

Addendum to the Supplement Environmental Impact Statement

Toms Gully Underground Project





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PRiMARY
GOLD



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Acronyms

Abbreviation	Definition
AAPA	Aboriginal Areas Protection Authority
AMD	Acid and Metalliferous Drainage
ANCOLD	Australia National Committee on Large Dams
ANZECC & ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand
APR	Acid Potential Ratio
CIL	Carbon in Leach
CRD	Concentrate Residual Dam
NLC	Northern Land Council
Draft EIS	DRAFT Environmental Impact Statement
DoB	Department of Business
DoEE	Department of Environment and Energy (Commonwealth)
DoI	Department of Infrastructure
DPIF	Department of Primary Industry and Fisheries
DPIR	Department of Primary Industry and Resources
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
ESCP	Erosion and Sediment Control Plan
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999.
GL	Gigalitre
GSE	Groundwater Sensitive Ecosystems
ICMC	International Cyanide Management Code
IECA	International Erosion Control Associations
MCP	Mine Closure Plan
MMP	Mining Management Plan
MNES	Matters of National Environmental Significance (as protected under the EPBC Act)
MRM	Mineral Resources Management
NEPM	National Environment Protection Measures
NRETAS	Natural Resources, Environment and the Arts
NT	Northern Territory
NTPFES	NT Police, Fire and Emergency Services
OWRD	Oxide Waste Rock Dump

<i>PAF</i>	<i>Potential Acid Forming</i>
<i>PGO</i>	<i>Primary Gold Ltd</i>
<i>Primary</i>	<i>Short name for Primary Gold Limited used in the Supplement and EPA questions in Section 6</i>
<i>PMP</i>	<i>Probable Maximum Precipitation</i>
<i>PMST</i>	<i>Protected Matters Search Tool</i>
<i>QA/QC</i>	<i>Quality assurance and/or quality control</i>
<i>PWC</i>	<i>Power and Water Corporation, NT</i>
<i>ROM</i>	<i>Run-of-mine storage pad for mixing of ore prior to input into plant</i>
<i>SEIS</i>	<i>Supplementary Environmental Impact Statement</i>
<i>SWRD</i>	<i>Sulphide Waste Rock Dump</i>
<i>SSTVs</i>	<i>Site Specific Trigger Values</i>
<i>TGU</i>	<i>Toms Gully Underground Project</i>
<i>TPWC Act</i>	<i>Territory Parks and Wildlife Conservation Act 2006</i>
<i>TSF</i>	<i>Tailings Storage Facility</i>
<i>S.M.A.R.T</i>	<i>Specific, Measurable, Achievable, Relevant and Time-bound</i>
<i>WA</i>	<i>Western Australia</i>
<i>WAD</i>	<i>Weak Acid Dissociation</i>
<i>WMP</i>	<i>Water Management Plan</i>
<i>WRD</i>	<i>Waste Rock Dump</i>

1 Purpose and Context

In September 2015, PGO submitted a Draft Environmental Impact Statement (Draft EIS) for the TGU Project to the Northern Territory Environmental Protection Authority (NT EPA) under the *Environmental Assessment Act*. Subsequent to the Draft EIS, in August 2018 an Environmental Impact Statement Supplement (EIS Supplement) in response to public and government written submissions was lodged. From a review of the EIS Supplement, site visit by the NT EPA board members and related comments this Addendum to the Supplement (Addendum) responses to further regulatory comments. In addition, the document includes changes to the proposed infrastructure, activities associated with the management of tailings and waste rock produced during operations. These changes are a result of revisiting project alternatives as part of the NT EPA dialogue linked to the EIS Supplement review. The changes better align to stakeholder expectations and the Environmental Factors and Objectives developed by the NT EPA.

In combination with the previously reviewed draft Toms Gully Underground Project EIS and EIS Supplement, these documents form the environmental assessment documentation that will determine the acceptability of the project to proceed. Section 5 of this document details the areas of the Draft EIS, EIS Supplement and Addendum that are relevant to the original Terms of Reference.

1.1. Structure of the EIS Supplement

The structure of this Addendum is set out as follows:

1. Update the project description and design including changes to the proposed activities at TGU;
2. Detail the subheadings of the Terms of Reference with reference to the relevant sections of the Draft EIS, EIS Supplement and this document;
3. Provide a response to the comments associated with the supplement and project changes;
4. Update the risk assessment based on further site investigations and knowledge;
5. Update the commitments table; and
6. Provide all supporting studies and information as appendices.

2 Revised Project Description

The proposed changes beyond that provided in the EIS supplement relate to the management of tailings and waste rock during operations to further reduce the Acid and Metalliferous Drainage (AMD) generation of the TGU Project. The key changes are:

1. Construction of a Boxcut and associated decline to access the Toms Gully ore body. This negates the requirement to reuse the existing pit and underground workings to access the remaining orebody thus allowing both tailings and waste rock to be placed in the pit (Section 2.1).
2. Leave a 100 metre rock barrier pillar (i.e. Exclusion Zone) between the old underground workings and the proposed underground working to allow the pit lake to remain insitu for tailings and waste rock deposition. The barrier provides both vertical and horizontal separation between the two workings (Section 2.1).
3. Placement of all existing (whether processed or not) and future tailings into the Toms Gully pit under the existing pit water level (i.e. under a water blanket) using a floating head system. The system is proposed to discharge the tailings deeper in the water profile to avoid oxygenated water. Tailings positioning below the water level in the pit is to limit sulfide oxidation (Section 2.2).
4. Moving underground waste rock to surface during operations via the proposed decline and then positioning of that waste rock into the pit beneath the water. The co-blending of the waste rock with tailings in the pit will occur within 48 hrs. Waste rock placement below the water level in the pit is to limit sulfide oxidation (Section 2.2).
5. Full dewatering of the pit is no longer required reducing dewatering from 4.7 gegalitres to 1.7 gegalitres with subsequent displaced pit water being treated during operations. The preferred water treatment option remains the same with surface water, water within water holding facilities, dewatering and water displaced from the pit potentially being treated. The contingency water treatment option has been modified to be a two stage process with in-situ pit water treatment and a standalone treatment. The insitu treatment will be to use caustic soda/lime to modify the existing low pH to a higher pH which would assist dropping out heavy metals from the pit water. The second stage is to use a reverse osmosis plant to remove sulfides before discharge. PGO has conducted tests on the Boxcut oxide material and there is a potential to lessen the displacement volume by 0.33 gegalitres by placing the Boxcut waste on the top of the Sulfide Waste dump. Potentially only 1.37 gegalitres will be required to be pumped from the pit due to displacement. (see Comment 9 from date 25 October 2018) and contingency option discussed in Comment 10 from date 25 October 2018 of Section 6).
6. Treat pit water in-situ using methods currently utilised in the Northern Territory by the addition of either lime, caustic or Virtual Curtain to lower the pH and remove metals from the water column (Comment 10 from date 9 October 2018, Section 6).

7. All current tailings within Tailings Storage Facility (TSF) 1 and 2 placed in the pit removing the requirement to upgrade both facilities to take future tailings. PGO gives a commitment that all tailings will be placed in the pit whether processed or unprocessed within 18 months of the commencement of the Boxcut construction (Section 2.2 and Comment 2 from date 25 October 2018).
8. If demonstrated that TSF2 is a suitable structure and seepage can be managed convert TSF2 to a water storage dam during operations. Ultimately TSF2 removed and area rehabilitated at closure (see Section 2.3)
9. Remove the need for the proposed contingency TSF that covers a 9 hectare area as all tailings will be placed in the pit.
10. Undertake injection of lime or caustic or Virtual Curtain into the tailings stream if required for additional buffering capacity into the tailings pile to prevent release of metals and metalloids. (Comment 7 – 25 October 2018)
11. Use the suitable oxide waste rock from the Boxcut to cap the oxide and sulphide waste rock dumps to reduce the ingress of water through the waste rock pile.

The project amendments detailed in this Addendum have been previously submitted for consideration by the NT EPA under clause 14A of the Environmental Assessment Administrative Procedures. As part of this process the NT EPA have accepted the changes and confirmed the changes do not present a significant alteration outside the scope of the original project definition. The Section 14A submission is presented in Appendix A

Further details on the amendments are provided below. All other aspects of the Project remain as described in the Draft EIS or as amended in the EIS Supplement

2.1. New Decline and Retention of a Barrier Pillar

Instead of dewatering and reusing the existing pit and decline, PGO proposes to create a new Boxcut and decline from the surface see Figure 2-1 and 2-2 below. The new decline will allow access to the ore body further down dip and away from the current pit (Figure 2-1). Access to the ore body will remove the need to fully dewater the existing Toms Gully pit allowing the placement of tailings and waste rock into the pit during operations. This removes the need for a Contingency TSF and the reuse of TSF1 and TSF2 for the storage of tailings.

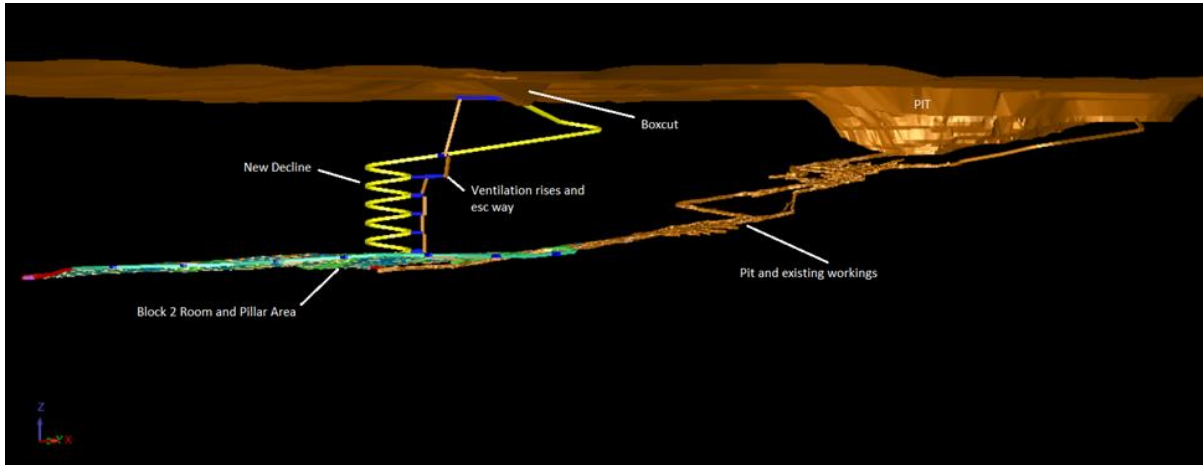


Figure 2-1: Proposed Boxcut Positioned Down Dip of the Ore Body.

To access the ore, the Boxcut is to be located south east of TSF1 in an area of disturbed ground Figure 2-8. The portal and decline are located west of the near vertical fault called the “Crabb fault”. Also the bottom ten metres of the Boxcut will be founded in fresh rock allowing the portal to be within stable ground conditions. Positioning of the decline negates having to transverse the fault, making development of the decline safer and easier. A 100 metre rock barrier pillar (i.e. Exclusion Zone) will be left (Figure 2-2). The barrier is designed to prevent the flow of water from the pit into the underground workings.

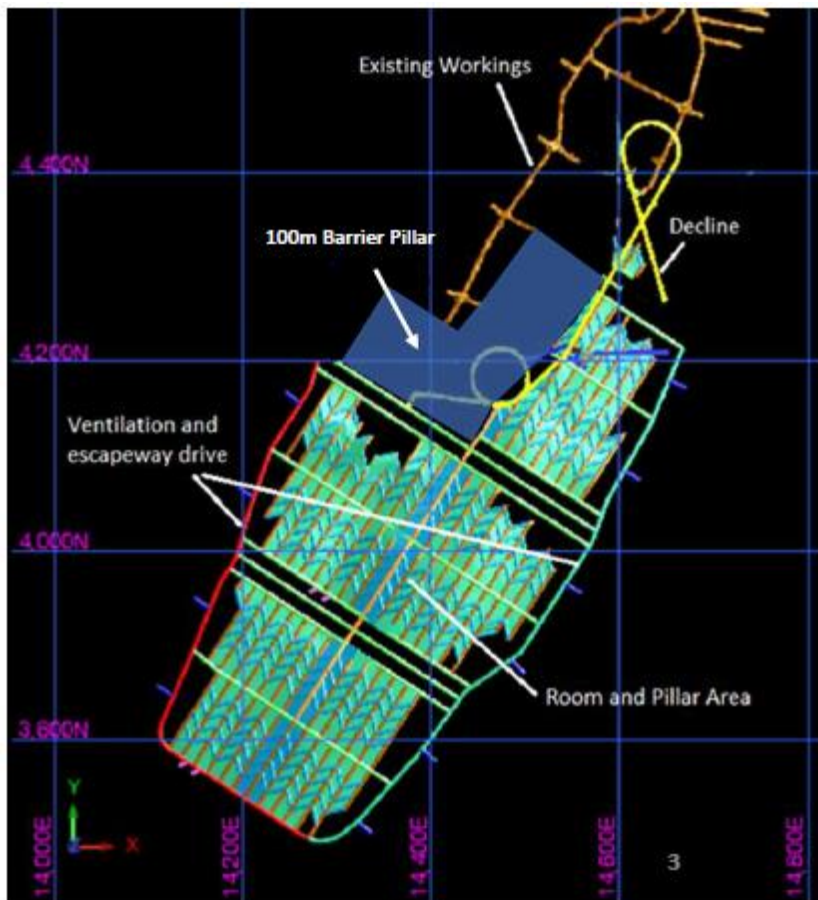


Figure 2-2: Proposed Underground Workings Relative to the Barrier Pillar.

A new decline will allow for a reduction in linear metres (i.e. amount of material to be mined) in some of the ore level tunnels in the main working areas. This reduction is offset by material excavated from the new decline. This means there is an increase in waste mined from the underground. It is estimated underground waste is now 0.85Mt.

Waste rock characterization of the material to be excavated from the Boxcut is geochemically suitable for use in rehabilitation of the waste rock dumps. This material will be used to cap the top surface of the existing waste rock dumps to limit the ingress of water through the waste rock pile. The mine closure plan has been updated to reflect this change (Appendix B). Boxcut material comprises approximately 0.66Mt of mainly oxide material. As a contingency measure the waste will be monitored with any material identified as geochemically unsuitable being placed in the pit (refer to the Acid and Metalliferous Drainage Plan Appendix C).

2.2. Use of Existing Toms Gully Pit for Tailings and Waste Rock Disposal

To reduce the site disturbance while consolidating and simplifying future management of tailings and waste rock it is proposed to use the existing pit for tails and waste rock disposal.

In total, 1.51Mt of new waste rock is to be produced with 0.85Mt produced from underground and 0.66Mt from the Boxcut. Boxcut material will be used to cap the waste rock dumps while part or all of the underground waste rock will be placed in the pit if no underground waste rock can be stored in the mined out underground voids. If required the size of the pit would allow for all of the waste rock (i.e. 1.51Mt) to be placed in the pit under a suitable water cover. Additionally, a total of 0.9Mt of new tailings will be produced with 0.38Mt of old tailings currently on site. An assessment of the Toms Gully Pit volume against the combined tonnage (and associated volume) of tailings and waste rock of 2.79Mt has demonstrated that all the tailings (both existing and new) and generated waste rock can be contained in the existing pit. Nominally requiring 42% of the measured pit capacity. If all material is deposited into the pit the nominal level the pit is filled to is -10AHD or 990mRL. This is nominally 30m to 40m below the surface topography and 25m below the current water level. Work undertaken by GHD (Appendix D) has indicated that a minimum of 1 to 5 metre of water cover is required considering variations in water stratification and seasonal pit water turnover. The difference between the water cover associated with the estimated material to be deposited and the calculated minimum water cover requirement from above provides additional water depth. This additional water depth is a contingency measure for seasonal variations of pit water levels associated with extreme climatic conditions either wetter or dryer.

Waste Rock

When looking at the pit profile, the top levels of the pit have shallow pit wall slopes thus direct tipping of waste rock over the side of the pit will only be successful in limited sections of the pit. This is a function of the tipped material not being able to slide down the walls for the majority of the pit due to the flatness of the top section of the walls. PGO propose to use a hopper and conveyer system

("Stacker") to drop waste rock approximately 60m from the pit edge towards the middle of the pit. The waste rock will fall through the water column and hit the wall where the pit slopes are steepest allowing the waste to slide to the bottom of the pit. The stacker is a mobile conveyer that is available with telescopic versions that can reach distances of 60m. Figure 2-3 and 2-4 below show the waste tipping method of a Stacker and final position of backfill material.

The Stacker is capable of moving 725tph or 240m³ per hour. During operations a daily average of 800 tonnes will require placement that can be easily achieved based on the known operational performance discussed earlier. The Stacker will be placed at the edge of the pit, so it can transport waste towards the internal sections of the pit.



Figure 2-3: Example of Telescoping Stacker

The mode of operation is to truck the waste from the underground mining area to the Stacker over a 24 hour period. Waste is loaded daily into the Stacker hopper and the waste is transported to end of the Stacker conveyor belt and dropped into the pit at a distance of 60m from the pit perimeter. Due to the forward velocity of the material as it leaves the conveyor belt there will be an additional distance beyond the length of the conveyor that waste rock is thrown (estimated at least 5m). Through this process waste rock will be in the pit within 48 hours.

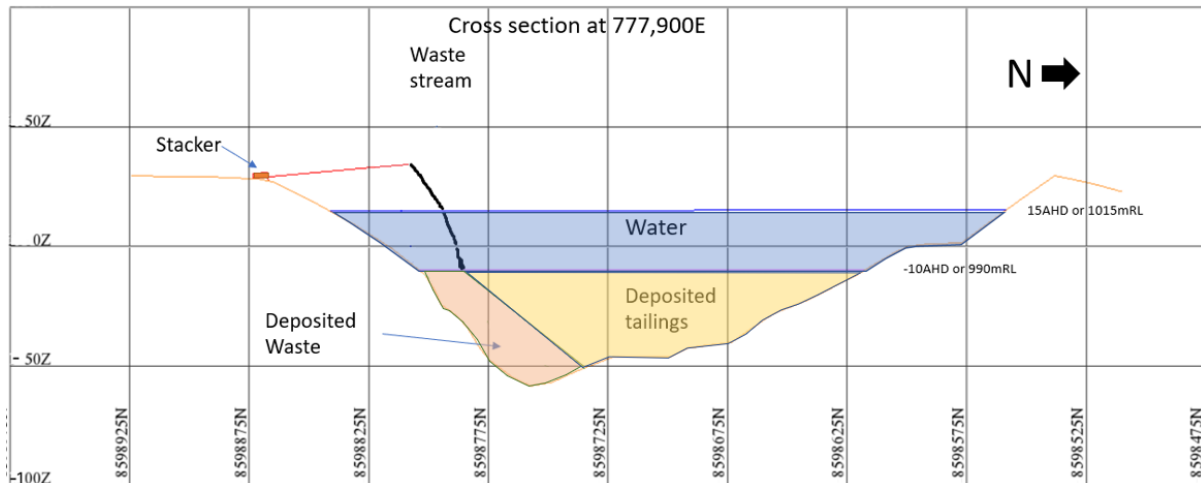


Figure 2-4: Cross Section Illustrating the Indicative Positioning of the Waste Rock and Tailings in the Pit.

Tailings

Tailings will be deposited into the pit by using a pipeline and floating head. The process will involve tailings being pumped from the process plant to the pit in a poly pipeline. The pipe will be extended onto the pit's water surface and will be attached to a "floating head" floatation device. A pipe will then extend 10m below the floating head down into the water column so tailings will be discharged below the top 10m of water in the pit. The floating head can be moved across the pit water surface to deposit tailings sub-aqueously to reduce oxidation and to evenly create a flat surface as the material is deposited. Additionally, the existing tailings storage facilities called TSF1 and TSF2 will have their contained tailings material removed and placed into the Toms Gully pit via the floating head system.

During ore processing tailings production is nominally 28 tonnes per hour or 680 tonnes per day (455 cubic metres per day). This production rate is low and consequently the tailings line will be a small diameter pipe and will be easy to handle. To assess the deposition characteristics of the tailings during discharge the current tailings storage facilities (i.e. TSF1 and TSF2) were examined. These facilities contain tailings that illustrate the angle of repose expected in the tails to be deposited into the pit. On average the angle of repose for the tailings was estimated by measuring the angles in the current tailing's storage facility. The angle varies from 0.3 to 0.5 degrees (Figure 2-5). A maximum angle of 0.5 degrees (i.e. 1m in 69m) was adopted when designing the proposed tailings discharge across the pit.

