Memorandum

10/07/2019

To	Charles Hastie (Primary Gold)		
Copy to	Mark Qiu (Primary Gold)		
From	Dr Stuart Winchester	Tel	02 9239 7337
Subject	Tom's Gully Operational and Post-closure CSMs	Job no.	43 22623 01

Dear Charles,

Please find following update conceptual site models (CSMs) for the operational and post-closure phases of the Toms Gully Gold Project (the Project) to address the NT EPA's request for information.

1 Background

The Project, located near Marrakai in the Northern Territory, has been in operation intermittently since 1988. Carpentaria Exploration discovered the Toms Gully resource in 1986. Following its discovery, the Project has operated under the ownership of several different entities, most recently Crocodile Gold until 2010; then after a period of care and maintenance, it was divested to Primary Gold Limited (Primary).

Primary, the current leaseholder, has applied to recommence underground mining and ore processing at Toms Gully, as described in the Project's Environmental Impact Statement (EIS), Supplementary Environmental Impact Statement (SEIS) and Section 14A amendment (refer to https://ntepa.nt.gov.au/environmental-assessments/register/toms-gully-underground-project). Recent project amendments as described in the Section 14A notification include:

- Subaqueous storage of future underground sulfidic waste rock, almost all from the proposed boxcut and mine development.
- Subaqueous storage of all existing sulfidic tailings from previous operations on site from tailings storage facilities 1 and 2, potentially following re-treatment, plus all future tailings into the Toms Gully pit using a floating head system.
- Treatment of the existing pit water *in-situ* throughout operations to maintain circumneutral pH values and thereby reduce dissolved bioavailable metal concentrations by the addition of quicklime or caustic soda.
- Treatment of displaced water from the pit using the proprietary BioAqua process (or contingency option) as waste rock and tailings are added, for off-site beneficial reuse and/or licenced discharge once approved.

Proposed changes to tailings management and water treatment are projected to result in a reduction of water discharged from site by around three gigalitres over the life of the project as compared to the originally proposed mine plan as described in the EIS and SEIS. Based on the updated water balance model (GHD 2019a), the discharge of treated water to Lake Bazzamundi and Mt Bundey Creek is expected to take place in from the Northern Rainfall Onset (when 50 mm of rainfall or greater is recorded at site after 1 September) and through the wet season.

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Primary engaged GHD Pty Ltd (GHD) to undertake updates to the baseline CSM reported by GHD (2018) for two scenarios, being the operational and post-closure phases of mining. The contents of this memorandum directly address Item 4 on the NT EPA's 'update to the second request for further information following site inspection: 25 October 2018' document.

Specifically, the NT EPA requested:

Provide a predicted CSM for the operational phase. This would be different to the existing (i.e. baseline situation – refer GHD 2018) situation because water will be actively managed (including monitoring and treatment where necessary). Include Lake Bazzamundi.

Provide a predicted CSM for the post-closure phase, once the pit has filled. Clarify why the pit will not continue to be the lowest water storage at the site.

Provide written confirmation that overflow from Lake Bazzamundi would enter Mt Bundey Creek and not Coulter Creek during operations. Provide the exact location where water will discharge to Mt Bundey Creek.

Include information about drainage around the site to account for any non-benign materials stored at surface (for any length of time).

Include modelling of the pit hydrology to indicate if water from the pit would overflow to surface water or exchange with groundwater. This could be achieved with a 3-dimensional model.

Primary's response to the above information requests are documented below.

1.1 Input documents

This memorandum used as inputs, and therefore should be read in conjunction with, the following documents:

- Aquatic Ecology Services (2019). *Technical Memorandum – Impacts to aquatic ecosystems at Tom's Gully.*
- Australasian Groundwater and Environmental Consultants (AGE) (2019). *Dewatering Assessment*. *– Toms Gully Gold Mine, NT.*
- GHD (2018). *Tom's Gully Gold Project – Geochemical baseline and conceptual site model*.
- GHD (2019a). *Tom's Gully EIS – Baseline Studies. Site Water Balance.*
- GHD (2019b). *Tom's Gully Project - Pit water geochemical modelling report.*
- GHD (2019c). *AMD Assessment – Tom's Gully Boxcut material*. Letter report.
- GHD (2019d). *Tom's Gully EIS – Baseline Studies. Tailings storage facility dam break analysis.*
- GHD (2019e). *Tom's Gully EIS – Baseline Studies – Flooding*.

2 Baseline

The baseline CSM was developed to support the SEIS, and therefore, preceded the Section 14A notification. The baseline CSM remains valid as the baseline remains a current snapshot in time showing the key site domains and processes. The Section 14A notification amended the proposed mine plan to reduce impact - for which additional impact assessment was undertaken (i.e. Aquatic Ecology Services (2019), GHD (2019a, b, c, d and e)). The baseline CSM schematic from GHD (2018) has been reproduced herein as a point of reference (refer Figure 1).

The baseline CSM findings as reported by GHD (2018) found that there were releases of acid and metalliferous drainage (AMD) into the environment at Toms Gully that required attention. These included:

- Contaminated runoff from the sulfide waste rock dump (SWRD) stored in Evaporation Ponds 1 and 2 had historically been finding its way into Mt Bundey Creek via the drainage line to the north of Evaporation Pond 2.
- Saline, metalliferous and acidic throughflow and leachate from the oxide waste rock dump (OWRD) was overtopping the OWRD bund and discharging into Lake Bazzamundi during periods of extended rainfall and/or wet season storm events.

