

PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application



Mount Veteran Dalcouth Mine

Chapter 3 Terrestrial Ecology

September 2018

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CHAPTER 3 – TERRESTRIAL ECOLOGY

This chapter describes the existing environmental values (EVs) of the Dalcouth Project at Mount Veteran Mine site (the Project), in the context of terrestrial ecology. In this chapter, the Project Area is defined as the footprint of the infrastructure including the Dalcouth Pit and associated waste dump, haul roads, the new TSF location and associated holding ponds. Within this chapter the Study Area is defined as the extent of ML20547 & ML4393.

The key areas addressed in this report are:

- Identification of EVs of the site, including any significant flora and fauna associated with the Project Area
- Identification of the possible impacts to EVs due to the proposed activities and all associated risks to EVs
- Identification of the strategies to mitigate the identified risks to the EVs.

This chapter should be read in conjunction with the chapters describing soils (Chapter 2), aquatic ecology (Chapter 4), groundwater (Chapter 7) and visual amenity (Chapter 2).

3-1. Project Description

Refer to Chapter 1 – Project Description

3-2. Regulatory Framework

3-2.1. Commonwealth Legislation and Values

3-2.1.1. Environment Protection and Biodiversity Conservation Act

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), actions that have, or are likely to have, a significant impact on a matter of national environmental significance (MNES) require approval from the Australian Government Minister for the Environment. The EPBC Act provides for the listing of nationally threatened native species and ecological communities, native migratory species and marine species. These listed threatened species and ecological communities are recognised as MNES.

This Chapter determines the presence or likely absence of any ecological MNES within the Project Area, and the wider Study Area. Any impacts on listed MNES are considered, and mitigation proposed where appropriate.

3-2.1.2. EPBC Act Environmental Offsets Policy

The EPBC Offsets Policy 2012 outlines the position of the Commonwealth Government with respect to the use of environmental offsets under the EPBC Act.

Offsets will only apply to projects that are determined a controlled action, and that have a 'significant' impact on a MNES (as defined in the Significant Residual Impact Guidelines Version 1.1, 2013). Offsets are required to compensate for any residual significant impact to MNES.

This Chapter determines whether there is likely to be any significant residual impact on MNES, and whether offsets under the EPBC Act are required.

3-2.1.3. Directory of Nationally Important Wetlands

The Directory of Nationally Important Wetlands is a non-statutory recognition of the importance of some wetlands. The Directory identifies nationally important wetlands and provides a knowledge base of the variety of wetlands and the many fauna and flora species that depend on them.

There are no listed nationally important wetlands within the Study Area and this matter will not be considered further within this report.

3-2.1.4. Weeds of National Significance

The 32 Weeds of National Significance (WoNS) have been identified by the Australian government based on their invasiveness, potential for spread, and environmental, social and economic impacts. They have been nominated as they require coordinated action among levels of Government and between States to effectively control particular species.

National management plans, strategies and manuals have been published for all of these species. These strategies aim to:

- Prevent spread and new infestations
- Reduce adverse impacts of existing infestations
- Establish and maintain national commitment
- Coordinate management at a national level
- Increase community awareness.

National management groups have been established for various WoNS to oversee the implementation of the respective national strategic plans.

This Chapter determines the presence or likely absence of WoNS within the Project Area and proposes mitigation measures as required.

3-2.2. State Legislation and Values

3-2.2.1. Environmental Protection Act

In Queensland, environmental impacts to land associated with Environmentally Relevant Activities (ERAs) are regulated under the *Environmental Protection Act 1994* (EP Act) and subordinate legislation, including the *Environmental Protection Regulation 2008* (EP Regulation). The EP Regulation defines Category A and Category B environmentally sensitive areas (ESAs).

The EP Act sets out the criteria for ERAs, which are activities that are likely to cause environmental impacts. An environmental authority is required to conduct an ERA and will include conditions to protect land from environmental harm, and where applicable, to ensure that the land is rehabilitated. Environmental harm includes any adverse effect, or potentially adverse effect, on an EV. The EP Act governs the management, investigations and remediation of any contaminated land. If land becomes contaminated there is a duty to notify DES (Qld Department of Environment and Science). The EP Act also describes the requirements of applications for an EA, which includes details for how the land will be rehabilitated after each ERA ceases to have effect.

This Chapter determines the presence or absence of ESAs within the Project Area and describes potential impacts on EVs.

3-2.2.2. Nature Conservation Act (Qld)

A framework is created under the *Nature Conservation Act 1992* (NC Act) for the creation and management of protected areas (e.g., national parks) and the protection of native flora and fauna (protected wildlife). It is unlawful to take, use, keep or interfere with a natural resource of a protected area, and outside of protected areas it is unlawful to kill, injure, or otherwise take protected wildlife without approval.

Subordinate legislation lists protected species and areas to which the regulatory provisions of the NC Act apply including:

- Nature Conservation (Wildlife) Regulation 2006: this Regulation lists terrestrial and aquatic plant and animal species presumed extinct, endangered, vulnerable, rare, common, international or prohibited. It recommends management objectives for the protection and maintenance of these species in Queensland, as appropriate
- Nature Conservation (Protected Plants) Conservation Plan 2000: this Plan provides for protection and management of native flora

This Chapter determines the likely presence or absence of threatened native flora and fauna species within the Project and Study Areas and their context in relation to protected areas.

3-2.2.3. Vegetation Management Act (Qld)

The *Vegetation Management Act 1999* (VM Act) established Queensland's vegetation management framework and classifies 'remnant' vegetation in Queensland. Classifications under the VM Act have been used as the basis for assessment of remnant vegetation communities in the Study and Project Areas.

Mining activities approved by the grant of an environmental authority under the EP Act are exempt from vegetation clearing requirements under the VM Act. The EA for the Project will, however, identify the area of vegetation permitted to be cleared under the EP Act.

3-2.2.4. Planning Act

In relation to additional ecologically related approvals, Section 4A of the *Mineral Resources Act 1989* precludes the application of the *Planning Act 2016* (Planning Act) to activities undertaken for purposes of the mining tenure where those activities occur within the mining lease.

3-2.2.5. Biosecurity Act

Invasive species (flora and fauna) management in Queensland has previously been undertaken under the auspices of the *Land Protection [Pest and Stock Route Management] Act 2002*. On July 1st, 2016 this Act was superseded by the *Biosecurity Act 2014* (Biosecurity Act). Unlike the previous Act, the Biosecurity Act classifies species as 'restricted matters' and places them in categories rather than classes.

This Chapter will identify any invasive species listed under the Biosecurity Act that are recorded within the Project and Study Areas.

3-2.2.6. Fisheries Act

The main purpose of the *Fisheries Act 1994* (Fisheries Act) is to provide for the use, conservation and enhancement of fish resources and habitats, as the means to apply and promote the principles of ecologically sustainable development. It regulates the taking and possession of specific fish, removal of marine vegetation, the control of development in areas of fish habitat, and lists noxious fish species.

Chapter 4 (Aquatic Ecology) will consider the requirements of the Fisheries Act in relation to the Project.

3-2.2.7. Environmental Offset Act

The *Environmental Offsets Act 2014* (EO Act), Environmental Offsets Regulation 2014 and the Queensland Government Environmental Offsets Policy provides a streamlined framework for environmental offset requirements. Offsets are required where there is an unavoidable impact on significant EVs.

This Chapter will identify any significant residual impacts on any significant EVs and determine whether any offsets under this Act are required.

3-2.2.8. Regional Planning Interests Act

The *Regional Planning Interests Act 2014* (RPI Act) identifies and protects:

- Priority Agricultural Areas (PAAs)
- Priority Living Areas (PLAs)
- Strategic Environmental Areas (SEAs)
- Strategic Cropping Areas (SCAs)

None of the above areas are mapped within the Project or Study Areas and will not be considered further within this report.

3-3. Environmental Objectives

3-3.1. Objectives

The objective is to ensure that the:

- Activity is performed in a way that protects EVs including soils, landforms and their associated flora and fauna
- Choice of the site at which the activity is to be carried out minimises serious environmental harm on areas of high conservation value and special significance
- Location of the activity on a site protects all environmental values relevant to adjacent sensitive land uses
- Design of the facility permits the operation of the site at which the activity is to be carried out, in accordance with best practice environmental management
- Project avoids significant residual impacts to matters of national and state environmental significance; mitigates impacts where they cannot be avoided, and offsets any residual impact.

3-3.2. Performance Outcomes

The performance outcomes are:

- The Project activities are managed so that adverse effects on terrestrial ecology are minimised
- Fauna is able to utilise retained habitats within and adjacent to the Project Area post-development
- No unplanned or unapproved disturbance / clearing of flora and fauna occurs
- Compliance is maintained with the Project's EA conditions

3-4. Methods

3-4.1. Literature Review

Previous ecological studies completed for the Mount Veteran site were reviewed for key findings. These included:

- Environmental Management Plan (2007) (Landline Consulting)
- Baseline Environmental Report (2014) (Landline Consulting)
- Ecology Environmental Impact Study (2014) (Biotropica Australia)

3-4.2. Database Review

Desktop assessment was completed for the entire Mount Veteran site (the existing Study Area) in 2014 (refer Appendix 1). However, due to changes in the schedules of Endangered, Vulnerable and Near Threatened (EVNT) species associated with the EPBC Act and the NC Act, these searches have been updated for this report. To meet the desktop research requirements in the Flora Survey and Assessment in Northern Queensland (Wannan 2012), EPBC Act Protected Matters Search and NC Act Wildlife Online searches were performed on a centre point of the Study Area (-17.5774, 145.145), with a buffer of 50km (see Appendix 6). To obtain a more accurate determination of the likely species recorded in the Study Area a further search of both databases was undertaken based on the centre point for the Study Area with a 25km buffer.

A range of spatial databases were also interrogated to gain additional insight into matters of environmental significance that may occur within the Study Area (refer Table 3-1).

Table 3-1: Spatial Databases reviewed

Database
<i>Vegetation Management Act 1999</i> (VMA) - Regional Ecosystem (RE) and Remnant Map – V10.1
VMA - Regulated Vegetation Management Map V1.46
NC Act - Protected Plants Flora Survey Trigger Map V5
MSES – State Planning Policy (SPP) 2017
VMA - Essential Habitat Map V4.46
<i>Fisheries Act 1994</i> - Queensland Waterways for Waterway Barrier Works
Map of Referrable Wetlands (Wetland Protection Areas)
Watercourse Identification Map 2017
Atlas of Living Australia (ALA) 2018

Desktop studies were completed prior to field assessments to obtain background information relating to the potential presence and distribution of species and ecological communities that may occur on site. This information informed the field assessment.

3-4.3. Field Assessment

An ecological assessment was completed by Biotropica in 2014, based on field assessments completed in November 2013 and March 2014 (refer Appendix 2 – Map 1). These assessments included flora and fauna assessments at 17 study sites based in representative locations across the two Mining Leases (refer Appendix 2 - Map 2). The flora surveys followed the standard methods the Queensland Herbarium recommends for regional ecosystem (RE) mapping (Neldner et al. 2017), and the fauna assessments met the requirements of the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2012).

An ecological survey was completed in January 2018 within the footprint of areas that will be subject to significant disturbance (including the proposed pit, waste dump, new TSF and water storage locations) (refer Appendix 1 - Map 1). The aim of this survey was to confirm and update the results of the 2014 survey and complete more detailed surveys in key areas.

Based on the outcome of the initial vegetation and habitat survey in January 2018, a detailed fauna survey was commissioned, including the use of song-meters to record bat activity, and the use of infra-red motion sensitive cameras to passively observe fauna in areas of selected habitat. These surveys were completed in March 2018.

The surveys completed in November 2013 and March 2014 were designed to capture seasonal variation in species detectability and to describe the key vegetation communities and habitat types across the site. The survey in 2018 was completed in January, after the first significant rainfall had induced a flush of new vegetative growth. The timing of flora and fauna sampling in this highly seasonal environment is one of the critical factors in determining the proportion of species captured during sampling. In monsoon savannah landscapes such as that encompassing the Project Area, there is a flush of annual flora, including many forbs, which appear after the summer rains and persist only briefly before senescence (Wilson et al. 1990, Fox et al. 2001). The survey timing was considered optimal to record these forbs.

When considering the surveys in 2013, 2014 and 2018, the survey methodology and coverage is considered to be robust.

3-5. Desktop Assessment Results

3-5.1. Land Tenure

Land tenure consists of mining leases ML20547 and ML4349. It should be noted that the clearwater dams are excised from the Mining Leases.

3-5.2. Cultural Heritage and Native Title

Since the *Native Title Act 1993* (NT Act) commenced in 1994, the management of cultural and spiritual values of the land with regards to mining activities is conducted via the 'right to negotiate' provisions in the NT Act, usually resulting in an agreement developed with the relevant Aboriginal group.

An Agreement would generally include provisions for meeting the duty of care requirements for cultural heritage as required under the *Aboriginal Cultural Heritage Act 2003* (ACH Act).

A search of Mining and Native Title databases revealed the following information:

3-5.2.1. ML4349

ML4349 was granted 28 March, 1985. As the grant of the mining tenement predates the NT Act there is no native title obligation in relation to this tenement.

However, the mining lease holder needs to meet their obligations for protecting cultural heritage under the *Aboriginal Cultural Heritage Act 2003* (ACH Act). The ACH Act provides for protection of Aboriginal cultural heritage and applies to all land users. The process would usually involve a search of the Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) database (see below) and negotiation with the relevant Aboriginal party (see below).

3-5.2.2. ML20547

ML20547 was granted to Garimperos in 2013. A condition of the grant would be to have an Agreement with the Native Title party in place. An agreement can be made to validate the mining under the NT Act by Indigenous Land Use Agreement (ILUA), or by section 31 (NT Act) agreement. ILUAs are available through the public record and searches revealed that no ILUAs have been registered over this area between the parties. The regional native title representative body, the North Queensland Land Council (NQLC), confirmed they hold section 31 agreements for the tenement.

The Agreement usually continues regardless of change of ownership of the mining tenement.

3-5.2.3. Bar-Barrum Native Title Claim #8

In 2015, the Bar-Barrum people registered a native title claim (QC2015/012 #8) that includes the Mount Veteran Mine. Note, this claim was lodged after ML20547 was granted to Garimperos. There may have been pre-existing claims over the area, and further research would be required to assess this.

The Bar-Barrum #8 native title claim was withdrawn from the Federal Court in December 2017. This does not suggest native title does not exist in the area, only that this application was not progressed.

Under the 'Last Claim Standing' clause of the ACHA, Bar-Barrum would be the Aboriginal party with relevant relationships to cultural heritage. Section 35 of the ACHA defines the Aboriginal party including 'is or was a native title party'.

3-5.2.4. Cultural sites

Bar-Barrum elders Tom Congoo and John Watson inspected areas within ML20547 that may have cultural significance on or around October 10th 2009 and made a determination that there were no areas of concern.

DATSIP search results revealed no cultural sites recorded within ML4349 or ML20547. Two sites are recorded 5-7km south of the tenements, and both are places of importance to Bar-Barrum people.

3-5.3. Climate

The local climate at the Study Area was described by Landline Consulting (2013) as being modified by altitude with a Koeppen climatic classification category of sub-tropical with a pronounced winter dry season. Mean monthly rainfall was described as varying between 7mm in September to a high of 200mm in February. Landline Consulting (2013) described total annual rainfall over a 100-year period as varying from 239 to 1,453mm with a mean figure of 811mm and an average of 73 rain days per year.

The closest rainfall recording site to the Project is the Mount Garnet Post Office (Queensland Bureau of Meteorology Station number 31046), approximately 11.5km south-southwest of the Project and at an elevation of 658m AHD. This station has a continuous rainfall record from March 1901 to the present day (January 2018). At this station mean monthly rainfall varies between 6.9mm in September to a high of 198.1mm in February. Annual rainfall during the period 1901 to 2017 has varied between 237mm in 1915 to 1,453mm in 1991 with a mean annual value of 817.2mm.

The closest Bureau of Meteorology (BoM) station that is operational and recording a full range of climate data, including evaporation, is at Walkamin Research Station (station 031108). This is approximately 57km northeast of the Project and at an elevation of 594m AHD. This weather station opened in 1965 and has rainfall records for the period 1965 to 2018 and temperature and evaporation records from 1968 to 2018. Mean monthly values for rainfall, evaporation and minimum and maximum temperatures for Station 031108 are shown in Figure 3-1. Key climatic data indicate the Project Area experiences a distinct wet season with the highest rainfall occurring during the summer months (December to March) and drier periods predominating in the winter and early spring months (June to October). Average annual evaporation is considerably higher than average annual rainfall, but average rainfall typically exceeds average evaporation over the period January to March, with the latter period being when precipitation recharge to groundwater is likely to occur.

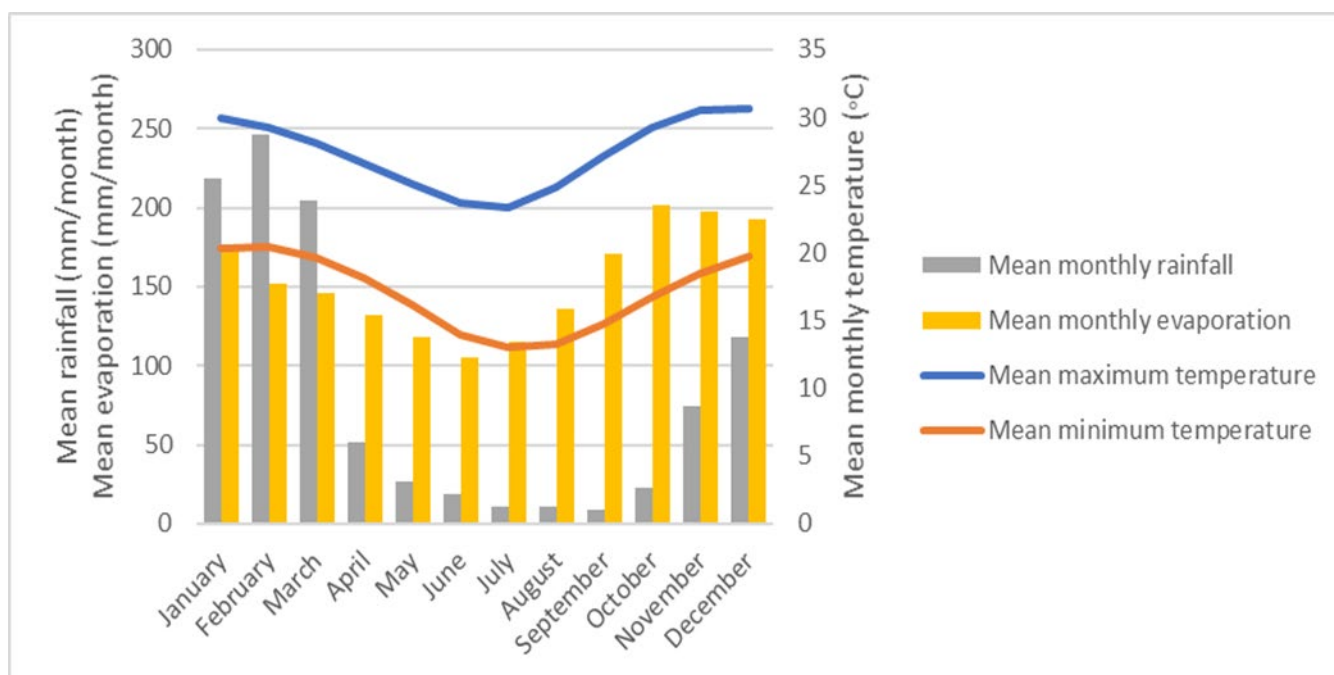


Figure 3-1: Mean climatic conditions

3-5.4. Topography

The Project is situated near to the Great Dividing Range within the upper reaches of the Herbert River catchment, approximately 4km south of the Herbert River northern catchment boundary. The area is characterised by small valleys and ridges, with the Dalcouth deposit located in the bottom of the Males Creek valley at a surface elevation of between 740 to 750m AHD. The Males Creek valley runs in a northeast to southwest direction, declining in elevation to the southwest where Males Creek meets Copper Creek. Northeast to southwest trending ridges bound the Males Creek valley on both its northern and southern sides. To the south the land rises up to approximately 850m AHD and to the north it rises to about 860m AHD. Minor tributary gullies extend away from Males Creek, the most pronounced of which extends southeast of Clearwater Pond 2, where the new TSF is to be located.