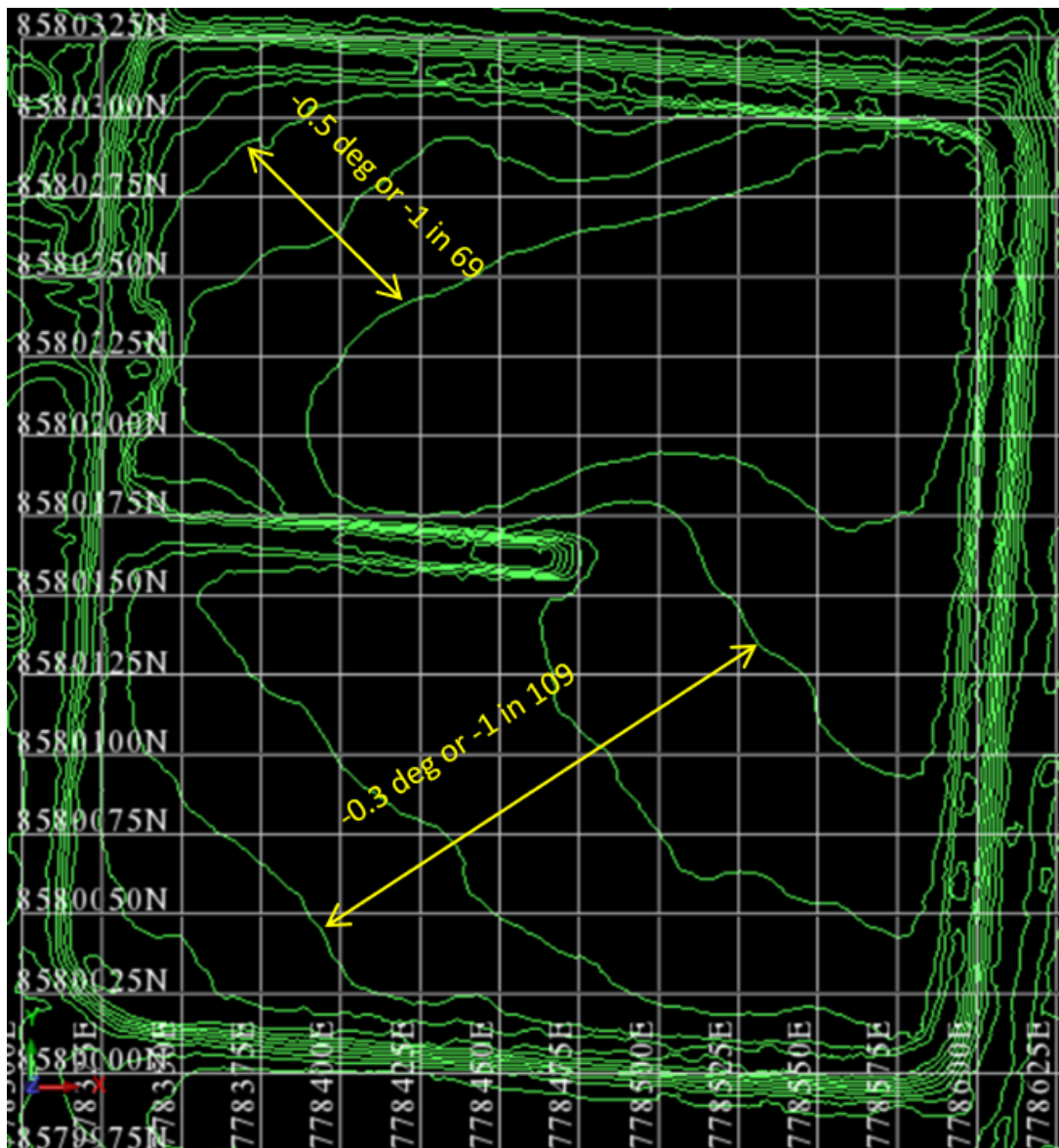


Figure 2-5: Contours of TSF2 Demonstrating Slope Angle of Tailings in Facility.

The pipeline to the floating head on the water surface will be a mixture of poly pipe and “mining hose”(robust hose to handle rock slurry). It will be concertinaed on the surface of the water to allow the floating head to move without constant need for adding or subtracting pipe during the mine life. The floating head will be moved by pulling on three cables; two on the northern side of the pit and one on the southern side. The three cables, set at angles, will firmly locate the floating head on the water’s surface. The location of the floating head will be moved nominally on a monthly basis depending on the results of a monthly survey of deposited tailings in the area around the floating head. Due to the irregular base of the pit the floating head will require variable time at each location to fill to the prescribed level of tailings. Deposition to a level of -10AHD will be targeted as the maximum final level assuming all waste and tails are deposited into Toms Gully pit.

Tailings are expected to flow out at 0.5 degrees as discussed above, which is fairly flat. To ensure the tails are nominally flat the floating head will be moved in north-south traverses at 50m intervals. Once the floating head has completed a traverse from one side of the pit to the other it will be pulled back

50m to start the next traverse. This will continue until the eastern end of the pit is reached (Figure 2-6). The nominal height of tails to be deposited in this first west to east pass is -25AHD.

Then the pipe will be lengthened in 50m intervals to deposit tails between the previous traverses to thus even out any peaks in tailings deposition (Figure 2-6). The floating head will move to the west in 50m traverses until it reaches the western end of the pit (this is the second stage). During the second stage a final target height of -7 to -10AHD is to be reached before moving the floating head to its next position. Frequent surveys will be done and if the tailings rise too high in a month, the floating head will be moved and survey monitoring will occur more frequently.

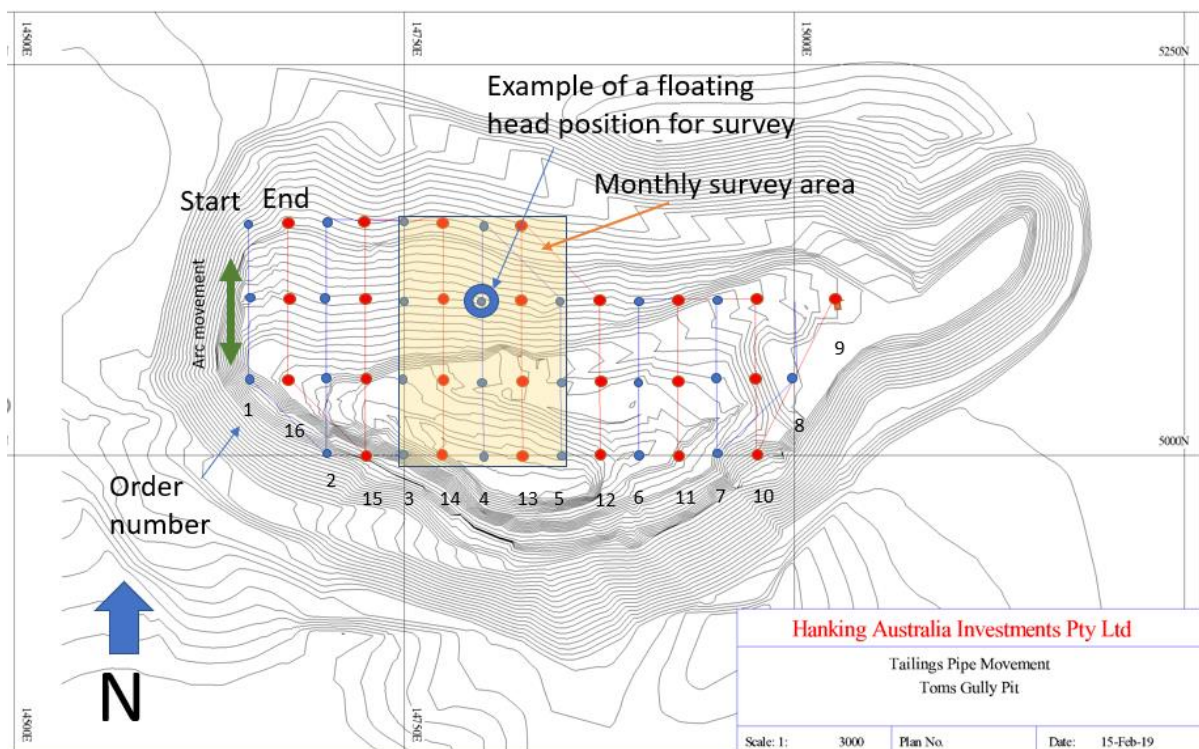


Figure 2-6: Proposed Locations of the Floating Head Traverses during Toms Gully's Mine Life.

Survey monitoring of the tailings surface will be conducted via a boat and surveyor with an electronic distance measuring theodolite to record a surface start position and the height (AHD) of the boat. This location will be used as a reference point to calibrate a GPS sonar device such as Garmin produce. To measure depth of tailings; the surveyor will use a GPS sonar device to measure the bottom surface of the pit and deposited tailings and waste rock. These measurements will be converted into a plan that shows a contour map via the device's software. These devices can contour to a 30cm interval.

Figure 2-7 shows an example of a contour map that can be created by commercially available GPS sonar devices. The survey will be completed on a monthly basis. If necessary, the surveys will be done more frequently if the filling of the pit is occurring more rapidly. The monthly surveys will also help in managing the level of waste rock being stacked into the south edge of the pit as discussed above.



Figure 2-7: An Example of a Contour Map Created by a Readily Available GPS Sonar Device.

2.3. Reuse of Tailings Storage Facility 2 (TSF2) for Water Storage (approximately 0.08 GL storage capacity)

With the decision to place all the existing tailings in the pit as discussed in Section 2.2, TSF2 will be empty of tailings. Once emptied the facility has the potential to hold 0.08 GL of water. If the facility passes an assessment of stability, water retention capacity and suitability for upgrading for water storage the facility will be re-purposed as a water dam. Where relevant the assessment will be against ANCOLD 2012 guidelines. If repurposed the TSF2 will provide additionally water storage capacity. This capacity provides flexibility to:

- aid management of excess water during peak monsoon periods;
- support the water treatment and discharge process; and
- store underground dewatering when required (approximately 34 days storage).

2.4. Amended Disturbance Table

Taking into consideration all of the changes outlined in Sections 2.1 – 2.3, the proposed site disturbances for the TGU Project areas are outlined in Table 2-1 and Figure 2-8. The EIS Supplement proposed clearing 83 hectares of vegetation for the purposes of recommencing the TGU Project. However, due to changes to the project infrastructure (i.e. removal of contingency TSF) the proposed clearing has been reduced to 76 hectares in this EIS Addendum.

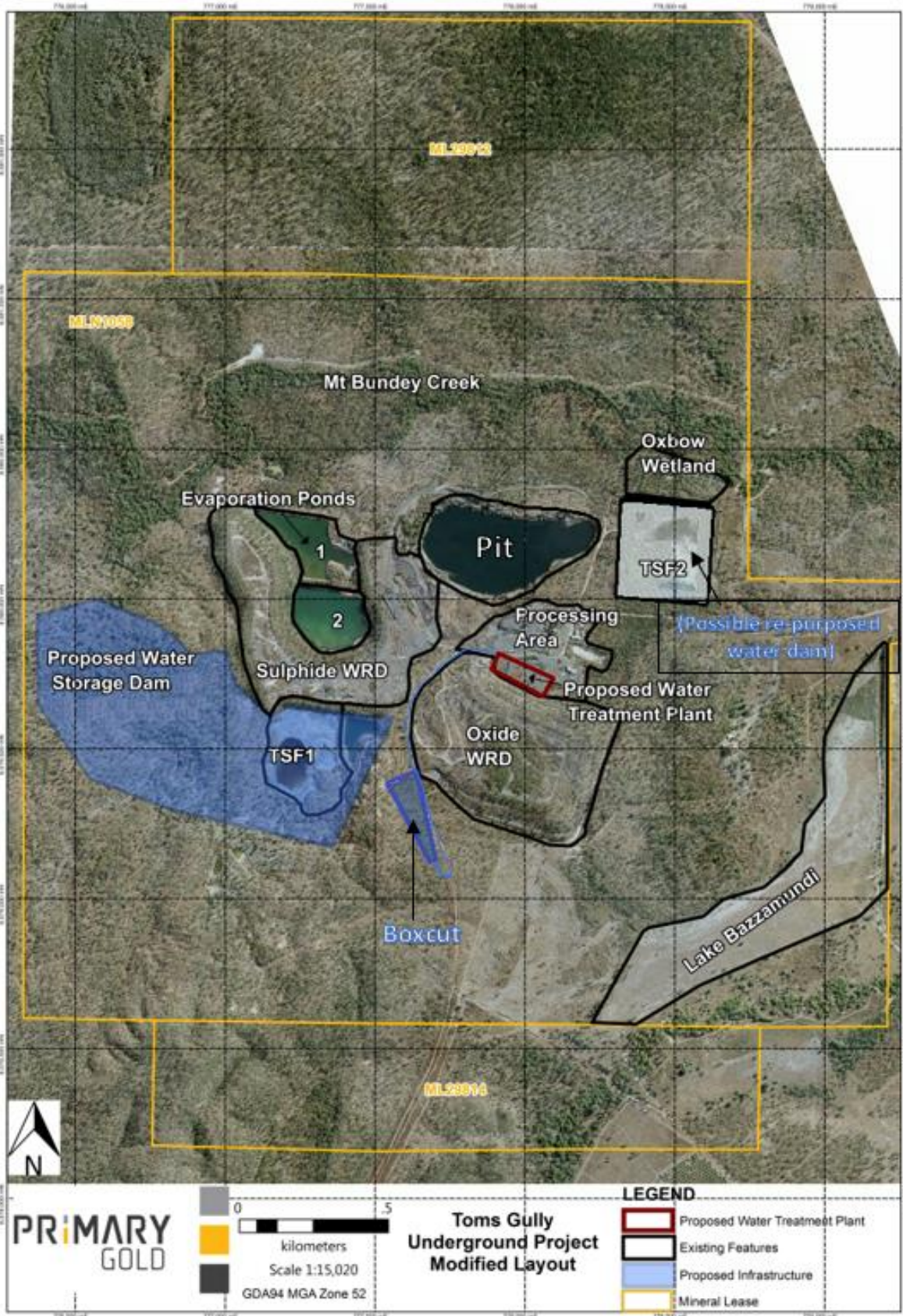


Figure 2-8: TGU Project Layout 2019

Table 2-1 TGU Project 2019 Disturbance Table

Disturbance Domain	2013 Disturbance Area Calculation (ha)	2019 Disturbance Area (ha)	Comments
Oxide WRD (WRD1)	25	25	Confirmed by 2016 LiDAR imagery.
Sulphide WRD (WRD2)	20	28.5	LiDAR 2016 imagery shows a larger disturbance than previously reported.
TSF1	10	10	Confirmed by 2016 LiDAR imagery.
TSF2	12.25	13.05	2016 LiDAR imagery showed the TSF2 disturbance area as 8.66 ha and the oxbow wetland as 4.39 ha. Therefore the total disturbance for TSF2 is 13.05 ha.
Water Ponds / Dams	13.3	14	Subtracted the process pond (0.7 ha) from the Area of Infrastructure (processing area) and added it to Water Ponds/Dams.
Area of Infrastructure (processing area)	4	9.84	LiDAR 2016 imagery shows a larger area of disturbance than previously reported. Within the recalculated disturbance area is a number of vegetation pockets
Drill Pads and Sumps	2.25	2.25	Confirmed by 2016 LiDAR imagery.
Tracks / Roads	2	2	Confirmed by 2016 LiDAR imagery.
Pit	-	15	LiDAR 2016 imagery was used to calculate 15 ha.
SUB TOTAL (EXISTING DISTURBANCE)	88.8	119.64	
Proposed Water Storage Dam	-	16	Proposed to construct a 1GL water storage dam for the storage of treated water and excess water on site.
Proposed Boxcut to access the Toms Gully ore body	-	2	Boxcut to allow access to the Toms Gully orebody further down dip allowing tailings and waste rock to be deposited into the pit during operations.
Proposed borrow pits and associated access tracks	-	58	Borrow pit material is required for the construction of the water storage dam embankments and for rehabilitation.
SUB TOTAL (PROPOSED DISTURBANCE)	-	76	
GRAND TOTAL	88.8	195.64	

3 Changes to Environmental Measures and Management

Based on the proposed modifications and the relocation of infrastructure since the Draft EIS, the proposed environmental management and mitigation measures outlined in the Draft EIS and EIS Supplement have been refined and updated. These changes can be summarised as:

- Provide water quality trigger values for supplying water to a third party (Comment 6 - 25 October 2018);
- Updated commitments summary compiled (Appendix E);
- No tailings (either existing or future) or proposed waste rock to be mined are to remain at surface after closure with material contained within the aqueous pit environment to minimise acid and metalliferous drainage;
- Establishment of additional surface water sampling sites, in particular around Lake Bazzamundi, to increase the surface monitoring network and gain a more comprehensive understanding of upstream and downstream interactions at the TGU site. This has also resulted in a revised and updated Water Management Plan (WMP). See Appendix F for updated WMP;
- Review and refinement of the risk assessment framework for the TGU Project to incorporate project changes. See Appendix G for updated Risk Assessment Framework;
- The Mine Closure Plan (MCP) has been revised and updated using project changes and further studies for the TGU Project (Appendix B);
- Details have been provided on the process to be taken to manage the site environmental risks and legal obligations (including tailings) during care and maintenance periods. Refer to Appendix H;
- Updated Acid and Metalliferous Drainage Management Plan reflecting project changes (Appendix C); and
- Revision of Water Management Plan to match project changes (Appendix F).

As detailed above and throughout the EIS documents; PGO is committed to improved environmental outcomes and ongoing stakeholder engagement during the development and implementation of the TGU Project.

4 Alignment of the Toms Gully Underground Project with the NT EPA Environmental Factors and Objectives.

The NT EPA key environmental factors for the TGU Project are as follows:

- Terrestrial flora and fauna
- Terrestrial Environmental Quality
- Aquatic Ecosystems

- Inland Water Environmental Quality
- Social economic and Cultural Surroundings

In trying to achieve acceptable environmental outcomes that are aligned to the EPA's objectives for each of the above factors, PGO has proposed a number of management measures in both the Draft EIS and EIS Supplement to reduce the risks of AMD and associated impacts at the TGU Project. The proposed measures in this Addendum aim to further reduce contamination of surface and groundwater as well as achieving long-term suitable closure outcomes.

4.1. Environmental Factors and Objectives

PGO has set out an approach that shows how the objectives for each of the key environmental factors for the TGU Project can be met. This includes the changes to the Draft EIS through the EIS Supplement and this Addendum. See Table 4-1 for how each objective can be met.