GHD (2018) recommended that an updated site water balance be undertaken to be used to inform sizing and design of surface water storage. This recommendation was enacted and the subsequent report is referenced herein as GHD (2019a).

3 Operational phase

Provide a predicted CSM for the operational phase. This would be different to the existing (i.e. baseline situation – refer GHD 2018) situation because water will be actively managed (including monitoring and treatment where necessary). Include Lake Bazzamundi.

A predicted CSM for the operational phase that includes Lake Bazzamundi is provided as Figure 2. As noted by the NT EPA, it would be different to the existing (baseline) CSM, as water would be actively managed during mine operations. Key changes to the original water management strategy as notified by Primary in Table 1 of the Section 14A include:

- Only water displaced by in pit tailings and waste rock deposition to be treated *ex situ* and discharged under licence to Mt Bundey Creek or provided to third parties for beneficial reuse (as against the entire pit water volume originally); and
- The annual operational water discharge to Lake Bazzamundi that would be treated *in situ* if monitoring determined that water quality was not suitable for release would be discharged to either Lake Bazzamundi or Mt Bundey Creek, or be provided to a third party for beneficial reuse.
- Underground water pumped to the surface will be treated to a suitable purity for discharge.

With respect to water treatment, GHD (2019b) conservatively modelled active water treatment requirements and impacts using quicklime and caustic soda for the pit considering current pit water quality, the site water balance including groundwater – pit water interaction, and the geochemistry of the waste rock and tailings that would be emplaced into the pit under the Section 14A notification.

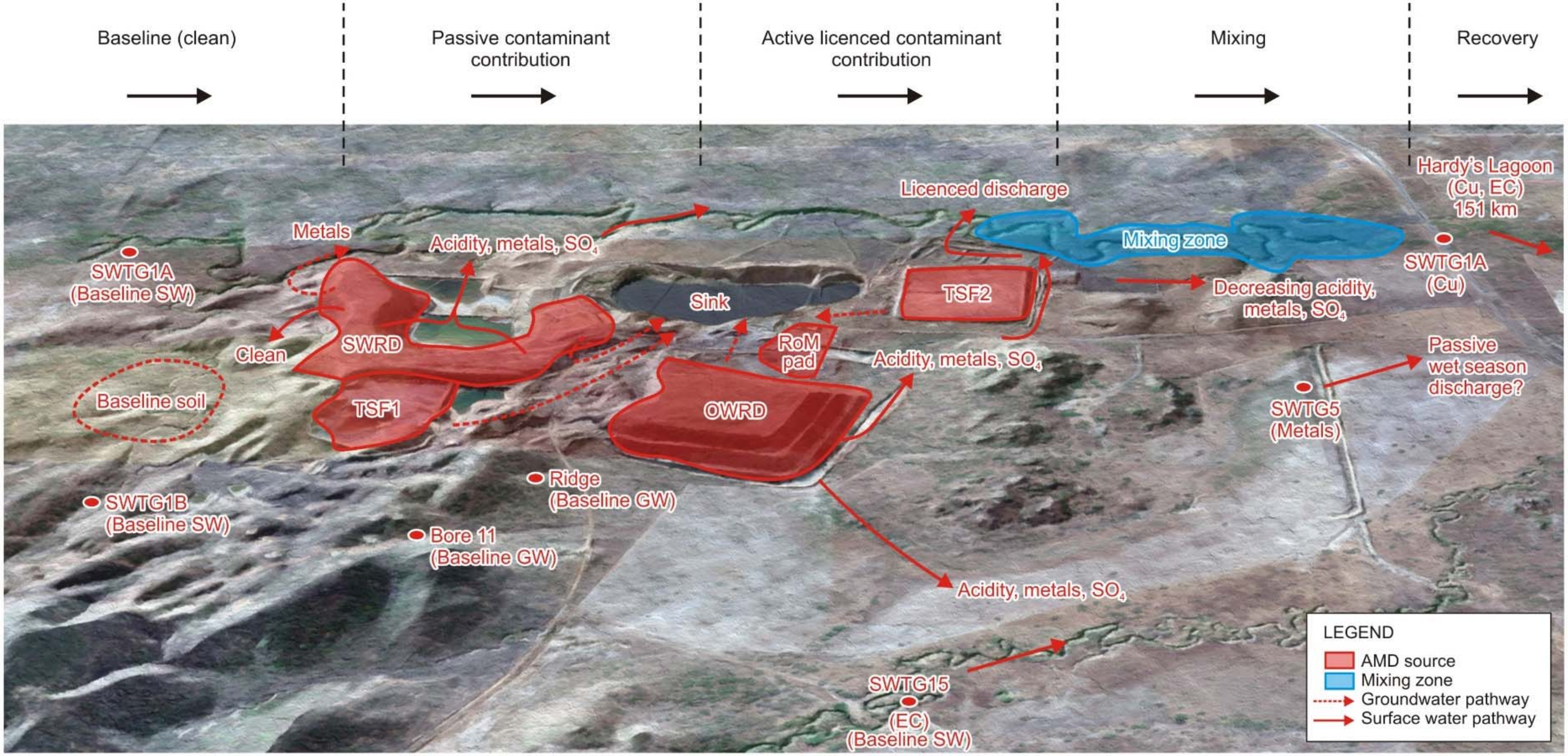

Figure 1 Baseline conceptual site model schematic

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Figure 2 Operational phase conceptual site model schematic

Geochemical information used in the model was sourced from GHD (2018) and GHD (2019c), and therefore included data from existing tailings storage facilities (TSFs) 1 and 2, future metallurgical tailings (GHD 2018) and waste rock from the proposed boxcut and development drives (GHD 2019c).