3-5.5. Surface Water

The Project is wholly contained within the upper reaches of the Herbert River Basin and is located around 4km south of the northern catchment boundary. The Project is within the Nanyetta (Return) Creek sub-catchment and the Dalcouth deposit is in the catchment of the smaller Males Creek watercourse. Males Creek runs in a northeast to southwest direction to discharge into Wyndham Dam on Return Creek. Copper Creek is to the northwest of the proposed Dalcouth pit and runs from north-northeast to south-southwest and meets Males Creek before discharging into Wyndham Dam. The Project sits immediately south of the minor catchment divide between Males Creek to the south and Copper Creek to the north.

The main mine infrastructure and existing Cleanwater Ponds 1 and 2, and the TSF Overflow Containment Pond are situated on or adjacent to Males Creek. A new TSF will be built in a small side valley southeast of Males Creek and will replace the existing TSF.

3-5.6. Soils and Geology

Refer Chapter 2 – Soils

3-5.7. Environmentally Sensitive Areas

Environmental values that are required to be assessed in an EA application include Category A and Category B environmentally sensitive areas (ESAs) as defined under Schedule 12 of the EP Regulation.

There are no Environmentally Sensitive Areas (ESAs) mapped within the Study Area (refer Appendix 3).

3-5.8. Bioregion and Regional Ecosystems

The site is within the Einasleigh Uplands Bioregion, subregion 6 – Herberton – Wairuna.

The only RE that is mapped within the Project Area is RE9.11.10, the details of which are reproduced in Table 3-2. The remainder of the Project Area is mapped as non-remnant vegetation. There are no 'Of Concern' or 'Endangered' REs mapped within the Project Area. There are no REs mapped as 'Threatened Ecological Communities' (TEC) within the Project Area.

Table 3-2: RE9.11.10 details

Regional Ecosystem 9.11.10	
Vegetation Management Act Class	Least Concern
Biodiversity Status	Of Concern
Subregion	6, (2), (3)
Estimated extent	Pre-clearing 35,000ha, remnant 2015 34,000ha
Extent in reserves	No representation
Short description	<i>Eucalyptus cloeziana</i> , <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , <i>E. portuensis</i> and <i>E. cullenii</i> mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks
Structure category	Sparse
Description	Mixed woodland to open forest including combinations of the species <i>Eucalyptus cloeziana</i> (Gympie messmate), <i>Corymbia citriodora</i> subsp. <i>citriodora</i> (lemon-scented gum), <i>C. leichhardtii</i> (yellowjacket), <i>E. portuensis</i> (white mahogany), <i>E. cullenii</i> (Cullen's ironbark), <i>E. atrata</i> (Herberton ironbark), <i>E. crebra</i> (narrow-leaved ironbark) and <i>C. clarksoniana</i> (Clarkson's bloodwood) +/- <i>Callitris intratropica</i> (cypress pine). There can be an open <u>sub-canopy</u> of canopy species, <i>Grevillea glauca</i> (bushman's clothes peg) and <i>Allocasuarina inophloia</i> (stringybark sheoak). The <u>shrub layer</u> varies from scattered plants to mid-dense and can include juvenile canopy species, <i>Grevillea</i> spp., <i>Acacia</i> spp., <i>Persoonia falcata</i> , <i>Melaleuca viridiflora</i> (broad-leaved paperbark), <i>Cycas platyphylla</i> and <i>Xanthorrhoea johnsonii</i> (grass-tree). The grassy <u>ground layer</u> is mid-dense to dense and often dominated by <i>Themeda triandra</i> (kangaroo grass), <i>Arundinella</i> spp. and occasionally <i>Triodia</i> spp. (Spinifex). Occurs on steep dissected hills and flats on highly metalliferous metamorphic rocks, often with shallow soils. (BVG1M: 13a)

Regional Ecosystem 9.11.10	
Special values	Habitat for geographically restricted and vulnerable flora species including <i>Goodenia stirlingii</i> , <i>Acacia purpureopetala</i> , <i>Homoranthus porteri</i> , <i>Grevillea glossadenia</i> and <i>Corymbia rhodops</i>
Fire management guidelines	SEASON: Early dry season and storm time. Timing of early dry season burns will vary depending on seasonal conditions; it may sometimes commence as early as March. Avoid burning August-October when south-easterly winds are typically strongest. INTENSITY: Low, with occasional moderate or high. INTERVAL: 5-10 years. STRATEGY: Apply mosaic across the landscape at a range of frequencies to create varying stages of post-fire response. ISSUES: These ecosystems contain shrubs that germinate after fire. Seedlings typically take a number of years to mature. Avoid repeated fires at short intervals and high intensity burns of broad areas. Leave areas of long unburnt vegetation to maintain a diversity of habitat for wildlife. Shrub species diversity will decline if areas are left long unburnt.
Comments	Occurs predominantly in the Irvinebank area in the central bioregion.

3-5.9. Threatened Flora and Fauna Species

The nearest Protected Plants High Risk area is mapped in the south west corner of the Study Area and does not overlay the Project Areas. There is no requirement to complete a high risk flora study.

The desktop assessment identified the key threatened flora and fauna that may occur in the Study Area. A full account of these species and the likelihood of their occurrence is provided in Appendix 4.

The desktop assessment identified 13 species of flora, and five species of fauna that are potentially present within the Study Area or its surrounds. These species are shown in Table 3-3 below.

Table 3-3: Threatened species potentially occurring in Project Area

Name	Common Name	NCA Status	EPBC Status	Preferred Habitat & Distribution	Potential to Occur in Study Area
Fauna					
<i>Dasyurus hallucatus</i>	Northern Quoll	-	E	<i>Dasyurus hallucatus</i> is the smallest of the quoll species and the most arboreal. Although found in a variety of habitats, it is most common in rocky eucalypt woodland and open forest within 200 kilometres of the coast. They are opportunistic omnivores feeding on invertebrates, small birds and mammals, frogs, reptiles, fruits and nectar). Northern Quolls will den in tree hollows, termite mounds, fallen logs and rock crevices and will use a number of dens across their territory (Oakwood 2002). ALA records show the majority of the records are clustered near the coastal ranges. However, there is two records near Innot Hot Springs (approx. 10km distant) and several others near Irvinebank (approx. 15km distant). There is a further record near Forty Mile Scrub, but no records further west than that.	Possible A limited number of small rocky outcrops recorded within study area. The species would be close to the western extent of its local range if found on site.
<i>Hipposideros diadema reginae</i>	Diadem leaf-nosed bat	NT	-	Habitat is lowland rainforest, eucalypt and paperbark forest and open woodland. Day-roosts are in caves, disused mines, old sheds and large road culverts (Van Dyck et al. 2013) ALA shows a record approx. 11km southwest of site, one record from 40- mile scrub and a cluster of records near Chillagoe.	Possible The species would be close to the western extent of its range if found within the study area.
<i>Macroderma gigas</i>	Ghost bat	E	V	Whilst using a wide variety of habitats for temporary and/or feeding sites, permanent roosts, especially maternity sites, are in deep natural cave systems or large disused mines and have particular structural and microclimatic features. Individuals may disperse well away from maternity roosts when not breeding and can move between several roost sites regularly (Curtis et al. 2012) ALA shows records from Mount Garnet, 40- mile scrub, and further north west of the site.	Possible Within species range. Habitat for roosting possible within study area. Maternity roost unlikely to be found on site.
<i>Petauroides volans minor</i>	Greater glider (NQ subspecies)	V	V	Habitat is eucalypt dominated low open forests on coast to tall forests in the range and low woodland west of Great Dividing Range. ALA shows records the most westerly record as being between Millstream and Innot Hot Springs. However, previous surveys in 2013 / 2014 positively recorded this species on the site.	Occurs Previously recorded within study area.

Name	Common Name	NCA Status	EPBC Status	Preferred Habitat & Distribution	Potential to Occur in Study Area
<i>Tyto novaehollandiae kimberli</i>	Masked owl (northern subspecies)	V	V	Habitat is sclerophyll forest and woodland, often near ecotones with open areas and typically grassy, or with a mosaic of sparse and dense ground-cover. Roosting sites are generally tree-hollows, caves or dense foliage (3-8m above the ground) (Curtis et al. 2012) ALA expert distribution shows that the site is within the 'maybe' distribution category for this species.	Possible Within ALA 'maybe' expert distribution range. Marginal habitat within study area – missing open grassland aspect.
Flora					
<i>Acacia longipedunculata</i>	-	NT	-	Habitat is restricted to shallow, sandy and rocky soils in open forest near Herberton and in Paluma Range in north-east QLD. ALA shows records scattered around Herberton and Irvinebank. The closest record is approximately 10km north of the Study Area.	Possible Suitable habitat is present within study area and is within current range
<i>Acacia purpureopetala</i>	-	V	CE	Confirmed in original survey. ALA shows records scattered around Herberton and Irvinebank. The closest record is approximately 7km north-east of the Study Area.	Occurs Previously recorded within study area
<i>Corymbia rhodops</i>	Red-throated bloodwood	V	V	The species is found inhabiting low open forest on stony hills and ridgetops in shallow sandy soils. ALA shows records scattered west of Herberton and around Irvinebank. The closest record is approximately 6km north-east of the Study Area.	Possible Suitable habitat (RE9.11.10) is present within study area and is within current range
<i>Cycas platyphylla</i>	-	V	V	Habitat is grassy ironbark dominated woodland on shallow loamy soils on stony slopes. ALA shows records scattered west of Herberton around Petford and south, almost to Mount Garnet. The closest record is approximately 4km east of the Study Area.	Possible Habitat within study area is not optimal, but species may still possibly occur. The species would be close to the southern extent of its range if found within the study area.
<i>Diuris oporina</i>	Northern white donkeys tails	NT	-	There is little information on preferred habitat for the species other than it is found in open forest within the Herberton / Irvinebank area. ALA shows records scattered west of Herberton around Petford and south, almost to Mount Garnet. The closest record is approximately 10km north of the Study Area.	Possible Suitable habitat is present within study area and is within current range

Name	Common Name	NCA Status	EPBC Status	Preferred Habitat & Distribution	Potential to Occur in Study Area
<i>Euphorbia carissoides</i> (syn. <i>Chamaesyce carissoides</i>)	-	NT	V	The species grows on rocky cliff-lines, among rocky outcrops and hillsides in shrubland and low open woodland, in shallow soils derived from sandstone, granite and rhyolite. ALA shows records scattered from Herberton, west and south west almost to Georgetown. A disjunct population occurs near Hopevale. The closest record is approximately 20km west of the Study Area.	Possible Habitat within study area is not optimal, but species may still occur.
<i>Goodenia stirlingii</i>	-	V	-	There is little information on preferred habitat for the species other than it is found in open forest within the Herberton / Irvinebank area. ALA shows records scattered from Herberton, north to Mount Emerald and west of Mount Garnet. The closest record is approximately 18km north-east of the Study Area.	Possible Optimal habitat (RE9.11.10) is present within study area and is within current range
<i>Grevillea glossadenia</i>	-	V	V	The species grows in Eucalypt woodland or low open forest in shallow to skeletal granitic soils on rolling hills, gravel terraces near stream beds, and along roadsides and mining tracks. ALA shows records centralised around the Irvinebank / Stannary Hills area and north to Mount Emerald. The closest record is within 2km of the Study Area.	Possible Optimal habitat (RE9.11.10) is present within study area and is within current range
<i>Homoranthus porteri</i>	-	V	V	The species grows in open Eucalypt woodland on sandstone pavement, rocky outcrops, hillsides and scree slopes. ALA shows records scattered around the Herberton / Ravenshoe area and north to Mount Mulligan. The closest record is approximately 25km east of the Study Area.	Possible Some suitable habitat (RE9.11.10) is present within study area. The species would be close to the western extent of its range if found within the study area.
<i>Macropteranthes montana</i>	-	V	V	Habitat is low woodland or vine thicket on shallow soils, including limestone. ALA shows records scattered From Herberton west to Georgetown, north to Mount Carbine and south to Pentland. The closest record is approximately 20km north-west of the Study Area.	Possible Habitat within the study area is not optimal, but species may still occur.
<i>Melaleuca sylvana</i>	-	E	-	Habitat is open forest, heath, and low open woodland on soils derived from rhyolite. It is commonly found on steep rocky hillslopes above 800m elevation. ALA shows records scattered around Herberton, Walkamin and Ravenshoe. The closest record is approximately 20km north-east of the Study Area.	Possible Rhyolite derived soils are not present on site and habitat is not optimal, but species may still possibly occur.

Name	Common Name	NCA Status	EPBC Status	Preferred Habitat & Distribution	Potential to Occur in Study Area
<i>Melaleuca uxorum</i>	-	E	-	Habitat is open woodland dominated by <i>Eucalyptus lockyeri</i> on soils derived from rhyolite. It is commonly found on rock pavements between 950m and 1050m elevation. ALA shows records restricted to the northern Herberton Range near Walkamin. The closest record is approximately 20km north-east of the Study Area.	Possible Rhyolite derived soils are not present on site and habitat is not optimal, but species may still possibly occur.
<i>Stylidium trichopodum</i>	-	NT	-	Habitat is sandy soils on flat or gently sloping terrain, often dominated by <i>Melaleuca</i> species ALA shows records sparsely scattered between Mount Garnet, north to Laura in CYP. The closest record is approximately 25km west of the Study Area.	Possible Habitat on site is not optimal, but species may still possibly occur around water points and dams.
<i>Triplarina nitchaga</i>	-	V	V	The species is found on granite and rhyolite outcrops in Eucalypt-dominated open forest. ALA shows records restricted to the areas around Millstream and Koombuloomba. The closest record is approximately 25km south-east of the Study Area.	Possible Habitat on site is not optimal, but species may still possibly occur. The species would extend its current range if found on site.

3-5.10. Matters of National Environmental Significance (MNES)

There are no MNES recorded on site additional to those fauna and flora species discussed in Section 3-5.9.

3-5.11. Matters of State Environmental Significance (MSES).

In this instance, MSES are established in the context of the planning framework, under the Planning Act 2016 by the definition in the SPP. MSES include values that are protected under other Queensland legislation such as:

- *Nature Conservation Act 1992*
- *Marine Parks Act 2004*
- *Fisheries Act 1994*
- *Environmental Protection Act 1994*
- *Wild Rivers Act 2005 (now repealed)*
- *Regional Planning Interest Act 2014*
- *Vegetation Management Act 1999*

MSES and their applicability to the Project Area are shown in Table 3-4.

Table 3-4: MSES and their applicability

Matters of State Environmental Significance (SPP 2017)	Applicability to Project Area
State Conservation Areas	
MSES 1 - Protected Area – Estates	No
MSES 2 - Protected Area – Nature Refuges	No
MSES 3 - Marine Park – Highly Protected Zones	No
MSES 4 – Declared Fish Habitat Areas	No
Wetlands and Waterways	
MSES 5 - Strategic Environmental Areas (Designated Precinct)	No
MSES 6 – ‘High Ecological Significance’ Wetlands (Map of Referable Wetlands)	No
MSES 7 – High Ecological Value (HEV) Waters (Wetlands)	No
MSES 8 – High Ecological Value (HEV) Waters (Waterway)	No
Protected Species	
MSES 9 – Wildlife Habitat (derived from records of threatened wildlife under the Nature Conservation Act 1992 and special least concern animal under the Nature Conservation (Wildlife) Regulation 2006)	No
Regulated Vegetation	
MSES 10 - Regulated Vegetation – Category B (E or OC)	No
MSES 11 - Regulated Vegetation – Category C (E or OC)	No
MSES 12 - Regulated Vegetation – Category R (GBR-Riverine)	Yes
MSES 13 - Regulated Vegetation – Essential Habitat	No

Matters of State Environmental Significance (SPP 2017)	Applicability to Project Area
MSES 14 - Regulated Vegetation – Intersecting a Watercourse	Yes
MSES 15 - Regulated Vegetation – 100m from Wetland	No
Offset Areas	
MSES 16 - Legally secured offset areas – Offset Register	No
MSES 17 - Legally secured offset areas – Vegetation Offsets	No

The locations of the MSES mapped within the Study Area are shown on (Appendix 1 - Map 4). The mapping of these MSES within the study area triggers the requirement to investigate the presence of this environmental matter during field surveys, impact assessments and consideration of environmental offsets.

3-5.11.1. MSES 12: Regulated vegetation – Category R

Category R vegetation is native woody vegetation on freehold land, Indigenous land or leasehold land granted for agriculture of grazing purposes, located within 50 metres of a watercourse in the Burdekin, Mackay, Whitsunday and Wet Tropics Great Barrier Reef catchments.

The required outcomes for retaining Category R vegetation include:

- Category R regrowth vegetation conserved
- Wetland and watercourse bank stability, water quality and habitat is maintained
- Landscape stability is maintained

It should be noted that the presence of this feature on the relevant map is a trigger to determine whether further investigation of the presence of the environmental matter is required. The assessment will take into consideration the on-ground presence or absence of the MSES.

The potential impacts on this vegetation will be discussed in Section 3-7.1.1 and 3-7.2.1

3-5.11.2. MSES 14 – Regulated vegetation intersecting a watercourse

MSES 14 is defined as: Regulated vegetation under the VM Act that is category A, B, C, R areas that are within a defined distance from the defining banks of a relevant watercourse identified on the vegetation management watercourse and drainage feature map.

To be a defined MSES, a distance from the watercourse defining bank is required to be applied. Any RVM category areas (A, B, C or R) within that distance is MSES. Distance varies dependent on the location (coastal or non-coastal bioregion) and the stream order.

Copper Creek and Males Gully are mapped as defined watercourse under this MSES. The Project Area is within a non-coastal bioregion and Copper Creek is mapped as stream order one, whilst Males Gully is stream order two. Hence using Table 3 from the 'Method for mapping Matters of State Environmental Significance for the State Planning Policy 2017 Environmental Offset Regulation 2014', any regulated vegetation within 25m of the edge of the defining bank of Copper Creek and Males Gully is an MSES.

There is also a watercourse under the VM Act mapped in the valley in which the new TSF will be located. It should be noted that the presence of this feature on the relevant map is a trigger to determine whether further investigation of the presence of the environmental matter is required. The assessment will take into consideration the on-ground presence or absence of the MSES.

3-6. Existing Environmental Values – Field Survey Results

3-6.1. Flora Description

3-6.1.1. Study Area

Broadly, the vegetation within the study area corresponds with the REs mapped across the site. RE9.11.10 is mapped as covering almost the entire lease (95%). RE9.11.10 is a broad community dominated by a mixture of *Eucalyptus* species. Eucalypts vary across the site, some hills dominated by Grey ironbark (*Eucalyptus atrata*), others by Lemon-scented gum (*Corymbia citriodora*) and/or Gympie messmate (*Eucalyptus cloeziana*) and Brown bloodwood (*Corymbia trachyphloia*).

Most of the woodlands across the study area are in relatively good condition, as indicated by the abundance and cover of native grasses and herbs. A total of 175 native species, including one Special Least Concern Species were recorded on site. No threatened flora was recorded. There were 25 exotic plants recorded within the project area, commonly near abandoned mining operations.

Sites 1, 5, and 7 (refer Appendix 2- Map 2) show the highest abundance of native species recorded (36, 39, and 36 native species respectively). Each of these sites was located along a ridge top or slope with a south-easterly aspect, a habitat which generally showed little or no evidence of anthropogenic disturbance. All steep slopes surveyed recorded a diverse ground-layer attributed to the lack of grazing by cattle at the time of survey.