Table 4-1 NT EPA Factors and Objectives for the TGU Project

Theme	EPA Factor	EPA Objective	Existing Site Conditions	Potential Impacts	Proposed Environmental Management Measures (Based on Draft EIS and EIS Supplement)	Predicted Environmental Outcomes
Land	Terrestrial Flora and Fauna	Protect the NT's flora and fauna so that biological diversity and ecological integrity are maintained.	<p>Flora and Vegetation</p> <ul style="list-style-type: none"> Pine Creek bioregion No flora species of conservation significance were recorded Nine introduced species (one of which is a WoNS - <i>Andropogon gayanus</i>, gamba grass) There are two broad vegetation types occurring within the TGU Project area: <ul style="list-style-type: none"> a) 4: Open forest, Eucalyptus with grass understorey b) 15: Woodlands, Eucalyptus with grass understorey 4 surveyed vegetation types at TGU (GHD 2015), most of which have been disturbed <p>Fauna</p> <ul style="list-style-type: none"> No threatened fauna species listed under the EPBC Act were recorded at Toms Gully (LES 2017) One Mertens Water Monitor (<i>Varanus mertensi</i>), listed as Vulnerable under the TPWC Act was recorded 0.7 km upstream of TGU (GHD 2018) The fauna survey recorded three species listed as near-threatened under the NT TPWC Act; the orange leaf-nosed bat (<i>Rhinonictis aurantia</i>), the bush-stone curlew (<i>burhinus grallarius</i>) and the yellow-rumped mannikin (<i>Lonchura flaviprymna</i>); Six introduced fauna species were recorded at the Toms Gully project area during both surveys, these included horse, house mouse, cane toad, pig, cat and cattle. 	<p>Direct Clearing Impacts</p> <ul style="list-style-type: none"> Clearing of a maximum of 76 ha of native vegetation (WSD, Boxcut and Borrow Pits) Loss of native vegetation communities Fragmentation of vertebrate fauna habitat resulting in displacement of fauna Vehicle strike causing injury or death to native fauna Increase in pest species impacting native fauna <p>Indirect Impacts</p> <ul style="list-style-type: none"> Dust generated from mining activities resulting in reduced vegetation health and condition Spread or introduction of weeds resulting in reduced native vegetation cover and diversity Presence of artificial surface water bodies effecting birdlife behavior and health. Modification of surface water flows resulting in loss, or reduced health and condition of native vegetation 	<p>Flora and Fauna</p> <ul style="list-style-type: none"> Reduced clearing footprint of WSD resulting in overall 10 ha reduction from 83 ha to 76 ha Land disturbance will be kept to the minimum necessary Land clearing will be undertaken progressively with the amount of active disturbance minimised where possible Progressive rehabilitation will be undertaken on disturbed areas as they become available Monitoring will be carried out on an annual basis to assess the success of revegetation in rehabilitated areas Inductions will provide information on protection of vegetation and ground disturbance authorisation procedures Vehicles and mining equipment will keep to designated roads Dust suppression will be carried out during construction and operations when weather conditions dictate A weed hygiene system will be developed and implemented in consultation with the pastoralist Weed inspections will be included in the rehabilitation monitoring program <p>Fauna</p> <p>Implementation of vehicle speed limits, driving on designated tracks only for mining purposes and drive to road/weather conditions to minimise fauna strike and habitat destruction. Minimise the number of surface water bodies and their extent. Large water bodies will have egress mats installed</p> <p>Internal Ground Disturbance Procedures Biodiversity Management Plan Mine Closure Plan Traffic Management Plan</p>	<ul style="list-style-type: none"> No flora species of conservation significance will be impacted by clearing The only areas to be cleared are within the broad scale mapped vegetation Type 4: Eucalyptus with grass understorey (Wilson et al., 1990); which corresponds to the detailed site mapped vegetation type 1a/1 (GHD 2015). This vegetation type extends beyond the TGU Project boundary and is well represented in undisturbed areas. Progressive rehabilitation will be undertaken Fauna injury/death due to vehicle strikes may occur but is unlikely to impact native fauna at the population level Clearing associated with the TGU Project will result in some habitat fragmentation but the impacts on fauna are likely to be incidental due to availability of habitat outside of the project area. Limited potential for bird wildlife to use artificial water bodies. The EPA objective for terrestrial flora and fauna can be met

Theme	EPA Factor	EPA Objective	Existing Site Conditions	Potential Impacts	Proposed Environmental Management Measures (Based on Draft EIS and EIS Supplement)	Predicted Environmental Outcomes
	Terrestrial Environmental Quality	Maintain the quality of land and soils so that environmental values are protected.	<ul style="list-style-type: none"> Land unit mapping of the area by Fett & Hall (1983) is available at a scale of 1:25,000. The majority of the TGU site is within Land Unit 2b: Rugged terrain associated with siltstones and greywacke of Burrells Creek formation and Upper Proterozoic dolomites and sandstones; slopes >10%; surface stone and outcrop extensive. Three distinctive soil types have been identified for the area, which are associated with different plant communities (Primary Gold 2013b): Skeletal and gravelly yellow lithosoils associated with low woodland; Shallow lithosoils and deep red earths associated with open forests; and Extensive alluvium (black soils) associated with low open woodland/grassland. Surface elevation reaches 51 mAHD in the southwest corner of the MLN1058 and falls to 16 mAHD in the low-lying areas An artificial wetland, Lake Bazzamundi is located in the south west corner of the mine lease, and has been used to store mine water and stock compliant bore water. Mapping prepared by Natural Resources, Environment, the Arts and Sports (NRETAS) presented in Hill and Edmeades (2008) indicates that the TGU Project area is not considered to be an ASS risk. Average annual rainfall of 1400 mm 	<ul style="list-style-type: none"> Clearing of vegetation leading to increased dust and soil erosion Introduction of new weed species or spread of existing weed infestations due to vehicle and machinery earthwork movements Hydrocarbon or chemical spills leading to localised soil contamination Creation of new landforms (WSD and boxcut) leading to altered surface water flows Liberation of leachates from waste dumps leading to AMD Ineffective rehabilitation 	<ul style="list-style-type: none"> See management measures for flora and fauna Ensure appropriate storage of hydrocarbons and chemicals according to Australian Standards and spill kits contained on site Weekly inspections of storage areas Positioning of infrastructure and water diversion structures to prevent inundation and installation of diversion drains or bunds Ensure resourcing for rehabilitation and closure early on in planning stages Placement of all future and existing tailings into the Toms Gully Pit. TSF2 emptied of tailings with decommissioning and removal at closure. TSF1 emptied of tailings with integration into the closure management (i.e. sediment and water) of the SWRD. Water treatment plant to treat all existing AMD contaminated water on site before being discharged AMD Management Plan Mine Closure Plan TSF Operating Manual Water Management Plan 	<ul style="list-style-type: none"> Removal of TSF1 and 2 lessens the number of landforms improving environmental outcomes relating to waste minimisation and, the quality of discharge and/or seepage Improved integration of infrastructure into existing topography and geomorphology. The proposed water treatment plant will result in much less acidic water and thus reducing the risk of AMD contamination to terrestrial features (vegetation, soil etc.) The EPA objective for terrestrial environmental quality can be met
Water	Aquatic Ecosystems	Protect aquatic ecosystems to maintain the biological diversity of flora and fauna and the ecological functions they perform.	<ul style="list-style-type: none"> GHD (2018a) noted that coincident with reduced water quality downstream of the mine site, the relative abundance of in stream macroinvertebrates was lower for sites MBC01, SWTG2, MBC03 and SWTG3 relative to the upstream baseline site SWTG1A and reference sites on Mt Bunday Creek. Sites MBC01 and MBC03 were rated as impaired, with reduced community composition The highest number of fish species recorded in the May 2017 sampling event coincided with distance from the mine site, with the downstream site (SWTG3) returning the highest number of fish species (10); slightly more than the baseline site (SWTG1A) (8). This observation supports the water quality data, which shows recovery to near-background conditions at SWTG3. Four species 	<ul style="list-style-type: none"> Discharging mine affected Water to Mt Bunday Creek Increased salinity and/or acidity in Mt Bunday Creek affecting aquatic ecosystem health Increased metal concentrations in Mt Bunday Creek affecting aquatic ecosystem health Poor fish condition, as well as low abundance and diversity due to water quality parameters that are potentially ecotoxic 	<ul style="list-style-type: none"> Treatment of all mine affected water prior to discharge (quality of water to be aligning to SSTVs and water quality parameters) Implementation and maintenance of all surface water runoff via bunds and drains to ensure all water is captured and treated before going off site Surface water monitoring program and Site Specific Trigger Values (SSTVs) Consolidation of all tailings into a single facility with contaminate loads contained within the tailings profile under pit water. 	<ul style="list-style-type: none"> The results from the May 2017 (GHD 2018) aquatic sampling indicated that water quality in Mount Bunday Creek is of poorest quality around TSF2. Water treatment plant is likely to increase the quality of water runoff and discharge into the creek, particularly around TSF2. Less sources to potentially generate AMD across the site. Water to be treated and water quality to meet Site Specific Trigger Values (SSTV) and /or water quality parameters. The EPA objective for Aquatic ecosystems can be met

Theme	EPA Factor	EPA Objective	Existing Site Conditions	Potential Impacts	Proposed Environmental Management Measures (Based on Draft EIS and EIS Supplement)	Predicted Environmental Outcomes
			<p>were identified at MBC01, six species at SWTG2 and five at MBC03.</p> <ul style="list-style-type: none"> Fish health was also noted to be poor at MBC01, with several Spangled Perch showing signs of Tropical Ulcerative Syndrome (red spot disease); brought on by acidic pH values and subsequently elevated aluminium concentrations. A number of Seven-spot Archerfish were observed swimming sluggishly at the same site Overall, the water quality and aquatic ecology monitoring data in GHD (2018a) suggests that water quality in Mt Bunday Creek is poorest adjacent to TSF2 and the Wetland Oxbow. 		<ul style="list-style-type: none"> Dosing of tailings or pit water with lime/caustic to adjust water quality. Reduction in above ground sources of acid mine drainage. Water Management Plan (including sampling of creeks and assessing Aquatic ecosystem health) Biodiversity Management Plan 	
Inland Water Environmental Quality	Maintain the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are protected.	<p>Surface Water</p> <ul style="list-style-type: none"> At a local level, Toms Gully is within the Mount Bunday Creek catchment, which comprises a series of small ridges and dissected hills that are drained by small, steep rivulets which converge into the creek. According to the 2018 baseline geochemistry report (GHD 2018), The Evaporation Ponds (EP1 and EP2), the RO Pond, the Old Decant Pond (ODP) and the pit lake (TGM Pit) are all storing acid and metalliferous water with varying compliance against SSTVs. Downstream sampling locations beyond SWTG2, being SWTG3 and SWTG16 are mostly compliant with SSTVs and consistent with baseline conditions, with the exception of slightly elevated zinc and copper (SWTG3) and EC and copper (SWTG16); suggesting influences beyond that of Tom's Gully on downstream surface water quality (GHD 2018). Positive site water balance and annual average rainfall of approximately 1400 mm <p>Groundwater</p> <ul style="list-style-type: none"> Previous work by AGECE (2004) and Rockwater (1994) has identified three broad groundwater systems/hydrogeological units within the project area. They are: Upper weathered profile in the Wildman Siltstone and more distance metasediments and igneous rocks, with relatively low permeability; "Fresh" Wildman Siltstone and other fractured rock aquifers with moderate to high permeability; and The highly permeable ore body fault zone and the Crabb Fault 	<ul style="list-style-type: none"> Increased salinity, acidity and metal concentrations into groundwater and surface water bodies as a result of AMD runoff and / or seepage Decrease in aquatic ecosystem functioning as a result of poor water quality discharge Accidental spills (hydrocarbon or chemical) causing contamination of surface water and groundwater Overall positive site water balance leading to large storage volumes of potentially AMD contaminated water and AMD runoff 	<ul style="list-style-type: none"> Groundwater and surface water monitoring sampling program and results within upgraded SSTVs No above ground tailings storage In-situ bulk treatment of pit water Dosing of tailings or pit water with lime/caustic to adjust water quality. Use of suitable Boxcut material to cap waste rock dumps. Waste rock placed within aqueous environment of the Toms Gully pit. WSD footprint to be lined/compacted and located away from creek lines. All hydrocarbons and chemical storages and refueling areas will be designed and constructed in accordance with Australian Standards Weekly inspections of storage and refueling areas will be undertaken Vehicles and machinery will be regularly maintained and serviced to reduce likelihood of spills and leaks Spill kits will be present onsite Adherence to SSTVs and water quality supply requirements. Commitment to WRD investigations to reduce AMD producing facility Water Management Plan (including groundwater and surface water sampling in line with SSTVs) Modify the size of bunds where required based on the additional 	<ul style="list-style-type: none"> Controls to be implemented by PGO will ensure that any spills are contained and remediated to avoid impacts to surrounding water environment Surface water management infrastructure will ensure that potentially contaminated waters are contained and treated and discharged appropriately Improved pit water quality. Improvement in water quality leading to an improved discharge quality providing protection to aquatic ecosystems and inland water environmental quality Improved water management via water storage dam with minimized seepage. Remove reusing TSF1 and TSF2 thus removing local groundwater mounding that would have an effect on the local hydrological processes. Sources of seepage reduced and removed during operations and closure. Reduce the amount of water to be discharged. Reduce total potential contaminate loading across the site due to reducing the number of sources. Improve water quality for either discharge or use by a third party for agricultural or horticultural use. Third party water usage provides economic benefits in the area adjacent to Toms Gully (i.e. social, economic and cultural surroundings). 	

Theme	EPA Factor	EPA Objective	Existing Site Conditions	Potential Impacts	Proposed Environmental Management Measures (Based on Draft EIS and EIS Supplement)	Predicted Environmental Outcomes
			<ul style="list-style-type: none"> Generally, the groundwater at TGU is circumneutral to slightly acidic, with the exception of G8, which had a pH between 3.9 and 5.61. The elevated sulfate (and metals where analysed), but neutral pH in the shallow bores OB10 (-8.76 mAHD), OB11 (3 mAHD) and G1 (9.2 mAHD) suggests there has been impact from oxidised sulfides with neutralisation of acidity. This is likely to be due to seepage from the adjacent evaporation pond EP2 (GHD 2018). Based on the chemistry of these bores and an area of white staining, suggesting a salt scald around G1, it is possible there is some local shallow discharge to Bundy Creek, 100 m to the northwest of G1. G8 had the highest elevated concentrations of several metals (aluminium, cadmium, cobalt, copper and nickel) in comparison to multiple guidelines as well as the surrounding bores. This suggests groundwater in the area is impacted by the immediately adjacent waste rock dump. 		<p>completed baseline surveys/information. Maintain all drains to ensure separation of clean water and mine affected water</p> <ul style="list-style-type: none"> Utilisation of Oxbow Wetlands as passive treatment for runoff from OWRD Annual MMP As built WRD design report 	<ul style="list-style-type: none"> The environmental objective for inland water environmental quality can be met and the residual impacts are acceptable.
People and Communities	Social, Economic and Cultural Surroundings	Protect the rich social, economic, cultural and heritage values of the NT.	<ul style="list-style-type: none"> No registered Aboriginal sites or other places of heritage significance at TGU. Key stakeholders include the pastoralist, native title claimants, and the residents and businesses surrounding Mt Bunday area. 	<ul style="list-style-type: none"> Land degradation on surrounding pastoral stations due to weeds, dust, erosion or AMD contamination, death of livestock due to mining activities – all causing strained relationship with pastoralist Relationships with traditional owners strained due to mining activities 	<ul style="list-style-type: none"> Early ongoing stakeholder engagement with underlying land users Economic and social impact statement Adherence to all land access agreements and pastoralist agreements Supply of water for agricultural and horticultural use. Weed and dust management measures implemented Implementation of and adherence to Stakeholder Engagement Strategy (as per MMP and Mine Closure Plan) Complaints register (to reported in annual MMP) 	<ul style="list-style-type: none"> No registered Aboriginal sites or other places of heritage significance at TGU. Key stakeholders include the pastoralist, native title claimants, and the residents and businesses surrounding MT Bunday. The proposed TGU impacts on social surroundings are considered to be minimal. The EPA objective for social, economic and cultural surrounds can be met

5 Terms of Reference and Related Sections of Draft EIS, EIS Supplement and Addendum.

To provide clarity across the three documents (i.e. Draft EIS, EIS Supplement and this Addendum) this section references the relevant parts of each of the documents against the key sections of the “Terms of Reference for the Preparation of an Environmental Impact Statement, Toms Gully Mine Project, November 2014”. More detailed cross referencing of the Terms of Reference is provided in the Table contained in Appendix I. Within this table the final column cross references only the relevant sections of the Draft EIS and EIS Supplement that remain current and the sections of this Addendum that apply.

5.1. Regulatory Context (Section 2 Toms Gully Terms of Reference)

Approvals and Conditions

Details of the applicable project regulatory approvals, government and stakeholder agreements and, relevant guidelines have been detailed in:

- Section 2.1 to 2.7.2, 6.6, 7.7, 8.6, 9.3, 9.6, 10.6, 11.6, 12.7 and 16.1 Draft EIS, and
- Minor amendment in Comment 21, Section 6 EIS Supplement

Environmental History

Details on the site environmental history are presented in:

- Section 1.2.2, 2.7.1 to 2.7.3 Draft EIS.

Ecological Sustainable Development

Details on the site Ecological Sustainable Development are presented in:

- Section 17, Draft EIS.
- Totally updated and including NT EPA Environmental Factors and Objectives in Section 5, EIS Supplement.
- Refined to reflect project changes in Section 4, this Addendum.

5.2. Project Description (Section 3 Toms Gully Terms of Reference)

Overview

Information on the project overview are presented in:

- Section 3.1, 3.2, 3.12.1 and 3.12.2, Draft EIS.
- Updated proponent details and project activities associated with water treatment and water storage dam Section 3 and 4, EIS Supplement.
- Project activities associated with access to the ore body and, tailings and waste rock management in Section 2 of this Addendum.

Project Details

Information on the project details are presented in:

- Section 1.1, 3.4.1, 3.4.2, 3.5.1, 3.5.6, 3.6.1, 3.8.2, 3.8.4, 3.9, 3.11.1, 3.11.2, 4.4.4, 4.4.5, 7.3.2, 7.3.3, 10.4.1, 10.4.2, 12.1, 12.3, 12.5.2 and 12.5.3 Draft EIS.
- Updated proponent details and project activities Section 3.1, 3.3 and 4, Comment 10, 11, Section 6 Appendix A, EIS Supplement.
- Project activities associated with access to the ore body and, tailings and waste rock management in Section 2, Appendix A – Section 14A of this Addendum.

Decommissioning, Rehabilitation and Closure

Information on the decommissioning, rehabilitation and closure details are presented in:

- Section 13, Draft EIS.
- Project closure updated in Appendix B – Mine Closure Plan and Appendix H - Care and Maintenance of this Addendum.

Alternatives

Information on the project alternatives are presented in:

- Sections 3.8.1, 3.9.1, 3.15.1, 6.4.2, 6.4.3.1, 7.4.2, 8.4.1, 13.3.1.2, 13.3.5, 13.3.7.113, Draft EIS.
- Water dam location in Appendix O, EIS Supplement.
- Underground mine access, management of tailings and waste rock Section 2 and Comment 7 (9 October 2018) of Section 6 within this Addendum.

5.3. Existing Environment (Section 4 Toms Gully Terms of Reference)

Topography and Geology

Information on the topography and geology are presented in:

- Section 4, 7.4.2 and 10.3.1, Draft EIS.

Water

Information on the water is presented in:

- Section 4, 6.3.2, 6.3.3, 6.3.5, 6.3.8, 6.7, 7.4.2, 8.3.3, and 11.4.4, Draft EIS.
- Site water conditions updated in Appendix A Geochemical Baseline Study and Site Conceptual Model and Appendix C – Groundwater Modelling, EIS Supplement.
- Site conditions further refined in Appendix L, N, and R of this Addendum.

Biodiversity

Information on the biodiversity is presented in:

- Section 4.5, 3.4.1, 8.3.1, 8.3.4 Biodiversity Report, Aquatic Ecology Report, Biodiversity Management Plan, Draft EIS.
- Comment 13 of Section 6, Appendix D – Flora and Fauna Survey, Appendix E – Aquatic Ecosystem Survey and Appendix N – Assessment of EPBC 1999 Referral, EIS Supplement.
- Comment 7 (September 2018) of Section 6 and Appendix M of this Addendum.

Indigenous and Cultural Heritage

Information on the indigenous and cultural heritage details are presented in:

- Section 2.4.9, 4.6.1 to 4.6.3, 4.6.5, 4.6.6 and 8.3.2, Draft EIS.
- Comment 15 Section 6 of EIS Supplement.
- Comment 5 (September 2018) of Section 6 and Appendix M of this Addendum.

5.4. Risk Assessment (Section 5 Toms Gully Terms of Reference)

Risk Assessment Approach

Information on the risk assessment are presented in:

- Section 5, Draft EIS.
- Risk assessment totally updated in Appendix G of this Addendum.

Information Requirements

Information requirements are presented in:

- Section 2.4.12, 2.4.7, 2.6.1, 2.6.2, 7.2 and 12.1, Draft EIS.
- NT EPA Environmental Factors and objectives Section 5 of EIS Supplement.
- NT EPA Environmental Factors and objectives Section 4 of this Addendum.

Cumulative Impacts

Information on the cumulative impacts are presented in:

- Section 6.3.8 and 18, Draft EIS.
- Comment 16 of Section 6 EIS Supplement.

Water

Information on water is presented in:

- Section 2.6.3, 3.8.1, 4.4, 5.2, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 8.3, 10.2, 10.4, 13.3, 13.7 and 15.1, Draft EIS.
- Section 3.3, Comment 3, 4, 5, 6, 7, 18, 24, 34 of Section 6, Appendix A, B, C, E and F, EIS Supplement.
- Comment 3 (September 2018) and Comment 1, 3, 4, 8, 9, 10 (October 2018) of Section 6, Appendices C, D, F, L, N, O and P of this Addendum.

Infrastructure Integrity and Suitability

Information on the infrastructure is presented in:

- Section 3.8, 4.4, 6.2, 6.3.1 to 6.3.3, 6.3.8, 6.5, 6.6, 7.2, 7.6, 10.1, 10.2, 10.3, 10.4, 10.5, and 10.6, Draft EIS.
- Comment 4 and 32 of Section 6, Appendix A, B and C, EIS Supplement.
- Project activities associated with access to the ore body and, tailings and waste rock management in Section 2 and Appendix A of this Addendum.