For the operational phase, the following scenarios were modelled by GHD (2019b):

- Initial treatment of pit water; and
- Operational phase pit water treatment requirements at two years of operations, including:
    - Pit water stratification as per the current conditions was assumed, i.e. anoxic conditions at the solids level in the pit; and
    - Loss of pit water stratification due to a pit water turnover event i.e. oxidising conditions at the solids level in the pit.

Results from the conservative modelling scenarios that predicted conditions after two years of operations at Toms Gully indicated that only some acidity would be generated in the pit, even in the very unlikely event that the low concentrations of dissolved oxygen present are thermodynamically available for the oxidation of sulfides (GHD 2019b). When the model accounted for a pit water turnover event, the higher concentration of dissolved oxygen resulted in more acidity being generated, though for both of the models, pH adjustment was shown to be achievable through the further addition of quicklime. Continuous injection of quicklime into the tailings stream would allow for the neutralisation of any acidity produced, should oxidation of sulfides within the tailings occur. The rate of quicklime addition to the tailings would ideally be calibrated based on of static and kinetic tailings geochemistry results, and pit water quality monitoring.

The use of quicklime to manage acidity pit would result in residual in-pit alkalinity, however, the model did not predict pH values to increase above the upper target site-specific trigger value (SSTV) of 8.0. Further, no SSTV for alkalinity is required for the project.

Provide written confirmation that overflow from Lake Bazzamundi would enter Mt Bundey Creek and not Coulter Creek during operations. Provide the exact location where water will discharge to Mt Bundey Creek.

Figure 3 shows a schematic of water management at Tom's Gully during the operational phase. GHD (2019a) provides quantified annual operational flows around the water management schematic for additional information.

Flood modelling that was undertaken as part of the EIS baseline reporting (GHD 2019a) showed that Lake Bazzamundi overflows into Coulter Creek (within the mining lease boundary at or around existing surface water quality monitoring point SWTG5) rather than directly into Mt Bundey Creek (refer Figure 2). The GHD (2019a) flood modelling showed that Lake Bazzamundi is effectively part of the Coulter Creek floodplain. Given the relatively small capacity of Lake Bazzamundi compared to its catchment area, Lake Bazzamundi is expected to overflow into Coulter Creek in all modelled flood conditions (i.e. 10, 50, 100 and 1,000 year average recurrence interval design storm events plus the probable maximum flood event). Note that Coulter Creek discharges into Mt Bundey Creek approximately 4 km downstream of the Arnhem Highway crossing (refer Figure 2). Mt Bundey Creek subsequently drains north to Hardies Creek and then into the Mary River.

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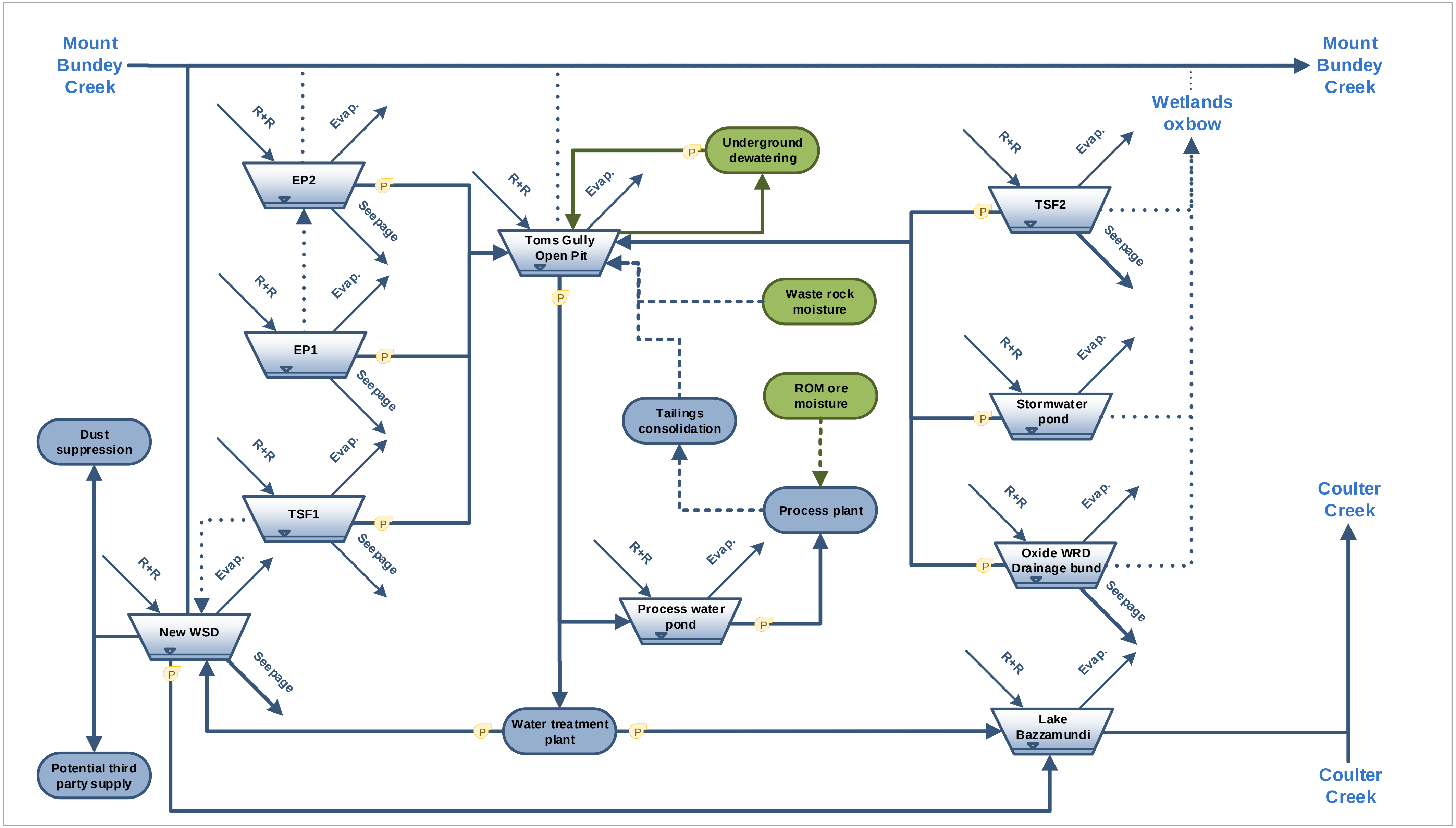