The vegetation community surveyed at Site 7 is a potential refuge for plant species that are less fire tolerant than other plant communities in the study area. This site is dominated by *Callitris intratropica* (Tropical cypress pine) with the ground layer composed of species more characteristic of a heath community. The site is situated between two ridges descending toward the southern lease boundary. A seasonal creek borders the eastern side where high intensity fires appear to be a less frequent occurrence.

Vegetation communities located within or along watercourses/drainage lines provide important habitat for fauna, and seasonal creeks and drainage lines provide habitat for plants that are not found elsewhere within the site. The presence of *Lophostemon grandiflorus* and *L. suaveolens* indicate that these areas are seasonally inundated (RE9.3.15 – Site 10 & 11; refer to Appendix 2 - Map 2).

Communities located on flats or on gentle slopes were more heavily grazed during the dry season survey and had a greater ground cover of introduced weed species. Cattle had been removed from the site soon after the dry season survey, and during the wet season survey much of the site had begun to recover from grazing. Sites exhibiting a high prevalence of weeds are those associated with the most intense disturbance, with Site 9 (located below the TSF wall) recording the highest weed count.

3-6.1.2. Study Area flora survey

Four localities were targeted for assessment during the 2018 survey; Waste Dump, Dalcouth Pit, Proposed TSF and the Plant pond. Each locality is described below in Table 3-5.

Table 3-5: Study Areas descriptions

Locality	Habitat Description	Level of Disturbance	Mapped RE	On-ground RE
Waste Dump	Flat to slightly undulating topography with upper to middle banks of Copper Creek present in the northern portion of the site. Deeply incised drainage network into Copper Creek. Open woodland to 16m dominated by <i>Corymbia citriodora</i> (Lemon scented gum), <i>Eucalyptus cullenii</i> (Cullen's ironbark), <i>Eucalyptus crebra</i> (Narrow-leaf ironbark) and <i>Eucalyptus atrata</i> (Herberton ironbark) with <i>Corymbia trachyphloia</i> . FPC is approximately 30%. <u>Shrub layer</u> comprises <i>Acacia disparrima</i> , <i>A. calyculata</i> , <i>Grevillea glauca</i> , <i>Coelospermum reticulata</i> and <i>Maytenus cunninghamii</i> with some areas dominated by a <u>shrub layer</u> of <i>Petalostigma pubescens</i> (Quinine tree). <u>Ground cover</u> comprises; <i>Themeda triandra</i> (Kangaroo grass), <i>Alloteropsis semialata</i> (Cockatoo grass), <i>Arundinella nepalensis</i> , <i>Lomandra multicaulis</i> , <i>Galactia tenuifolia</i> , <i>Murdannia graminea</i> . Exotic species dominate the <u>ground layer</u> ; <i>Stylosanthes scabra</i> (shrubby stylo) and <i>Praxelis clematidea</i> (Praxelis) are the most common. Large trees with hollows were abundant throughout the site.	The area shows moderate levels of disturbance and grazing is evident. The area of the current sample storage location has been cleared of vegetation. Exotic species are common, though most species present are environmental weeds only. A small patch of <i>Themeda quadrivalvis</i> (grader grass) was recorded along-side the sand bag piles. The natural drainage network across the site is subject to erosion.	RE9.11.10	RE9.11.3a
Dalcouth Mine Pit site	Undulating landform on upper banks of Copper Creek, with a network of deeply incised drainage lines flowing to the north. Open woodland to 16m dominated by <i>Corymbia citriodora</i> (Lemon scented gum), <i>Eucalyptus crebra</i> (Narrow-leaf ironbark) and <i>Eucalyptus atrata</i> (Herberton ironbark). FPC is approximately 30%. <u>Shrub layer</u> comprises <i>Acacia disparrima</i> , <i>A. calyculata</i> , <i>Grevillea glauca</i> , <i>Coelospermum reticulata</i> and <i>Jacksonia thesioides</i> . The more disturbed areas comprise a <u>shrub layer</u> of <i>Lamprolobium fruticosa</i> , <i>Acacia decora</i> and <i>Acacia simsii</i> to 2m. <u>Ground cover</u> comprises; <i>Themeda triandra</i> (Kangaroo grass), <i>Alloteropsis semialata</i> (Cockatoo grass), <i>Arundinella nepalensis</i> , <i>Galactia tenuifolia</i> , <i>Murdannia graminea</i> . Exotic species dominate the <u>ground layer</u> ; <i>Stylosanthes scabra</i> (shrubby stylo) and <i>Praxelis clematidea</i> (Praxelis) are the most common. Large trees with hollows were abundant throughout the site.	The area shows moderate to high levels of disturbance, much of the area has been previously cleared for drilling investigations and is subject to ongoing disturbance. Ground cover is sparse and exotic species are common. Gully and rill erosion is present throughout the area.	RE9.11.10	RE9.11.3a
Proposed TSF	Open woodland dominated by <i>Eucalyptus cloeziana</i> (Gympie messmate), and <i>Corymbia citriodora</i> (Lemon-scented gum) to 18m with <i>Corymbia erythrophloia</i> and <i>Eucalyptus portuensis</i> . FPC is approximately 50%. The <u>shrub layer</u> comprises <i>Acacia calyculata</i> , <i>A. disparrima</i> , <i>Grevillea parallela</i> , <i>G. glauca</i> , <i>Maytenus cunninghamii</i> , <i>Callitris intratropica</i> , and <i>Xylomelum scottianum</i> to 4m. The <u>ground layer</u> comprises, <i>Acacia whitei</i> , <i>Themeda triandra</i> (Kangaroo grass), <i>Arundinella nepalensis</i> , <i>Mnesithea rottboellioides</i> , <i>Heteropogon triticeus</i> and <i>Lomandra multiflora</i> with a high diversity of leguminous forbs. Some small sections of rocky outcrops offer moderate habitat potential for threatened fauna. Abundance of tree hollows, and logs was lower than in other areas.	The area shows mild disturbance. Grazing evidence was limited. Exotic species were uncommon. Some old access tracks were apparent, though over-grown. The area shows high integrity relative to other sections of the Project Area.	RE9.11.10	RE9.11.10
Plant pond	Wetland dominated by <i>Eleocharis acutangula</i> , <i>Fimbristylis</i> spp. with open woodland on outer banks	Grazing at the water point was evident. Long-term ground disturbance was evident. Nevertheless, exotic species were rare.	Non-remnant	Non-remnant

3-6.2. Threatened Flora Species

No threatened flora species were recorded within the study area in 2013/2014, nor within the project area in 2018.

There are unconfirmed reports of *Acacia purpureopetala* (Vulnerable NC Act and Critically Endangered EPBC Act) existing towards the north-east boundary of the mining lease. The Study Area is located in the opposite corner of the mining lease from previous records of *A. purpureopetala* and this species was not recorded during targeted ground surveys in 2013, 2014 or 2018.

3-6.3. MNES & MSES

3-6.3.1. MNES

One MNES was recorded within the Study Area and this species (*Petauroides volans minor* - Greater glider (Vulnerable EPBC Act)) is also likely to be found in other parts of the Project Area. Impacts on this species are discussed in Section 3-7.1.5.

3-6.3.2. MSES 12 – Category R vegetation

Category R vegetation is native woody vegetation on freehold land, Indigenous land or leasehold land granted for agriculture of grazing purposes, located within 50 metres of a watercourse in the Burdekin, Mackay, Whitsunday and Wet Tropics Great Barrier Reef catchments.

The location of the mapped Category R vegetation is inaccurate as this mapping is completed as a desk-based exercise at a broad scale. To more accurately delineate the location of the Category R vegetation, the watercourses on site were accurately mapped. This exercise was completed based on the definition of the extent of a watercourse as set out in Section 5 of the Water Act.

The on-ground extent of Category R vegetation was then mapped by using a 50m buffer around the on-ground location and extent of the water course. The accurate Category R mapping is shown in Appendix 2 – Map4.

Impacts on this vegetation will be discussed in Section 3-7.

3-6.3.3. MSES 14 – Vegetation intersecting a watercourse

A watercourse under the VM Act is mapped in the valley in which the new TSF will be located. However, onsite survey of this location did not record a watercourse in this location.

Under the VM Act, 'watercourse' has the meaning given by the Water Act 2000, Section 5. Within the Water Act 2000, S5 (3), it is noted that a watercourse does not include a 'drainage feature'. During heavy rain, water would drain along the valley floor due to the topography or the area, before pooling due to the presence of an historic haul road that intersects the valley. The flatter valley floor does not have attributes that would be required in a watercourse such as defined bed and banks. The vegetation throughout the valley is homogenous with no change in vegetation that would be associated with a watercourse. This feature meets the definition of a drainage feature under the Water Act which states:

‘Drainage feature means –

- b) a natural landscape feature, including a gully, drain, drainage depression or other erosion feature that
 - i) is formed by the concentration of, or operates to confine or concentrate, overland flow water during and immediately after rainfall events; and
 - ii) flows for only a short duration after a rainfall event, regardless of the frequency of flow events; and
 - iii) commonly, does not have enough continuing flow to create a riverine environment.’

A series of discussions were held with the Principal Natural Resource Management Officer and Director of Policy within the Natural Resource Assessment team within the Department of Natural Resources, Mining and Energy in regards to this matter. DNRME acknowledged that the vegetation management watercourse mapping is a guide to what is on the ground, but sometimes watercourses are mapped that are not there (pers. comms.). Although this mapping will be updated in April 2019, there is no known pathway for mapping updates currently. DNRME suggested that the mapping is only a fairly accurate guide, and that better evidence is usually given more weight in their assessments (pers. comms.).

The on-ground assessment shows that the mapping of a watercourse within the area of the new TSF is incorrect and DNRME accept that the on-ground assessment carries more weight than the mapping that contains known errors. In the absence of a process to get the erroneously mapped watercourse removed, it is recommended that the assessment recognises that there is no watercourse in this area and hence there is no trigger for MSES 14 within the proposed TSF location.

Copper Creek and Males Gully are correctly mapped as watercourses. As discussed in Section 3-5.11.2., any clearing of vegetation within 25m of these watercourses would trigger the requirement to consider MSES 14. Impacts on this vegetation will be discussed in Section 3-7.

3-6.3.4. MSES 9

Although MSES 9 is not triggered by the statutory mapping, the record of Greater glider (Vulnerable EPBC Act and NC Act) within the Study Area, and the likely presence of this species within the Project Area triggers the requirement to consider this MSES. Impacts relating to MSES 9 will be considered in Section 3-7.1.5.

3-6.4. Exotic Species

All weeds listed under local, state or national legislation recorded during the surveys in 2013/2014 and 2018 are shown in Tables 3-6 and 3-7 below. The tables show whether each species is listed as a WoNS, under the Biosecurity Act, or under the Tablelands Regional Council Pest Management Plan (TRC PMP). Note that for consistency, the species recorded in 2013/2014 have been assessed against current legislation, not the legislation in force at the time of the survey.

Table 3-6: Listed weed species recorded within the Project Area in 2013/2014

Species	Common Name	Abundance	WoNS	Biosecurity Act 2014	TRC PMP 2015-2018
<i>Sporobolus fertilis</i>	Giant Parramatta grass	O		Category 3	Medium

R – Rare – one or two individuals | O – Occasional – scattered patches | C – Common – species is widespread

Table 3-7: Listed weed species recorded within the Study Areas in 2018

Species	Common Name	WoNS	Biosecurity Act 2014	TRC PMP 2015-2018
<i>Cyperus aromaticus</i>	Navua sedge			Medium
<i>Sporobolus fertilis</i>	Giant Parramatta grass		Category 3	Medium
<i>Themeda quadrivalvis</i>	Grader grass			Medium

The 2018 survey of the Study Area recorded 15 weed species. Only three of these (refer Table 3-7) are listed under current legislation. Of these, Giant Parramatta grass (*Sporobolus fertilis*) was the most widespread. The species was commonly scattered throughout the open woodland near the proposed Waste Dump area, and generally occurs in most sites with well-drained soil throughout the Project Area.

Grader grass (*Themeda quadrivalvis*) was only observed within the proposed Waste Dump area. The species is often grazed by stock, and it is possible that it is more widespread than surveys suggest. Grader grass is highly invasive and will readily replace native Kangaroo grass (*Themeda triandra*) which was common throughout the Project Area.

Navua sedge (*Cyperus aromaticus*) was only recorded at a single site. The species was observed within a drainage channel above the proposed Plant pond, adjacent to the mill site. Navua sedge commonly invades drainage channels and wet areas and readily out-competes native grasses and sedges. The species was not listed in local government legislation at the time of previous surveys in 2013/2014.

The three listed weeds and the remaining 12 species recorded are all relatively common in the region.

3-6.5. Fauna Species and Habitat

3-6.5.1. Study Area

A total of 136 native, two exotic and four threatened species were recorded across the study area during the 2013/2014 studies. Native species consisted of 27 mammals, 60 terrestrial birds, 27 water birds, 11 reptiles and nine amphibians. As with plants, some fauna species are ubiquitous and occur across a range of habitats, whilst other species are more obligate and show a narrower range of habitat tolerance. All of the species recorded within the study area are commonly encountered in Mount Garnet environs.

The highest diversity of native fauna species was recorded on the dams within the Study Area, with 56 species recorded across the two surveys. Of the individual study sites, Site 9 recorded the highest diversity of native fauna species (30 species), with Sites 2 and 4 each having 28 fauna species recorded. The sites in the far north-east of the Study Area (Sites 15, 16 & 17) are relatively depauperate in faunal diversity. The remaining sites do not show significant variation in faunal diversity or abundance.

3-6.5.2. Project Area

A fauna survey compliant with EIS Guidelines was not completed within the Project Area, but the site from the 2013/2014 fauna study that is closest to the Project Area (Site 11), did not return significant values for fauna diversity or abundance when compared to the study area.

The 2018 survey confirmed that the vegetation within the Dalcouth Pit and Waste Dump area contains some values for fauna species. There were frequent hollows in mature trees that may be suitable for some bat, mammal and bird species (Plate 3-1), some rocky outcrops that may be suitable for quolls (Plate 3-2), and some tunnels in stream banks that may be suitable for specialist birds (Plate 3-3).



Plate 3-1: Example of tree hollow within Waste Dump site



Plate 3-2: Rocky outcrop habitat



Plate 3-3: Tunnels in bank

Bats

Microbats typically rely on echolocation for orientation and foraging in flight. These echolocation calls are usually well above the frequency range audible to humans but can be used to survey microbats. Bat detectors are a non-invasive method designed to record the echolocation calls emitted by bats as they fly past a microphone. These recordings can then be viewed as sonograms and analysed using appropriate software by experienced personnel to identify species or species groups.

Bat detectors were used during the 2013/2014 studies. The results of this study confirmed the presence of 11 species of microbat, none of which are EVNT species. To further determine the presence or likely absence of EVNT bat species within the project area, two bat detectors were again deployed for two nights in March 2018 within new infrastructure areas (refer Appendix 2 - Map 5). It should be noted that;

- Bat detectors were set up as a passive monitoring approach, i.e., to automatically monitor and record bat calls unattended;
- Bat detectors were used in two locations. 12h recordings were collected for two nights at each of the small mammal trapping survey sites.
- The bat detectors were placed elevated off the ground and orientated in the direction with the least amount of vegetation and the highest likelihood of microbat flight paths.

Echolocation recordings from the survey were analysed by Greg Ford, an acknowledged specialist in this field. This report is included as Appendix 5.

Results of the bat monitoring returned records of 14 species of bat as shown in Table 3-8. None of these species are threatened under the EPBC Act or the NC Act.

Table 3-8: Bat species recorded within the Project Area

Species	Mine Pit / Waste Dump (RE9.11.3a)	New TSF (RE9.11.10)
<i>Rhinolophus megaphyllus</i>	☐	☐
<i>Chalinolobus gouldii</i>	☐	☐
<i>Chalinolobus nigrogriseus</i>	☐	☐
<i>Nyctophilus sp.</i>	-	☐
<i>Scotorepens balstoni</i>	☐	-
<i>Scotorepens greyii</i>	☐	☐
<i>Scotorepens sanborni</i>	☐	☐
<i>Vespadelus troughtoni</i>	☐	☐
<i>Miniopterus australis</i>	☐	☐
<i>Miniopterus orianae oceanensis</i>	☐	☐
<i>Austronomus australis</i>	☐	☐
<i>Ozimops lumsdenae</i>	☐	☐
<i>Ozimops ridei</i>	☐	☐
<i>Saccolaimus flaviventris</i>	☐	☐

Northern Quoll

During the Study Area survey in March 2018 habitat that may be suitable for use by *Dasyurus hallucatus* (Northern Quoll) was recorded close to the proposed Waste Dump area (refer Appendix 2 - Map 5 and Plate 3-2). To further investigate whether quolls were likely to be using the rocky outcrop a motion sensitive infra-red camera was used to record any activity at the rocky outcrop for a total of 48 hours. Review of the images taken showed no evidence of quolls using or passing through the area.

Bank-nesting Birds

During the Study Area survey in March 2018, small tunnels were observed in naturally occurring banks adjacent to watercourses (refer Appendix 2 - Map 5, and Plate 3-3). The holes had potentially been excavated by *Pardalotus striatus* (Striated pardalote – not listed) or *Merops ornatus* (Rainbow bee-eater - listed Marine EPBC Act). To further investigate whether these tunnels were excavated and used by either of the above species, a motion sensitive infra-red camera was to be used to record activity at these holes. However, on return to site after a week of heavy rain, the holes were either under the new water level and hence flooded or had been destroyed by slippage of the bank in which they were built. No viable habitat remained.

3-6.6. Threatened Fauna Species

Five fauna species that were listed under the EPBC Act or NC Act in 2014 were recorded within the Study Area during the 2013/2014 surveys. No additional species were recorded during the March 2018 studies. Only two of these five species (Fork-tailed swift - *Apus pacificus* (Migratory Marine EPBC Act and Special Least Concern NC Act) and Glossy ibis (*Plegadis falcinellus* (Migratory Marine species EPBC)) are still listed as a Migratory species under the EPBC or NC Acts at the time of this report. The remaining three species that were previously listed are now least concern are *Nettapus coromandelianus* (Cotton pygmy-goose), *Ardea ibis* (Cattle egret) and *Merops ornatus* (Rainbow bee-eater). Of the species recorded in 2018, one that was unlisted at the time is now listed, this is the Greater glider (*Petauroides volans minor* (Vulnerable EPBC and NC)). These three listed species are discussed below.

3-6.6.1. *Apus pacificus*

Apus pacificus is a non-breeding visitor to all states and territories of Australia (Higgins, 1999). There are no measures of the species abundance in Australia. This species is almost exclusively aerial, flying from less than 1m to at least 300m above the ground. They mostly occur over dry or open habitats, but have been recorded over settled areas, including towns, urban areas and cities. Due to the aerial nature of *Apus pacificus*, the Project will have no impact on this species and will not be considered further.

3-6.6.2. *Petauroides volans minor*

Petauroides volans minor is an arboreal nocturnal marsupial, largely restricted to eucalypt forests and woodlands. It occurs in eastern Australia, from the Windsor Tableland to central Victoria, with an isolated inland subpopulation in Gregory Range west of Townsville (Winter et al., 2004) and another in the Einasleigh Uplands (Vanderduys et al., 2012). During the day individuals shelter in tree hollows with a particular selection for large hollows in large, old trees. Females give birth to a single young from March to June (Tyndale-Biscoe & Smith 1969; McKay 2008). The Project will not fragment existing habitat and there are large undisturbed areas of similar RE in the surrounding environment. The potential impacts on this species will be discussed in Section 3-7.