Biodiversity

Information on the biodiversity are presented in:

- Section 8.1, 8.2, 8.3, 8.4, 13.3.7, 13.6 and 13.7, Biodiversity Management Plan, Draft EIS.
- Section 3.1, 4 and 5, Comment 1, 12, 13, 21, 23, 53, 64, 72 and 73 of Section 6, Appendix A, D, E, F and N, EIS Supplement.
- Comment 7 (September 2018) of Section 6 and Appendix M of this Addendum.

Human Health and Safety

Information on the human health and safety is presented in:

- Section 3.9.5, 3.10, 8.4.3, 11.1, 11.2, 11.4 to 11.6, 12.2 and 14.1, Emergency and Crisis Management Plan, Draft EIS.
- Comment 21 of Section 6, Appendix A, D, E, F and N, EIS Supplement.
- Appendix G – Risk Assessment of the Addendum.

Socio-Economic Risks

Information on the socio-economic risks are presented in:

- Section 8, 9, 12.1, 12.2, 12.4, 12.6, 12.7, 15.1 and 16, Appendix 8, Draft EIS.
- Section 5.1.3, EIS Supplement.
- Appendix G – Risk Assessment and Comment 6 (September 2018) of the Addendum.

Historic and Cultural Heritage

Information on the historic and heritage details are presented in:

- Section 4.6, 9.1, 9.2, 9.4 and 9.6, Draft EIS.
- Comment 5 (September 2018) of Section 6 and Appendix M of this Addendum.

Rehabilitation and Closure

Information on the rehabilitation and closure are presented in:

- Section 3.13, 3.14, 6.3.3, 6.5 13.1 to 13.7, Draft EIS.
- Appendix B – Mine Closure Plan and Appendix H - Care and Maintenance of this Addendum.

Other Risks

Information on the other risks are presented in:

- Section 14, Environmental Management Plan, Draft EIS.
- Comment 66 of Section 6, EIS Supplement.
- Appendix G – Risk Assessment.

5.5. Environmental Management (Section 6 Toms Gully Terms of Reference)

Information on environmental management is presented in:

- Environmental Management Plan, Draft EIS.
- Section 4, EIS Supplement.
- Section 3 of this Addendum.

6 Responses to EIS Supplement Submissions and Project Changes

The NT EPA examined the EIS Supplement for the TGU Project, after a regulatory review in consultation with Northern Territory government advisory agencies that concluded, the NT EPA direct PGO to provide further information. Upon further dialogue with the NT EPA (including a site visit by the NT EPA board) and an internal project assessment, the original project proposal was modified via a Section 14A. Project modifications were to enhance the intended environmental outcomes associated with the mining operations and closure. The project changes are discussed in Section 2.1 to 2.3 with the Section 14A presented in Appendix A. Three written requests (dated September 2018, October 2018 and February 2019) for information associated with the EIS Supplement and project amendments were received from the NT EPA. The February 2019 request did not ask new comments but modified the previous two information requests based on project changes. A total of 18 comments were received.

Each of the 18 comments received either in September 2018 and October 2018 and, then modified in February 2019 have been addressed individually in this section. The response to comments have been set out in such a way that each comment is tabulated (as per the NT EPA format) and a response is provided below each comment. Each comment (table) has been allocated the comment number as presented in the information request with the date of that request in order to make referencing of each comment easier. Where comments have been superseded by subsequent comments or no longer apply due to project amendments a response stating the comment no longer applies is given or the reader is directed to the most up to date comment related to the environment matter using the new comment number and associated request date.

A number of the comments received required PGO to undertake further investigations or studies and in some cases update various management plans. All further studies and revised management plans are provided as appendices in the back of this Addendum.

<i>Inland water environmental quality</i>
<i>Comment 1 (First Request for Information – 5 September 2018)</i>
<i>The proposed water BioAqua water treatment process is currently (or soon to be) under trial with a pilot plant at the Toms Gully site. The NT EPA is concerned that this process has not yet been shown to be effective in the Top End climate and at the scale required for dewatering and disposing of the poor-quality water on site.</i>
<i>Further Information Required</i>
<i>Provide a summary of the contingency plan in the case that the BioAqua process does not prove to be effective to treat the required quantities of water to the SSTVs.</i>

In response

This comment has been superseded by Comment 10 in the second request for further information. Please refer to Comment 10 (Second Request for Information – 25 October 2018) for further information.

<i>Inland water environmental quality</i>
<i>Comment 2 (First Request for Information – 5 September 2018)</i>
<i>There are several components of the existing (legacy) infrastructure that are transporting contaminants into the environment via groundwater seepage and at times via surface water flows.</i>
<i>The NT EPA notes that Primary would apply for a Waste Discharge Licence under the Water Act, and that this would require a good quality of water at compliance points. The NT EPA considers that source control within the mine site is required in managing discharge water quality, so understanding contaminant loading from all existing and proposed sources on site would be critically important.</i>
<i>The NT EPA acknowledges that the Supplement has provided considerable new information on this matter and will clarify with Primary on the level of certainty that needs to be demonstrated.</i>
<i>Further Information Required</i>
<i>Provide sufficient information to demonstrate how potential contamination to the environment from all sources (existing and new) within the mine lease would be monitored and mitigated or managed.</i>
<i>Provide a characterisation of the box cut material with reference to the NT EPA’s guideline on acid and metalliferous drainage.</i>

In response

PGO acknowledges the requirement to protect the environmental values of the surrounding and downstream ecosystems. Throughout the Toms Gully Underground Draft EIS, EIS Supplement and Addendum details have been provided on the nature of the source terms and potential contamination loading. A large part of the work associated within EIS Supplement was targeted to build knowledge around the site conditions not fully detailed in the Draft EIS. This work was presented in Appendix A – Geochemical Baseline and Conceptual Site Model, EIS Supplement and discussed in the Supplement. Further work presented in Appendix N of this document has refined the Conceptual Site Model to reflect operational and closure conditions. The findings of this work have shaped the intended monitoring and mitigation measures to thus manage the potential contamination to the environment from all sources located at the site. The discussion below will provide a systematic summary of these elements with cross referencing to the Draft EIS, EIS Supplement and Addendum where required. For the project a source-pathway-receptor Conceptual Site Model (refer Appendix N, in this Addendum) was adopted. This model forms the basis for detailing potential contamination to the environment from all sources (existing and new). Figure 2-8 provides the location of the mining features while Table 6-1 provides a summary that supports the text below.

Sources

Mining of the Toms Gully ore has produced both waste rock and tailings that contain a component of sulfide minerals that are predominantly pyrite and chalcopyrite. Upon exposure to oxygen and approximately 1400 to 1600mm of annual rainfall, oxidation of these sulphide minerals creates acid and metalliferous drainage with related products. Exposure of these minerals in the pit walls and mining voids has created an acidifying pit water body. Previous mining activities have resulted in the waste rock being placed in the Sulfide and Oxide Waste Rock Dumps with some material used for the construction of the plant site and RoM pad. Within the Sulfide Waste Rock Dump it is estimated a total acid load of approximately 115,031 tonnes of H_2SO_4 is present while the Oxide Waste Rock Dump has an estimated total acid load of approximately 3,761 tonnes of H_2SO_4 (GHD 2018).

Ore was processed with the residual tailings placed in TSF1 during the earlier operational phases with the later stage tailings placed in TSF2. In both cases the tailings contain a level of sulfur in the form of pyrite and chalcopyrite that result in acid mine drainage. As a result of changes in mineralogy and processing TSF1 contains a higher level of pyrite and chalcopyrite with an estimated total acidity load of approximately 27,320 tonnes of H_2SO_4 compared to TSF2 with an estimated total acidity load of approximately 9,205 tonnes of H_2SO_4 (GHD 2018)

To manage water on site during operations a number of water storage structures or facilities were constructed. These can be summarised as follows:

- Decant Pond located at TSF1; the decant pond (known as the Old Decant Pond) was constructed to contain mine affected water from TSF1. This facility has water of a poor quality however this facility does not contain acid mine drainage forming material.
- Evaporation Pond 1; located within the horseshoe shaped Sulfide Waste Rock Dump (SWRD) and totally surrounded by the SWRD and Evaporation Pond 2. The facility was designed to capture water percolating through the waste rock dump profile and surface runoff from the inside batters of the SWRD. Water in the pond is acidic and potentially contains limited amounts of acid forming sediments/salts.
- Evaporation Pond 2; located within the horseshoe shaped sulfide waste rock dump with its northern embankment facing towards Mt Bundey Creek. The facility was designed to capture water percolating through the waste rock dump profile, surface runoff from the inside batters of the SWRD and overflow from Evaporation Pond 1. Water in the pond is acidic and potentially contains limited amounts of acid forming sediments/salts.

- Oxbow Wetlands located on the northern side of TSF2 between TSF2 and Mt Bunday Creek used for passive treatment of surface water from the site. Area is ephemeral only containing water during the wet season.
- Drainage bund/channel located on the south eastern corner of the Oxide Waste Rock Dump (OWRD) to capture and redirect surface water and seepage emanating from the OWRD. Seasonally contains mine affected water with minor sediment from the OWRD within the channel.

During recommencement of operations it is proposed the following structures and activities will occur:

- A proposed 1GL water storage dam for site water balance management will be situated to the west of the existing SWRD. The water dam is proposed to be lined or compacted to limit seepage;
- Potential conversion of TSF2 into a water dam once tailings removed;
- Proposed placement of future tailings and waste rock in the pit;
- Placement of existing tailings located above ground into the pit; and
- Construction of a Boxcut to enter the ore body from a different location.

Monitoring

As discussed in Comment 16, EIS Supplement the key pathway and associated transporting medium is water either in the form of surface or groundwater. To continually assess the environmental performance and management of acid mine drainage sources at the operation the following monitoring programs have been proposed (elements of these monitoring programs are currently existing across the site and where required will be upgraded as detailed in the EIS documents):

- Surface water monitoring (further details of this monitoring program are presented in Section 5.3 of Appendix F - Water Management Plan in this Addendum). Also surface water sampling is discussed in Comment 5 (Second Request for Information – October 2018)
- Groundwater monitoring (Further details of this monitoring program are presented in Section 5.4 of Appendix F - Water Management Plan in this Addendum). The upgrade of the current groundwater network via the addition of 11 new monitoring bores has been detailed in Section 2.6.3 of Appendix F - Water Management Plan).
- Aquatic Monitoring (further details of this monitoring program are presented in the response to Comment 4 (First Request for Information – September 2018) within this document and Section 5 of Appendix F - Water Management Plan).
- Water balance (monitoring across the site to prevent the build-up of poor quality water is presented in Section 2.6.3, Appendix F - Water Management Plan and Appendix O – Water Balance).

The integrated monitoring that covers discharge water, surface water, groundwater and aquatic monitoring is intended to identify early patterns, trends and exceedances along contamination pathway. Subsequent analysis of each of the data sets is not intended to be viewed in isolation. When analysing the various monitoring data detailed above a number of indices and criteria will be used for the aquatic monitoring while SSTVs and water quality triggers will be used for water quality. The process of monitoring the potential impacts will occur during the restart, operating period and then through to the eventual site closure. This approach will aid in adaptive management and mitigation across the site.

Mitigation and Management

To control sources of poor quality water understanding contaminant loading from all existing and proposed sources on site has been critically important. As discussed above and further detailed in Appendix D,J and N – Pit Geochemical Modelling, Boxcut Geochemical and Site Conceptual Model, EIS

Supplement and updated for operational conditions in Appendix N the sources have been defined. To manage these sources the following mitigation and management measures are to be implemented.

- Construction and operation of a standalone water treatment plant to treat water from across the entire site. Treating the water to defined SSTVs and water quality levels (i.e. water quality for third party) to allow reuse or discharge
- In situ pit water treatment to increase pH to between 6 to 8 and drop out metals prior to deposition of tailings and waste rock.
- If required addition of lime/caustic/virtual curtain to pit water and tailings to maintain water quality.
- Capture and treat mine affected water emanating from the Sulfide and Oxide Waste Rock Dumps
 1. Water capture points for the SWRD are TSF 1, Evaporation Pond 1 and Evaporation Pond 2.
 2. Water capture points for the OWRD is the drainage bund/channel located on the south eastern corner.
- Use suitable material from the Boxcut to cap SWRD and OWRD to limit the ingress of rain water into the waste rock dump profile.
- No existing waste rock within the WRDs will be used for construction purposes
- The existing sulfide and oxide waste rock dumps are to be maintained to ensure their integrity
- Capture affected surface water draining RoM pad and process area via the storm water pond. Treat water through standalone water treatment plant.
- Tailings in TSF1 to be placed back in the pit under a water blanket whether processed or not. TSF1 used to capture surface water associated with SWRD once tailings removed.
- Tailings in TSF2 to be placed back in the pit under a water blanket whether processed or not.
- TSF2 potentially repurposed as a water storage dam to assist in the management of water across site.
- Prior to tailings relocation water levels across TSF1 and TSF2 maintained to prevent build-up of water at the facilities.
- No existing and future tailings to remain at surface (i.e. positioned below water in the pit).
- Old Decant Pond levels maintained to prevent build-up of water in the facility.
- Evaporation Pond 1 maintained to prevent build-up of water in the facility.
- Evaporation Pond 2 maintained to prevent build-up of water in the facility.
- Removal of water potentially entering the Oxbow Wetlands from areas associated with the OWRD drainage bund/channel and the storm water pond.
- Proposed water dam to be lined or compacted to limit seepage.
- All future underground waste rock to be disposed in the pit under a water blanket.
- No future waste rock is to be deposited long term beyond the pit perimeter.
- Tailings and waste rock positioned to minimize oxygen availability to Potentially Acid Forming components. The water will work as an oxygen barrier. The dissolved oxygen concentration in water is 8.6mg/L at 25°C, which is approximately 25,000 times lower than in the air. Organic matter and other reduced compounds can rapidly consume the dissolved oxygen in the water, which is then not available for sulfide oxidation (DMP 2009).
- Installation of flow meters and water storage gauges to validate the water balance model. Weekly readings will be collected on all transfers across site and storage levels with action taken if a build-up of water is identified.

Boxcut: Waste Rock Characterisation

An analysis of the waste rock to be produced during the Boxcut excavation is presented in Appendix J. Analysis indicated the material is predominantly NAF with less than 5 % of samples reporting as uncertain and none of the samples classifying as PAF. As over 95 % of the tested samples reported as non-acid forming, the mean and median values may also be classified as NAF. The kinetic NAG testing

further confirmed this low risk with no pH results below 4.5 (i.e. classified as acidic) and increasing pH values over time in most cases. The samples also pose a low risk for metalliferous (neutral) and saline drainage with metals exceedances within acceptable dilution factors.

Based on the results the oxide material sourced from the Boxcut can be placed on the waste rock dumps. To provide a secondary level of protection, during excavation once transition material is encountered and if partially oxidised sulfides are observed than this material will be assigned for emplacement in the pit beneath the water level using the stacker discussed in Section 2.2. Identification of the change from oxide to transition and the presence of sulfides will be the responsibility of the senior geologist on site.

Table 6-1 Source, Pathway, Control, Monitoring, Performance Criteria and Environmental Outcomes.

SOURCE	NATURE OF SOURCE	PATHWAY	MONITORING*	CONTROL (MITIGATION AND MANAGEMENT)
RoM Pad and Stockpiles	Ore, Low Grade Ore and Waste (area)	Surface Water and Groundwater	<ul style="list-style-type: none"> • Surface water monitoring 	<ul style="list-style-type: none"> • Area compacted during construction to limit water infiltration. • Constructed storm water pond to capture surface runoff. • Capture surface water and treated by standalone plant if required.
Sulfidic Waste Rock Dump (SWRD)	Waste Rock (Majority fresh with minor oxidized It is estimated that the volume of material is 3,267,800m ³ with a potential source of around 115,031 tonnes of H ₂ SO ₄)	Surface Water and Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring 	<ul style="list-style-type: none"> • Surface water and water percolating through the profile captured in the existing TSF1, Evaporation Pond 1 and Evaporation Pond 2 and treated by standalone plant if required. • Use suitable Boxcut material to cap top surface to limit the ingress of rain water into the waste rock dump profile. • No existing waste rock within the WRD will be used for construction purposes • The existing sulfide waste rock dumps are to be maintained to ensure their integrity
Oxide Waste Rock Dump (OWRD)	Waste Rock (Majority oxidized with minor fresh material. It is estimated that the volume of material is 3,967,800m ³ with a potential source of around 3,761 tonnes of H ₂ SO ₄)	Surface Water and Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring 	<ul style="list-style-type: none"> • Surface water and water percolating through the profile captured in the existing Surface water and water percolating through the profile captured in the existing drainage bund/channel located on the south eastern corner of the Oxide Waste Rock Dump and treated by standalone plant if required. • Use suitable material to cap top surface to limit the ingress of rain water into the waste rock dump profile. • No existing waste rock within the WRD will be used for construction purposes. • The existing sulfide and oxide waste rock dumps are to be maintained to ensure their integrity.
Tailings Storage Facility 1 (TSF1) and associated decant pond	Tailings (It is estimated that the 131,000m ³ with a potential load of around 27,230 tonnes of H ₂ SO ₄)	Surface Water, Wind and Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • If reprocessing by Bioaqua process undertaken sulfur and mix metal oxides removed from tailings. • Preventing the build-up of water by removing and treating the excess water if required. • Placement of tailings in the pit beneath a water layer whether processed or not. • Integrate the empty facility into the management of surface water and sediment around the SWRD.
Tailings Storage Facility 2 (TSF2).	Tailings (It is estimated that the 90,000m ³ with a potential load of around 9,205 tonnes of H ₂ SO ₄)	Surface Water Wind and Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • If reprocessing by Bioaqua process undertaken sulfur and mix metal oxides removed from tailings. • Preventing the build-up of water by removing and treating the excess water if required. • Placement of tailings in the pit beneath a water layer whether processed or not. • If suitable re-use facility for the storage and management of water across the site.
Pit	Exposed sulfides in wall rock and poor quality water. Approximately 4.7 Gigalitres of poor quality water	Groundwater. Surface water if pit were to overflow.	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • No dewatering of pit thus preventing the exposure of unoxidised or semi oxidised sulfides. • Insitu treatment of pit water prior to tailings and waste rock deposition. • Removal and treatment of water that will be displaced by tailings and waste rock deposition.
Underground voids	Sulfide in wall rock and poor quality water. Water volume included in the pit water volume.	Groundwater	<ul style="list-style-type: none"> • Groundwater monitoring 	<ul style="list-style-type: none"> • No dewatering of underground workings thus preventing the exposure of unoxidised or semi oxidised sulfides. • Insitu treatment of water prior to tailings and waste rock deposition.
Evaporation Pond 1 (EP1)	Water; Run off from SWRD and water pump from other facilities	Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • Prevent the accumulation of excess water in the facility. • Treat water for the purpose of reuse or discharge.
Evaporation Pond 2 (EP2)	Water; Run off from SWRD, water pump from other facilities and seepage from EP1	Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • Prevent the accumulation of excess water in the facility. • Treat water for the purpose of reuse or discharge.

SOURCE	NATURE OF SOURCE	PATHWAY	MONITORING*	CONTROL (MITIGATION AND MANAGEMENT)
Tailings and waste rock placed within the pit	Waste Rock and tailings (Majority fresh with minor oxide material). Amount of material is the combined total of TSF1 and TSF2 tailings discussed above, 0.9Mt of new tailings, 0.85Mt of waste rock from mining and 0.66Mt waste rock from the boxcut if this material is unsuitable for rehabilitation purposes.	Groundwater	<ul style="list-style-type: none"> • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • Deposition of tailings using a floating head to deposit tailings subaqueous to minimize oxidation and achieve a flat tailings surface. • Use of a telescoping hopper and conveyor system to place the waste rock within the pit away from the pit walls. • Placement of waste rock into the pit within 48hrs. • Placement of both tailings and waste rock in the pit beneath a water layer to prevent long term sulfide oxidation. • Application of lime/caustic/virtual curtain to either water or tails to manage water chemistry.
Proposed Water Dam	Water from waste water treatment plant and other facilities	Groundwater	<ul style="list-style-type: none"> • Surface water monitoring • Groundwater monitoring • Water Balance monitoring 	<ul style="list-style-type: none"> • Line or compact base of water dam to minimize seepage. • Use dam to manage water across the site and prevent the storage of excess water. • Use as part of the storage and treatment of water for the purpose of reuse or discharge.

*Note that aquatic monitoring has not been allocated to a specific source but will be used to assess the quality of the aquatic ecosystem health as a result of the interaction with the site (i.e. the effect of all sources across the site).