Legend

Surface process	Surface water flow
Underground process	Groundwater flow
Surface storage	Entrained moisture
Pump	Overflow path

Primary Gold Ltd
Toms Gully Gold Project
Site water balance

Water management schematic

Project No. 4322623
Revision No. 3A
Date 12/04/2019

FIGURE 3

Created by: Tyler Tinkler

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As a result of the Section 14A revised water management strategy, Aquatic Ecology Services (2019) noted that GHD's (2019) water balance modelling stipulated that flow will decrease in volume at the end of the wet season in line with flow conditions upstream of Toms Gully Mine. This will allow natural ecological processes related to intermittent streams to occur in the early dry season, and assist in the maintenance of flow-related cues. While discharges will be proportional to flow, the volume of water in the receiving environment will be greater than in upstream areas of both creeks. Surface water connection between Mount Bundey Creek and Coulter Creek will be present for a longer period than would be expected under natural conditions, and there is also the likelihood of isolated pools on Mount Bundey Creek persisting into the early dry season. As previously mentioned, discharges will be reduced and ceased according to flow conditions upstream of Toms Gully Mine. This is likely to delay some natural ecological processes associated with the early dry season, but will not impede them.

Baseline monitoring has previously confirmed the presence of Mertens water monitors in Mount Bundey Creek upstream and adjacent to Toms Gully Mine, suggesting that refugial pools are likely to persist along the watercourse well into the dry season. The proposed water management and discharge regime is not likely to have an impact on populations of Mertens water monitors, as wet and dry season water availability will remain similar to baseline conditions (Aquatic Ecology Services 2019).

Aquatic Ecology Services (2019) recommended that continued aquatic ecology monitoring should be undertaken to maintain an unbroken record of aquatic ecosystem health surrounding Toms Gully Mine. Continued remote camera monitoring for water monitors will have the indirect outcome of also monitoring any introduced species and their presence downstream of the Project area. Currently remote camera monitoring does not extend to the section of Mount Bundey Creek to be affected by discharges, including the site furthest downstream on Mount Bundey Creek (SWTG3). This site was added to remote camera monitoring in 2019, and should be considered for ongoing monitoring to assist with an understanding of these potential impacts.

Currently, remnant pools that naturally occur in Mount Bundey Creek through to the end of the dry season (if any) are not mapped. Understanding the location of these pools, if they are present will assist in placement of fauna cameras in these locations to monitor terrestrial and aquatic fauna densities in these locations.

Aquatic Ecology Services (2019) noted that CSIRO (2018) suggested the use of ecotoxicity testing to establish an additional line of evidence that current SSTVs are sufficient to protect the aquatic fauna of soft waters. It was recommended by Aquatic Ecology Services (2019) that ecotoxicity testing take place during the wet season, and at the ceasing of wet season flows, when water discharged to Mount Bundey and Coulter Creek will make up 50 % of flow being received by the catchment. This will assist in assessing the effectiveness of water treatment and the discharge regime to protect aquatic ecological values.

Finally, Aquatic Ecology Services (2019) recommended that a new water quality compliance monitoring point (i.e. licenced discharge point (LDP) 2) be established on Coulter Creek. This should be located on Coulter Creek in the mine lease between the discharge point at the spillway from Lake Bazzamundi and the Arnhem Highway crossing. The existing surface water quality monitoring point SWTG5 may be suitable, or an alternate location immediately downstream closer to the lease boundary on the overflow path but within the mine lease. Similarly, as Primary are planning to discharge from the water supply dam

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(WSD) to Mt Bundey Creek on occasion, a second new licenced discharge point (i.e. LDP 3) should be located between the WSD and Mt Bundey Creek (refer Figure 2). These would be complimentary to the existing LDP 1 on the Wetlands Oxbow where water is released to Mt Bundey Creek.

Aquatic Ecology Services (2019) also recommended that establishment of a new water quality monitoring location on Coulter Creek upstream of the confluence of Coulter and Mt Bundey Creeks to assist with determining mine water influences downstream in Mt Bundey Creek (i.e. SWTG17 on **Error! Reference source not found.**).

Please refer to Figure 2 for the suggested locations of the new water quality compliance (SWTG5 / LDP 2 and LDP 3) and monitoring points (SWTG17).

Aquatic Ecology Services (2019) concluded that short-term changes to habitat availability, water availability and connectivity within Coulter and Mt Bundey Creeks are expected from increased water volume received during discharges. The short-term modifications to the ecosystem are considered a better outcome for the aquatic ecology of both creeks, compared with previously proposed strategies that would have required a permanent discharge over a number of years.