3-6.6.3. *Plegadis falcinellus*

Plegadis falcinellus is found across the majority of Australia, with the Australian population estimated to be approximately 12% of the species total population (Marchant & Higgins 1990). The preferred habitat for foraging and breeding are fresh water marshes at the edges of lakes and rivers and man-made water bodies. The species roost in trees or shrubs usually near, but sometimes far from water bodies (Marchant & Higgins 1990). The species has low breeding fidelity and will inhabit new habitat if it becomes available (Melvin et al 1992). As the Project will not impact on habitat preferred by this species, it is unlikely to have an impact and will not be considered further.

3-7. Potential Impacts

The Project comprises a number of components and operational activities including Dalcouth open cut mining area and associated waste dump, the new TSF and the mill as well as associated infrastructure such as haul roads and water holding ponds. Each of these components has the potential to have direct and indirect impacts on the terrestrial ecology of the project area.

3-7.1. Direct Impacts

3-7.1.1. Vegetation clearing

The Project will require the clearing of remnant vegetation for the construction of Dalcouth Pit and associated waste dump, and the new TSF location. A small amount of clearing may also be required for the upgrade of the existing haul roads, mill and associated infrastructure.

There are no 'Of Concern' or 'Endangered' REs listed under the VM Act, EPBC Act listed 'Threatened Ecological Communities' or MSES vegetation (excluding MSES 12 and 14 that are discussed separately) that will be directly impacted by the Project.

Table 3-9 details the total projected clearing for each RE within the Project Area. It should be noted that areas of previous mining disturbance are still mapped as remnant vegetation. Table 3-9 shows the accurate representation of the land that has already been disturbed, separate from the new clearing that will be required.

Table 3-9: Vegetation clearing required

Infrastructure	Mapped RE	Actual RE	Area previously impacted (ha)	Area newly impacted (ha)	Area to be cleared (ha)
Dalcouth Pit	9.11.10	9.11.3a	2.55	1.91	4.46
	Non-remnant	Non-remnant	0.05	0.13	0.18
Waste Dump	9.11.10	9.11.3a	0.64	5.28	5.92
Work Area (between pit and waste dump)	9.11.10	9.11.3a	0.18	0.68	0.86
TSF	9.11.10	9.11.10	0.52	3.79	4.31
	Non-remnant	Non-remnant	0.05	0.12	0.17
Plant Pond	9.11.10	9.11.10	0.18	0.12	0.3
	Non-remnant	Non-remnant	0.04	0.07	0.11
Haul Road	9.11.10	9.11.3a	0.06	0.04	0.1
Other Access Roads	9.11.10	9.11.3a	0.08	0.15	0.23
Total clearing area (ha) split by Actual RE					
RE9.11.10			0.7	3.91	4.61
RE9.11.3a			3.51	8.06	11.57
Non-remnant			0.14	0.32	0.46
TOTAL			4.35	12.29	16.64

All of the vegetation to be cleared is mapped and ground-truthed as least concern or non-remnant and is a common vegetation community within and surrounding the Project Area. For example, there is an estimated 25,000ha of RE9.11.10 & RE9.11.3a within a 20km radius of the Project Area.

3-7.1.2. Habitat loss

Clearing of vegetation will result in loss of habitat for terrestrial fauna species that may occur on site (refer Table 3-3), including *Petauroides volans minor* (Greater glider) which was recorded during the site survey completed in 2013. The vegetation that will be cleared for the Project has habitat values including nest hollows. The Greater glider is susceptible to habitat fragmentation due to relatively small home ranges and low dispersal ability (Taylor & Goldingay 2000). The Project will not create habitat fragmentation as there are large undisturbed tracts of similar RE in the surrounding environment. There are no habitat values within the Project Area that are not commonly found in the surrounding area.

3-7.1.3. Impact on threatened flora

There were no threatened flora species recorded during the 2013/14 or 2018 flora surveys. *A. purpureopetala* was recorded in the north-east corner of the Study Area in 2008, however it is sufficiently distant from the project area that it would not be impacted by the proposed infrastructure. The species has not been recorded within the project area.

3-7.1.4. Biosecurity

Several exotic flora species were recorded on site. The majority of these species are environmental weeds with low risk of invasion into remnant vegetation on site. One species, *Sporobolus fertilis* (Giant Parramatta grass) is classified under the Biosecurity Act as a restricted species which requires the following in relation to Category 3 restricted species:

You must not distribute this restricted matter. This means it must not be given as a gift, sold, traded or released into the environment unless the distribution or disposal is authorised in a regulation or under a permit. Deliberate human distribution or disposal is a key source of spread into other areas of the state.

Weed species thrive in areas of disturbance and care must be taken to ensure that these species do not spread as a result of Project activities.

3-7.1.5. Impact on threatened fauna

Impacts on threatened fauna species will result from land clearing, habitat loss and fragmentation. The potential for occurrence of threatened fauna species is shown in Table 3-3 and these are discussed in further detail below.

None of the bat species potentially occurring on site were recorded during the targeted audio surveys in 2013, 2014 and 2018. They are therefore now considered unlikely to occur and will not be considered further. However, one species, *Macroderma gigas* (Ghost bat) is not readily detectable via acoustics and the absence of this species cannot be determined from audio surveys. While using a wide variety of habitats for temporary and/or feeding sites, permanent roosts, especially maternity sites are in deep natural cave systems or large disused mines and have particular structural and microclimatic features (Curtis et al, 2012). There are no systems suitable to sustain a Ghost bat maternity site within the Project Area. Individuals may disperse well away from maternity roosts when not breeding (Curtis et al, 2012). Individuals of this species using the site would be at the western extent of their known range. However, using the precautionary principle, this species may utilise the Project Area on an intermittent basis for foraging. Mitigation for this species is discussed in Section 3-8.1.2.

The Northern Quoll (Endangered EPBC Act) may transiently use the habitat within the Project Area for foraging. However, there are no suitable denning sites within the Dalcouth Pit and Waste dump area, and only one rocky outcrop within the new TSF area that may be suitable for this species. This rocky outcrop is located high in the valley and will not be flooded by the water within the new TSF. This species was not trapped during the mammal trapping regime completed within the Study Area, nor the remote sensing camera set within the Project Area. There is unlikely to be any impact on Northern quoll den sites, and there is sufficient analogous habitat within the surrounding vegetation that any impact due to loss of foraging habitat is insignificant. This species will not be considered further.

Greater glider (Vulnerable EPBC Act; Vulnerable NC Act); this species has been recorded within the Study Area in 2013 & 2014 (within habitat then mapped as RE9.11.10). Habitat suitable for this species is present within both of the ground-truthed REs present within the project area and all areas to be cleared. It is anticipated that impacts to this species will include a minor reduction in the quantity of foraging and roosting habitat. It should be noted that the area of clearing for the Project is small (12.3ha), whilst there is a great extent of similar or higher quality habitat within the wider region (25,000ha within a 20km radius of Project Area). The impact on this species is not considered to be significant. Proposed mitigation measures to reduce impacts on this species will be implemented (refer Section 3-8.1.2).

The habitat within the Study Area is sub-optimal for the Masked owl (northern subspecies) (Vulnerable EPBC Act; Vulnerable NC Act) as this species utilises ecotones of sclerophyll woodland with open areas such as grassland, heath or cane fields (Curtis et al, 2012). The habitat on site does not provide these open grassy areas for foraging and as such is unlikely to be core habitat or foraging resource for this species. This species is unlikely to be impacted and will not be considered further.

Migratory fauna species that may transiently utilise the Study Area are shown in Appendix 4. There is unlikely to be any significant impacts on these species given their transient use of site. Most migratory species lack high site fidelity and are likely to access suitable habitat in the large areas of similar habitat surrounding the Project Area.

3-7.1.6. Fauna mortality

Fauna injury or mortality may occur during the clearing of vegetation during the construction phase of the Project, especially given the presence of numerous tree hollows within the Project Area. This risk can be mitigated by the use of a qualified spotter-catcher to carry out pre-clearance surveys and to be present during vegetation clearing.

A small ongoing risk to fauna is posed by the increase in traffic on the site, and the risk of fauna entrapment in Project infrastructure such as excavations. These will be managed through a Project EMP.

3-7.1.7. Aquatic habitat

The impact of the Project on aquatic ecology is discussed in Chapter 4.

3-7.2. Indirect Impacts

3-7.2.1. Habitat fragmentation and connectivity

Clearing of vegetation for the Project will occur in small and discrete areas. There are no large linear corridors to be cleared that would present a barrier to movement of fauna species. The area of vegetation clearing for the Project is low compared to the extent of similar habitat in the surrounding 20km area (12.3ha vs. 25,000ha). There is expected to be no significant habitat fragmentation as a result of the Project.

Connectivity of the Project Area to the wider environment is primarily via watercourses. Males Creek runs in a north-east to south-west direction to discharge into Wyndham Dam on Return Creek. Copper Creek is to the north-west of the proposed Dalcouth pit and runs from north-northeast to south-southwest and meets Males Creek before it discharges into Wyndham Dam. However, there is little to no riparian vegetation associated with these creeks which limits their value as landscape linkages. There will be no direct impacts on watercourses or associated vegetation with a 50m buffer from all creeks being included in the design criteria. There is no impact on connectivity expected as a result of the Project.

3-7.2.2. Edge effects

A key impact associated with the clearing of vegetation and construction of infrastructure is the creation of smaller patches of vegetation, with a greater ratio of lower quality 'edge' habitat compared to higher quality 'interior' habitat. Impacts such as light penetration, temperature increase and humidity decrease are termed 'edge effects'. Weed species are adapted to thrive in such conditions and may invade, thereby decreasing the value of the remaining vegetation. As the clearing for the Project is in small and separate areas within much larger areas of vegetation that will not be disturbed, the amount of edge effect vegetation will be very small in comparison to the remaining interior habitat and edge effects will not be a significant impact for the Project.

3-7.2.3. Other indirect impacts

Impacts related to matters such as surface water, erosion, groundwater, air, noise and dust are considered within other chapters of this study.

3-8. Mitigation Measures

The following mitigation measures are proposed to reduce the predicted impacts on terrestrial ecology. These will be set out in more detail in the Project Environmental Management Plan and associated sub-plans.

3-8.1. Mitigation of Direct Impacts

3-8.1.1. Vegetation clearing & Habitat loss

The impacts as a result of vegetation clearing will be minimised by the following mitigation measures:

- Vegetation clearing will be minimised whenever possible. The on-ground extent of allowable vegetation clearing will be clearly marked for the duration of the Project.
- No vegetation clearing or other disturbance will be located within 50m of the bank of any watercourse.
- Vegetation clearing will not be completed in one operation, but rather will be cleared in a progressive manner as required
- Progressive rehabilitation will be undertaken as each area is mined.
- Coarse woody debris such as fallen logs and rock piles will be retained and used within rehabilitated areas.
- Top soil will be carefully removed and stored for use in rehabilitation.

3-8.1.2. Threatened species

- Vegetation clearing will be conducted outside the breeding season for the Greater glider which is likely to occur within the Project Area. The female of this species gives birth to a single young from March to June (McKay 2008) and the clearing will commence from October 2018.
- A pre-clearance survey will be completed by an experienced environmental professional prior to clearing. The results of the survey will inform additional measures that need to be completed prior to or during clearing.
- A certified spotter-catcher will be present during vegetation clearing works.

3-8.1.3. Biosecurity

- A Weed Management Plan will be utilised for the duration of the project. This may include the washdown procedure for vehicles before they first enter site.
- A Waste Management Plan will be used to ensure that wastes are appropriately managed to reduce access to food waste by pest fauna species.

3-8.1.4. Fauna mortality

- Fauna mortality during clearing will be reduced using the mitigation measures in Section 3-8.1.2. and 3-8.1.4.
- A site vehicle speed limit will be imposed to reduce fauna mortality due to vehicle collisions
- Any voids will be covered or have fauna escape facilities installed overnight.

3-8.1.5. Aquatic habitat

- No works including vegetation clearing will occur within a 10m buffer of Copper Creek. A physical barrier will be erected on site to designate the buffer area.
- Other mitigation measures for aquatic ecology are outlined in Chapter 4.

3-8.2. Mitigation of Indirect Impacts

The indirect impacts of habitat fragmentation and edge effects as a result of the Project are unlikely to be significant and do not require specific mitigation measures.

Mitigation measures in relation to surface water, groundwater, air, noise and dust are considered within other chapters of this study.

3-8.3. Impact Mitigation for MNES

Section 3-5.10. & Section 3-5.11 discusses the MNES & MSES that are mapped as occurring within the Project Area, whilst Section 3-6.3. discusses the MNES and MSES that actually occur within the Project Area.

3-8.3.1. MNES

The only MNES that is likely to occur on site is the Greater glider (*Petauroides volans minor*– Vulnerable EPBC Act). It should be noted that this species has not been recorded within the Project Area. However, given the homogeneity of habitat in the Study Area, the precautionary principle is used, and the presence of the species within the Project Area is assumed.

The potential presence of this species within the Project Area triggers the requirement of an assessment under the EPBC Act to determine whether there is likely to be a significant residual impact that requires referral under the EPBC Act. Table 3-10 shows the criteria relating to whether an action is likely to have a significant impact on a vulnerable species, with an assessment of the Project activities against these criteria.

For Table 3-10 an important population of a species is defined as:

“A population that is necessary for a species’ long-term survival and recovery.

This may include populations identified in recovery plans, and/or that are:

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity, and/or
- Populations that are near the limit of the species range.”

It should be noted that there are no adopted or prepared Recovery Plan for this species. Given the scarcity of surveys, information and records for this species and its associated population, it is difficult to determine key source populations and the genetic diversity of individuals inhabiting a population or sub-population. Given the paucity of information available, significance of impacts to threatened species has been based on the experience of the assessment team and the latest available information.

The species is listed under EPBC Act Criterion 1 – population size reduction. It is noted in the Conservation Advice for the species that there are no robust estimates of population size or population trends across its total distribution. However, declines in numbers, occupancy rates and extent of habitat have been recorded at many sites, from which a total rate of decline can be inferred. In Queensland in particular, it is stated that the population is continuing to decline, based on anecdotal observations over a 20-year period and evidence of a decline in large, hollow-bearing trees due to past logging activities and repeated burning (Eyre et al., 2010). However, Winter et al (2004) noted that the species was ‘common’ in the north Queensland portion of its range.

The extent of occurrence is estimated at 1,586,870km² and the area of occupancy estimated at 16,164km² (Threatened Species Committee, 2016). It was therefore determined that the geographic distribution is not restricted, or limited. Figure 3-2 shows the current known distribution of the Greater glider in north and central Queensland. It can be seen that Mount Garnet and the Project Area is not near the limit of the species range.

It is concluded that the record of this species within the Study Area should not be considered an ‘important population’.

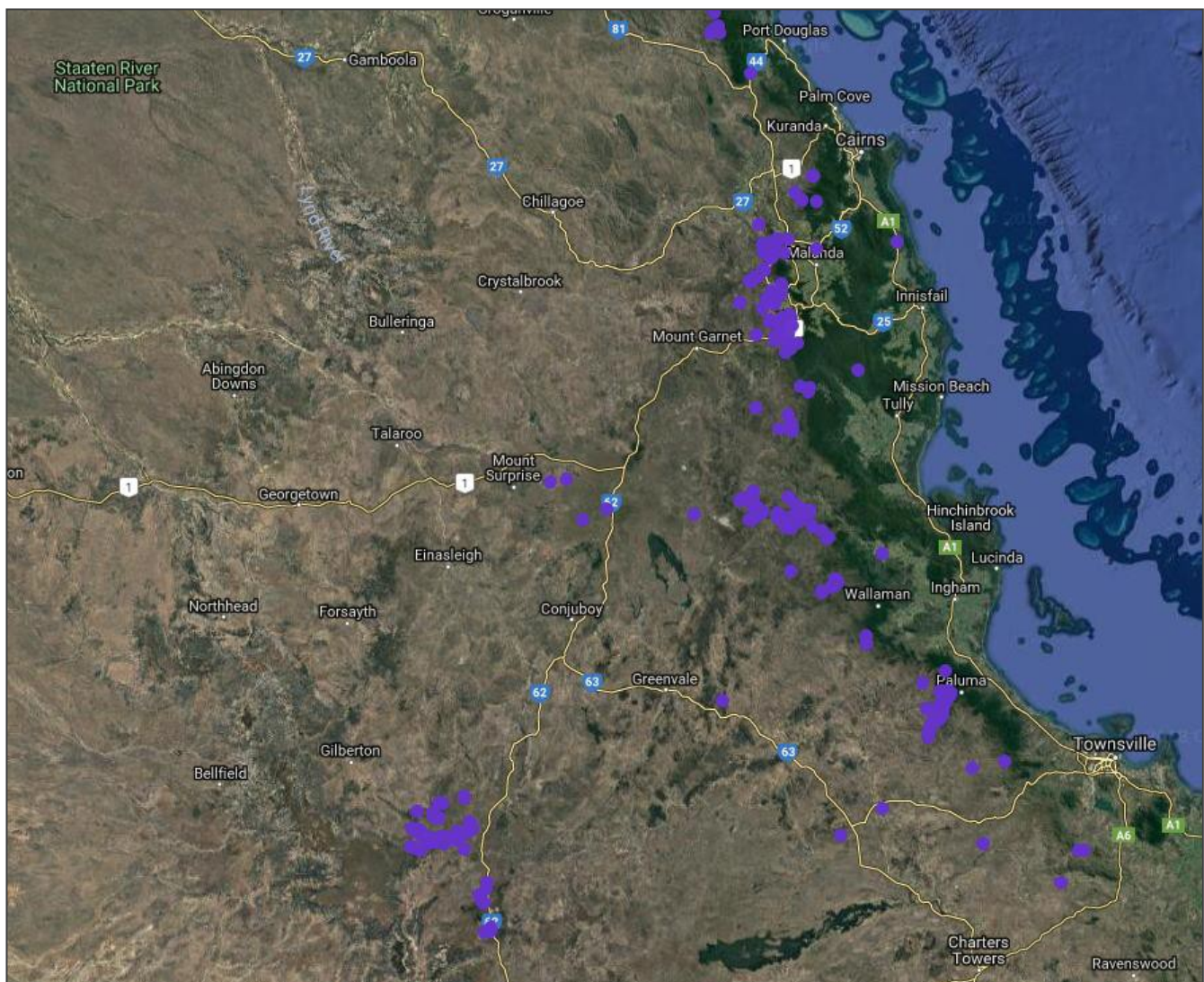


Figure 3-2: Current known distribution of the Greater glider in north and central Queensland

Table 3-10: EPBC Act Significant Impact Criteria

Significant Impact Criteria	Project-specific Considerations
An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:	
Lead to a long-term decrease in the size of an important population* of a species	The population within the Study Area does not meet the definition of an 'important population'. The Project requires the clearing of 12.3ha of remnant vegetation. This habitat remains widespread in the surrounding region with over 25,000ha mapped within 20km of the Project Area. The clearing of this small proportion of suitable habitat is unlikely to cause a long-term decrease in the size of any population utilising the Study Area.
Reduce the area of occupancy of an important population	The population within the Study Area does not meet the definition of an 'important population'. The Project requires the clearing of 12.3ha of remnant vegetation. This habitat remains widespread in the surrounding region with over 25,000ha mapped within 20km of the Project Area. The clearing of this small proportion of suitable habitat is unlikely to cause a long-term decrease in the size of any population utilising the Study Area.
Fragment an existing important population into two or more populations	The population within the Study Area does not meet the definition of an 'important population'. The Project will not fragment any population in the wider Study Area as it requires small discreet patches of clearing amongst widespread and continuous habitat. The project will not result in habitat fragmentation.
Adversely affect habitat critical to the survival of a species	There is ample habitat of similar or better quality in land surrounding the Project Area. The Project Area does not contain habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	The population within the Study Area does not meet the definition of an 'important population'.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	There is ample habitat of similar or better quality in lands surrounding the Project Area. The small amount of clearing required within a larger matrix of suitable habitat will not cause the species to decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	A Biosecurity Management Plan will be established to ensure that the Project will not result in the establishment of any invasive species
Introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species	A Biosecurity Management Plan will be established to ensure that the Project will not result in the introduction of any diseases

3-8.4. Impact Mitigation for MSES

3-8.4.1. MSES 12

Category R vegetation is native woody vegetation that grows within 50m of a watercourse. This vegetation type does occur in the vicinity of Copper Creek which is to the north of Dalcouth Pit and associated waste dump, and Males Gully that is adjacent to the Settling, Clearwater and Plant ponds.