Inland water environmental quality

Comment 3 (First Request for Information – 5 September 2018)

The NT EPA notes that the greatest potential for impact on water quality (with subsequent impacts on aquatic ecosystems and social, economic and cultural values) would be from a catastrophic failure of existing or proposed contingency waste storage facilities. The NT EPA considers that it is necessary for Primary to demonstrate that potential impacts to downstream water quality from a worst-case scenario of catastrophic waste storage (e.g. TSF embankment) failure have been assessed, and describe what measures would be implemented to protect downstream water quality and aquatic ecosystems and their associated social, economic and cultural values.

It is not clear if this information is included in the EIS. The Supplement does include commitments such as design of tailings storage facilities to ANCOLD requirements, management plans and monitoring infrastructure integrity. The response to comment 37 included reference to Appendix A (Geochemical Report). Appendix A, Table 5-27, Item 4, refers to risk of catastrophic failure and references GHD 2018a (flood memo) regarding the aquatic ecology environment. However, information on catastrophic failure does not appear to be in the GHD 2018a reference. Flood modelling with existing infrastructure is included.

Further Information Required

Provide an assessment of potential impacts to downstream water quality and aquatic ecosystems and their social, economic and cultural values from a worst-case scenario catastrophic failure of any or all of the existing. For proposed tailings storage facilities. For example, contaminant transport modelling of such a failure would assist the Proponent, NT EPA and stakeholders in understanding the potential for impact and its significance.

Still required as a discussion of the risk of dam break during the period until existing tailings storage facilities are emptied and closed (especially while tailings are being excavated).

Provide clarification about flood scenarios with new infrastructure and potential impacts on the receiving environment.

In response

GHD completed an assessment on the movement and deposition of tailings from a catastrophic tailings dam embankment failure at either TSF1 or TSF2. Findings of the assessment are presented in Appendix K. The work indicated that a failure due to piping erosion would result in released tailings material being transported along the length of Mount Bundey Creek and deposited within stream breakout and anabranch areas associated with Mount Bundey Creek. Also, it is expected that smaller volumes of tailings would be deposited along the fringes of Mount Bundey Creek upstream and downstream of the TSFs where flow velocities are reduced.

During an overtopping event associated with a probable maximum flood, there is no appreciable difference in the modelled results for the overtopping failure of TSF1 and TSF2. Under either scenario, the released tailings would be significantly diluted by the large volumes of flood waters. There is, however, a potential for tailings (and other mobilised materials) to be deposited within the flood fringe areas.

It is proposed that the tailings from TSF1 and TSF2 will be relocated into the Toms Gully pit within 18 months (whether processed or unprocessed) after the excavation of the Boxcut has commenced. An assessment of the dam failure risk and its consequences are presented in Appendix G-Risk Assessment. To prevent a failure event prior to or during tailings removal no new tailings will be added to the facilities. In addition, water levels will be managed during the wet season under the site's operational water balance to maintain freeboard to prevent overtopping and/or the build-up of water. During the

same period the facilities will have weekly monitoring for geotechnical stability as part of the tailings and water dam management strategy. By incorporating the above management measures the likelihood of embankment failure is greatly reduced resulting in a failure being highly unlikely.

Flood Assessment

An updated project footprint has been assessed against potential flood scenarios. Flooding during a 100year through to a 1000year ARI event would have a low potential of eroding the Tailings Storage Facilities, Evaporation Ponds, Water Storage Dam (WSD) and Waste Rock Dumps. The location of the new WSD and Boxcut on the fringe or outside of the probable maximum flood respectively means these features will have negligible impacts to the receiving environment. Impacts of all other existing infrastructure remain as previously assessed within Appendix B, EIS Supplement. Full details of the updated flood assessment are presented in Appendix L

Aquatic ecosystems

Comment 4 (First Request for Information – 5 September 2018)

The NT EPA acknowledges that Primary has committed to a water management plan, a bio-monitoring program and a Waste Discharge Licence that would mitigate impacts on aquatic ecosystems.

The NT EPA considers that the EIS has not provided certainty on how aquatic ecosystem health would be monitored during and after the proposed operations.

Further Information Required

Provide information on planned monitoring of aquatic ecosystem health during and after operations, including approach to selecting locations for monitoring, data to be collected, statistical analysis to be undertaken, and how resulting information may be used to detect any impact/s resulting from implementation of the Proposal.

In response (Includes input from GHD)

Within the Draft EIS a commitment was given to undertake an annual aquatic monitoring survey. A survey was completed in 2015 as part of the Draft EIS (Appendix 4, Draft EIS) with the survey methodology modified to reflect regulatory feedback associated with the Draft EIS review. The updated methodology has been used for the surveys completed in 2017 (Appendix E, EIS Supplement), 2018 and 2019. During the restart, operations and eventual closure it is proposed to retain the sampling sites that are currently in use, the sites are presented in Figure 6-1. The retention and use of these locations is a function of and to provide the following:

- A historical dataset that allows for assessments against baseline data, historical analysis (including spatial and temporal trends) and comparison with ongoing water quality monitoring.
- Sampling of both upstream and downstream aquatic environments within Mt Bunday and Coulter Creeks as well as upstream and downstream of their confluence to identify patterns and trends in the surrounding environs and across the site.
- Replication at site level, as well as within sites, which allows for a robust assessment of the downstream impact of operations at Toms Gully Mine; and
- Provide safe access for monitoring at sites that have been assessed for hazards such as estuarine crocodiles.

In seeking a waste discharge licence and mining management plan approval a monitoring plan will be formulated covering the locations in Figure 6-1. When producing the monitoring plan the relevant regulatory agencies will be consulted. The formulated monitoring plan is intended to be an extension of the baseline surveys by sampling the upstream and receiving environments. As with the previous surveys the annual survey will occur during the early dry season when conditions are characterised by

steady state flows, water is shallow and clear enough to enter safely and conforms to protocols detailed in the Darwin-Daly AUSRIVAS Sampling and Processing Manual. Data to be collected during the surveys at each site will include:

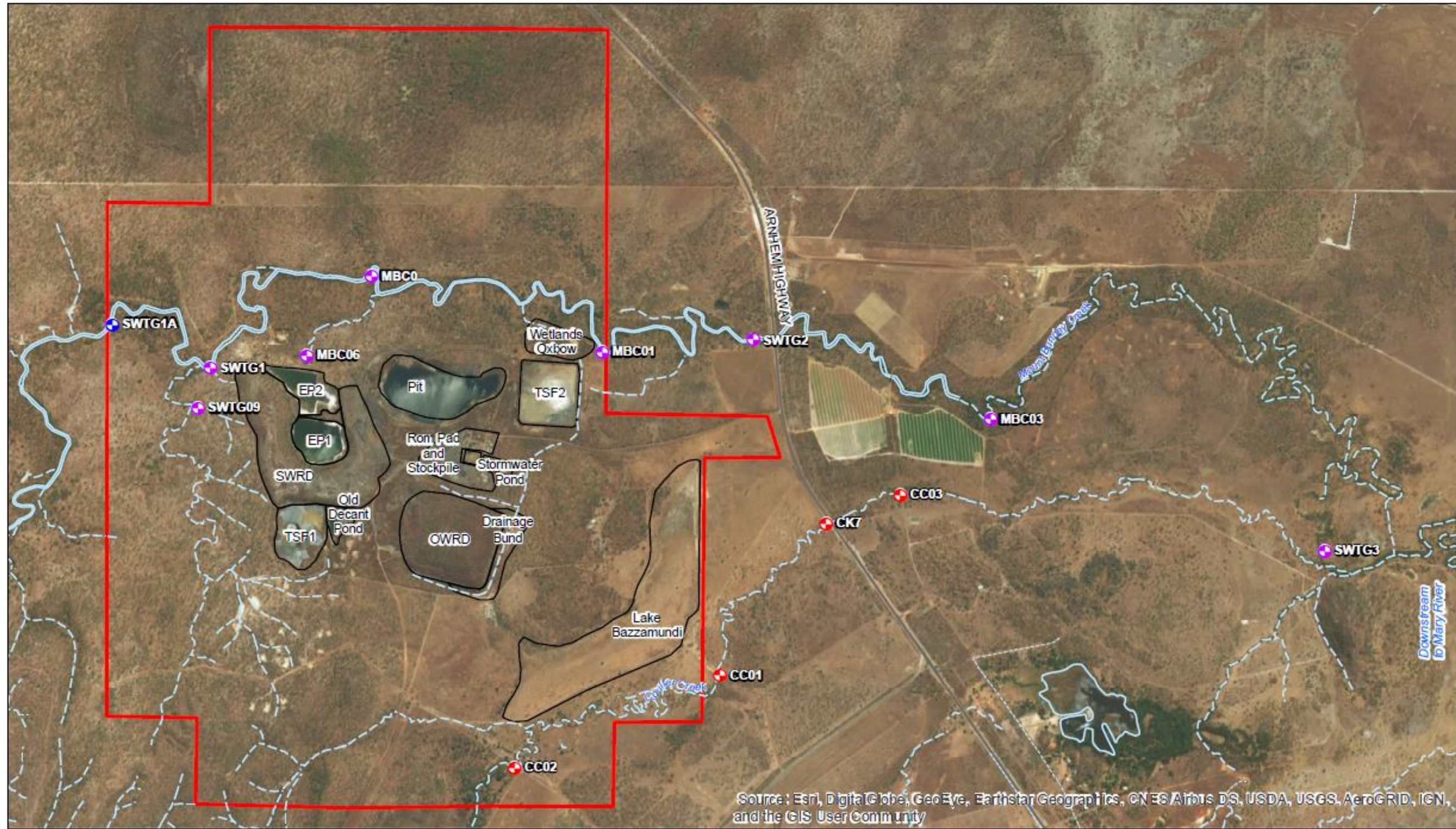
- Condition and habitat description of each site;
- *In situ* water quality covering pH, electrical conductivity, water temperature, dissolved oxygen and turbidity;
- Laboratory analysis of water quality covering physio-chemical, cyanide, major anions and cations, and dissolved and total metal parameters;
- Aquatic macroinvertebrates sampling using AUSRIVAS protocols; and
- Fish sampling using backpack electrofishing, bait trapping and netting; and
- Camera trapping at selected sites to identify terrestrial fauna species that frequent areas around the site.

For aquatic macroinvertebrates the approach will involve the use of univariate analysis covering abundance, taxa richness, PET richness, SIGNAL-2 and AUSRIVAS O/E50 and Bandings to assess the conditions at each site and between treatments (upstream or downstream of The Mine). Median values for each site will be used to assess any deviations in univariate indices from what would be expected based on the baseline data collected over several years. Medians will be recalculated with every year of data collected prior to the recommencement of mining activities at Toms Gully. Multivariate analysis will also be used to understand any variability in the macroinvertebrate community. Where there are deviations from medians in univariate metrics or if there is high variability in the macroinvertebrate community between sites, further multivariate analysis will be undertaken to investigate the possible causes of these differences. Further details of analyses completed to date are contained in Appendix E, EIS Supplement.

Analysis of the results of fish sampling will involve the tabulation of diversity, composition, distribution and health at each site and across the area. Additionally, the data will be used for temporal comparison. NMDS ordination will be used to understand differences in the fish community between sites and years.

Camera trapping will be used to assess the presence of terrestrial fauna including endemic and feral species overtime to assess presence, frequency and use of each area. This will allow the generation of a dataset overtime to assess if trends over time can be detected.

The aquatic survey and subsequent data analysis of the aquatic ecosystem will not be viewed in isolation but will be used in addition to the whole of site surface water sampling to track conditions and patterns in a weights of evidence approach to assess environmental performance and outcomes. When analysing the various data detailed above a number of indices and criteria will be used as multiple lines of evidence approach to assess the data, monitor and quantify the impact of the restarted operations through the transition into closure and eventual site closure. Water quality will be compared to site specific trigger values (contained in Table 3 of Appendix F, EIS Supplement) to assess exceedances and patterns overtime.



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

<p>Paper Size A4</p> <p>0 125 250 500 750</p> <p>Metres</p> <p>Map Projection: Transverse Mercator Horizontal Datum: GDA 1994 Grid: GDA 1994 MGA Zone 52</p>	<p>LEGEND</p> <ul style="list-style-type: none"> Site Boundary Mine Site Layout Roads Water Body Perennial Watercourse Intermittent Drain 	<p>GHD</p> <p>PRIMARY GOLD</p>	<p>Primary Gold Limited Toms Gully EIS Aquatic Ecology Monitoring 2017</p> <p>Aquatic ecology monitoring sites visited May 2017</p>	<p>Job Number 43-22623 Revision 0 Date 22 Sep 2017</p>
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Figure 2-3

Figure 6-1: Aquatic Ecosystem Monitoring Sites.

Social economic and cultural considerations

Comment 5 (First Request for Information – 5 September 2018)

The draft EIS and Supplement have not provided evidence that an archaeological survey has been conducted in the area proposed to be cleared. Comment 15 on the draft EIS requested ‘surveys to identify sites or objects of historic or cultural heritage significance’. The response states that ‘Primary has completed a heritage survey covering the current TGU site area as well as all future activities’, and mention is made that an AAPA Authority Certificate has been issued, but no mention is made of any Aboriginal archaeological sites. It appears that sacred sites may have been confused with archaeological sites under the banner of cultural heritage, as there is no reference to any archaeological surveys being conducted; and no archaeological survey reports have been included as part of the Supplement.

The NT EPA acknowledges the commitment to stop work in the event of a discovery of objects of historic or cultural heritage significance. However, an archaeological survey would detect if any significant cultural heritage sites or objects are present/absent, and enable the Proposal design to be modified to avoid impact to known values. The Heritage Branch of the Department of Tourism and Culture has recommended that an archaeological survey report is provided, specifically targeting the areas proposed for the water storage dam and contingency tailings storage facility. The facilities are located within a few hundred metres of a watercourse; and Aboriginal archaeological sites are commonly located near watercourses.

Further Information Required

Provide a report of an archaeological survey of the area proposed to be cleared. If any significant heritage finds are located during the survey, provide information on the potential significance of impact and measures that would be undertaken to avoid or mitigate impact to the associated cultural values.

In response

Response previously submitted on the 16 October 2018. The submitted document and survey are presented in Appendix M.

Social economic and cultural considerations

Comment 6 (First Request for Information – 5 September 2018)

The NT EPA and Parks, Wildlife and Heritage Division of the Department of Tourism and Culture consider that the social, economic and cultural values associated with the Mary River National Park and surrounds have not been adequately considered in the draft EIS and Supplement. These values are strongly tied to healthy aquatic ecosystems. The Amateur Fisherman’s Association of the NT also highlighted the importance of these values in their response to the draft EIS.

The Supplement acknowledges that there is potential for impacts to downstream aquatic ecosystems, and provides substantial information on how good water quality would be achieved so as to avoid or mitigate such impacts, including considerable information on site specific trigger values and guidelines values.

The potential impacts of catastrophic failure on downstream water quality and aquatic ecosystems (discussed in comment 3 above) would have the greatest effect on these values.

Further Information Required

Provide a discussion of the potential impacts on socio-economic values regarding tourism in the vicinity and downstream of the Proposal.

In response

PGO acknowledges the importance of the aquatic ecosystem health of the Mary River National Park wetland and the associated social, economic and cultural values. The Mary River catchment is divided into a number of areas with defined land uses including pastoralism, horticulture, mining, tourism, defence training and conservation (MRJMP 2015). Tourism within the Mary River catchment in the vicinity and downstream of the project takes three forms that can be summarised as follows:

1. Travelling through the area on route to Kakadu or other tourist destinations (i.e. transiting along the Arnhem Highway or very brief stops within the area);
2. Independent/self-guided four wheel driving, hunting, camping, fishing, wildlife watching and walking; and
3. Guided or escorted scenic wetland tours, fishing, hunting or wildlife cruises across the downstream catchment and billabongs (includes wilderness resort stays).

The majority of tourists visiting the area are travelling to other tourist destinations. On a yearly average (between 2015 and 2017) a total of 218,000 visitors journeyed and stayed in the Kakadu Arnhem tourism region (Tourist NT 2017). The largest impact on these transit visitors is to disrupt the visual amenity and driving experience along the Arnhem Highway. At its closest point the Toms Gully site is located 0.9 km from the Arnhem Highway, the sites location has the advantage of the local topography (ridgeline) and existing tree line that prevents the site from being visible from the road. Not being visible from the road minimises disruption of the visual amenity and driving experience.

During the project it is anticipated that a large component of the workforce will be sourced locally and transported to and from the site by buses to reduce traffic volumes. Within the local area a limited number of food and accommodation services are available with two roadhouses and two tourist villages (Appendix 8 - Economic and Social Impact Statement, Draft EIS). The use of accommodation by short term visitors or specialist personnel associated with Toms Gully may have the potential to limit accommodation for tourists. However, as stated by Tourism NT in Comment 71, EIS Supplement the increased demand associated with the operation would have a positive effect by raising occupancy rates and assist in smoothing out the effects of seasonality.

In operating the site noise will be confined to surface activities associated with the processing plant, underground ventilation fan and vehicles as the majority of the mining fleet will be operating in the underground mine areas. In addition, blasts will be limited to the underground mine. Sound and vibration from underground activities will be absorbed by the surrounding geology. The closest tourist accommodation is the Corroboree Road House location 10km away. Between the two locations a zone of elevated terrain and dense vegetation exists that will act to attenuate the noise and vibration. The next closest tourist accommodation is the Mary River Wilderness Retreat that is located 13km from the site on the other side of the Mt Bundey range that forms a natural noise barrier being approximately 80 metres higher than the surrounding terrain. Based on the location of the tourist accommodation it is unlikely that noise and vibration will effect tourist's experiences.

Within the Mary River Catchment the distribution of tourism activities is a function of the access and the presence of water (Finlayson et al 1996). Thus activities are restricted to floodplain edges, billabongs and major channels. During the wet season access is further reduced due to seasonal flooding and associated ground conditions. Major access points into the Mary River National Park are the Delta Block West (12km from the site), Delta Block East (14km from the site) Corroboree Billabong and boat ramp (15km from the site), Couzens Lookout (16km from the site), Wildman Wilderness Lodge (26km from the site), Stuart Point Wilderness Lodge (36km from the site) and Shady Camp (42km from the site). Across the catchment limited information on tourist numbers entering the area

and the nature of the activities are available. At the Shady Camp Conservation Reserve a popular spot in the catchment the site had an estimated 36,400 visitors in 2017 based on traffic counts (DTC 2018). The Toms Gully minesite is a pre-existing site and occurs on the Old Mount Bunday Pastoral Station the restart of operation does not have the potential to limit or inhibit tourist access to the floodplains or major access points as described above.

Fishing tourism across the Northern Territory has an estimated economic contribution of \$26 million of this the majority of fishing effort occurs in coastal areas with almost one-third occurring in an around Darwin Harbour (Tourism NT 2018). In the context of inland fishing for barramundi the Mary River and associated charter fishing operators are one of many areas including the Adelaide River, Daly River and Arnhem Land competing for business. From this perspective the economic contribution of fishing tourism in the Mary River area will be a small proportion of the overall \$26 million expended in the Northern Territory. De Groot et al 2008, completed a pilot study that assessed the monetary value of the wetland ecosystem related to the lower Mary River catchment covering an area of 1126km². It was estimated the value of tourism (i.e. sightseeing) to be \$1.73 million, recreational fishing \$0.27 million and recreational hunting \$0.15 million for a total of \$2.15 million in comparison the monetary value of crop-growing and pastoralism accounts for approximately \$19.9 million.

Directly downstream of the site and to the north of the Arnhem Highway for approximately 3km the Mount Bunday Creek has a Beneficial Use Declaration which states that livestock water supply is the beneficial use. This declared use is associated with the agricultural activities along this stretch of the Mount Bunday Creek that is ephemeral with a small number of isolated pools present during the dry season. With agricultural and pastoral activities along this stretch of Mt Bunday Creek generally the landscape has been modified thus affecting scenic amenity and access. Tourists have limited access due to the fencing required to contain livestock for animal husbandry. Upon entering the Mary River the defined channel of the Mt Bunday Creek and other tributaries dissipates into an extensively distributed floodplain (Barber et al 2018). The potential environmental impacts of the Toms Gully mine leading to socio-economic effects on tourism within the Mary River flood is the potential degradation of water quality through sediment, tailings or release of mine affected water.

In the short term, a worst case scenario is the catastrophic failure of an existing tailings storage facility by either piping erosion or overtopping. This would result in the release of tailings and water into the environment that is discussed in Comment 3 (First Request for Information – September 2018) above. As detailed in Section 2 to remove this risk in the long term the project has been amended to position all existing and future tailings and, waste rock into the pit beneath the water level. Placement of the material in the pit removes the future requirement for geotechnical engineered structures and removes the potential risk of surface tailings release from existing storage facilities.