Although wet season flows in both creeks will be altered, provided a stepped decrease in discharge is undertaken at the conclusion of wet season dewatering each year, it is unlikely that long-term impacts on the aquatic ecology of the receiving environment will occur.

Coulter Creek is susceptible to erosion given that the catchment is highly disturbed. Where appropriate erosion and sediment control is in place and regular monitoring is undertaken, modifications to the channel of Coulter Creek are less likely to be such that habitat availability or water quality are negatively impacted.

Ongoing monitoring of the receiving environment will be the most effective tool in adaptive management of the discharge strategy, should negative impacts be observed.

Include information about drainage around the site to account for any non-benign materials stored at surface (for any length of time).

Figure 3 provided the site water management schematic showing water reporting relationships between site domains, including those hosting non-benign mineral waste (i.e. potentially AMD generating) materials stored at surface. These include TSFs 1 and 2, the run-of-mine (RoM Pad), the OWRD and the SWRD. Figure 3 shows that surface water through the operational phase is pumped from TSFs 1 and 2 into the pit. Surface drainage from the OWRD flows into the drainage bund that is actively pumped to the pit, with residual flow reporting to the Wetlands Oxbow and ultimately to Mt Bundey Creek through surface water monitoring point SWTG12, which also acts as licenced discharge point 1 (LDP1). Primary have committed to pumping surface water from the OWRD drainage bund to ensure it is appropriately managed for operational water volumes. The majority of surface drainage from the SWRD drains internally to evaporation ponds (EP) 1 and 2, which are pumped into the pit as shown on Figure 3.

The Section 14A notification indicated that during operations, Primary plan to reprocess all tailings currently stored in TSFs 1 and 2 to de-risk these areas as AMD point sources as they hold geochemically reactive materials (refer GHD 2018). The pit water quality geochemical modelling undertaken by GHD (2019b) accounts for this proposal. This proactive management strategy will reduce surface water pumping requirements through the latter stages of site operations, and de-risk TSF 1 and 2 as post-closure AMD point sources. Furthermore, all tailings generated throughout operations from underground operations would also be stored long-term in-pit, removing surficial AMD risk from the metallurgical tailings as a potential additional post-closure point source.

In addition, GHD (2019c) reported that the geochemistry of the boxcut waste that is currently proposed for sub-aqueous disposal in-pit is relatively benign. The material was assessed to be predominantly non-acid forming (NAF) with less than 5 % of samples reporting as uncertain and none of the samples classifying as potentially acid forming (PAF). As over 95 % of the tested samples reported as non-acid forming, the mean and median values of the full data are also classified NAF. The kinetic net acid generation (NAG) testing further confirmed the low risk, with no pH results below 4.5 (i.e. none classified as acidic), with increasing pH trends shown over time in most cases. The boxcut samples were also assessed to pose a low risk of generating metalliferous (neutral) and saline drainage.

Based on the results reported by GHD (2019c), the boxcut material was deemed suitable for beneficial reuse on site as an inert capping resource for the existing OWRD and SWRD. This assumed geotechnical suitability and standard on-site operational erosion and sediment controls, with appropriate water management in place. Should Primary seek, and ultimately gain, approval for this beneficial reuse, it is likely that positive impacts to surface water quality in drainage from the OWRD and SWRD would be realised post-closure; once the new capping material on the waste rock dumps were stabilised and re-vegetated.

Include modelling of the pit hydrology to indicate if water from the pit would overflow to surface water or exchange with groundwater. This could be achieved with a 3-dimensional model.

The development of the updated groundwater modelling report (AGE 2019) and the site water balance (GHD 2019a) are iterative, whereby groundwater pumping rates required from the underground workings through operations inform pit water levels, as do the addition of tailings and waste rock to the pit.

The pit lake water volume during operations are presented in Figure 4, with seepage rates into the underground working (i.e. out of the pit) being shown in Figure 5.