On ground mapping of the watercourses and associated Category R vegetation has been completed. All infrastructure is set back at least 50m from a watercourse and there will be no disturbance of Category R vegetation.

3-8.4.2. MSES 14

As discussed in Section 3-8.3.2., a 50m buffer will be maintained between the bank of Copper Creek and Males Gully and any vegetation clearing. This buffer will be clearly demarcated on site and there will be no disturbance in this area.

The unnamed watercourse marked within the new TSF location does not exist, as discussed in Section 3-6.3. As the watercourse is not present in this location, there cannot be vegetation intersecting with a watercourse and there is no impact.

Vegetation intersecting a watercourse will hence not be impacted.

3-9. Offsets

Under Queensland's environmental offsets framework, an environmental offset may be required as a condition an authority when:

1. An activity has been identified as a prescribed activity; and
2. The activity will have an impact on a 'prescribed environmental matter'; and
3. Despite undertaking all reasonable avoidance and mitigation measures, that activity will have a 'significant residual impact' (SRI) on the prescribed environmental matter; and
4. An environmental offset is a suitable outcome.

For the Project, although Points 1 & 2 above are applicable, the consideration of the significance of any environmental impacts discussed is required. Significance of residual environmental impacts is set out in the Queensland Offsets Policy Residual Impacts Guideline (EHP (now DES)).

3-9.1. SRI Test - Regulated vegetation

The significant residual impact test for clearing of regulated vegetation is as shown in Figure 3-3.

2.1 Significant residual impact test—criteria Table 1

		Clearing in a regional ecosystem that is: <i>endangered, or of concern</i>	Clearing in the portion of a regional ecosystem that lies within a mapped wetland	Clearing in a regional ecosystem that is within the defined distance of a watercourse
1	For clearing for linear infrastructure: - greater than 25m wide in a grassland (structural category) regional ecosystem; or - greater than 20m wide in a sparse (structural category) regional ecosystem; or - greater than 10m wide in a dense to mid-dense (structural category) regional ecosystem. For clearing other than clearing for linear infrastructure: - area greater than 5 ha where in a grassland (structural category) regional ecosystem; or - area greater than 2 ha where in a sparse (structural category) regional ecosystem; or - area greater than 0.5 ha where in a dense to mid-dense (structural category) regional ecosystem.	✓	✓	✓
2	Clearing within 50m of the defining bank	N/A	✓	N/A
3	Clearing within 5m of the defining bank	N/A	N/A	✓

NOTES:

For a prescribed activity to have a significant residual impact on a regional ecosystem that lies within a mapped wetland, criteria 1 and 2 must be exceeded.

For a prescribed activity to have a significant residual impact on a regional ecosystem that is within the defined distance of watercourses, criteria 1 and 3 must be exceeded.

The values of the wetland and watercourses themselves are not covered in this section (only the vegetation associated with these natural features)—the values of the wetland and watercourses themselves are considered in section 5.

(Significant Residual Impact Guidelines, EHP)

Figure 3- 3: Residual impact test for clearing of regulated vegetation

In respect of the clearing required for the Project;

- There will be no clearing of endangered or of concern regional ecosystems;s
- There will be no clearing within 50m of the defining bank of a wetland
- Assuming that the erroneous watercourse within the new TSF location is acknowledged, there will be no clearing within 5m of the defining bank of a watercourse.

There are no significant residual impacts on regulated vegetation.

3-9.2. SRI Test - Landscape Fragmentation and Connectivity

The proposed infrastructure footprint was supplied to DES for processing with the Landscape Fragmentation and Connectivity Tool. The outcome was that the proposed clearing footprint would not have a significant impact upon connectivity.

3-9.3. SRI Test - Wetlands and Watercourses

The significant residual impact test for wetlands and watercourses shows that an offset may be required if the following are impacted:

1. Wetland in a wetland protection area as shown on the Map of referable wetlands under Schedule 12, part 2 of the EPR 2008;
2. Wetlands of high ecological significance as shown on the Map of referable wetlands under Schedule 12, part 2 of the EPR 2008; and
3. Wetland or watercourse in high ecological value waters as identified under the Environmental Protection (water) Policy 2009, Schedule 2.

The Project will not impact on any of these matters, and there are no significant residual impacts on wetlands or watercourses.

3-9.4. SRI Test – Protected Wildlife Habitat

This section applies to the matters shown in Table 3-11 as set out in the *Environmental Offsets Regulation 2014 (EO Regulation)*. Table 3-11 shows the applicability of each matter to the Project.

Table 3- 11: Offsets - MSES applicability

Matter	Applicable to Project?
An area of essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife (section 2(3)(b), Schedule 2, EO Regulation)	Not applicable
An area that is shown as high risk area on the flora survey trigger map and that contains plants that are endangered or vulnerable wildlife (section 6(1), Schedule 2, EO Regulation)	Not applicable
An area that is not shown as high risk area on the flora survey trigger map, to the extent the area contains plants that are endangered or vulnerable wildlife (Section 6(2), Schedule 2, EO Regulation)	Not applicable
An area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is endangered, vulnerable or a special least concern animal (Section 6(4), EO Regulation)	Applicable <i>Petauroides volans minor</i> (greater glider) was not recorded in the Project Area but was recorded in the larger Study Area. It is possible that this species uses the habitat within the Dalcouth Pit and Waste Dump areas.

The greater glider is listed as vulnerable under both the EPBC Act and the NC Act. The significant residual impact criteria are based on the EPBC self-assessment Guidelines shown above, however instead of meeting the criteria of 'important population' in the EPBC Guidelines, the SRI Guidelines use the term 'local population'. The term 'population' is defined within the Guidelines as "an occurrence of the species in a particular area. In relation to vulnerable species, occurrences include but are not limited to; a geographically distinct regional population or collection of local populations or, a population, or collection of local populations that occurs within a particular bioregion." The term 'local population' is not defined in the Guidelines. The consideration of the impact on the greater glider against the SRI Guidelines is shown in Table 3-12.

Table 3- 12: Consideration of the impact on the greater glider against the SRI Guidelines

Significant Impact Criteria	Project-specific Considerations
An action is likely to have a significant impact on vulnerable wildlife if the impact on the habitat is likely to:	
Lead to a long-term decrease* in the size of a local population;	The Project requires the clearing of 12.3ha of remnant vegetation. This habitat remains widespread in the surrounding region with over 25,000ha mapped within 20km of the Project Area. The clearing of this small proportion (less than 0.5%) of suitable habitat is unlikely to cause a long-term decrease in the size of any population utilising the Study Area.
Reduce the extent of occurrence of the species	
Fragment an existing important population	The Project will not fragment any population in the wider Study Area as it requires small discreet patches of clearing amongst widespread and continuous habitat. The project will not result in habitat fragmentation.
Result in genetically distinct populations forming as a result of habitat isolation	The Project will not result in genetically distinct populations as the clearing is in small discreet patches amongst widespread and continuous habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	A Biosecurity Management Plan will be established to ensure that the Project will not result in the establishment of any invasive species
Introduce disease that may cause the species to decline, or interfere substantially with the recovery of the species	A Biosecurity Management Plan will be established to ensure that the Project will not result in the introduction of any diseases
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	The greater glider has not been recorded within the Project Area, only in the wider study area. There is some habitat that may be suitable for use by the species, however there is no evidence that any of the vegetation to be cleared is used as breeding, feeding, nesting, migration or resting sites by the species. There is a large area (over 25,000ha) of suitable habitat mapped within 20km of the project area. It is considered highly unlikely that the clearing of 12.3ha (less than 0.5% of the suitable habitat) is likely to cause disruption to the breeding, feeding, nesting, migration or resting sites of this species.

* Long term decrease means any decline in a population that is greater than which would be apparent without the action being present.

3-9.5. SRI Test - Koala Habitat

There is no koala habitat mapped across the study area.

3-9.6. SRI Test - Protected Areas

There are no protected areas mapped across the study area.

3-9.7. SRI Test - Habitat Areas and Marine Parks

There are no fish habitat areas or marine parks mapped across the study area.

3-9.8. SRI Test - Waterway providing for fish passage

There are no waterways that provide for fish passage that will be impacted within the study area as all works will be at least 50m from any watercourse

3-9.9. SRI Test - Marine Plants

There are no marine plants that will be impacted within the study area as all works will be at least 50m from any watercourse.

3-9.10. SRI Test – Legally secured offset areas

There are no legally secured offset areas mapped within the study area.

3-9.11. SRI Test - Summary

In conclusion, Sections 3-9.1 – 3-9.10 show that there are no significant residual impacts expected on any MSES matters, and hence there are no offsets required for the Project. Table 3-13 is based on Table H2 of the Model Mining Conditions Guideline (EHP, 2017), although no significant residual impacts to prescribed environmental matters are expected, this table is included for completeness and clarity.

Table 3-13: Significant residual impacts to prescribed environmental matters

Prescribed Environmental Matter	Location of Impact	Maximum Extent of Impact
Regulated vegetation		
Endangered regional ecosystem	N/A	0 ha
Of concern regional ecosystem	N/A	0 ha
Regional ecosystems that intersect a wetland on the vegetation management wetlands map	N/A	0 ha
Regional ecosystems within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map	New TSF	0 ha (assumes that on ground survey takes precedence over mapping as per advice from DNRME)(refer Section 3-6.3)
Essential habitat for endangered wildlife	N/A	0 ha
Essential habitat for vulnerable wildlife	N/A	0 ha
Connectivity areas		
Connectivity area that is a regional ecosystem	N/A	0 ha
Wetlands and watercourses		
A wetland in a wetland protection area shown on the Map of referable wetlands (HES wetlands in GBR)	N/A	0 ha
A wetland of high ecological significance shown on the Map of referable wetlands	N/A	0 ha
Designated precincts in strategic environmental areas		
Designated precincts in strategic environmental areas	N/A	0 ha
Protected wildlife habitat		

Prescribed Environmental Matter	Location of Impact	Maximum Extent of Impact
An area shown as a high risk area of the flora survey trigger map that contains plants that are endangered or vulnerable wildlife	N/A	0 ha
An area not shown as a high risk area on the flora survey trigger map that contains plants that are endangered or vulnerable wildlife	N/A	0 ha
A non-juvenile kola habitat tree located in an area shown as bushland habitat, high value rehabilitation habitat or medium value rehabilitation habitat in the "Map of Assessable Development Area Koala Habitat Values"	N/A	0 ha
Habitat for an animal that is endangered wildlife	N/A	0 ha
Habitat for an animal that is vulnerable wildlife	N/A	0 ha
Habitat for an animal that is special least concern wildlife	N/A	0 ha
Protected areas		
National Park	N/A	0 ha
Regional Park	N/A	0 ha
Nature Refuge	N/A	0 ha
Highly protected zones of State marine parks		
Conservation park zone	N/A	0 ha
Marine national park zone	N/A	0 ha
Preservation zone	N/A	0 ha
Other zones	N/A	0 ha
Fish habitat areas		
A declared fish habitat area	N/A	0 ha
Waterway providing for fish habitat		
Fish passage	N/A	0 ha
Marine plants		
Marine plants	N/A	0 ha
Legally secured offset area		
Legally secured offset area	N/A	0 ha

3-10. Qualitative Risk Assessment

Potential impacts resulting from the current Project on ecological values have been assessed utilising. For the purposes of risk associated with aquatic EVs risk levels are defined as follows:

- **Extreme** – Works must not proceed until suitable mitigation measures have been adopted to minimise the risk;
- **High** – Works should not proceed until suitable mitigation measures have been adopted to minimise the risk;
- **Medium** – Acceptable with formal review. Documented action plan to manage risk is required; and
- **Low** – Acceptable with review.

A qualitative risk assessment that outlines the potential impacts, the initial risk, control measures and the residual risk following the implementation of the control measures detailed in the previous sections is shown in Table 3-13. Potential impacts relating to aquatic ecology, air and noise are considered in Chapters 4, 5, and 6 accordingly.

Table 3-14: Qualitative risk assessment

Issue	Potential Impacts	Potential Risk	Control Measures	Residual Risk
Vegetation clearing & associated habitat loss	- Clearing of remnant vegetation for required infrastructure - Loss of fauna habitat due to clearing of vegetation	Medium	- Minimise clearing of remnant vegetation - Ensure extents of clearing are marked on-ground for the duration of the Project - Clear vegetation only when required - Progressive rehabilitation of vegetation	Low
Impact on threatened species	Impact of habitat loss on threatened species	High	- Minimise clearing of vegetation - Complete pre-clearing survey - Spotter/catcher to be present during all clearing	Medium
Biosecurity	Introduction of system transforming invasive species	Medium	Use of Project Biosecurity Management Plan	Low
Connectivity	Reduction of connectivity via watercourses	Medium	Vegetated buffer to be retained around Copper Creek and Males Gully	Low
Habitat fragmentation and edge effects	Habitat fragmentation and edge effects caused by vegetation clearing for infrastructure	Low		Low

APPENDIX 1 – 2013/14 ECOLOGICAL ASSESSMENT OF THE STUDY AREA

Mount Veteran Mine
Flora and Fauna Assessment
April 2014

Report No: MGT13.11.01
Prepared for: MGT Mining
Prepared by: Biotropica Australia Pty Ltd



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1.0 EXECUTIVE SUMMARY

Flora and fauna studies were undertaken within Mining Leases ML20547 and ML4393 (the 'study area') known as the Mount Veteran mine owned by MGT Mining Limited.

Desktop assessment revealed a total of 36 species of threatened terrestrial vertebrates are known or considered likely to occur within the study area (12 mammals, 14 birds, three reptiles, five amphibians and two fish) together with 13 migratory species (excluding marine reptiles and mammals). In addition 44 species of threatened flora and two threatened ecological communities were also known or considered likely to occur within the study area.

Seasonal ('wet' and 'dry' season) field surveys were undertaken using a variety of recognised survey methods to comply with guidelines and to encompass the diversity of flora and fauna expected on site.

A total of 175 native flora species, two special least concern species, no listed threatened species and 25 exotic species were recorded within the study area. Clearing of special least concern species would require a permit under the Nature Conservation Act 1992 (NC Act), and a biodiversity offset including a net conservation gain would also be required. Clearing of least concern native plants no longer requires a permit under recent changes to the NC Act. Clearing of remnant vegetation on site is addressed under the Development Approval (DA) process and may require a vegetation offset, however vegetation offset policies are currently being reviewed by the Department of Environment and Heritage Protection (DEHP). If clearing is required within areas mapped as 'high risk' then a detailed flora survey will be required in this area.

One species, *Sporobolus fertilis* (Parramatta Grass) that is listed under Class 2 of the Land Protection (Pest and Stock Route Management) Act 1992 was recorded on site. Under this Act, the landowner has a legal obligation to take reasonable steps to keep their land free of this weed species.

A total of 136 native, two exotic, and four threatened species were recorded across the study area. The native species consist of, 27 mammals, 60 birds, 27 water birds, 11 reptiles and nine amphibians. Where development activities may cause disturbance to animal breeding places, prior approval of DEHP must be obtained. Threatened fauna recorded on site consisted of one terrestrial (*Nettapus coromandelianus* – Cotton pygmy-goose [near threatened NC Act]) and three migratory species (*Ardea ibis* – Cattle egret, *Apus pacificus* – Fork-tailed swift, *Merops ornatus* – Rainbow bee-eater). Development on site is unlikely to affect *Ardea ibis* and *Apus pacificus*, however potential impacts on *Nettapus coromandelianus* and *Merops ornatus* should be considered.

Flora and fauna communities across the study area are generally representative of habitats found in landscapes of the Mt. Garnet area. The diversity of flora in the study area is related to both topography and aspect with assemblages on ridges and steep slopes, and those with a south-easterly aspect generally supporting the highest diversity. This is in part attributable to the limited access to these areas for the cattle grazing on site.

Fauna records were relatively homogenous across the site with the exception of microhabitats such as dams, tree hollows, caves, and abandoned mine, shafts which support a relatively high diversity of species, including threatened species. These habitats have the highest ecological values and should be retained where possible when considering future development.

2.0 BACKGROUND

The study area encompasses Mining Leases ML20547 and ML4393, known as the Mount Veteran mine and owned by MGT Mining Limited. The site is located approximately 12km north-east of Mount Garnet and is located in the upper reaches of the Herbert River Catchment on the undulating metamorphic hills of the Hodgkinson Formation. The vegetation generally consists of open dry sclerophyll woodlands.

The history of mining in the study area extends over approximately 120 years with 56 historic mining leases recorded by the Mines Department. Tin has been the primary target although copper and lead ores have also been mined. Almost the entire project area has been subject to historic disturbance including dredging in major valleys and the use of mobile plants to extract tin from hill slopes and gullies. There are also a few small underground workings. There appear to have been three major periods of mining activity; extending from 1898 to around 1910, from around 1930 to 1940, and from the mid- 1960's through until about 1980. There has been little or no active rehabilitation of the mined areas, and disturbance from the more recent period of activity remains visible (Landline Consulting 2013).

Current activity on site consists of a Level 1 mining operation entailing the mining and processing of hard rock tin/tungsten deposits, and reprocessing of historic tailings at the Mount Veteran Mill, located on ML4393.

2.1 Proposed Development

MGT Ltd currently plans to develop an open cut mine on one of the deposits within the mine lease. The location of the development is yet to be determined; consequently this flora and fauna study was conducted across both mining leases, to enable a better understanding of the ecology of the study area, and to identify any constraints or opportunities resulting from development.

2.2 Study Objectives

The objectives of this report are to:

- Assess the flora and fauna currently existing within the study area
- Assess the flora and fauna of the study area in relation to their status under State and/or Federal environmental legislation
- Characterise the terrestrial ecology across the study area and, stemming from this characterisation, examine potential constraints and opportunities relating to the development

2.3 Permits and Licenses

Site surveys were performed under:

- Animal Ethics Permit CA 2011/10/555, issued on 1st November 2011 and valid until 31st October 2014
- Scientific Purposes Permit registration WISP11299912, issued on 29th May 2012 and valid until 31st October 2014
- Scientific Use Registration No. 273, issued on 27th November 2009 and valid until 26th November 2015

2.4 Survey Personnel

The field surveys were undertaken by Lars Kazmeier, James Hill and Dr Paul Williams.

Lars Kazmeier has a Diploma Degree in Biology, has undertaken PhD research on arboreal mammals in FNQ and has over 12 years' experience in tropical zoology.

James Hill has a BSc (Hons) with a botany major, is completing a PhD on seed production and viability in tropical plant species and has over 4 years of practical tropical botany experience.

Dr Paul Williams has a PhD in tropical vegetation ecology, and has over 18 years of tropical botany experience.

3.0 RELEVANT LEGISLATION

Environmental protection of flora and fauna values is governed by several legislative acts, policies and guidelines. Those with relevance to this study are outlined below, along with the practical implications of each in terms of the Mt. Veteran project:

3.1 Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (the *EPBC Act*) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage placed – defined in the *EPBC Act* as matters of national environmental significance (MNES). The *EPBC Act* affects any group or individual (including companies) whose actions may have a significant impact on an MNES. When a proponent wants an action assessed for environmental impacts under the *EPBC Act*, they must refer the project to the Department of the Environment.

3.2 Environmental Protection Act 1994

The Environmental Protection Act 1994 (*EP Act*) is primarily concerned with environmental pollution. While the legislation has an extremely broad objective “to achieve ecologically sustainable development in Queensland”, in practice the legislation concentrates primarily on point-source pollution and land contamination. The *EP Act* creates a general duty for all people, companies and government bodies to take all reasonable and practicable steps to avoid harm to the environment. The *EP Act* also establishes a system of licenses and approvals for conducting particular activities. The purpose of this system is to allow the authorities to set conditions for conducting the activity which should prevent or minimise the risk of harm to the environment.