Lesser impacts would be the uncontrolled release of mine affected water or eroded sediment. These releases may occur during the wet season due to the build-up of water within water storage facilities and/or surface water erosion across the site. If the project is not managed appropriately the impact on tourism activities as defined in points 2 and 3 above may degrade the aquatic ecosystem quality and associated productivity resulting in a reduction in the monetary values detailed in de Groot et al 2008. In the situation of fish consumption, (which can also include tourist fishing) this aspect has been discussed in Comment 21, EIS Supplement. To manage the potential for sediment a commitment has been given in Comment 24, EIS Supplement to prepare and implement an Erosion and Sediment Control Plan covering the site to mitigate the potential for sediment erosion in proposed clearing areas and across the existing site.

The “Geochemical Baseline Study and Site Conceptual Model” (Appendix A, EIS Supplement) and operational/closure Site Conceptual Model (Appendix N) detailed the current conditions at the site, poorest water quality is located at the site with water quality conditions improving downstream to become equivalent to background conditions. Water treatment, tailings and waste rock management will improve water quality at the source. The intended water treatment has two goals one is to improve water quality and the second is to prevent the build-up of water by discharging or reusing water of appropriate quality. The reuse of water will either be for mining purposes or to support other landuse practices in the area including agriculture and/or horticulture. Further details are presented in Comment 5, 9 and 34, EIS Supplement and, Comment 6 (Second Request for Information – October 2018) of this document.

As previously discussed in the Draft EIS, EIS Supplement and this Addendum careful consideration has been given to monitoring, management and mitigation measures that are to be put in place to manage water quality, tailings and sediment across the site. The purpose is to:

- Protect the Mary River catchment area as it is important for nature conservation;
- Improve site conditions; and
- minimise the anthropogenic downstream impacts of mining in the context of the cumulative impacts associated with multiply land uses (including tourism) across the catchment.

It is considered that the environmental management associated with the recommencement of mining activities and subsequent closure will improve the existing conditions, contribute to the local economy and mitigate the socio-economic effects on tourism in the region as discussed above.

Terrestrial Flora and Fauna

Comment 7 (First Request for Information – 5 September 2018)

*The Supplement response to comment 23 states that two targeted flora surveys were undertaken for investigating the potential presence of the shrub *Helicteres macrothrix* (endangered under the Commonwealth Environment Protection Biodiversity Conservation Act 1999 and Territory Parks and Wildlife Conservation Act). The Flora and Fauna Division of the Department of Environment and Natural Resources has advised that while two flora surveys were undertaken, they did not target the potential habitat of *H. macrothrix* in the area proposed to be cleared.*

*Without an understanding of the presence or absence of *H. macrothrix*, the NT EPA is unable to assess the potential for impact to this species from the Proposal. The NT Herbarium (Flora and Fauna Division) has advised that a targeted survey for *H. macrothrix* could be conducted at the current time of year. The Herbarium is able to provide advice on a suitable methodology that would limit survey effort by focussing on suitable habitat.*

Further Information Required

*Provide results of a targeted flora assessment, including survey, for *Helicteres macrothrix* in the area proposed to be cleared, after consulting with the NT Herbarium on a suitable survey methodology.*

In response

Response previously submitted on the 16 October 2018. The submitted document and survey are presented in Appendix M.

Water Balance
Comment 1 (Second Request for Information – 25 October 2018)
<p><i>The Water Balance provided in the Supplement is incorrect (as confirmed by the Proponent by phone 26/9/18) – it was not updated to 2018 volumes of water onsite. The Water Management Plan has correct volumes.</i></p> <p><i>The Water Balance schematic (figure 2-2) doesn't include volumes of water and doesn't include Lake Bazzamundi, despite the intention to discharge all operational dewatering (1.1 GL/year) to the Lake. The Proponent indicated by phone that during operations water from the Lake would overflow to Mount Bunday Creek (and maybe Coulter Creek), including possibly in the Dry Season.</i></p>
Further Information Required
<p><i>Provide an updated Water Balance.</i></p> <p><i>Include Lake Bazzamundi in the Water Balance, including in the Water Balance schematic.</i></p> <p><i>Primary Gold advised verbally that Lake Bazzamundi will receive water from operational dewatering and lose water to evaporation, infiltration and overflow to one or both creeks.</i></p> <p><i>Include the scenarios mentioned in comment #8 below, and include consideration of seasonal variations including very wet and very dry conditions</i></p>

In response

The water balance has been updated to include the current water volumes, Lake Bazzamundi and scenarios as mentioned in comment 8. An updated water balance is presented in Appendix O.

TSF Option
Comment 2 (Second Request for Information – 25 October 2018)
<p><i>Primary Gold advised verbally that tailings in the TSFs may be processed before the water treatment pilot plant is installed. In that case, water from the pit would be used to reprocess tailings.</i></p> <p><i>Some questions to consider are:</i></p> <ul style="list-style-type: none"> <i>• Is geotechnical stability a factor that would determine if TSF1 and/or TSF2 is upgraded to ANCOLD?</i> <i>• If tailings are reprocessed (independent of the BioAqua process), what process would be used and what would be the geochemical properties of the new tailings?</i> <i>• What will determine whether TSF1 and/or TSF2 material is treated using the BioAqua process?</i> <p><i>While it is understood that tailings will be transferred into one TSF while processing is undertaken on material from the other TSF, there is a lack of clarity on how tailings would be processed / treated and where the residuals would be (re)deposited.</i></p>
Further Information Required
<p><i>Provide more clarity on the range of options for processing tailings and upgrading TSFs, including criteria that may be applied to determine which option is implemented, and timeframes.</i></p> <p><i>Provide a schedule/materials balance of outputs (liquids and solids) when tailings are processed (before or during treatment of water from the pit).</i></p> <p><i>Describe where and how tailings in TSF1 and 2 would be processed without the water treatment plant.</i></p>

Provide updated information and commitments regarding the placement of existing and new tailings into the pit.

Provide the schedule for transfer of existing tailings to the pit (this may include the optional reprocessing of tailings). Indicate how this may be influenced in the case of early unforeseen closure or any period of care and maintenance.

Provide information on the options for potential re-use of the existing tailings storage facilities after tailings have been transferred to the pit.

In response

As a result of the project changes all existing and future tailings will be relocated to the pit. PGO gives a commitment that tailings from TSF1 and TSF2 whether processed or unprocessed will be transferred and placed in the pit. During operations no reprocessed or future tailings will be placed in TSF1 and TSF2. The processing of tailings by PGO or via the Bioaqua process will be based on an assessment on the ability to extract economic value from the tailings. If the tailings processing doesn't meet the required economic parameters placement of the material into the pit will be undertaken. Timing to place existing tailings into the pit will occur when equipment is mobilised to site. It is anticipated that the transfer of existing tailings to the pit will occur within 18 months of Boxcut commencement. Tailings produced during operations will be deposited in the pit on a continuous basis through a mobile floating head system. If unforeseen closure occurs prior to the 18 month period, closure implementation will be bought forward with the existing tailings placed in the pit and the facilities rehabilitated as detailed in the mine closure plan (Appendix B). For management during care and maintenance refer to Appendix H.

If tailings are reprocessed by the Bioaqua process it will be after water treatment has commenced. The Bioaqua process will lead to the chemistry of the tailings reflecting the removal of mix metal oxides and sulfur from the tailings (i.e. reduced acidity load and metal content).

If tailings are reprocessed only to recover residual gold, this activity will only occur after the commencement of ore processing. The processing of existing tailings will either occur in combination with ore processing or on a campaign basis dependent on the mining schedule. The chemistry of the tailings once processed would reflect the removal of gold and the addition of lime as part of the process therefore the tailings chemistry would have slightly more alkaline in comparison to the existing in-situ tailings.

While tailings remain in both TSF1 and TSF2 the facilities will be monitored regularly for stability, erosion of the embankments and water levels to track changes in the facilities performance. Once tailings has been removed from TSF2 an assessment of the stability and potential for seepage will be completed. The assessment where relevant will be completed in accordance to ANCOLD 2012 guidelines. If the assessment demonstrates the facility can be converted into a water storage facility, then the facility will be repurposed (refer to section 2). Please note the updated site water balance supplied in this document has not included the repurposed TSF2 as the assessment work has not been completed and can only occur once tailings is removed. The TSF2 assessment work will be in consultation with the Department of Primary Industry and Resources with the final design fully assessed and approved by the department. All work and designs will be aligned to ANCOLD 2012 including geotechnical and removal of the trees located on the embankment. At closure, TSF2 whether repurposed or not will have had the tailings removed. The embankments will then be rehabilitated by levelling and revegetating. If the embankment material is appropriate for use in rehabilitation the

embankments would be removed and the area levelled and revegetated. If used as a water dam the rehabilitation process will occur at the cessation of operations.

Upon removal of tails from TSF1, the empty facility and embankments will be assessed for stability. If suitable it is intended the facility will be integrated into the sediment/water management associated with the Sulfide Waste Rock Dump. The final design of the conversion to a sediment basin will be assessed by the Department of Primary Industry and Resources. At closure the modified sediment basin will remain for ongoing management of surface water and sediment.

Table 6-2 below shows the discharge estimate of Pit displacement water and Underground water.

Table 6-2 Schedule of Water Discharge at Toms Gully

Pit water displacement and UG dewatering			Year 1				Year 2				Year 3				Year 4				Year 5				
Discharge Estimate			Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	
Location source	Cause of dewatering	Total ML	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	13	14	15	16	
Boxcut ML	Displacement in pit	300	300.0																				
Capital devp ML	Displacement in pit	48		16	16	16																	
Waste dev ML	Displacement in pit	314			0	26	26	26	26	26	26	26	26	26	26	26	26	26	2				
Existing Tailings	Displacement in pit	269		53.8	53.8	53.8	53.8	53.8															
New tailings ML	Displacement in pit	654					20	25	33	48	48	48	48	48	48	48	48	48	48	48	48	48	
UG pumping ML	UG direct all inflows	2,193	0	78	93	210	187	163	171	171	156	156	148	132	132	132	132	132	132	-	-	-	
less Pit inflow to underground workings			1,501	-	18	37	97	84	83	115	128	124	128	126	112	112	112	112	112	-	-	-	
Total ML discharged			2,277	300	130	126	209	202	185	115	117	105	102	96	94	94	94	94	94	70	48	48	48
Total L/s discharged			15	39	17	16	27	26	24	15	15	14	13	12	12	12	12	12	12	9	6	6	6
stop UG mining																							

The old existing tailings dams will be placed into the Toms Gully Pit within 18 months of the Boxcut excavation starting. As the processing of new ore from underground only starts in month 13; it will be highly unlikely the operation will be shutdown due to ore not being up to expectations (either by grade, dilution or quantity). Usually mines will persevere with mining a few months before taking a view the quality of the ore is not what was expected. All of the old tailings will be in the pit before any adverse ore treatment findings will force a shutdown of the mine.

PGO has the financial backing of parent company Hanking China Holdings in China. Hanking China Holdings has been on the Hong Kong stock exchange since September 2011 and currently operates three iron ore mines in China, a nickel mine in Indonesia and has three gold mines in Australia (on care and maintenance).

Surface water hydrology
Comment 3 (Second Request for Information – 25 October 2018)
<i>The Proposal will result in surface water flows in creeks during the Dry season, when the creeks would normally cease flowing at that time (a few isolated pools may remain).</i>
<ul style="list-style-type: none"> • <i>Pre-mining dewatering is estimated to take 200 days at a rate of up to 30 ML/day; discharged into the ephemeral Mount Bunday Creek across both Wet and Dry seasons.</i> • <i>Operational dewatering will likely result in water flowing from Lake Bazzamundi into Mount Bunday Creek and/or Coulter Creek in both the Wet and Dry seasons.</i>
<i>The Proponent has not assessed the potential impact of this altered hydrology. Some ecological processes may depend on the isolated pools or dry times.</i>

Further Information Required

Provide more specific estimates of the discharges (volumes and timing) to Mount Bunday Creek and/or Coulter Creek – both direct and indirect (e.g. via Lake Bazzamundi) during the pre-mining and operational stages of the Proposal.

Assess the potential impacts on aquatic and terrestrial ecosystems of changed hydrology associated with increased water flows, including continued flows in the Dry season.

In response

With the new mining access method to the orebody the Toms Gully pit does not need to be dewatered completely. Only the water displaced by addition of mining waste material and tailings is required to be pumped out of the pit and treated then the water is pumped to Mt Bunday creek (via the WSD) or Lake Bazzamundi.

The Toms Gully pit is currently flooded with approximately 4.7 GL of poor quality water. Prior to dewatering of the pit, the pit will be treated with caustic soda/ lime to bring the pit chemistry up to pH of 7.8. Refer to Appendix D section 3.1.1 Scenario 1 – Initial treatment of pit water.

To mine underground it is anticipated that the first phase of operational recommencement will involve the partial dewatering, water treatment and discharge of the Toms Gully pit water to Mt Bunday Creek or Lake Bazzamundi. This is to allow Boxcut waste material to be placed into the pit without causing the water level in the pit to rise above the nominal level of 15AHD.

In the first three months of operation the Boxcut will be excavated and placed into the Toms Gully pit. The total volume of material in the Boxcut is estimated to be 300,000 m³. This equates to 300,000 m³ of water displaced if the material is placed into the pit. Over a three month period this is, on average, a dewatering rate of 3.3ML per day or 38.6L/s.

The Boxcut material has been tested and is considered to be suitable to place on top of the current waste dumps (Appendix J). If the Boxcut material is used to cap the waste dumps there is no need to dewater the pit until the Decline starts in month four. This is PGO's preferred option.

Water inflows into the UG workings from the pit through the orebody and is mixed with groundwater inflows. Both inflows are pumped to the surface where the pit inflow water is put back into the pit as a recirculating load and the excess water is sent to the water treatment plant. This is done to keep the pit water level static at 15AHD to prevent oxidation of the tailings and UG waste being deposited into the pit.

Table 6-3 above shows the estimate of water being treated and disposed of into either the new WSD, Mt Bunday Creek or Lake Bazzamundi. This is without the Boxcut material being placed into the Pit, which is PGO's preferred option.

If the Boxcut waste material is placed on the existing waste dumps as a capping (PGO preferred) then Table 6-3 below shows the estimate of water discharged to the treatment plant then discharged to either the new WSD, Mt Bunday Creek or Lake Bazzamundi.

Table 6-3 Water Discharge without Boxcut material Being Placed into Toms Gully Pit

Toms Gully Underground Project
Addendum to the Supplement Environmental Impact Statement

Pit water displacement and UG dewatering			Year 1				Year 2				Year 3				Year 4				Year 5				
			Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	Qtr	
Discharge Estimate	Cause of dewatering	Total ML	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	13	14	15	16	
Boxcut ML	Displacement in pit	-																					
Capital devp ML	Displacement in pit	48		16	16	16																	
Waste dev ML	Displacement in pit	314			0	26	26	26	26	26	26	26	26	26	26	26	26	26	2				
Existing Tailings	Displacement in pit	269		53.8	53.8	53.8	53.8	53.8															
New tailings ML	Displacement in pit	654					20	25	33	48	48	48	48	48	48	48	48	48	48	48	48	48	
UG pumping ML	UG direct all inflows	2,193	0	78	93	210	187	163	171	171	156	156	148	132	132	132	132	132	132	-	-	-	
less Pit inflow to underground workings			1,501	-	18	37	97	84	83	115	128	124	128	126	112	112	112	112	112	-	-	-	-
Total ML discharged			1,977	-	130	126	209	202	185	115	117	105	102	96	94	94	94	94	94	70	48	48	48
Total L/s discharged			13	-	17	16	27	26	24	15	15	14	13	12	12	12	12	12	12	9	6	6	6

stop UG mining

Appendix O details the water balance at Toms Gully.

Appendix P discusses the effects of water discharge into Mt Bunday Creek and Coulter Creek (via Lake Bazzamundi). Conclusion stated in the report is that the change in mining method (new decline) is better than the previous plan to dewater the Toms Gully pit and use the existing declines again. The effect to the aquatic environment is lessen and is unlikely to cause any long term impacts on the aquatic environment.

Once the pit is dewatered the rehabilitation of the underground and subsequent mining as discussed in Comment 11, EIS Supplement would commence. During operations dewatering is estimated to be an average of 0.44 GL per year, this equates to an average of 14 l/s. Water of appropriate quality would be used for dust suppression, process plant requirements and potential reuse by third parties.

Based on the estimates of discharge covering both volumes and timings, attached in Appendix P is the desktop assessment of the potential impacts on the downstream ecosystem included flows in the dry season

Conceptual site model
Comment 4 (Second Request for Information – 25 October 2018)
<i>The conceptual site model (CSM) provided in the Supplement gives a good overview of sources and pathways of contamination of the existing site. However, the CSM and associated text indicates overflow from Lake Bazzamundi flows east towards Coulter Creek, while the Proponent informed staff by phone and during the site inspection that overflow from Lake Bazzamundi during operations would travel north, under the access road, and into Mount Bunday Creek.</i>
<i>Additionally, the Proponent indicated by phone that eventually (post-closure) the pit will fill and no longer be a sink. This has implications for potential contaminant transport in groundwater and surface water. Pit overflows would be into Mount Bunday Creek.</i>
Further Information Required
<i>Provide a predicted CSM for the operational phase. This would be different to the existing situation because water will be actively managed (including monitoring and treatment where necessary). Include Lake Bazzamundi.</i>
<i>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.</i>

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

In response

Appendix N states on page 12 that overflow from Lake Bazzamundi will enter Coulter Creek not Mt Bunday Creek.

Water from Lake Bazzamundi will ultimately enter Mt Bunday creek vis Coulter Creek in a mixing zone near sampling point SWTG3 as shown in Figure 6-3 below. This 3.1km east of Lake Bazzamundi.

Conceptual Site Model and Pit Hydrology

A predictive conceptual site model for operations and closure has been developed using previous and current site surveys and studies. These models are provided in Appendix N. During operations underground dewatering will result in a cone of depression within the water table. As a result of the drawdown of the water table beneath the site, seepage associated with the TSFs, evaporation ponds and pit will be captured for subsequent water treatment either insitu within the pit or via the water treatment plant if required. If water is an appropriate quality then it will be discharged to Lake Bazzamundi, Mt Bunday Creek and/or pass to a third party.

At closure the number of surface sources of potential acid and metalliferous mine drainage will be reduced by the removal of tailings located in the existing TSF1 and TSF2 as this material will be placed in the pit. Further work will occur with respect to the capping of the Oxide and Sulfide Waste Rock Dump using the Boxcut material that is intended to reduce seepage. Through the waste rock dump profiles. At closure pit water quality will be assessed and if required treated insitu, during operations pit water levels will be maintained to provide a minimum water cover over the sulfidic material. At closure the pit water level is predicted to rebound quickly.

At equilibrium the pit is expected to generally act as a groundwater sink, during periods of intensive wet season activity the pit is expected to overtop the spill level of 19 m AHD in wet seasons. Therefore, post-closure, the pit will both exchange with groundwater and overflow to surface water in wet season from time to time. The impact of these events will be limited by the fact that groundwater and adjacent creek levels will be correspondingly higher, restricting the volume of water seeping out from the pit, much of which would be recaptured as pit water levels again drop below surrounding groundwater levels (Appendix N - Conceptual Site Model and Appendix O - Water Balance). In addition, the water quality will have been treated in-situ resulting to improved water quality then currently located at site.

Lake Bazzamundi Outflow

Based on further flood modelling water released into Lake Bazzamundi will be overland flow resulting in water flowing downstream to the eastern end of Lake Bazzamundi with overtopping leading to

water flowing to Mt Bunday Creek and Coulter Creek. In addition, along the southern margin of Lake Bazzamundi during larger events cross country flow can result in water entering Coulter Creek prior to the creek crossing the Arnhem Highway (Appendix N – Conceptual Site Model and Appendix L Baseline Studies Flooding) The locations of the proposed water discharge points have been presented in Figure 6-3 and discussed further in Appendix N.



Figure 6-2: Proposed Discharge Points.

Site Drainage

As discussed in Section 6.3.2.3, Draft EIS a range of structures divert and retain water around the site that has come into contact with the existing waste rock dumps, tailings storage facilities, evaporation ponds and process area. Also Comment 2 (First Request for Information – September 2018) above has summarised the water capture points and water holding facilities. It is intended to remove all existing surface tails for placement in the pit thus reducing two sources of non-benign material. Further rehabilitation is proposed for the waste rock dumps with the capping of the top surfaces with boxcut material to reduce water percolation through the waste rock dump profiles. Further discussion on the non-benign material is presented in Appendix N.