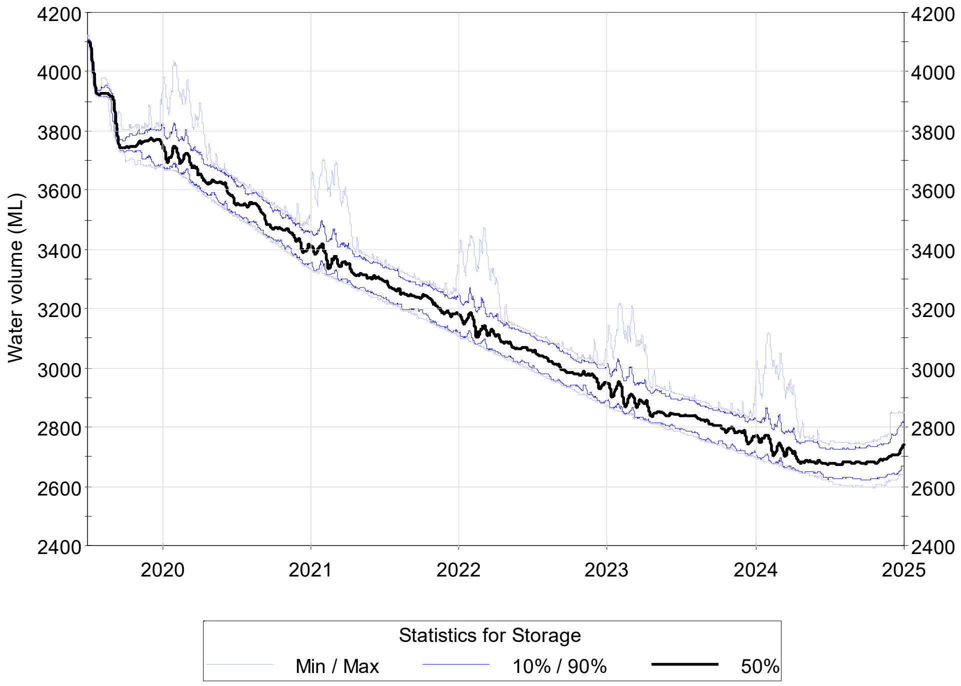

Figure 4 Simulated initial open cut water volume

Figure 4 shows that the volume of water in Toms Gully Open Pit is expected to decrease on average as material emplacement begins and dewatering commences. Although the volume of water in the pit will fall, the elevation of the water surface is expected to remain the same, as the water volume is displaced by waste rock and tailings volume.

Figure 5 from AGE (2019) shows that the total inflow to underground workings from groundwater and the pit is predicted to peak at a maximum of around 2.4 ML/day (27 litres per second) by the end of June 2020 under the worst-case sensitivity modelling analysis. The predicted volume is predominantly derived from water stored within the formation for the first months of mining activities, and gradually becomes sourced from water stored within the existing mine pit.

AGE (2019) noted the uncertainty of some model input parameters at present and recommended further investigation of the Wildman Siltstone, the orebody and the Crabb Fault zone to better understand the range in permeability for the three geological units. This could include:

- In-situ packer permeability testing which can isolate specific target areas and provide information of the variable nature of the hydraulic conductivity values of the discrete zones
- Undertaking longer duration pumping test(s) to identify likely flow barriers and determine what mine dewatering would be required to maintain safe, dry mine working conditions.
- Installing water level dataloggers in monitoring bores to identify the magnitude of response to groundwater levels from pumping and recharge from rainfall events.

AGE (2019) noted that the additional data would enable development of a more robust conceptual hydrogeological model for the orebody and surrounding Wildman Siltstone. This, in turn, would will allow the groundwater model to be updated to better reflect the heterogeneity that is not adequately represented in the numerical groundwater model, thereby reducing the uncertainty on the model and providing a narrower range of predicted inflows.

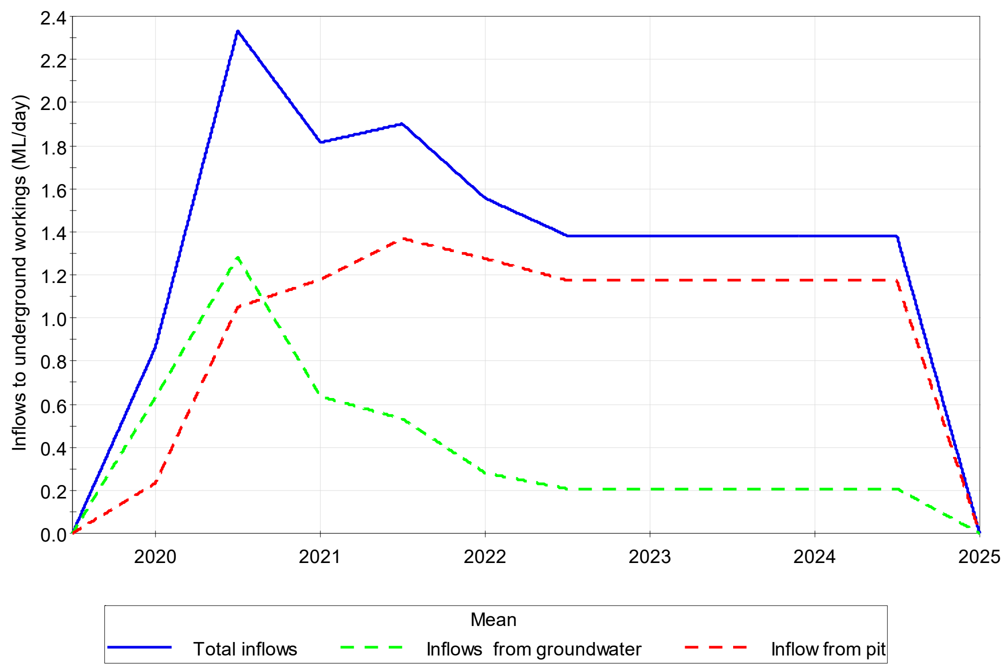

Figure 5 Simulated net flow to underground workings

During site operations, the requirements for discharge of excess water generated from mine dewatering is expected to be mitigated by storage of water in the New WSD during the dry season for use by third party irrigation. Modelling results from GHD (2019a) indicate that these measures will allow discharges to be constrained to the wet season when dilution is available for the natural flows in Mount Bundey Creek and Coulter Creek. With its larger catchment area, Mount Bundey Creek is expected to provide the greatest dilution of wet season discharges, however, some discharges to Coulter Creek via Lake Bazzamundi are still expected to occur, depending on day to day operations.

Despite the water management system proposed for the Project, there inevitably remains an inherent possibility of uncontrolled discharges due to rare rainfall events. The likelihood of this occurrence was assessed using the site water balance model (GHD 2019a). Results showed a modelled probability of uncontrolled discharge from the Stormwater Pond and OWRD drainage bund occurring in any given month over the mine life; scenarios which are entirely manageable. Importantly, no discharges from other surface water storages, including the pit, were forecast by the model simulations. The probability of discharge from the pit and TSFs was found to be less than one percent, based on proposed operational water management.

