sediment deposition downstream. With the CTD TSF occurring within two sub-catchments (CTD TSF North and CTD TSF South), floodwater could potentially erode the CTD TSF embankment if controls were not in place. However, the CTD TSF has several existing controls minimising the likelihood of the linkage between pathway and impact. The initial protection against floodwater is the Eastern Diversion Levee which is a North-South oriented bund to the east of the CTD TSF and prevents westward flowing runoff from reaching the CTD TSF embankment. The Eastern Diversion Levee directs stormwater to the Southern Diversion Drain, which conveys runoff to the south of the CTD TSF en route to Lake Carey.

The Northern Diversion Drain intercepts runoff flowing north of the Eastern Diversion Levee. Water is conveyed between the CTD TSF and Aerodrome en route to Lake Carey.

As part of the works for Stage 12, a 160 m northward extension of the Eastern Diversion Levee has been identified for construction as part of Stage 12A. The Eastern Diversion Levee and Northern and Southern Diversion Drains are all designed to convey a 1% AEP with a peak flow of 55 m^3/s.

A source pathway receptor linkage exists for flooding to impact the external embankment of the CTD TSF, without drainage protection. However, the Eastern Diversion Levee diminishes the pathway for an impact to occur. The proposed 160 m extension further de-risks this scenario and the SPR linkage is unlikely to be realised.

7.4 Impact of Overtopping by Tailings or Stormwater

Construction of the CTD TSF Stage 12 embankment raise reduces the risk of overtopping in the short term as it increases the capacity of the CTD TSF impoundment volume. However, the risk gradually increases over time as the impoundment volume is displaced by tailings.

Design of Stage 12 of the CTD TSF has undertaken critical review of the facility to assess changes needed to be implemented to ensure the facility is constructed and operating in accordance with applicable standards (such as those by DEMIRS and the Australian National Committee on Large Dams [ANCOLD]). Design aspects to prevent overtopping include:

- A beach freeboard for the Stage 12 embankment being a minimum of 0.8 m (DMP 2013, ANCOLD 2019).
- Flood retention capacity of the SSP of a minimum 1% AEP 72 hour rainfall event superimposed on a normal operating pond plus 0.5 m (DMP 2013) and
- Flood retention capacity of the SSP a minimum 1% AEP 72 hour rainfall event (ANCOLD 2019).
- Spillway design storm for both the CTD TSF and SSP is to manage a 0.01% AEP. It is noted spillway design does not prevent overtopping but rather ensures should an overtopping event occur, it is managed in accordance with the design.

The CTD TSF surface water management system for management of incident rainfall comprises two gravity decant systems draining into the SSP, two spillways into the SSP and an emergency discharge spillway on the perimeter embankment of the SSP. The decant towers are arranged with varying inlet elevations to accommodate transfer of peak flows resulting from runoff from specific storm events; (1:5 year, 1:10 year and 1:20 year ARI).

The CTD TSF is designed to spill into the SSP in the event of large storm events (such as those which occurred in 2024). Contained water can be pumped from the SSP to the processing plant for use. The SSP is designed to hold a 1:100 year 72 hour storm event plus a contingency storage allowance of 0.5 m dry freeboard to emergency spillway level. The SSP spillways are designed with a peak flow depth of 0.4 m for a 1:1,000 30 minute duration storm. The design intent is for the discharge from the SSP emergency spillway to flow into the southern seepage trench, which under sustained flow from the SSP emergency spillway will overflow at its northern end releasing onto natural land en route to Lake Carey.

The spillways between the CTD TSF and the SSP were designed to cater for rare and extreme storm events up to 1:1,000 ARI, to manage situations where the flow capacity of the gravity system was exceeded. The 1:1000 year peak flood flow for the Stage 10 expansion was calculated to be 114.0 m^3/s (WSP, 2023b).

The source pathway receptor linkage for overtopping the CTD TSF theoretically exists, however design has incorporated standards required under ANCOLD (2019) and DMP (2013) determining a 0.8 m freeboard is required on the Stage 12 embankment.

Likewise there is also a source pathway receptor linkage for the SSP to overtop with storm water. This does however require an emergency situation where a rainfall event exceeds the 1% 72 hour AEP. This would result in release of storm water en route to Lake Carey.