Excluding the existing infrastructure and landforms the only proposed non-benign materials to be stored at surface during operations will be waste rock and ore generated from underground operations. Ore will be positioned and stored within the RoM area prior to processing to extract the gold. The RoM area and adjacent process area have been designed to drain into the storm water pond.

Approximately 800 tonnes of waste rock will be produced daily, prior to placement in the pit this waste rock will be temporarily stored along the southern edge of the pit adjacent to the stacker. During operations the stacker will be moved regularly along the southern edge of the pit to evenly distribute the waste rock. Topographic elevation along the southern pit margin increases away from the pit thus surface water drains back into the pit. Therefore water that comes into contact with waste rock will drain to the pit. Both the waste rock and ore will only be stored for a short period for waste rock this will be 48 hours. If for any reason there are delays in depositing or processing the material due to mechanical breakdowns water draining the areas will either report to the storm water pond or pit.

WDL
Comment 5 (Second Request for Information – 25 October 2018)
Compliance points (2) are proposed to be at eastern lease boundary on Mount Bunday and Coulter Creeks. Other downstream sites would also be monitored by the Proponent, including the previous compliance point at SWTG2 (next to the Arnhem Highway). If Lake Bazzamundi overflows into

Mount Bunday Creek, as discussed above, this overflow would enter the Creek downstream of the compliance point (outside the lease boundary). An additional compliance point may be necessary.

The Proponent confirmed during site inspection that discharge from Lake Bazzamundi reaches Mount Bunday Creek before compliance point SWTG2.

During site inspection staff discussed how water will be sampled. It was suggested that a permanent water height marker is established to record water height when sampling.

Further Information Required

Propose an additional compliance point that would take into account water discharged from Lake Bazzamundi towards (or into) Mount Bunday Creek.

In response

From a further surface water assessment water discharged to Lake Bazzamundi will enter Coulter Creek. From the desktop assessment of the impacts to the aquatic ecosystem it detailed a compliance point to monitor water quality would be best situated between the discharge point at Lake Bazzamundi and the Arnhem Highway Appendix P. At this location water quality sampling site CK7 already exists and is being sampled depending on seasonal flows (Appendix F - Water Management Plan). Also water exiting from Lake Bazzamundi that could enter Mt Bunday or Coulter Creek will be sampled at sample location SWTG5. SWTG5 is located at the overflow point from Lake Bazzamundi prior to flowing overland.

It was also recommended to establish an additional water quality point on Coulter Creek upstream of Coulter and Mount Bunday Creek confluence. This location would aid in determining mine water influences downstream in Mount Bunday Creek. The new point is to be known as SWTG17 and is situated downstream of the Arnhem Highway prior to the confluence of Coulter and Mount Bunday Creek (Figure 6-2).

Potential use of bore water

Comment 6 (Second Request for Information – 25 October 2018)

During the site inspection the Proponent mentioned that there will be a positive water balance and options for repurposing excess water are being explored.

The Supplement states that water from bores near the underground workings will be tested prior to direct release into Lake Bazzamundi. If water quality does not meet the site-specific trigger values (SSTVs) defined in the Supplement, it will be sent to the water treatment plant for treatment prior to release. The Supplement also stated that Lake Bazzamundi will provide the pastoralist with additional water in the Dry season. It is unclear if the water to be provided to the pastoralist for irrigation or stock water use would also be of a quality meeting the SSTVs or if other standards may be applied (e.g. stock water supply according to ANZECC water quality guidelines). If other standards are applied, would the water be stored in Lake Bazzamundi prior to transfer to the Pastoralist, and how would the Proponent ensure that this water does not enter Mount Bunday Creek or Coulter Creek?

Further Information Required

Provide clarification on the fate and quality of water that may be used by the pastoralist:

- *For what purposes might the pastoralist use the water?*

- *If water quality targets lower than SSTVs are to be applied, how would the Proponent ensure that this water does not enter the Mary River catchment?*

In response

After discussions with the pastoralist it is anticipated that 200 Megalitres of water a year could be used for activities during the dryer periods of the year. The use of the water would be for the production of hay, pasture production for cattle and the watering of a mango orchard located approximately 2km from the site. During the CSIRO assessment of Site Specific Trigger Values (Appendix F, EIS Supplement) to protect aquatic ecosystem allowing wet or dry season discharge to Mt Bunday Creek a preliminary review was completed on water quality associated with passing water to a third party. The review covered livestock watering and irrigation purposes. This initial review discussed ANZECC Irrigation Short Term Trigger Values for 20 year irrigation periods.

In passing water to the pastoralist for the purposes above a more conservative approach is to be adopted for water quality with the adoption of the ANZECC Long Term Trigger Values for 100yr irrigation periods to minimise the build-up of contaminants in surface soils. This approach has also built in conservatism as the period for the transfer of water will not be for a period of 100yr but will reflect the operating period that is much less (i.e. approximately 5 years). For the manganese and iron values where the SSTVs devised by the CSIRO for discharge to Mt Bunday Creek were higher than the ANZECC guidelines for 100yr irrigation the CSIRO values were adopted. In the situation where no values for EC and sulfate are provided in the ANZECC irrigation guideline an EC level of 700 uS/cm and a sulfate level of 500mg/L are to be adopted. The adoption of an EC level of 700 uS/cm is to reflect levels affording protection to plants sensitive to salinity and associated EC (DPI NSW 2016). The level of 500mg/L for sulfate is to protect soil quality as this level is unlikely to acidify the soil due to leaching during the monsoon season. Table 6-4 below provides the list of the final proposed trigger values for the transfer of water at the discharge point to a third party.

As discussed in Comment 5, EIS Supplement it is proposed that monitoring will be at the discharge point to ensure water quality meets the required criteria. As PGO is a mining company and not engaged in the management of irrigation, crop/pasture production and associated drainage from the irrigation area once water is passed to the pastoralist water dispersion and management will be the responsibility of the pastoralist.

Table 6-4 Water Quality Targets for Supplying Water to a Third Party

Analyte	Final Proposed Site Specific Trigger Values (SSTVs) for the Discharge Point or Compliance Site SWTG2 after dilution (CSIRO 2018)	Livestock Drinking Water (ANZECC/ARMCANZ , 2000)	Irrigation Short Term Trigger Value 20yr (ANZECC/ARMCANZ , 2000)	Irrigation Long Term Trigger Value 100yr (ANZECC/ARMCANZ , 2000)	Final Proposed Trigger Values for the transfer of water at the discharge point to a third party.
pH	5.8-8				5.8-8
Sulfate, mg/L	210	1000			500
EC, uS/cm	41	3000			700
Al, ug/L	295	5000	20000	5000	5000

As, ug/L	42	500	2000	100	100
Cd, ug/L	0.4	10	50	10	10
Cr, ug/L	6	1000	1000	100	100
Cu, ug/L	1.8	1000	5000	200	200
Fe, ug/L	2700		10000	200	2700
Pb, ug/L	5.6	100	5000	2000	2000
Mn, ug/L	2500		10000	2000	2500
Ni, ug/L	13	1000	2000	200	200
Zn, ug/L	15	20000	5000	2000	2000

Closure - pit

Comment 7 (Second Request for Information – 25 October 2018)

In the closure phase, the pit will be flooded to cover waste rock (PAF material) and prevent it from further oxidising. The AMD Management Plan indicates that this should occur within 6-12 months, however it is unclear from where the water will be obtained. The Proponent has indicated that water could be pumped from the WSD (capacity 1 GL) to the pit (capacity 4.7 GL). Additionally, the pit may partly fill from passive groundwater inflows and from incident rainfall. Past observations indicate the passive filling rate is 3 to 9 metres per year. These data indicate that, at best, would take at least 5 years to cover the waste rock (shown in figure 2 of Attachment A).

During the site visit, the NT EPA asked if any tailings could go into the pit. The Proponent said they would explore the feasibility of this option.

Further Information Required

Provide more information on the flooding of the pit with water to cover waste rock – source/s of water, height of waste rock, rate of filling, in-pit water treatment options, etc.

Provide a discussion on the feasibility of tailings being stored in the pit.

Due to the alterations to the Proposal, the information previously required is no longer applicable. Instead, the following is required:

Provide a description of the methods to be used to place waste rock and tailings sub-aqueously in the pit. Include discussion of alternatives such as the deposition of tailings via an underwater pipe.

Provide details of the monitoring program and management measures that may be required to ensure materials are deposited low in the pit and have a reasonably even surface.

Provide details of the management measures that will be implemented to manage water quality.

Include predictions of pit water chemistry. The modelling / predictions should take into account seasonal variations including extreme climate conditions. It should also address:

- *variations in stratification of the pit water column*
- *the stability of pit walls*

- *the potential zone of impact around the pit, given that some mixing of waters will occur between the pit and surrounding groundwater.*

In response

To address the original comment PGO have made a commitment to place all the tailings and future waste rock within the current pit lake beneath the water level. As the pit will not be dewatered there is no requirement for pit flooding.

Details on the methods used to place waste rock and tailings sub-aqueously in the pit are detailed in Section 2. Other alternatives for tailings and waste rock disposal that were considered and ruled out are as follows:

For tailings deposition:

- A rigid walkway and associated pipeline, this method provides a semi static discharge point creating a large cone of tailings with varying depths of water cover.
- An underwater pipeline ending either at the base of the pit or at a depth of 20 metres. An underwater pipeline if terminated at the pit base does not provide sufficient fall to allow the tailings to flow away from the outlet thus resulting in blockages. Positioning the termination point of the pipe at 20 metres depth in the pit would overcome this. However, using an underway pipeline does not allow for the fast, efficiency and systematic deposition of tailings across the pit base. To move the underwater pipeline would require the cutting and physical repositioning of the pipeline using mechanised equipment. If the tailings pipeline cannot be emptied of tailings the weight of the pipeline may prevent repositioning, the old pipeline would then be left in-situ with a new pipeline positioned in another part of the pit.

As the above methods are highly rigid and require a large amount of resourcing to relocate the outlet, the use of the floating head with an associated floating pipeline is preferred, as the:

- Depth of deposition in the water column can be selected by altering the length of pipe going into the water column.
- Once established the end can be easily controlled and manoeuvred by ropes to change deposition localities.
- Shortening of the pipeline on land results in the systematic distribution of tailings across the base of the pit.

For waste rock deposition:

The assessed alternatives were:

- Dumping of the waste rock directly over the side of the pit with a dump truck or an excavator to cast the waste rock into the pit. These strategies were unable to ensure the waste rock would make the base of the pit as the upper pit wall angles are shallow at 35 to 40 degrees. This geometry prevents the material from rilling to the base of the pit. Waste rock by being held up on the pit wall has the potential to have reduced water cover.
- Crushing the waste rock to be able to move the material via a pipeline to deposit in the pit. By crushing the rock could increase the potential acid formation of the material as increasing the surface area to volume ratio of the material exposes more sulfides to oxidation. By not crushing the waste rock reduces the chance of sulfides encapsulated in the surrounding rock matrix from oxidising.

The above methods of waste rock placement in the pit could increase acid generation by improperly placing waste rock in the water profile or exposing more sulfides to oxidation. As discussed in Section

2 the preferred option is using a stacker that deposits the blasted waste rock without modification further out into the pit to aid rilling of the material to the base of the pit.

Monitoring and Management of Material Placement Low and Evenly in the Pit

Details of the survey monitoring and management measures undertaken to ensure the tailings and waste rock are deposited low in the pit with an even upper surface are presented in Section 2. Overall management of the deposition process will be the responsibility of the mine manager who will:

- ensure appropriate resources are available,
- assess the monthly surveying, and
- adjust the location and/or discharge schedule of tails and waste rock where required to achieve the desired positioning of the material.

Manage Pit Water Quality

To manage pit water quality prior to the placement of tailings and waste rock into the pit, pit water will be treated insitu as discussed in Comment 10 (Second Request for Information – October 2018). Treatment will ensure water quality has a neutral pH and lowered metal content. During operations pit water quality will be monitored fortnightly as detailed in the water management plan and, tailings and waste rock will be sampled to verify the material's chemistry as per the AMD management plan.

As discussed in Appendix D the Pit Water Geochemical Modelling Report during tailings and waste rock are deposition it is considered that water quality may deteriorate due to the presence of low concentrations of dissolved oxygen during tailings and waste rock settlement. At closure water quality overtime will be dependent on the tailings and waste rock positioning relative to the oxic layer at the top of the pit. Further details of the geochemical pit modelling in association with variations in pit stratification and seasonal conditions are presented in Appendix D. If water quality monitoring detects a deviation from the anticipated then to improve water quality either lime/caustic/virtual curtain will be injected into the tailings stream or a bulk insitu treatment of pit water can be completed. Whichever method is selected, the process would include input from geochemical specialists to ensure the water quality outcome can be attained and engagement of the DPIR to meet their expectations and gain approval.

As the Toms Gully pit is full of water thus covering the walls a geotechnical assessment of pit wall stability cannot be undertaken. It is considered the stability of the pit walls will have little effect on pit water quality. Since the pit was excavated in 1991, the pit has been filled with water and dewatered twice. Dewatering is a period when the supporting pressure of the pit water is removed and pit wall cracking can occur. Pit wall cracking is a function of water flowing/depressurising out of the walls due to the hydraulic water gradient between the empty pit and the surrounding geology. By not fully dewatering the risk of pit wall cracking is greatly reduced and while the pit is fill of water the various forces are in a state of equilibrium. As the tailings and waste rock are deposited at the base/toe of the pit wall the dense mass of material provides further wall support by preventing failure initiating at lower levels of the pit wall. It is considered that the pit walls in their current condition have obtained a stable state over a 27 year period with little visual evidence of major failures as such pit wall competency is likely to remain during operations and closure.

While depositing tails and waste rock the pit walls will be regularly monitored for wall instability precursors and changing rock mass conditions. The monitoring system will comprise prism monitoring and visual inspections of rock conditions (i.e. development of cracks and/or changes in ground support conditions). If changes are identified an assessment or investigation (if required) will be completed

dependent on the outcome the response may include more detailed monitoring, restricted access and/or varying the pit water levels.

During operations the pit water level will be maintained to cover tailings and waste rock. Dewatering of the underground will form a cone of depression with surrounding groundwater and pit water flowing down gradient. Capturing the pit water and surrounding groundwater will prevent mixing. At closure water chemistry will be modified by in-situ water treatment to maintain water quality to reduce the impact of water mixing.

Closure / care and maintenance

Comment 8 (Second Request for Information – 25 October 2018)

The Supplement does not include scenarios relating to closure of the mine due to unforeseen circumstances.

Some questions include:

- If the Proposal does not proceed as described quite soon: When would the pit and other water storages reach capacity? How would potential impacts to environmental values from contaminated water be prevented / mitigated / managed? How would unauthorised discharge of contaminated water be prevented?*
- In the case of unforeseen closure or periods of care-and-maintenance (e.g. due to a drop in gold prices or some kind of failure such as degradation of the underground infrastructure): What measures might be implemented to prevent contaminated seepage entering the environment from existing infrastructure (e.g. TSFs). How would impacts from contaminated water entering the environment from the mine site be prevented / mitigated / managed?*

Further Information Required

Provide an assessment of scenarios in which the environmental risks from contaminated water and/or existing waste storages are not reduced as planned. This is to include a summary of measures that may be implemented to prevent or mitigate environmental impacts due to contaminants entering the environment. These scenarios should include:

- If the Proposal does not proceed, is substantially delayed, or proceeds in a modified manner that results in the pit water (and other contaminated waters) not being treated.*
- In the case of early closure or periods of care-and-maintenance, if the existing TSFs and their material remain in situ.*

Provide an updated draft Mine Closure Plan, including a discussion on unplanned closure or any periods of care and maintenance.

In response

The scenarios associated with environmental risks from contaminated water and/or existing waste storages not being reduced as planned can be summarised as follows:

- Regulatory approval delays associated with this EIS, Waste Discharge Licencing and/or Mining Management Plan.
- Inability to treat the water to the desired SSTV's.
- A period of Care and Maintenance whereby water treatment has not commenced.

The above scenarios may lead to the build-up of mine affected water over a number of monsoon periods due to limited water reduction during the dry season or during a monsoon season with an extreme rainfall period. The build-up of water creates a positive water balance. As detailed in

Appendix O, whereby spare capacity in the TSFs, evaporation ponds and pit are not present to allow the pumping of water between facilities which is the practice during the current care and maintenance period. With the facilities and/or pit at full capacity the potential for overtopping events or for elevated seepage generated by the increased hydraulic heads are present.

Any overtopping event would likely coincide with a period of heavy rainfall and associated surface water thus leading to the mixing/diluting of mine affected water and surface water. In the situation of seepage which may or may not coincide with an overtopping event the seepage is likely to take longer due to the movement of water through either the shallow alluvium across the site or via the deeper fractured rock aquifers associated with the ore body or adjacent to the ore body.

To mitigate the risks of not reducing water on site the following measures maybe implemented:

- To prevent overtopping of the TSFs and evaporation ponds that could result in tailings and or sediment release the water would be pumped to the pit. With the ability to treat water in a two stage process (i.e. the staged treatment process as discussed in Comment 10 (October 2018) of this Addendum) due to no longer needing to dewater the pit, if the Bioaqua water treatment option is not effective in-situ treatment of pit water can be undertaken. In-situ treatment will improve the water quality leading to reduced contaminate loading so that better quality water exists in the pit allowing the discharge of water with suitable dilution under appropriate licencing.
- Construction of the proposed 1 GL water dam to store excess water will occur at the same time as the excavation of the Boxcut, therefore increasing water storage capacity across site.
- Seek and have approved a Waste Discharge Licence and the associated Mining Management Plan approval to enable the establishment of the water treatment plant to treat and discharge the water prior to commence of operations to reduce water volumes across site.

However all the above mitigation measures would require both regulatory support of the NT EPA and DPIR allowing these options to be implemented in a timely manner.

An updated Mine Closure Plan is presented in Appendix B that details the process of early closure and, care and maintenance periods. In addition, more detail on Care and Maintenance periods are documented in Appendix H. The care and maintenance process in Appendix H also discusses site management if tails remain in the existing TSFs during the care and maintenance period.

BioAqua process

Comment 9 (Second Request for Information – 25 October 2018)

The BioAqua treatment process involves the use of nutrients in green mulch to feed sulfide-reducing bacteria. The EIS includes little information on the source and management of materials required for this process. The Proponent informed staff by phone that the bacteria are naturally occurring so shouldn't cause adverse impacts if released, and the mulch can be from native species so shouldn't cause impacts. The Proponent informed staff that the materials would be kept in a closed system so shouldn't enter the surrounding environment.

Staff consider that significant amounts of nutrients inadvertently entering the environment could cause significant impacts to aquatic ecosystems. This could include algal blooms due to high levels of nutrients. There may also be risks from the addition of unnatural quantities of a bacteria.

A mixed metal oxide is produced as a by-product. It is understood that this by-product will be placed in geobags and sold as a recyclable material.

Further Information Required

Provide more details on the BioAqua process and the management of materials/bacteria required for the process. What would be the potential impacts from the mulch piles or escaping process fluids? How would these be prevented, mitigated or managed? Provide data on the quality of water achieved from this process at other sites.

Provide details of what would happen if the bacteria in the plant dies and what the implications would be e.g. how long it would need to build back up? What waste would be generated? Confirm that all wastewater that does not meet the quality criteria for release will be stored on the site.

Discuss the market for the mixed metal oxide produced by the treatment plant and what the contingency plan would be if the material could not be sold.

In response

Please refer to Appendix Q that has been provided by Global Aquatica in response to the above comment.

Water Treatment Plant

Comment 10 (Second Request for Information – 25 October 2018)

In the EIS five water treatment options were investigated, with the BioAqua Process being the preferred option. Reasoning as to why the BioAqua plant was the preferred option was not provided in the EIS. No information has been provided on what the contingency plan would be if the BioAqua plant is unsuccessful.

During the site inspection the virtual curtain technology was identified as being the preferred option B if the BioAqua pilot plant was unsuccessful.

It is understood that the virtual curtain technology requires a secondary process to remove sulfate from the water.

Further Information Required

List the success triggers for BioAqua and consequences if the process does not meet the requirements including what will cause a move to option B.

Provide information on alternative treatment technology that would form the backup, including how sulfate will be processed and what will be done with the sulfur.

Describe the decision making process to determine the technology that will be used to treat water to be discharged and in-situ pit water.