With respect to water monitoring, Primary currently has a routine surface and groundwater monitoring plan that is implemented at Toms Gully. The water monitoring plan would be updated to meet operational requirements for approval by the NT Government post-approval. Primary would then adopt an adaptive management approach whereby monitoring feedback would be pro-actively used to improve site water management as required.

4 Post-closure phase

Provide a predicted CSM for the post-closure phase, once the pit has filled. Clarify why the pit will not continue to be the lowest water storage at the site.

Include modelling of the pit hydrology to indicate if water from the pit would overflow to surface water or exchange with groundwater. This could be achieved with a 3-dimensional model.

A predicted post-closure CSM is provided as Figure 6.

The long-term water volumes in key water management features, including the pit, were forecast by extending the simulation water balance model until 2050 and assuming no active management of the site from 2025 onwards (GHD 2019a). The results are also representative of potential scenarios where the Project does not proceed, is substantially delayed, has early closure or proceeds in a modified manner that results in the pit water (and other contaminated waters) not being treated. In the case of care and maintenance, it would be expected that the contaminated water would continue to be actively managed and the results presented above would be representative of this case.

Figure 7 shows the following the end of active management (simulated from 2025 onwards), water levels in the pit are expected to increase over time, with the potential to reach the spill level after about five wet seasons. Thereafter, the pit water level was modelled to increase on average, with seasonal variation, before nearing an equilibrium by 2050.

GHD's (2019a) modelling indicates that:

- The pit is expected to overflow to surface water from time to time post-closure, however, the water balance model is likely to overestimate the occurrence of these events.
- When the water level in the pit is higher than surrounding groundwater, water from the pit is likely to flow via groundwater to Mount Bundey Creek.

Therefore, post-closure, it remains probable that the pit will both exchange with groundwater and overflow to surface water in wet season from time to time.

Considering the above findings, GHD (2019b) modelled the pit water quality post-closure, noting that the scenario whereby a pit water turnover event was not considered due to the predicted final solids level in-pit being within the oxic water layer.

More acidity was predicted to be generated for the post-closure scenario than the operational phase, as the final solids level in the pit is predicted to be within the oxic layer of pit water. This meant that oxidation of all of the sulfides within the oxic water layer was conservatively predicted, resulting in a pit water pH value lower than that was observed in the base case.

Figure 6 Post-closure phase conceptual site model schematic

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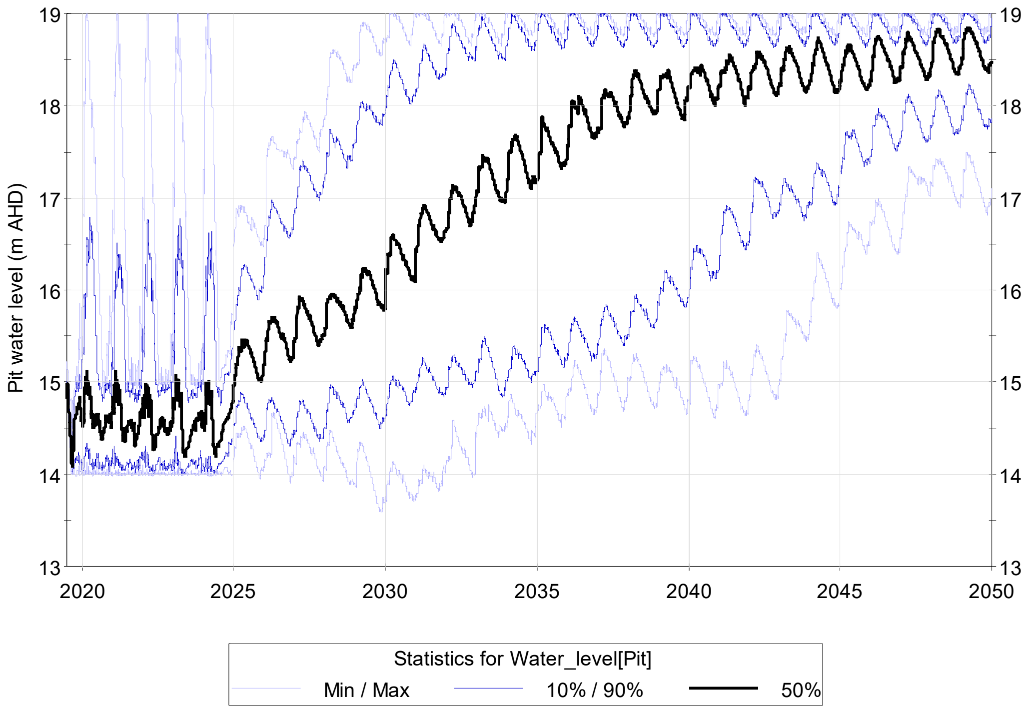

Figure 7 Post-closure pit water levels

While a literature review has shown that approximately the uppermost 10 centimetres, or less, of deposited solids are likely to be exposed to oxidation under this scenario, the acidity predicted by the model could be actively managed through quicklime addition to either the deposited tailings or pit water through operations to mitigate post-closure water quality risk. The addition of 230 mg/L of quicklime is predicted to raise pH to approximately 7.5, within SSTVs, and reduce electrical conductivity (EC) and concentrations of sulfate and iron.

As with the modelled operational scenarios reported above, the conservative assumptions used for the post-closure scenario mean that the water quality impacts from the subaqueous deposition of tailings would likely be less than those predicted by the modelling, particularly if active pit water treatment is undertaken during operations (GHD 2019b).