3.3 Fisheries Act 1994

The major regime regulating fishing, development in fisheries habitat areas, and damage to marine plants in Queensland is created by the Fisheries Act. Any development is required to comply with the Fisheries Act and minimise impacts to areas of fish habitat which are defined under the Fisheries Act as: ‘*Areas of water, land and plants that are associated with the lifecycle of a fish, including those not presently occupied by fish*’. The Fisheries Act also regulates land-based activities that damage declared fish habitat area and marine plants as well as development and works within watercourses. A permit system is utilised for works in watercourses that require a temporary or permanent watercourse barrier.

3.4 Land Protection (Pest & Stock Route Management) Act 2002

The *Land Protection (Pest and Stock Route Management) Act 2002* declares pest plants and pest animals for control and management in the State of Queensland, and divides them by priority for control into Class 1, Class 2 or Class 3 pests. Under this legislation, a landowner must take reasonable steps to keep their land free of Class 1 and Class 2 pests, unless they hold a relevant declared pest permit. Penalties and fines are set out for non-compliance.

3.5 Nature Conservation Act 1992

The objective of the NC Act is to conserve nature through strategies such as dedicating and declaring protected areas for those parts of Queensland with outstanding biological diversity, natural features and wilderness values. There are no protected areas located within, or adjacent to the Mount Veteran site.

In support of the purpose and the provisions of the NC Act, the Nature Conservation (Wildlife) Regulation 2006 lists all flora and fauna species which are considered to be 'extinct in the wild', 'endangered', 'vulnerable', 'near threatened' and 'least concern' wildlife.

In the event that the project would require the movement or clearing of these listed flora and fauna species, one or more of the following permits may be required:

- Protected Animals Movement Permits (Section 88);
- Protected Plants Clearing Permits (Section 89);
- Wildlife Movement Permits (Section 97) [for wildlife not protected under the NC Act but found in certain areas covered by conservation plans created and implemented under the NC Act]

Amendments made to the *NC Act* on 31st March 2014 mean that the clearing of least concern plants will now generally be exempt from the requirement for a permit.

3.6 Sustainable Planning Act 2009

The Sustainable Planning Act 2009 (*SP Act*) is Queensland's principle planning legislation. It seeks to achieve sustainable planning outcomes through managing the effects of development on the environment and managing the process by which development takes place.

The Queensland government's biodiversity conservation State interests under the *SP Act* are derived primarily from the legislative responsibilities under the *NCA Act*, *Marine Parks Act 2004*, *EPAct 1994*, *Coastal Protection and Management Act 1995*, *the Wet Tropics World Heritage Protection and Management Act 1993*, *the Vegetation Management Act 1999*, *the Land Act 1994* and other national and international agreements.

DEHP is responsible for protecting Queensland's biodiversity conservation and for identifying, protecting and managing these issues. To achieve this, DEHP has a process for mapping the State's biodiversity interests in statutory planning and development assessment activities under the *SP Act*.

3.7 Vegetation Management Act 1999

Queensland's vegetation management framework regulates the clearing of certain native vegetation. It protects the State's biodiversity and, by conserving native vegetation, addresses land degradation issues such as salinity, soil degradation, erosion and declining water quality.

With the introduction of new arrangements protecting regrowth vegetation in October 2009, the vegetation management framework protects native woody vegetation that is:

Mapped as remnant vegetation on a regional ecosystem or remnant map; and
Regulated regrowth vegetation.

'Remnant vegetation' refers to vegetation that has never been cleared or if it has been cleared in the past, has regrown to meet certain criteria, such as having an equivalent composition of plant species that would exist if the vegetation community within a Regional Ecosystem had not been disturbed. 95% of the vegetation across the Mount Veteran site is mapped as remnant vegetation under the *Vegetation Management Act 1999 (VM Act)*, encompassing a number of Regional Ecosystems.

Landowners wishing to clear native vegetation regulated under the vegetation management framework must either qualify for an exemption, or have the clearing conducted in accordance with the Regrowth Vegetation Code or a permit must be obtained.

3.8 Water Act 2000

The purpose of the *Water Act 2000* is to provide for the sustainable management of water and other resources. Under Section 266 of the *Water Act 2000*, a riverine protection permit is generally required to:

- destroy vegetation in a watercourse;
- excavate in a watercourse; and
- place fill in a watercourse

In the event that these activities would be required within the study area, a permit application would be required.

4.0 METHODOLOGY

4.1 Study Area

The staging, timing and extent of future mining activities within Mining Leases ML20547 and ML4393 have not been finalised. Therefore this assessment covers both mining leases in generalised terms.

Sampling species diversity and populations over large survey areas is problematic because it is not logistically feasible to survey a large area entirely. Therefore the Mining Lease was partitioned into assessment units that are relatively homogenous ecological units. This stratification was initially based primarily on the mapped Regional Ecosystems (RE's) and similar RE's were grouped into Broad Vegetation Groups (BVG's) (i.e. similar floristic composition and/or same land zone (Queensland Herbarium, 2012). These assessment units were used as the basis for planning the survey effort.

Once on site, the RE mapping and other information used to design the assessment units was verified prior to survey commencement.

4.2 Desktop Investigation

4.2.1 Previous Ecological Studies

Landline Consulting undertook a baseline environmental report based on field traverse in April 2008 and September 2009. In relation to flora the report concluded that remnant and regrowth vegetation in the project area corresponded generally to the mapped RE's, but considered the study area displayed a depauperate flora when compared to neighbouring areas. Of note were records of *Acacia purpureopetala* (common name) at several locations within the relatively undisturbed northern lease area. *A. purpureopetala* is listed as Vulnerable under the *EPBC Act* and the *NC Act*. Landline Consulting (2013) noted that "the population appears to be significant in terms of plant numbers and is possibly part of a larger population extending to the north east of the lease."

In relation to fauna, the Landline (2013) baseline environmental report states that there were noticeably low numbers of fauna species recorded and that no threatened fauna species were observed during site traverse however no direct animal trapping or search effort was undertaken at that time.

4.2.2 High Risk Flora Survey Guideline

The south eastern corner of the study area is mapped under the *NC Act* as a 'high risk area' using the DEHP flora survey trigger map (refer Map 4). If a non-exempt development including the requirement for clearing of vegetation is proposed within the area defined as 'high risk' on the flora survey trigger map, a more detailed flora survey is required. The Guidelines under the *NC Act* state that the flora survey must cover the area to be cleared as well as a buffer of 100m around the clearing. This total area is referred to as the 'clearing impact area'. The results of this survey will be required to either support the application for a protected plant clearing permit (if threatened species are recorded in the clearing impact area), or to support an application for an exemption under the *NC Act* (if no threatened species are recorded). Section 257 of the *Nature Conservation (Wildlife Management) Regulation 2006* defines the specific flora survey methodology to be complied with.

4.2.3 Regional Ecosystem Mapping

The RE's within and adjacent to the study area have been mapped by the Department of Environment and Resource Management (Version 8.0, 2013). Mapping has been produced at a scale of 1:100,000 and may not indicate vegetation communities that have a smaller extent. The majority of the study area (95% or 61.74ha) is mapped as remnant vegetation with only the freshwater dams, TSF and immediate downstream area, camp infrastructure and an area near the western boundary being mapped as non-remnant vegetation (refer Map 3). There may be some potential for disturbed areas not recognisable at the 1:100,000 scale (e.g., 'Dalcouth') to be re-defined as non-remnant vegetation via the Property Map of Assessable Vegetation (PMAV) process.

Regional Ecosystem 9.11.10 (Mixed open-forest to woodland) has been applied to most remnant vegetation within the mine lease. An area of 9.11.3a (Woodland to low open-woodland), present along the western boundary of the lease in an earlier version of the regional ecosystem map, has been redefined as a 50/50 % mixed RE 9.11.10/9.11.3a in the current Version 8 RE mapping. Small areas of remnant vegetation (totalling 10.63ha) mapped as RE 9.3.15 (Riverine wetland or fringing riverine wetland) are retained in the valley floor in the south- western corner of the study area (refer Map 3).

Regional ecosystems mapped within the mining lease are listed below in Table 1 and shown .

Table 1: Regional Ecosystem descriptions

RE	VMA Status	Vegetation	Soil/Geology
9.3.15	LC	Riverine wetland or fringing riverine wetland. Fringing woodland to open forest containing any combination of <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> and <i>E. platyphylla</i> +/- <i>Lophostemon suaveolens</i> +/- <i>Nauclea orientalis</i> +/- <i>Corymbia tessellaris</i> +/- <i>C. clarksoniana</i> . There is often an low sub-canopy layer which can include canopy species and <i>Ficus</i> spp. The open shrub layer contains juvenile canopy species and can include mesic species such as <i>Euroschinus falcatus</i> , <i>Acacia mangium</i> and <i>Syzygium</i> sp. The ground layer is medium to dense grassy and contains <i>Imperata cylindrica</i> , <i>Crotalaria</i> sp., <i>Heteropogon contortus</i> , <i>Cyperus</i> spp. and <i>Paspalum</i> spp.	Occurs on stream banks and channels in areas of higher rainfall in the central east of the bioregion (subregion 6). (BVG1M: 16a)
9.11.3a	LC	Woodland to low open-woodland of <i>Eucalyptus cullenii</i> (Cullen's ironbark) +/- <i>Corymbia clarksoniana</i> (Clarkson's bloodwood) +/- <i>Erythrophleum chlorostachys</i> (Cooktown ironwood) +/- <i>C. erythrophloia</i> (red bloodwood) +/- <i>C. dallachiana</i> (Dallachy's gum). <i>Eucalyptus crebra</i> (narrow-leaved ironbark) can be dominant in some areas. A variety of other <i>Eucalyptus</i> spp., <i>Corymbia</i> spp. and <i>Melaleuca</i> spp. can occur as subdominants throughout the range of this community. There can be an open sub-canopy containing canopy species, <i>M. stenostachya</i> (teatree), <i>Grevillea glauca</i> (bushman's clothes peg) and other <i>Grevillea</i> spp. The shrub layer can be absent to mid-dense and include <i>Maytenus cunninghamii</i> (yellowberry bush), <i>Gardenia vilhelmii</i> (breadfruit), <i>Petalostigma</i> spp., <i>Persoonia falcata</i> and <i>Grevillea</i> spp. The ground layer is grassy and dominated by <i>Themeda triandra</i> (kangaroo grass), <i>Heteropogon</i> spp. (speargrass), <i>Aristida</i> spp. and <i>Schizachyrium</i> spp. (firegrass).	Occurs on flats, hills and ranges of metamorphic ranges. (BVG1M: 13a)

RE	VMA Status	Vegetation	Soil/Geology
9.11.10	LC	Mixed open-forest to woodland including combinations of the species <i>Eucalyptus cloeziana</i> (Gympie messmate), <i>Corymbia citriodora</i> (lemon-scented gum), <i>C. leichhardtii</i> (yellowjacket), <i>E. portuensis</i> (white mahogany), <i>E. cullenii</i> (Cullen's ironbark), <i>E. atrata</i> (Herberton ironbark), <i>E. crebra</i> (narrow-leaved ironbark) and <i>C. clarksoniana</i> (Clarkson's bloodwood) +/- <i>Callitris intratropica</i> (cypress pine). There can be an open sub-canopy of canopy species, <i>Grevillea glauca</i> (bushman's clothes peg) and <i>Allocasuarina inophloia</i> (stringybark sheoak). The shrub layer varies from scattered plants to mid-dense and can include juvenile canopy species, <i>Grevillea</i> spp., <i>Acacia</i> spp., <i>Persoonia falcata</i> , <i>Melaleuca viridiflora</i> (broad-leaved paperbark), <i>Cycas platyphylla</i> and <i>Xanthorrhoea johnsonii</i> (grass-tree). The grassy ground layer is mid-dense to dense and often dominated by <i>Themeda triandra</i> (kangaroo grass), <i>Arundinella</i> spp. and occasionally <i>Triodia</i> spp. (Spinifex).	Occurs on steep dissected hills and flats on highly metalliferous metamorphic rocks, often with shallow soils (BVG1M: 13a)

Regional Ecosystem 9.11.10 is mapped across virtually the entire lease. As Table 1 indicates, RE 9.11.10 is a broad ecosystem with a mix of Grey ironbark (*Eucalyptus atrata*), Lemon-scented gum (*Corymbia citriodora*), with occasional Gympie messmate (*Eucalyptus cloeziana*) and Brown bloodwood (*Corymbia trachyphloia*). Each of these associations occurs within RE 9.11.10.

Most of the woodlands across the lease are relatively intact, as indicated by the abundance and cover of native grasses and herbs.

4.2.4 Threatened Flora and Fauna

A search of online State (Wildlife On-line) and Commonwealth (Matters of National Environmental Significance - MNES) databases was conducted to determine the species of conservation concern that may occur within the study area. The likely occurrence of these listed species across the study area and searches is shown in APPENDIX 1 and Table 2. Likelihood is based on an assessment under the following criteria:

- Confirmed: The species has been definitively recorded using one or more of the survey techniques described.
- Likely: The species is known to occur within the local area and/or there is core habitat in the project area.
- Unlikely: The species is considered to have a low likelihood of occurring in the project area, or occurrence is infrequent and transient. There may be habitat for the species; however, it is marginal or not considered core habitat. Existing database records are considered historic, invalid or based on predictive habitat modelling. Despite a low likelihood based on the above criteria, the species is known from the wider region and could potentially occur within the project area.

Table 2: Threatened Species Online Database Search Results

Scientific Name	Common Name	NC Act 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Site Occurrence
Fauna					
<i>Accipiter novaehollandiae</i>	Grey goshawk	NT	-	Bird	Possible
<i>Aerodramus terraereginae</i>	Australian swiftlet	NT	-	Bird	Unlikely
<i>Bettongia tropica</i>	Northern bettong	E	E	Mammal	Unlikely
<i>Casuarius casuarius johnsonii</i> (southern population)	Southern cassowary (southern population)	E	E	Bird	Unlikely
<i>Crocodylus porosus</i>	Estuarine crocodile	V	M	Reptile	Unlikely
<i>Dasyornis brachypterus</i>	Eastern Bristlebird	E	E	Bird	Unlikely
<i>Dasyurus hallucatus</i>	Northern quoll	-	E	Mammal	Unlikely
<i>Dasyurus maculatus gracilis</i>	Spotted-tailed quoll	E	E	Mammal	Unlikely
<i>Delma mitella</i>	Atherton delma, Legless lizard	NT	V	Reptile	Unlikely
<i>Dendrolagus lumholtzi</i>	Lumholtz's tree-kangaroo	NT	-	Mammal	Unlikely
<i>Egernia rugosa</i>	Yakka skink	V	V	Reptile	Likely
<i>Erythrotriorchis radiatus</i>	Red goshawk	E	V	Bird	Likely
<i>Erythrura gouldiae</i>	Gouldian finch	E	E,M	Bird	Unlikely
<i>Geophaps scripta scripta</i>	Squatter pigeon (southern)	V	V	Bird	Unlikely
<i>Hipposideros semoni</i>	Semon's leaf-nosed bat	E	E	Mammal	Unlikely
<i>Litoria nannotis</i>	Waterfall frog	E	E	Amphibian	Unlikely
<i>Litoria nyakalensis</i>	Mountain mistfrog	E	CE	Amphibian	Unlikely
<i>Litoria rheocola</i>	Common mistfrog	E	E	Amphibian	Unlikely
<i>Lophoictinia isura</i>	Square-tailed kite	NT	-	Bird	Likely
<i>Melanotaenia eachamensis</i>	Lake Eacham rainbowfish	-	E	Fish	Unlikely

Scientific Name	Common Name	NC Act 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Site Occurrence
<i>Neochmia ruficauda ruficauda</i>	Star finch (eastern subspecies)	E	E	Bird	Unlikely
<i>Nettapus coromandelianus</i>	Cotton pygmy-goose	NT	-	Bird	Confirmed
<i>Numenius madagascariensis</i>	Eastern curlew	NT	-	Bird	Unlikely
<i>Nyctimystes dayi</i>	Australian laceid	E	E	Amphibian	Unlikely
<i>Petaurus australis</i> unnamed subsp.	Yellow-bellied glider (northern subspecies)	V	V	Mammal	Possible
<i>Petrogale mareeba</i>	Mareeba rock-wallaby	NT	-	Mammal	Likely
<i>Phascolarctos cinereus</i> (combined populations of Qld, NSW and the ACT)	Koala	S	V	Mammal	Unlikely
<i>Poephila cincta cincta</i>	Black-throated finch (southern/ white-rumped subspecies)	E	E	Bird	Unlikely
<i>Pristis microdon</i>	Freshwater sawfish	-	V	Fish	Unlikely
<i>Pseudophryne covacevichae</i>	Magnificent broodfrog	V	V	Amphibian	Unlikely
<i>Pteropus conspicillatus</i>	Spectacled flying-fox	-	V	Mammal	Unlikely
<i>Pteropus poliocephalus</i>	Grey-headed flying fox	-	V	Mammal	Unlikely
<i>Rhinolophus philippinensis</i> (large form)	Greater large-eared horseshoe bat	E	E	Mammal	Likely
<i>Rostratula australis</i>	Australian painted snipe	V	E,MWS	Bird	Likely
<i>Saccolaimus saccolaimus nudiclunatus</i>	Bare-rumped sheath-tail bat	E	CE	Mammal	Unlikely
<i>Tyto novaehollandiae kimberli</i>	Masked owl (northern subspecies)	V	V	Bird	Likely
Migratory Species (excluding marine reptiles and mammals)					
<i>Apus pacificus</i>	Fork-tailed swift	S (C/J)	MMB	Aerial Bird	Confirmed
<i>Ardea alba</i>	Great egret/ White egret	S	MWS	Wetland Bird	Likely
<i>Ardea ibis</i>	Cattle egret	S	MWS	Wetland Bird	Confirmed

Scientific Name	Common Name	NC Act 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Site Occurrence
<i>Gallinago hardwickii</i>	Latham's snipe / Japanese snipe	S (C/J)	MWS	Wetland Bird	Likely
<i>Grus antigone</i>	Sarus crane	S (C)	MWS	Wetland Bird	Unlikely
<i>Haliaeetus leucogaster</i>	White-bellied sea-eagle	S (C)	MTS	Terrestrial Bird	Unlikely
<i>Hirundapus caudacutus</i>	White-throated needletail	S (C)	MTS	Aerial Bird	Unlikely
<i>Hirundo rustica</i>	Barn swallow	S (C/J)	MTS	Terrestrial Bird	Unlikely
<i>Merops ornatus</i>	Rainbow bee-eater	S (J)	MTS	Terrestrial Bird	Confirmed
<i>Monarcha melanopsis</i>	Black-faced monarch	S	MTS	Terrestrial Bird	Unlikely
<i>Monarcha trivirgatus</i>	Spectacled monarch	S	MTS	Terrestrial Bird	Unlikely
<i>Myiagra cyanoleuca</i>	Satin flycatcher	S	MTS	Terrestrial Bird	Unlikely
<i>Rostratula australis</i>	Australian painted snipe	V	E,MWS	Bird	Likely
Flora					
<i>Acacia longipedunculata</i>	-	NT		Shrub	Likely
<i>Acacia purpureopetala</i>	-	V	V	Shrub	Likely
<i>Alloxylon flammeum</i>	Red silky oak	V	V	Tree	Unlikely
<i>Aponogeton bullosus</i>	-	E	E	Aquatic Plant	Unlikely
<i>Arthraxon hispidus</i>	Hairy joint grass	V	V	Grass	Unlikely
<i>Cajanus mareebensis</i>	-	E	E	Shrub to small tree	Unlikely
<i>Canarium acutifolium</i> var. <i>acutifolium</i>	-	V	V	Tree	Unlikely
<i>Cepobaculum johannis</i> (syn. <i>Dendrobium johannis</i>)	Chocolate tea tree orchid	V	V	Orchid	Unlikely
<i>Chingia australis</i>	-	E	E	Fern	Unlikely
<i>Commersonia reticulata</i>	-	V			Possible
<i>Corymbia rhodops</i>	Red-throated bloodwood	V	V	Tree	Unlikely