In response

As documented in Section 2 entry to the Toms Gully ore body will no longer be via the existing pit and associated underground workings this allows for the in-pit disposal of tailings and waste rock. Entry will be via a new boxcut and decline. By changing the point of entry the full dewatering of the pit is not required, therefore water treatment becomes a two stage strategy. The decision making process associated with the technologies used within each of the stages can be summarised as follows;

Stage 1: The bulk in-situ treatment of pit water has the objective to improve water quality by modifying the pH to between 6 to 8. This treatment has two outcomes, firstly the modified pH results in a number of metals coming out of solution that will be captured in the residual sludge thus

improving the water quality. This sludge will be deposited at the base of the pit after passing through the water column. This material will be locked up in the base of the pit as tailings and waste rock are deposited. The second outcome of in-situ treatment is with the water having a pH sitting in the range 6 to 8 (and adjusted to stay at that range if required) then the risk of further acidifying conditions caused via the interaction of water with deposited tailings and waste rock is greatly reduced. For example a lower pH could result in the dissolving of pyrite or chalcopyrite from tailings and waste rock that further lowers the pH with the resultant liberation of metals. Once treated in-situ the water will enter stage 2 of the water treatment process.

To achieve the in-situ treatment it is proposed to either use lime, caustic or Virtual Curtain that will be introduced across the surface of the pit and allowed to pass downwards through the water column. Work completed by GHD indicated lime may be the most cost effective solution (Appendix D). Each of these treatments have demonstrated their ability to increase pH and precipitate metals. The selection of the in-situ option will be based on water quality produced, reagent availability and required quantity, residual alkalinity, volume of sludge produced and overall cost effectiveness.

Stage 2; treatment of water for disposal or reuse. Water treated during this stage will be produced by displacement from the pit, from underground dewatering and/or excess water from around the site. This water will be either discharged to Mt Bunday Creek or Lake Bazzamundi, passed to a third party or used around the site. It is intended to use the Bioaqua process to achieve the:

- Site Specific Trigger Values derived by the CSIRO (Appendix F, EIS Supplement and Appendix U in this Addendum) for direct discharge to Mt Bunday Creek during the wet and dry season; or
- Water quality parameters associated with the water supplied to a third party as detailed in Comment 6 (Second Request for Information – October 2018) of this document.

It is proposed to use the BioAqua water treatment process, however if the treatment option doesn't achieved the desired water quality due to an inability to treat the water (this will be assessed by the onsite trial) (**Trigger Point 1**) or failure to treat the anticipated volumes due to limited scalability (this will be assessed at the operational plant design) (**Trigger Point 2**) then the proposed contingency planning can be detailed as follows;

As the majority of water to be treated is from the open pit (in-situ treated) and underground dewatering (groundwater). The stage 2 water treatment process will be dealing with water having a more neutral pH and reduced metal loads while the sulfates remain elevated. To meet the Site Specific Trigger Values (SSTVs) for aquatic ecological protection and water quality supply parameters (i.e. water supplied to a third party) the aim is to reduce the residual metal and sulfate levels to meet the desire levels. If the Bioaqua process is unsuitable for water treatment then the modified/better water quality allows for the use of either sulfate reducing bioreactor, active ion exchange or reverse osmosis to achieve the desire water quality. These three options have been used at various mining sites. The selection of the stage 2 contingency water treatment option will be a function of the ability to achieve desired water quality, availability of reagents/membranes, ability to dispose of waste products, energy input, infrastructure requirements and overall cost effectiveness.

The contingency treatment option would be located in the existing site for the proposed Bioaqua treatment plant thus potentially using existing and proposed infrastructure. Additionally, sulfate that is removed as part of the secondary process as detailed above is unlikely to be converted from a sulfate to sulfur form. This sulfate waste sludge is proposed to be removed from site.

To undertake this contingency reconfiguration the Department of Primary Industry and Resources would be engaged to work through regulatory concerns and approvals would be sought.

Groundwater drawdown and nearby users
Comment 11 (Second Request for Information – 25 October 2018)
<p><i>The draft EIS and Supplement do not provide an assessment demonstrating that surrounding water users would not be affected by groundwater drawdown due to mining. There are 19 bores within 5 km of the mine lease, all to the south and east of the mine lease (draft EIS page 131, mapped on page 85). The draft EIS states that there is a low likelihood of groundwater drawdown impacts reaching the bores to the south and east of the mining lease.</i></p> <p><i>The Supplement provides a model of baseline groundwater conditions (Appendix C) but not a predictive model. The assessment states that water levels in the mine workings have a strong, rapid influence on water levels within the ore zone but significantly less effect on groundwater outside of the zone between the two faults.</i></p> <p><i>This is not sufficient evidence to conclude that the exaction of groundwater drawdown for underground mine operation would not result in a drawdown of water at nearby bores outside of the mine lease.</i></p>
Further Information Required
<p><i>Provide information to demonstrate that the extraction of groundwater for the underground mining operation would not result in drawdown of groundwater at the location of bores in use by other users in the vicinity of the mine.</i></p>

In response

After changing entry methods to the new underground workings, Australian Groundwater and Environmental Consultants Pty Ltd (AGE) were engaged. AGE modelled the potential ground water inflow into Toms Gully underground mine to determine the inflow of water into the Toms Gully mine in relation to the new mining concept of an independent decline access. Appendix R contains the ground water report by AGE.

Appendix V contains a report by a geotechnical consultant Geotechnical Consulting Pty Ltd (GCPL) who visited the existing underground workings in 2008. In section 5.3 of the report, the pumping capacity of the underground mine was quoted to be 15L/s to keep the mine dewatered at that time.

There are numerous bores within 5 km of the Toms Gully Mine site. Most bores are contained within the PGO mining tenements and are owned by PGO. There are approximately 19 bores outside the mining tenements and within 5 km of the mine. Six bores of major flow rates (5 to 10L/s) have been placed on Figure 6-4 below. Table 6-5 shows details of the major bores used by others and included to show distance from the top of the cone of depression.

Table 6-5 Major Bores Outside Toms Gully Tenements

Bore ID	Name	Distance from mine (km)	Estimated depth end of hole (m)	Depth water table below surface	Distance top Cone of

				when drilled (m)	Depression from bore
RN008712	Mt. Bundy Stn. Crusher Site	1.7	-11	2	1.3
RN027479	Police Cadets Bore Mt. Bundy Area	3.8	-32	12	2.3
RN027956	Homestead No.2 Old Mt. Bundy	2.3	-39	7	0.6
RN038456	B.F. Coulter (Boral Quarries)	3.6	-79	10	1.5
RN033880	Christian Outreach Centre	1.7	-54	NR	1.2
RN033881	Christian Outreach Centre	2.1	-72	NR	1.4

Figure 6-4 below shows the registered bores around Toms Gully.

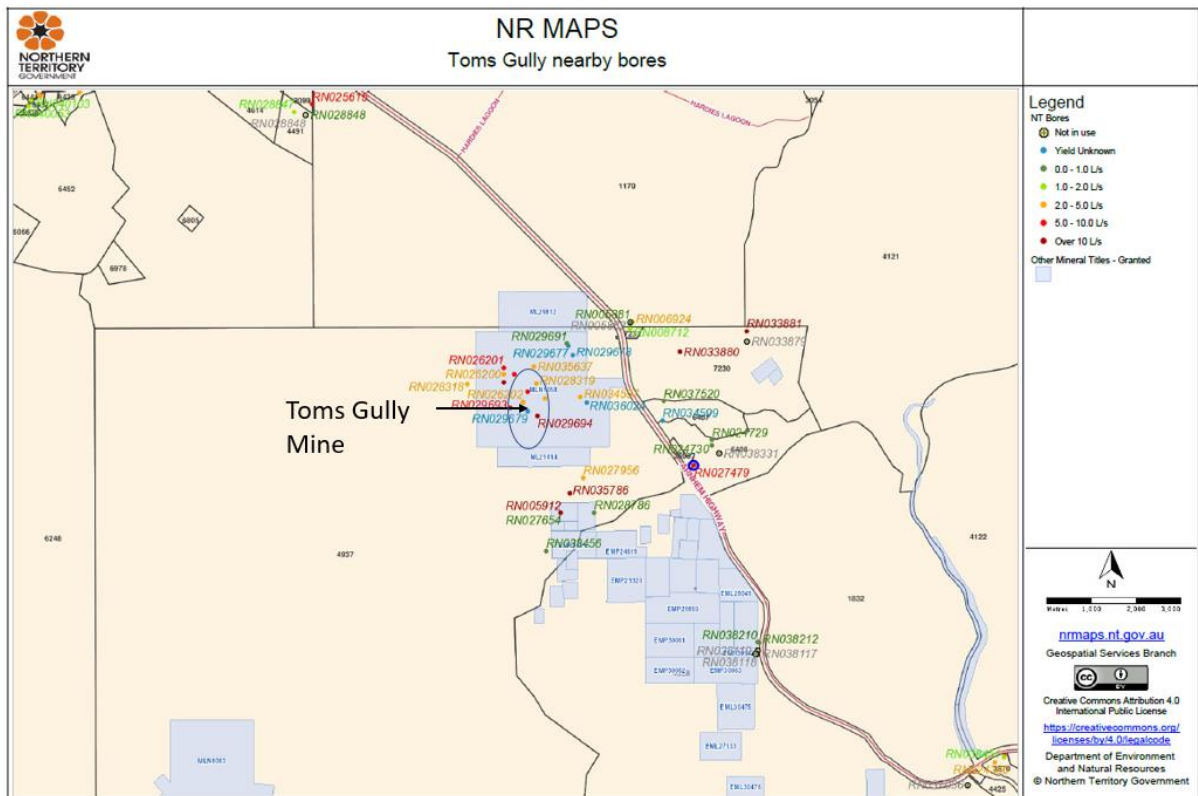


Figure 6-3 Registered Bores around Toms Gully Mine

In the AGE report shown in Appendix R, Figure 10 shows the cone of depression for the mine when mining has ended (final month).

The AGE model was constrained between two faults West and East of the mining workings (see Figure 6-4 below). Previous testing had indicated that the faults did not transmit water readily east-west (Appendix R section 6.1.4).

Considering a worst case scenario where the faults do not restrict the flow of water from the East and West, the cone of depression used in the age report is extended to the east and west of the underground mining area. Figure 6-4 below shows the extrapolation of the cone of depression.

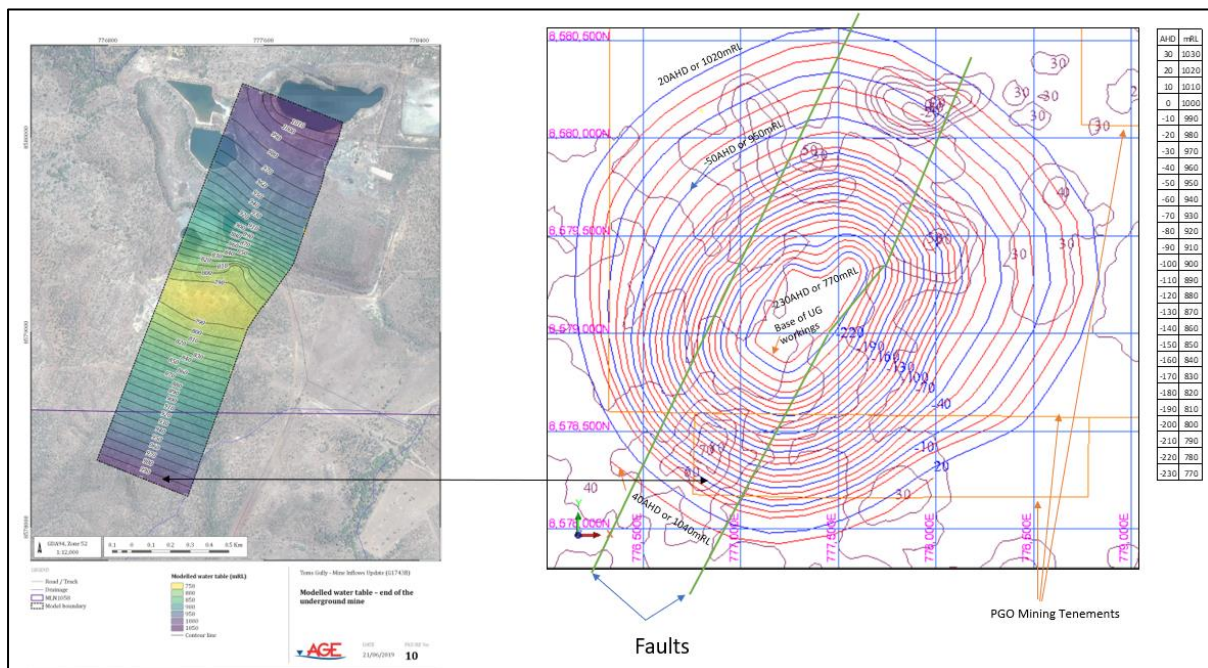


Figure 6-4 Extrapolated Cone of Depression at the End of Mining

The cone of depression is mainly contained in the PGO's mining tenements.

Figure 6-6 below shows a plan of the major bore users, the cone of depression and PGO's mining leases.

Figure 6-7 below is an east-west cross-section of the bores and the cone of depression.

The cone of depression shows it is unlikely to that the dewatering of the mine will affect the nearby bores outside the PGO mining tenements.

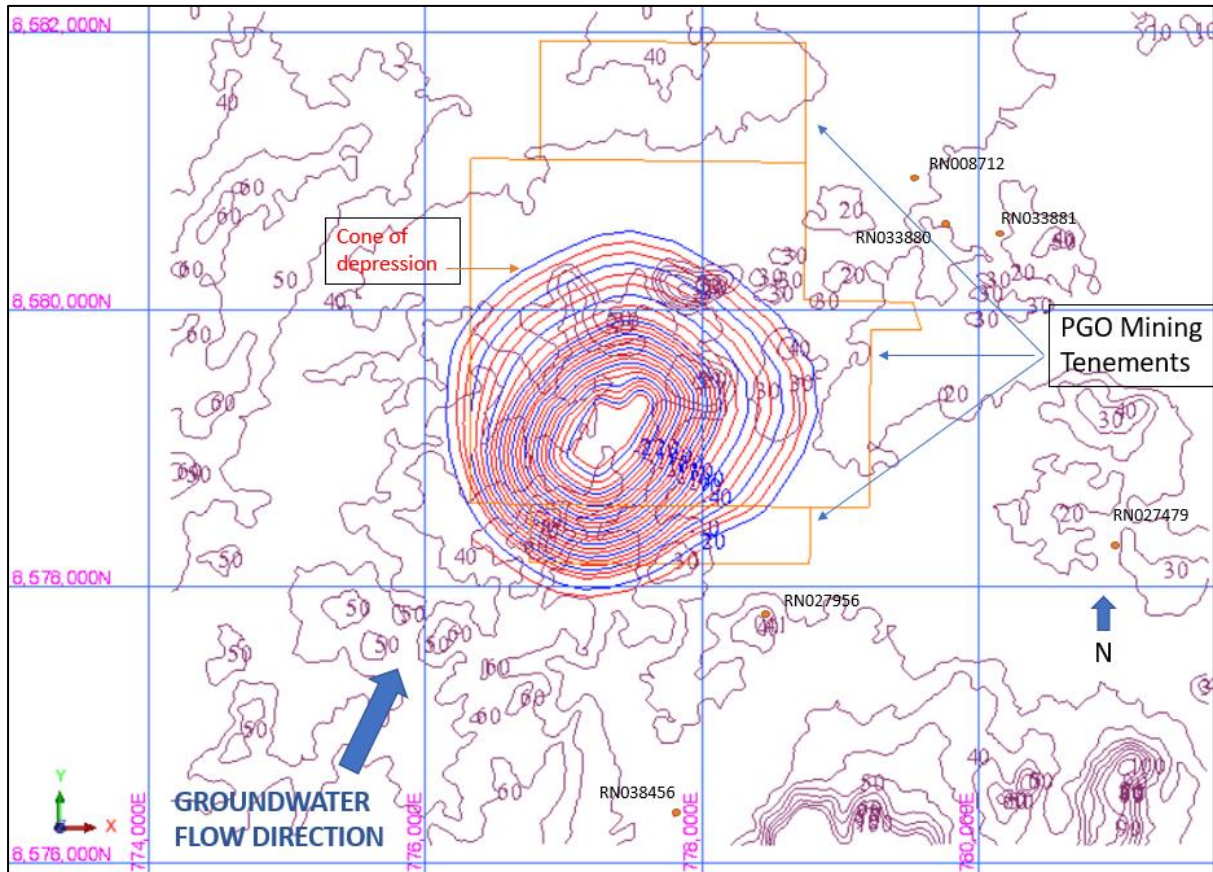


Figure 6-5 Plan of the Major Bores and the Cone of Depression

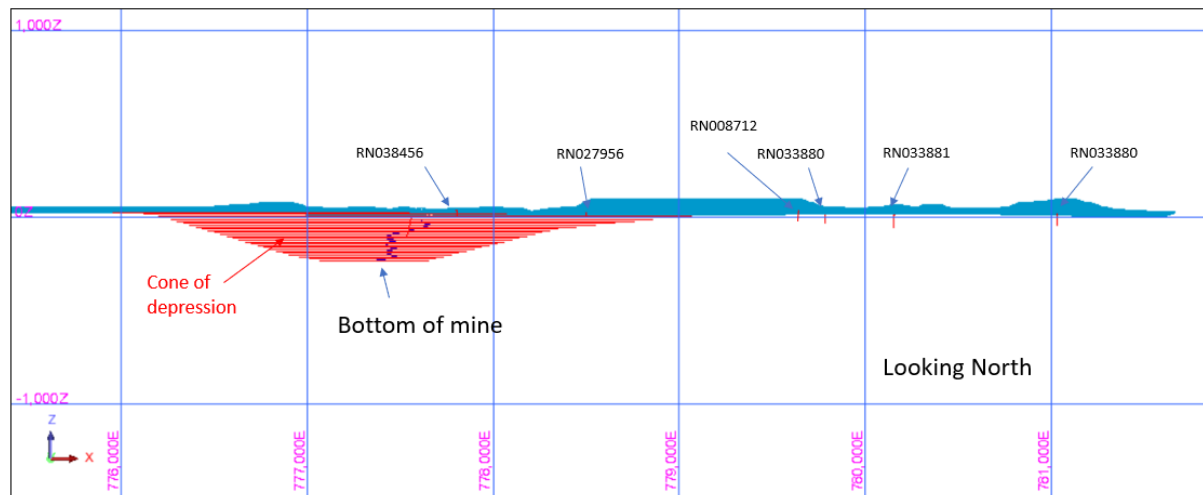


Figure 6-6 East-West Cross-section of the Cone of Depression and the Nearby Bores

The old homestead bore **RN027956** is the bore most likely to be affected by dewatering Toms Gully underground mine .

PGO have an agreement with the Mt Bundy Pastoralist to supply the homestead and associated orchard with treated water up to a quality of 200 ML per year or 6.3L/s. Additional water can be supplied if requested by the Pastoralist.

In practice if the water level at the bores outside PGO's mining tenements, and within 5km of the mine, drop below normal levels PGO will:

1. Supply a bore pump and additional rising main piping to lower the bore pump, if depth of bore allows; or
2. Drill a deeper bore and supply pumping gear for that bore; or
3. Pump treated water to the affected landowner for the duration of the mine. Normal approvals to dispose of water will be sought if pumping is required.

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8 Appendices

Appendix A – Section 14A Amendment – Modifications Reflective of Placing New Waste Rock and All Tailings in the Pit.

Appendix B – Mine Closure Plan.

Appendix C – Acid and Metalliferous Drainage Management Plan.

Appendix D – Pit Water Geochemical Modelling Report.

Appendix E – Commitments Summary Table.

Appendix F – Water Management Plan.

Appendix G – Risk Assessment Framework.

Appendix H – Care and Maintenance.

Appendix I – Terms of Reference Cross Referencing Table.

Appendix J – AMD Assessment: Toms Gully Boxcut Material.

Appendix K – Tailings Storage Facility Dam Break Analysis.

Appendix L – Baseline Studies Flooding.

Appendix M – Submission of Additional Information (Response to Comment 5 and 7) Environment Impact Statement (EIS), Supplement.

Appendix N – Toms Gully Operational and Post Closure Conceptual Site Model.

Appendix O – Water Balance.

Appendix P – Assessment of Impacts to Aquatic Ecosystems as a Result of Site Water Management.

Appendix Q – Global Aquatica Process.

Appendix R – Groundwater Modelling.

Appendix S – Site Geochemical Sampling Procedure.

Appendix T – Water Sampling Procedure

**Appendix U – CSIRO REVIEW IF SITE SPECIFIC TRIGGER VALUES FOR TOMS
GULLY MINE, NT**

Appendix V – GCPL Ground Control Management Plan 30 August 2008