In practice, the addition of natural carbon to the pit through fallen vegetation, along with the dissolved sulfate, iron and other metals in the pit water, would see the establishment and proliferation of sulfate reducing bacteria within the submerged upper tailings profile. An engineered solution such as the addition of a fine-grained ‘blanket’ of inert or alkaline cover material over the tailings surface would accelerate this natural process. This would lessen predicted water quality impacts from the conservative modelling scenario whereby (amongst other conservative model assumptions), all sulfidic tailings oxidise. Creating suitable conditions for bacterial assemblages to proliferate in such environments is routinely used as a pro-active management strategy to retard or reduce sulfide oxidation rates and sequester metals and sulfate, while also generating bicarbonate alkalinity in the water column, all of which reduce

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post-closure water quality risk (e.g. SENES Consultants Ltd 2002, Arcadis 2015 and references within GHD 2019b). In an environment such as the one the Toms Gully pit is located within, whilst there is natural vegetation growth surrounding the pit, this would be a self-sustaining post-closure water quality management strategy.

Include information about drainage around the site to account for any non-benign materials stored at surface (for any length of time).

As noted above, Primary has advised under the Section 14A notification that during the operational phase, historic sulfidic tailings currently retained within tailings storage facilities 1 and 2 are to be re-processed and stored long-term subaqueously in the pit. In addition, future metallurgical tailings and waste rock from the proposed box-cut and development drives is also to be stored long-term subaqueously in the pit. This initiative removes around 375,000 tonnes of historic sulfidic tailings from long-term sub-aerial storage at Toms Gully, thereby reducing AMD point-source risk and the dam break risk scenario and concomitant potential downstream impacts (GHD 2019d).

As a result of Primary's amended mine plan under the Section 14A notification, the remaining non-benign materials stored on surface for any length of time, are the existing OWRD and SWRD. GHD (2018) reported that whilst the SWRD contained around 3.27 million m^3 of mineral waste with a median net acid producing potential of approximately 16.2 kgH_2SO_4/tonne, the intrinsic oxidation rate of the contained pyrite was relatively slow at 0.4 kgH_2SO_4/tonne/year. Mineralogical analysis shows that the SWRD contains up to 1.4% pyrite, 0.4% arsenopyrite and up to 8.9% jarosite Therefore, whilst the SWRD is generating acidity, the acidity load is relatively manageable – either through active management during operations or natural dilution and attenuation through post-closure wet seasons.

Median historic surface water data from location SWTG13, being surface water runoff from the SWRD prior to it entering the evaporation ponds showed water quality consistent with sulfidic waste rock contact. This included an acidic pH value (4.0), elevated EC (1,145 µS/cm), acidity (274 mg/L $CaCO_3$ equivalents), sulfate (960 mg/L), and dissolved metal concentrations above respective SSTVs for aluminium, cadmium, cobalt, copper, manganese, nickel, uranium and zinc. However, median surface water quality collected at SWTG9, located in a drainage line on the western side of SWRD prior to it entering Mt Bundey Creek downstream of SWTG1A was entirely compliant with respective SSTVs for all analytes. This suggests that rainfall interacting with the rehabilitated western slopes of the SWRD was not entraining environmentally deleterious elements.

GHD (2018) also noted that the OWRD contains an estimated 3.97 million m^3 of mineral waste material. Mineralogical analysis shows that the SWRD contains up to 1.7% pyrite and up to 0.6% jarosite. It also contains carbonate as dolomite (up to 11.1%) and calcite (up to 1.9%). Acid base accounting showed that the OWRD had a median NAPP value of 0.9 kgH_2SO_4/tonne. The sulfide oxidation rate was shown to be very slow, with an intrinsic acidity generation rate of <0.1 kgH_2SO_4/tonne/year. Therefore, whilst the OWRD is generating acidity, it would appear that the annual load is small and manageable. Water and sediment quality reported by GHD (2018) indicates that surface water and sediment from the OWRD was overtopping the drainage bund and entering Lake Bazzamundi.

The data suggest that the SWRD and OWRD are more saline and metalliferous drainage risks than acid generating risks in their current state. Therefore, post-closure water management is important. The baseline CSM (Figure 1) showed acidity, metals and sulfate passively leaving site into Mt Bundey Creek to the north from the internal surface of the SWRD via EP1 and 2, with acidity, metals and sulfate overtopping the OWRD bund and entering Lake Bazzamundi. The passive discharges would ultimately report to Coulter Creek (from the OWRD bund) then Mt Bundey Creek (directly from EPs 1 and 2 and indirectly from the OWRD bund via Lake Bazzamundi and Coulter Creek), where they would be passively managed through natural wet season attenuation processes. Based on the current post-closure scenario under the Section 14A notification, this would continue to be the case unless additional rehabilitation work was undertaken on the OWRD and the SWRD.

As noted above, GHD (2019c) determined that the box-cut waste rock was suitable for beneficial reuse on-site as inert capping material for the existing OWRD and SWRD. This assumed geotechnical suitability and standard on site operational erosion and sediment controls, with appropriate water management in place. Should Primary seek and ultimately gain approval for this beneficial reuse, it is likely that positive impacts to surface water quality in drainage from the OWRD and SWRD would be realised post-closure; once the new capping material on the waste rock dumps stabilised and was re-vegetated.

Importantly, Aquatic Ecology Services (2019) concluded that although the wet season flows in both Coulter and creeks will be altered, provided a decrease in discharges is undertaken at the conclusion of wet season dewatering each year, it is unlikely that long-term impacts on the aquatic ecology of the receiving environment will occur.

Please contact me directly if you would like to discuss the contents of this memorandum further.

Regards,

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5 Limitations and Disclaimer

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6 References

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