Scientific Name	Common Name	NC Act 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Site Occurrence
<i>Cycas platyphylla</i>	Cycad	V	V	Cycad	Possible
<i>Diplazium pallidum</i>	-	E	E	Fern	Unlikely
<i>Diuris oporina</i>	Northern white donkeys tails	NT		Orchid	Possible
<i>Euphorbia carissoides</i> (syn. <i>Chamaesyce carissoides</i>)	-	V	V	Shrub	Possible
<i>Goodenia stirlingii</i>	-	V		Forb	Possible
<i>Grevillea glossadenia</i>		V	V	Shrub	Possible
<i>Homoranthus porteri</i>	-	V	V	Shrub	Possible
<i>Lastreopsis walleri</i>	-	V	V	Fern	Unlikely
<i>Lysiana filifolia</i>	-	NT		Parasitic shrub	Unlikely
<i>Macropteranthes montana</i>	-	V	V	Shrub to small tree	Possible
<i>Melaleuca sylvana</i>	-	E	-	Shrub	Unlikely
<i>Melaleuca uxorum</i>	-	E	-	Shrub	Unlikely
<i>Micromyrtus delicata</i>	-	E		Shrub	Unlikely
<i>Peripleura scabra</i>	-	NT		Forb	Possible
<i>Peripleura sericea</i>	Hairy-seeded fuzzweed	NT	-	Forb	Possible
<i>Phaius australis</i>	Lesser swamp-orchid	E	E	Orchid	Unlikely
<i>Phaius tancarvilleae</i>	Greater swamp-orchid	-	E	Orchid	Unlikely
<i>Phlegmariurus filiformis</i> (syn. <i>Huperzia filiformis</i>)	Rat's tail tassel-fern	E	E	Fern/ Epiphyte	Unlikely
<i>Phlegmariurus marsupiiiformis</i> (syn. <i>Huperzia marsupiiiformis</i>)	Water tassel-fern	V	V	Fern/ Epiphyte	Unlikely
<i>Plectranthus amoenus</i> (syn. <i>Vittadinia scabra</i>)	-	V		Forb	Unlikely
<i>Prostanthera clotteniana</i>	Mint bush	E	CE	Shrub	Unlikely
<i>Sarcochilus roseus</i>	Northern fairy bells	-	V	Orchid	Possible

Scientific Name	Common Name	NC Act 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Site Occurrence
<i>Sauropus macranthus</i>	Atherton sauropus	V	V	Shrub	Unlikely
<i>Streblus pendulinus</i>	Siah's backbone Prickly fig	-	E	Small tree/shrub	Unlikely
<i>Taeniophyllum muelleri</i>	Minute orchid	-	V	Orchid	Unlikely
<i>Tephrosia leveillei</i>	-	V	V	Forb	Unlikely
<i>Tomophyllum walleri</i> (syn <i>Ctenopteris walleri</i>)	-	V	V	Orchid	Unlikely
<i>Triplarina nitchaga</i>	-	V	V	Shrub	Unlikely
<i>Tropilis callitrophilis</i> (syn <i>Dendrobium callitrophilum</i>)	Thin feather orchid	V	V	Orchid	Unlikely
<i>Tylophora rupicola</i>	-	E	E	Vine	Unlikely
<i>Vappodes lithocola</i> (syn. <i>Dendrobium lithocola</i>)	Dwarf butterfly orchid	E	E	Orchid	Unlikely
<i>Vappodes phalaenopsis</i> (syn <i>Dendrobium bigibbum</i>)	Cooktown orchid	V	V	Orchid	Unlikely
<i>Zieria obovata</i>	-	V	V	Shrub	Unlikely
Ecological Community					
Broad leaf tea-tree (<i>Melaleuca viridiflora</i>) woodlands in high rainfall coastal north Qld RE equivalents: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2, 8.5.2a, 8.5.2c and 8.5.6	Broad Leaf Tea Tree Woodland	N/A	E	Woodland	Not present
Mabi Forest or Complex Notophyll Vine Forest Type 5b (Tracey 1982) RE equivalents: 7.8.3, 7.3.37	Mabi Forest	7.8.3 (E) 7.3.37 (E)	CE	Rainforest	Not present

CE – Critically Endangered, E – Endangered, V – Vulnerable, NT – Near Threatened, MMB – Migratory Marine Birds, MMS – Migratory Marine Species, MTS – Migratory Terrestrial Species, MWS – Migratory Wetlands Species, S – Special Least Concern, C – CAMBA, J - JAMBA

4.2.5 Queensland Herbarium's HERBRECS database

HERBRECS database produced a list of flora species of conservation significance (under the *Queensland Nature Conservation Act 1992*) that have been collected within the search area and have a precision greater than or equal to 1600, i.e. they occur somewhere within a square with sides of 1600m. HERBRECS records with a precision less than 1600 (e.g. 100,000) may occur anywhere in an area of 1,000,000ha and are therefore of low reliability.

4.3 Seasonality

The climate the study area is typical of that in tropical climates and has two distinct seasons, a cooler dry season from April to November, and a hot wet season from December to March.

The timing of flora and fauna sampling in this highly seasonal environment is one of the critical factors in determining the proportion of species captured during sampling. In monsoon savannah landscapes such as the study site, there is a flush of annual flora, including many forbs, which appear after the summer rains and persist only briefly before senescence (Wilson *et al.* 1990, Fox *et al.* 2001).

Many vertebrates such as amphibians, irruptive and nomadic mammals and birds have population cycles and movements, both local and widespread, more closely associated with stochastic events such as episodic heavy rainfall events, than to the regular turn of the seasons (Eyre *et al.* 2012).

Two site surveys were undertaken within a twelve month period, one five day / four night survey during the dry season (12-16th November 2013), and one six day / five night survey during the wet season (24 Feb -1st March 2014). Figure 1 below show the rainfall at Mount Garnet (approximately 12 kms from the study area) in 2013 and 2014. Note that the total for November is significant for one rain event between 19-26th November totalling 168mm. This rain event occurred after the dry season survey. There was only 26mm in the three months preceding the dry season survey that commenced on 12th November 2013. Surveys were undertaken during periods of rainfall representative of the 'dry' and 'wet' seasons as recommended by the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre *et al.* 2012).

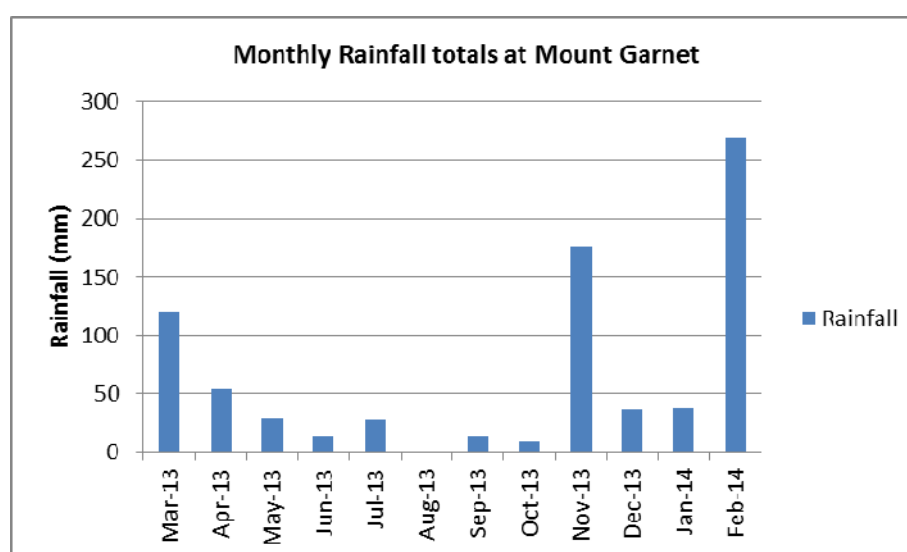


Figure 1: Monthly rainfall at Mount Garnet

4.4 Flora Methodology

During the dry season survey, 12 sites were selected in vegetation communities that were chosen to encompass the variation in species composition and structure throughout the mining lease. Variations in aspect, slope, fire frequency, water availability and disturbance (grazing intensity) are all factors that can influence the composition and structure of vegetation communities and these factors were considered when selecting survey sites.

One month previous to the November 2013 survey a significant wildfire burnt through the northern extent of the lease, encompassing approximately 40% of the study area. On inspection little regeneration was present so this area was not surveyed during the November 2013 site audit.

All 12 dry season sites were re-surveyed in the wet season with an additional five sites added, as post-fire regeneration was sufficient to permit successful survey (refer Map 2). Particular attention was paid to habitats considered most suitable for listed threatened species considered most likely to be present in the study area.

The survey methodology by Wannan (2012) was adopted which includes the identification of plant species within structural layers (i.e. Trees 1 – canopy, Trees 2 – mid-storey shrubs and Groundcover-grasses, herbs/forbs), the projected foliage cover, the integrity of the vegetation community (or how disturbed the site is due to natural and anthropogenic processes) and the ecological significance of the site (each of the survey sites are detailed in factsheets see APPENDIX 2).

The methods used to document the vegetation during the wet season surveys followed the standard methods the Queensland Herbarium recommends for regional ecosystem mapping (Neldner et al. 2012). This involved the combination of “secondary” and “quaternary” sites (“primary sites” being those marked permanently). Secondary sites are detailed full floristic surveys within 50 m X 10 m transects, documenting a list of all species present and their abundance using density counts and percentage crown cover. The 17 sites were surveyed in the wet season using the Queensland Herbarium datasheets (Neldner et al. 2012). A further 85 quaternary sites were surveyed to gather information on the distribution of vegetation and significant species across the lease (refer APPENDIX 3)

4.5 Fauna Methodology

Twelve vertebrate fauna and habitat survey sites were established across the study area for the dry season survey, with an additional five sites for the wet season survey. Of these, four survey sites in the dry season (and an additional [previously burnt] site) were targeted with a replicated configuration of small mammal trapping and bat detection systems to allow comparison among surveys and sites, spatially and temporally as recommended in the Terrestrial Vertebrate Fauna Survey Guidelines for Queensland (Eyre et al. 2012).

A variety of methods were used to target fauna groups as shown in Table 3.

Table 3: Fauna survey methods

Method	Amphibians	Reptiles	Diurnal birds	Nocturnal birds	Small mammals	Med – large mammals	Arboreal mammals	Microbats
Pitfall trapping	☐	☐			☐			
Diurnal active search	☐	☐			☐			
Elliot trapping					☐			
Cage trapping						☐		
Diurnal bird survey			☐					
Spotlighting				☐		☐	☐	
Echolocation call detection								☐
Scat and sign search		☐		☐		☐	☐	
Incidental	☐	☐	☐	☐	☐	☐	☐	☐

A description of each of the methods used is given in APPENDIX 4.

Microbat echolocation call data and recordings of frog and bird calls were interpreted by specialists at CDM Smith. The report can be found as APPENDIX 5.

5.0 EXISTING ENVIRONMENT

5.1 Vegetation of the Study Area

Broadly, the vegetation within the study area corresponds with the RE's mapped across the site, as shown in Map 3.

As noted, RE 9.11.10 is mapped as covering almost the entire lease (95%). As Table 1 indicates, RE 9.11.10 is a broad community dominated by a mixture of *Eucalyptus* species. Eucalypts vary across the site, some hills dominated by Grey ironbark (*Eucalyptus atrata*), others by Lemon-scented gum (*Corymbia citriodora*) and/or Gympie messmate (*Eucalyptus cloeziana*) and Brown bloodwood (*Corymbia trachyphloia*).

Most of the woodlands across the lease are in relatively good condition, as indicated by the abundance and cover of native grasses and herbs. A total of 175 native species, including one Special Least Concern Species were recorded on site (refer APPENDIX 6). No threatened flora was recorded. There were 25 exotic plants recorded on site, particularly near abandoned mining operations. Species diversity within each study site is shown in Table 4.

Table 4: Flora diversity by site

Site	Total native species count	Type A restricted species	Weed species
1	36	0	2
2	34	0	4
3	33	0	8
4	23	0	3
5	39	0	3
6	27	0	3
7	36	1	1
8	34	0	3
9	14	1	14
10	28	0	5
11	14	0	7
12	24	0	1
13	24	0	0
14	25	0	0
15	15	0	0
16	21	0	0
17	25	0	1
Between sites	38	0	1
Total*	175	2	25

*Note: The 'total' is not the sum of the rows above as many species were recorded in more than one study site.

Table 4 shows that Sites 1, 5, and 7 show the highest abundance of native species recorded (36, 39, and 36 native species respectively). Each of these sites was located on a ridge top or slope with a south-easterly aspect, a habitat which generally showed little or no evidence of anthropogenic disturbance. All steep slopes surveyed recorded a diverse ground-layer attributed to the lack of grazing by cattle at the time of survey.

The vegetation community surveyed at Site 7 is a potential refuge for plant species that do not tolerate annual fires. The area is dominated by *Callitris intratropica* (Tropical cypress pine) with the ground layer composed of species more characteristic of a heath community. The site is situated between two ridges descending towards the watercourses beyond the southern lease boundary. A seasonal creek borders the eastern side where high intensity fires did not appear to be a frequent occurrence. These areas may provide refuge for animals during periods of wildfire, providing resources when adjacent areas have been burnt.

Vegetation communities located within or along watercourses/drainage lines provide important habitat for fauna and seasonal creeks and drainage lines provide habitat for plants that are not found elsewhere within the site. The presence of *Lophostemon grandiflorus* and *L. suaveolens* indicate that these areas are seasonally inundated. (RE 9.3.15 – Site 10 & 11; refer to Map 3 and APPENDIX 2)

Communities located on the flat or on gentle slopes were recorded as overgrazed during the dry season survey and had a greater ground cover of introduced weed species. Cattle had been removed from the site soon after the dry season survey, and during the wet season survey much of the site had begun to recover from grazing.

Sites exhibiting a high prevalence of weeds are those associated with the most intense disturbance, with Site 9 (located below the TSF wall) recording the highest weed count.

5.2 Threatened Ecological Communities and Threatened Flora

No threatened flora was identified within the study area. There are unconfirmed reports of *Acacia purpureopetala* (Vulnerable NC Act and EPBC Act) existing towards the north-east boundary of the mining lease. Extensive searches were performed, however no *A. purpureopetala* were found in either November 2013 or February 2014 surveys. It is possible that this purple-flowering and distinctive wattle does occur in the north-east corner of the lease. The whole area had been burnt in October 2013, and *A. purpureopetala* may be slow to regenerate after fire. Many bi-pinnate seedlings of the genus *Acacia* were observed in the post-fire regenerating area in February 2014, but larger seedlings which had developed mature phyllodes were all identified as *Acacia calyculata*.

5.2.1 Special Least Concern Species (including former Type A Restricted Species)

Special Least Concern Species (including former Type A restricted plants) are popular horticultural species that may not be considered sufficiently rare to be classified as threatened plants, but are harvested and traded to the extent that a threat to the species might exist. To ensure populations of these plants are not depleted to the point where they become threatened, trade is controlled, as is taking in the wild for commercial or recreational purposes.

One species of Special Least Concern plant was observed during the surveys. Two small populations of Grass trees (genus *Xanthorrhoea*) were identified near survey site 7 and within burnt vegetation (unsurveyed) towards the north-west of the mining lease, near Site 15.

5.3 Noxious and Environmental Weeds

All listed weeds recorded during both of the surveys are shown in Table 5. The significance of the weed is shown in relation to its listing on Commonwealth, State, Regional or Local lists of significant weed species. No weed species recorded during the survey posed a threat to the ecological values of the mining lease.

Table 5: Listed weed species

Species	Common Name	Abundance	WoNS	Land Protection (Pest and Stock Route Management) Act			FNQROC				TRC PMP
				C1	C2	C3	C1	C2	C3	C4	
<i>Praxelis clematidea</i>	Praxelis	O								☐	
<i>Sporobolus fertilis</i>	Giant Parramatta Grass	O			☐						Rank 12 (high priority)
<i>Themeda quadrivalvis</i>	Grader grass	O								☐	Rank 8 (high priority)

R – Rare – one or two individuals | O – Occasional – scattered patches | C – Common – species is widespread

5.3.1 Commonwealth Level: Weeds of National Significance (WoNS)

The 32 Weeds of National Significance (WoNS) have been identified by the Australian government based on their invasiveness, potential for spread, and environmental, social and economic impacts. They have been nominated as they require coordinated action among levels of Government and between States to effectively control the species.

National management plans strategies and manuals have been published for all of these species. These strategies aim to:

- Prevent spread and new infestations
- Reduce adverse impacts of existing infestations
- Establish and maintain national commitment
- Coordinate management at a national level
- Increase community awareness.

National management groups have been established for each of these species to oversee the implementation of the respective national strategic plans.

No WoNS were recorded on site.

5.3.2 State Level: Queensland Declared Pest Plants

The *Land Protection (Pest and Stock Route Management) Regulation 2003* declares pest plants and pest animals for control and management in the State of Queensland, and divides them by priority for control into Class 1, Class 2 or Class 3 pests based on the following classification system.

Class 1 Pests

- not commonly present or established in the State; and
- have potential to cause an adverse economic, environmental or social impact in the State, another State or a part of the State or another State;

Class 2 and 3 Pests:

- are established in the State
- are causing, or have the potential to cause, an adverse economic environmental or social impact in the State, another State or a part of the State or another State

When deciding whether to declare an animal or plant to be a Class 2 or Class 3 pest, account is taken of:

- the significance of the animal's or plant's impact or potential impact
- the area affected, or likely to be affected, by the impact
- the extent to which the animal or plant has spread or is likely to spread

Under the *Land Protection (Pest and Stock Route Management) Act 2002*, a landowner must take reasonable steps to keep their land free of Class 1 and Class 2 pests, unless they hold a relevant declared pest permit. Penalties and fines are set out for non-compliance.

One declared weed species was identified during the survey, Giant Parramatta grass (*Sporobolus fertilis*). This species was occasionally observed at two locations (Site 4 and Site 9). These areas had been heavily grazed and it is suspected that cattle have brought seed into the lease from adjacent properties. Both sites had high soil moisture availability due to the presence of dams upstream which enabled this species to persist through the dry season. Under this Act, the landowner has a legal obligation to take reasonable steps to keep their land free of Class 1 & Class 2 weed species.

5.3.3 Regional Level: FNQ Regional Pest Management Plan

The FNQ Regional Pest Management Plan is the result of integration of the individual Pest Management Plans (PMPs) across the member councils of the Far North Queensland Regional Organisation of Councils (FNQROC) and Hinchinbrook Shire Council. This regional PMP allows better use of resources available within the community and government to strategically address priority pests, and provide for more efficient and cost-effective meeting of Local Government responsibilities under the Land Protection (Pest and Stock Route Management) Act 2002.

Weed species from the planning area that attracted high to medium priority control attention within individual PMPs are prioritised under 4 categories:

Category 1: To be eradicated

Category 2: To be contained and reduced with a long term view of eventual elimination from the region if possible

Category 3: Isolated outbreaks to be eliminated, populations reduced and spread suppressed

Category 4: Control to be effected consistent with level of Declaration and/or local adverse impact.

Two weed species (Praxelis and Grader grass) were identified on site are classified under the regional PMP. Praxelis was found at nine out of the 17 sites that were surveyed and was relatively common across the site. This species can invade native vegetation and grazing land forming dense monospecific stands that exclude other vegetation. A small patch of Grader grass was identified on the southern side of the dam wall at site 9. Whilst the current infestation is localised this species has the ability to spread rapidly and alter natural vegetation communities via the promotion of fire.