7.5 Impact of Ingestion of Water Containing Cyanide by Birds and Bats

AGAA is a signatory of the International Cyanide Management Code (Cyanide Code). To maintain certification with the Cyanide Code, operations must demonstrate compliance which includes management of decant. AGAA utilises hypersaline process water to ensure decant water is unpalatable for wildlife to drink.

As AGAA sources its process water from primarily hypersaline groundwater, there is no credible SPR linkage for unpalatable water on the decant of the CTD TSF to impact birds and bats.

7.6 Impact of Access to the Decant / SSP by Ambulatory Fauna

SDGM is situated in a location where either large ambulatory fauna such as kangaroos or livestock could potentially access the SSP and/or decant to seek water. Whilst the water is itself unpalatable, risks remain in terms of ambulatory fauna becoming trapped or a potential fauna mortality whilst attempting to access the SSP or decant pond. The CTD TSF is fenced with a locked gate to exclude access by ambulatory fauna.

The presence of a fence with a locked gate around the CTD TSF excludes fauna access, breaking the potential source pathway receptor linkage.

7.7 Impact of Dust

Since 1999, AGAA has been constructing, operating and expanding the CTD TSF. Construction phases for embankment raises are relatively short lived. Operation of the CTD TSF is continuous and dust has rarely presented an issue. This is due to the high salinity of the tailings, in a hot dry climate with high evaporation rates. As a result, drying tailings develop a crust of salt making the surface resistant to dust generation.

AGAA conducts vegetation monitoring around the CTD TSF annually. The 2024 vegetation monitoring observed that understorey vegetation parameters had improved beyond values previously recorded at all transects excluding CTD09, where parameters improved to a similar values recorded in 2020. In the upper storey, parameters remained stable (Stantec 2024). Vegetation response has been more pronounced due to rainfall fluctuations than impacts from fugitive dust.

Operational performance of the CTD TSF over 26 years suggests any SPR linkage for dust impacts to vegetation is not significant.

8 CONCEPTUAL SITE MODEL

To summarise the source pathway receptor linkages for the Stage 12 CTD TSF embankment raise, the conceptual site model table has been prepared in Table 6. By establishing the linkages between source, pathway and receptor along with existing and new controls, it can be demonstrated that environmental risks are either not being affected or are adequately mitigated.

Table 6: Conceptual Site Model for Stage 12 of the CTD TSF

Source / Activities	Potential Emissions, Pollutants or Contaminants of Concern	Potential Pathway	Potential Receptors	Potential Impacts	Proposed Controls and Contingencies
CTD TSF tailings deposition	Saline seepage containing cyanide	Vertical migration of seepage to groundwater	NA. Most groundwater around SDGM is hypersaline and without beneficial users	Minor groundwater quality decline with no detrimental impact to groundwater use or potential users.	• Continue decant recovery • Continue use of groundwater recovery bores • Extend seepage trenches to intercept seepage • Continue bore monitoring programme as per existing licence condition • Continue vegetation monitoring programme as per existing licence condition • Seepage recovery pumps operated to maximise seepage volumes recovered.
			Vegetation surrounding CTD TSF	Rising groundwater mound adversely impacts vegetation	
	Oxidation of tailings stored in CTD TSF generates acidic leachate	Vertical migration of seepage to groundwater	NA. Most groundwater around SDGM is hypersaline and without users	NA. Tailings will continue to be non-acid forming.	• NA
Tailings and return water pipelines	Thickened hypersaline tailings containing cyanide.	Release from pipeline to environment outside containment bund.	Surrounding soil and vegetation	Localised vegetation deaths and soil sterilisation.	• Twice daily pipeline inspections as per existing licence conditions.

Source / Activities	Potential Emissions, Pollutants or Contaminants of Concern	Potential Pathway	Potential Receptors	Potential Impacts	Proposed Controls and Contingencies
	Hypersaline decant water.				• Tailings pipeline corridor not impacted by Stage 12 raise of CTD TSF. • Pipelines contained by existing secondary containment and leak detection.
Flooding external to the CTD TSF perimeter	Sediment laden runoff generated from external embankment of CTD TSF	Overland runoff (external to CTD TSF) mobilising sediments	Native vegetation between CTD TSF and Lake Carey	Localised erosion Impaired vegetation health (short term)	• Existing surface water management structures around the CTD TSF. • Extension of the eastern flood levee during Stage 12 embankment earthworks • CTD footprint not substantially altered by Stage 12 embankment raise.
Overtopping CTD TSF	Tailings overflowing to environment	Discharge of tailings to the environment	Surrounding soil and vegetation	Localised vegetation deaths and soil sterilisation	• At least 0.8 m freeboard around the Stage 12 perimeter embankment. • Stormwater Storage Pond deigned to contain 1 in 100 year 72 hour event as per existing licence condition. • Daily inspection of deposition and embankment freeboard as

Source / Activities	Potential Emissions, Pollutants or Contaminants of Concern	Potential Pathway	Potential Receptors	Potential Impacts	Proposed Controls and Contingencies
					per existing licence condition. • Monthly aerial survey of the CTD TSF.
	Fresh stormwater mixed with saline decant water.	Severe rainfall reduces freeboard of CTD TSF, which overtops into Stormwater Storage Pond (SSP). Under extreme rainfall conditions (greater than 1% AEP, 72 hour storm event) the SSP will overtop to the environment.	Surrounding native vegetation, ultimately draining to Lake Carey	Localised erosion Highly diluted decant forms part of the surface water inputs to Lake Carey (actual impact limited) under extreme rainfall conditions.	• Stormwater Storage Pond designed to contain 1 in 100 year 72 hour event as per existing licence condition • Daily inspection of Stormwater Storage Pond as per existing licence condition
Decant water	Cyanide present in decant water or mixed with storm water	Fauna exposed to cyanide-containing water via direct contact or ingestion. Fauna accesses Decant or SSP	Birds or bats	NA. SDGM uses hypersaline water which makes the solutions unpalatable to wildlife.	• AGAA SDGM is certified under the International Cyanide Management Code. • Water quality in CTD TSF is hypersaline and unpalatable to wildlife.

Source / Activities	Potential Emissions, Pollutants or Contaminants of Concern	Potential Pathway	Potential Receptors	Potential Impacts	Proposed Controls and Contingencies
			Ambulatory fauna	Fauna enters water ponds and unable to extricate itself	• CTD TSF has existing perimeter fence. • Fauna egress mats on ponds
Dust	Dried tailings	Fugitive dust affecting native vegetation	Vegetation adjacent to the CTD TSF	NA. Active hypersaline tailings deposition across the CTD TSF. Hypersaline tailings forms a protective salt crust suppressing dust	• NA

9 SUMMARY OF CONTROLS APPLIED

Table 7 provides a summary of the controls (or mitigating properties) applied to Stage 12 of the CTD TSF to prevent or mitigate impacts to the environment.

Table 7: CTD TSF Environmental Controls

Control	Detail
Operational Freeboard	At least 0.8 m (compliant with Condition 8 of Licence 8579/2011/2)
SSP Freeboard	At least a 1% AEP, 72 hour storm event superimposed on a normal operating pond plus 0.5 m (compliant with Condition 9 of Licence L8579/2011/2)
Spillways	Able to manage a 0.1% AEP when water levels are level with the spillway inverts
Tailings/decant return pipeline containment and monitoring	No change to Condition 5 in Licence L8579/2011/2
Vegetation monitoring	No change to vegetation monitoring in Condition 22 of Licence L8579/2011/2
Monitoring Bores	Continue bore monitoring as per Condition 20 of Licence L8579/2011/2
Surface Water Diversions	Extend the Eastern Diversion Levee ~160 m to the north, designed for managing a 1% AEP 72 hour storm. No change to the existing Northern and Southern Diversion Drains
Seepage Interception Trenches	Excavation of a trench to link the Stage 10 and Southern Interception Trenches. No change to the existing Northern Seepage Interception Trench.
Seepage Recovery Bores	Three bores around the northern perimeter of the CTD TSF (no change)
CTD TSF and SSP inspections	Daily inspection of CTD TSF and SSP as per Condition 10 of L8579/2011/2
CTD TSF and pipeline inspections	Twice daily inspections of tailings and return water lines and CTD TSF as per Condition 10 of L8579/2011/2

10 REFERENCES

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11 APPENDICES

Central Thickened Deposition Tailings Storage Facility Stage 12 Raise Design Report – WSP 2025

Tailings Dam Stage 12 Embankment Raise Numerical Modelling - SRK 2025