5.3.4 Local Level: Tablelands Regional Council Pest Management Strategy

Priority weeds are species of pest plants which have been identified for control through Local Government Pest Management Plans. The Tablelands Regional Council ranks priority weeds between 1 – 36 based on their impacts on biodiversity, agricultural systems, riparian vegetation and urban areas. These ranks are also influenced by current national and state declarations and the feasibility to control/eradicate the weed species.

Two weed species were identified that are listed under the Tableland Regional Council Pest Management Strategy 2013-2017 - *Themeda quadrivalvis* (Grader grass) and *Sporobolus fertilis* (Giant Parramatta grass). A small patch of Grader grass was identified on the southern side of the dam wall at Site 9 and several individuals along tracks in the lower sections of the study site that are more often frequented by vehicles.

5.3.5 Environmental Weeds

The remaining 22 exotic species identified in the survey are 'environmental weeds'. These are un-listed species that may become abundant if environmental factors or disturbance favours successful colonisation and recruitment.

5.4 Fauna Species and Habitat

A total of 136 native, two exotic and four threatened species were recorded across the study area. The native species consist of 27 mammals, 60 birds, 27 water birds, 11 reptiles, nine amphibians (refer APPENDIX 5). As with plants, some fauna are ubiquitous and occur across a range of habitats, whilst other species are more obligate and show a narrower range of habitat tolerance. All of the species recorded within the study area are species commonly encountered in Mount Garnet area environments.

Table 6: Fauna abundance by site

Site	Total native species count	EVNT species	Exotic species
1	22	0	0
2	28	0	0
3	35	1	1
4	28	0	1
5	11	0	0
6	10	0	0
7	9	0	0
8	11	0	0
9	30	1	1
10	14	0	0
11	14	0	0
12	13	0	0
13	12	0	0
14	9	0	0
15	3	1	0
16	3	0	0
17	4	0	0
Dams	56	2	2
Between sites	50	0	1
Total	136	3	2

*The 'total' will not be the sum of the rows above as many species were recorded in more than one study site.

Table 6 shows that the highest diversity of native fauna species were recorded on the dams within the study area, with 56 species recorded across the two surveys. Of the individual study sites, Site 9 recorded the highest diversity of native fauna species (30 species), with Sites 2 and 4 each having 28 fauna species recorded. The sites in the far north east of the study area (Sites 15, 16 & 17) are relatively depauperate in faunal diversity. The remaining sites do not show significant variation in faunal diversity or abundance.

5.5 Feral and Invasive Fauna Species

The two exotic species recorded on site, *Rhinella marina* (Cane toad) and the feral pig (*Sus scrofa*) are ubiquitous across north Queensland.

5.6 Threatened and Migratory Fauna

Four Listed fauna were recorded on site. *Nettapus coromandelianus* (Cotton pygmy-goose) (NT NC Act) and *Ardea ibis* (Cattle egret- Migratory wetland bird) were recorded during both the wet and dry season surveys, whilst the Migratory marine bird *Apus pacificus* (Fork-tailed swift) and the Migratory terrestrial bird *Merops ornatus* (Rainbow Bee-eater) were recorded during the wet season only.

Nettapus coromandelianus

This species was recorded on the dams in both the wet and dry season surveys. This species is almost exclusively aquatic and is rarely seen on land. Its habitat is generally coastal wetlands and deep permanent pools. It is generally sedentary with some local seasonal movements. This species is rare or uncommon over most of its range (Morcombe 2000).

Given the almost exclusively aquatic nature of this bird, any development affecting the freshwater dams on site should consider the potential impact on this species.

Ardea ibis

This species was recorded on the dams and at Sites 3 & 9, which are both in close proximity to the dams. The species is widespread and common according to migration movements and breeding localities surveys. Its breeding range is the central east coast from about Newcastle to Bundaberg (Marchant & Higgins 1990). *A. ibis* arrived in northern Australia in the 1950's and its association with livestock added to its habitat adaptability which assisted species spread (Morcombe 2000). The range of the non-breeding population comprises the majority of Australia excluding central Western Australia.

Given the widespread and common nature of this species, together with its apparent ability to co-exist with humans (it is commonly associated with domestic animals and has been observed foraging in rubbish tips) (Marchant & Higgins 1990), it is unlikely that development of the site will have a significant impact on this species.

Apus pacificus

This species was recorded overflying Site 15 during the wet season survey. This species is almost exclusively aerial, flying and foraging from less than 1m to at least 300m above the ground and probably much higher. They are infrequently observed landing (Higgins 1999). *A. pacificus* is a non-breeding visitor to all states and territories of Australia (Higgins 1999).

Given the widespread non-breeding status of this species within Australia, together with its almost entirely aerial nature, it is unlikely that development of the site will have a significant impact on this species.

Merops ornatus

This species was recorded overflying the site during the wet season survey. The species is distributed across most of mainland Australia (Higgins 1999) and the population size is assumed to be reasonably large based on reporting rates (DEH 2014). Movement patterns of the Rainbow Bee-eater are complex and not fully understood. Populations that breed in southern Australia are migratory and move north during the non-breeding season. However, populations that breed in northern Australia are considered to be resident, and in many northern localities the species is present throughout the year (Higgins. 1999).

Rainbow Bee-eaters occurs mainly in open forests and woodland but is also regularly recorded in disturbed habitats including roadside vegetation and in quarries, mines or gravel pits (Higgins 1999). Nests are located at the end of a long burrow or tunnel that is excavated in flat or sloping ground, in the banks of rivers, creeks or dams, in the walls of gravel pits or quarries, in mounds of gravel or cliff faces (Higgins 1999).

Given its widespread status within Australia, it is unlikely that the development of the site will have a significant impact on this species however care should be taken not to disturb nesting locations that may be present in the banks of the creeks or dams, or disused pits on the site.

6.0 CONSTRAINTS AND OPPORTUNITIES

The flora and fauna communities recorded on the site are generally representative of those expected in R'E's mapped across the study area, and in the surrounding area.

The flora and fauna survey has characterised the diversity and abundance of native and threatened species across the Mining Lease. This allows relative values to be attributed to areas based on the likely significance of future impacts on such species.

Across the site there are microhabitats that are likely to have higher ecological value. These include features such as tree hollows, and caves or crevices in rocky habitat, quarries and abandoned mine shafts. These habitat types support many of the species on site including all eleven species of flying mammal, and many of the other mammals including possums and gliders. These habitat features should be retained where possible when considering future development. Where activities may cause disturbance to animal breeding places, prior approval of EHP must be obtained. It is unlawful to tamper with the breeding place of a protected animal without authorisation. However, S.332(4) of the *Nature Conservation (Wildlife Management) Regulation 2006* identifies that the removal of a breeding place may occur under an approved Species Management Program (SMP) or a damage mitigation permit.

Surveys indicate that in the dry season dams support a high diversity of waterbird species triggered by decreased standing water availability in the surrounding landscape. They also support a year-round population of both the threatened *Nettapus coromandelianus* (Cotton pygmy-goose) and the migratory wetland bird *Ardea ibis*.

Dams are of special importance in the dry season when other water sources dry up and fauna concentrate around the remaining water sources. 52 fauna species were recorded on the dams during the dry season survey compared to only twelve species during the wet season. It is recommended that future development is designed to have minimal impact on the dams within the study area.

The diversity of flora across the study area is related to both topography and aspect of the sites with assemblages on ridges and steep slopes, and those with south-easterly aspect generally having the highest diversity of flora species. This may be attributable to the impact of cattle grazing on the site which occurred until mid-2013 when the cattle were removed due to lack of feed available on site. This grazing and potential overgrazing on the accessible flatter areas reduces the diversity of native species, whereas the slopes, ridges, and inaccessible areas have a ground/understorey community more representative of the original vegetation cover.

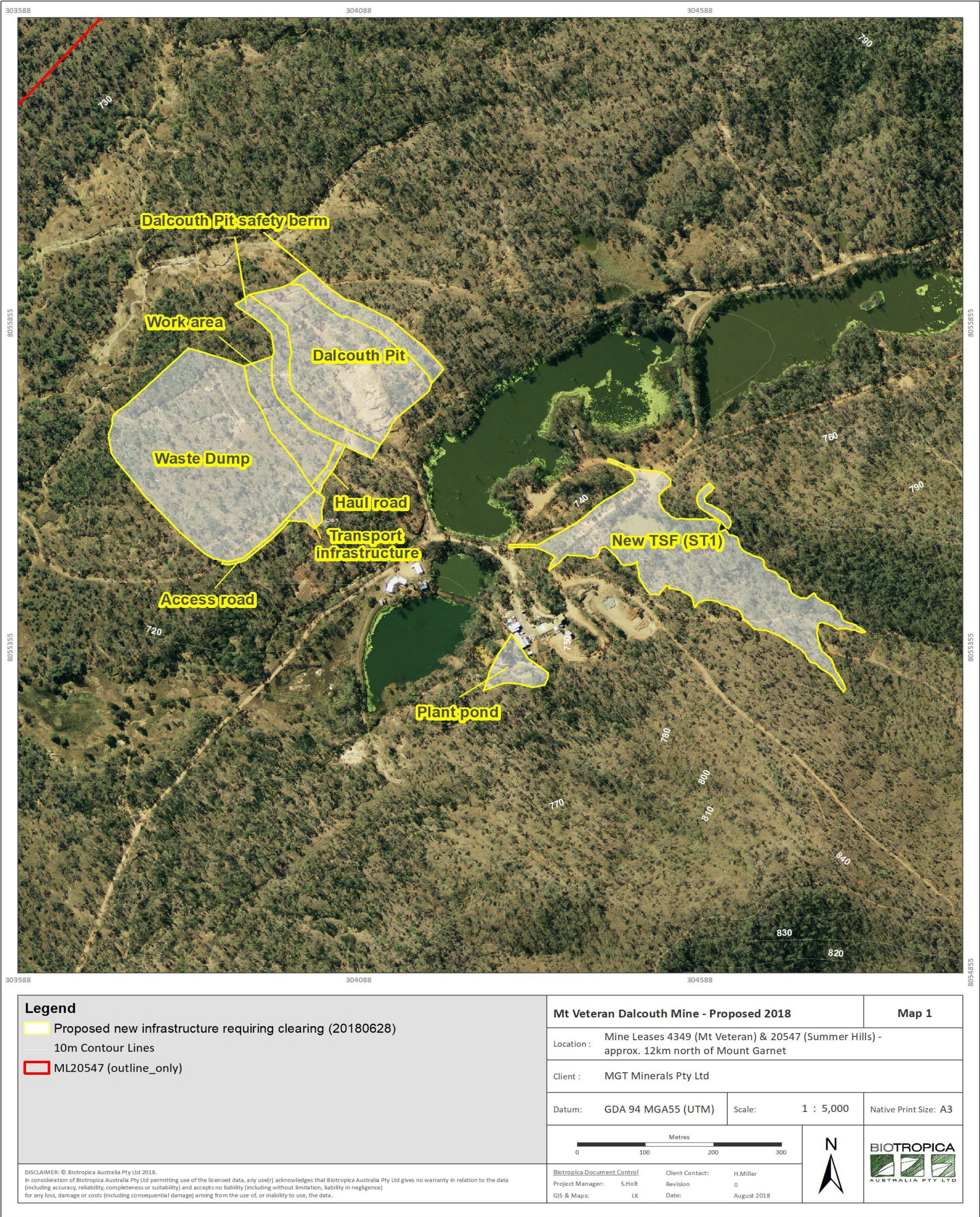
Development that requires clearing of remnant vegetation and/or Special Least Concern Species recorded on site may require permits under the *VM Act* and /or the *NC Act*.

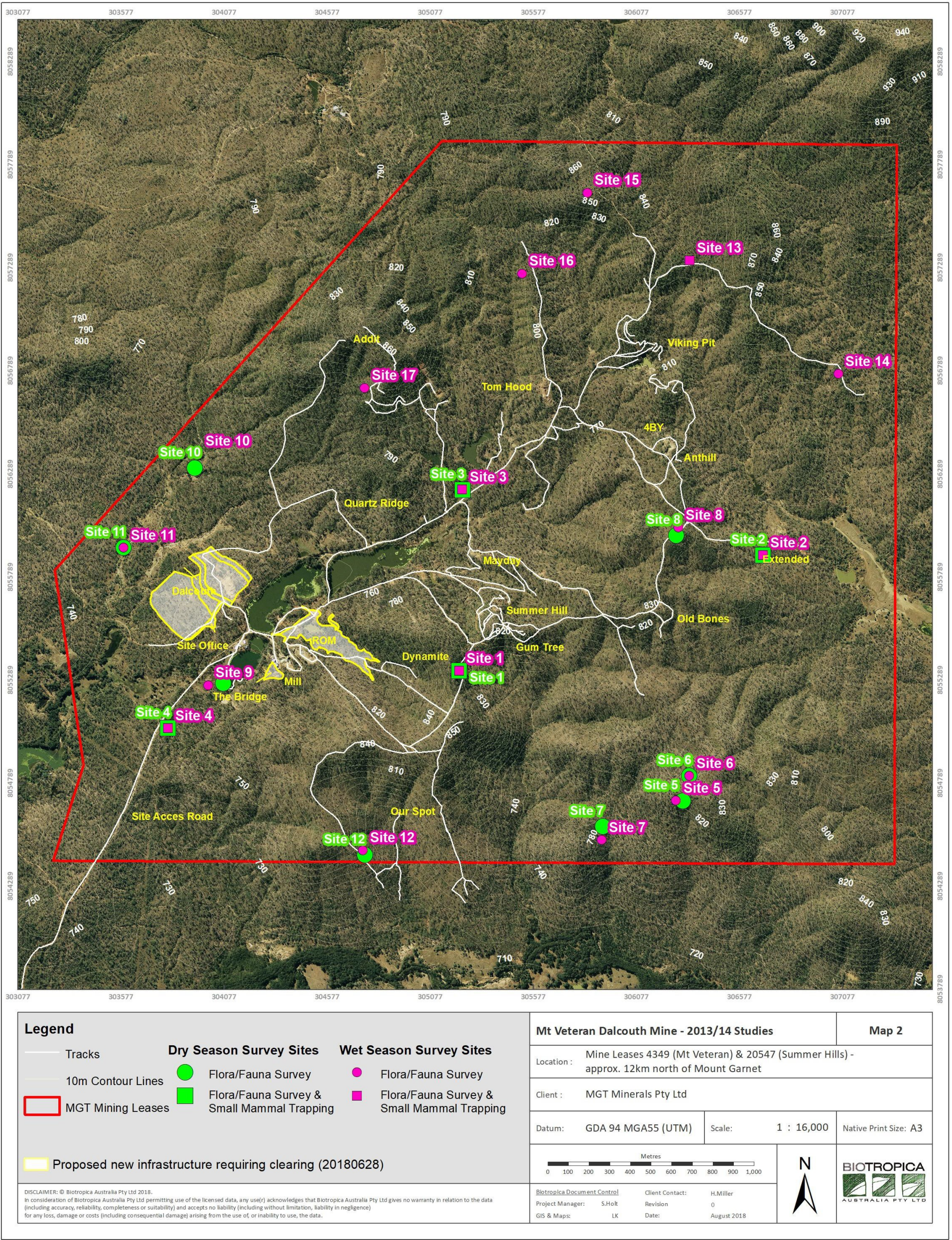
Areas of anthropogenic disturbance such as old mine workings and around the camp, tailings dam and main tracks show an increase in pest and weed species. Weeds and pests adapt quickly to disturbance and are able to colonise such areas more quickly than native species. Areas subject to anthropogenic disturbance have a lower ecological value than the remainder of the site

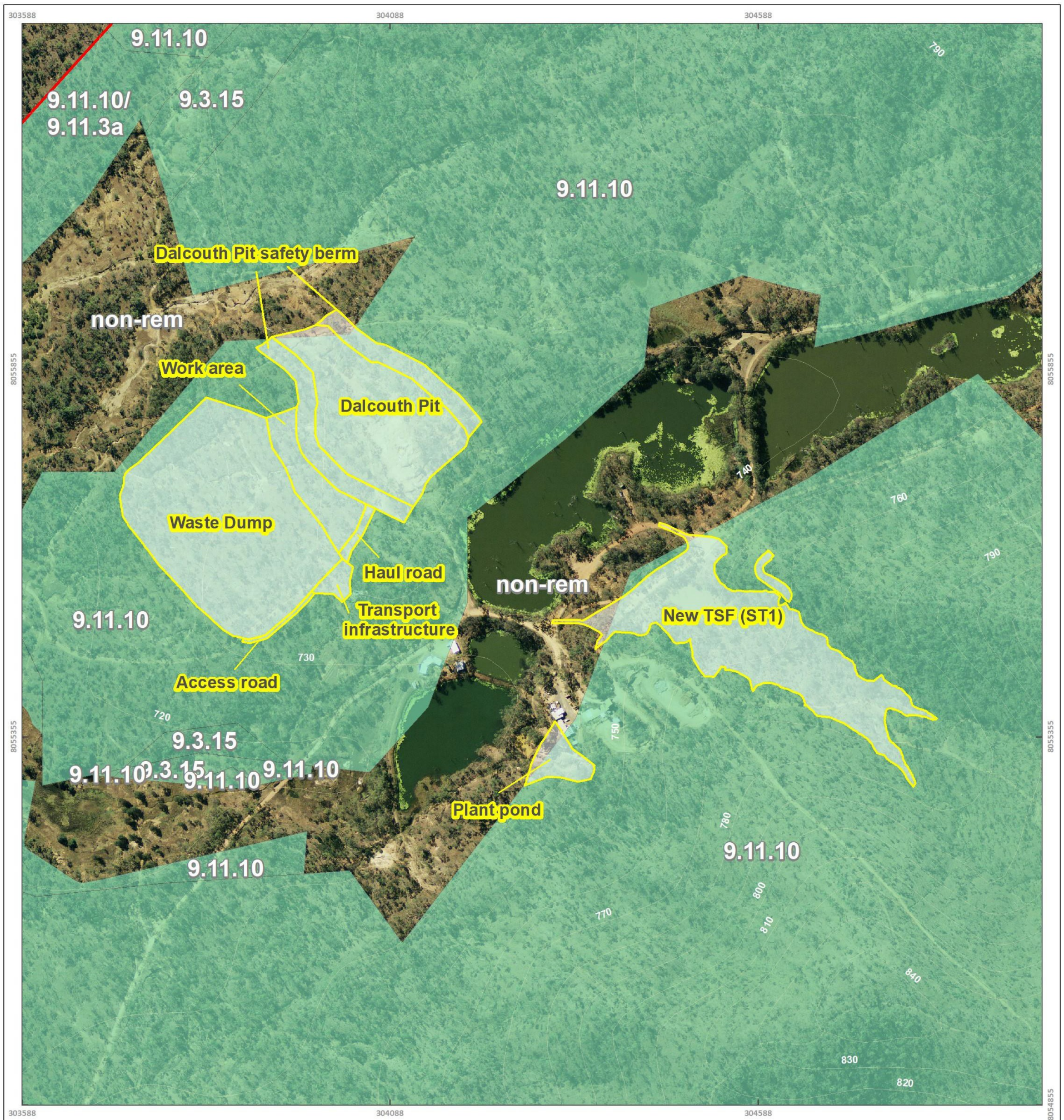
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APPENDIX 2 – MAPS







Legend

Proposed new infrastructure requiring clearing (20180628)

10m Contour Lines

ML20547 (outline_only)

Regional Ecosystems V10.1

Least Concern

Non-remnant

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Mt Veteran Dalcouth Mine - Regional Ecosystems

Map 3

Location : Mine Leases 4349 (Mt Veteran) & 20547 (Summer Hills) - approx. 12km north of Mount Garnet

Client : MGT Minerals Pty Ltd

Datum: GDA 94 MGA55 (UTM)

Scale: 1 : 5,000

Native Print Size: A3

Metres
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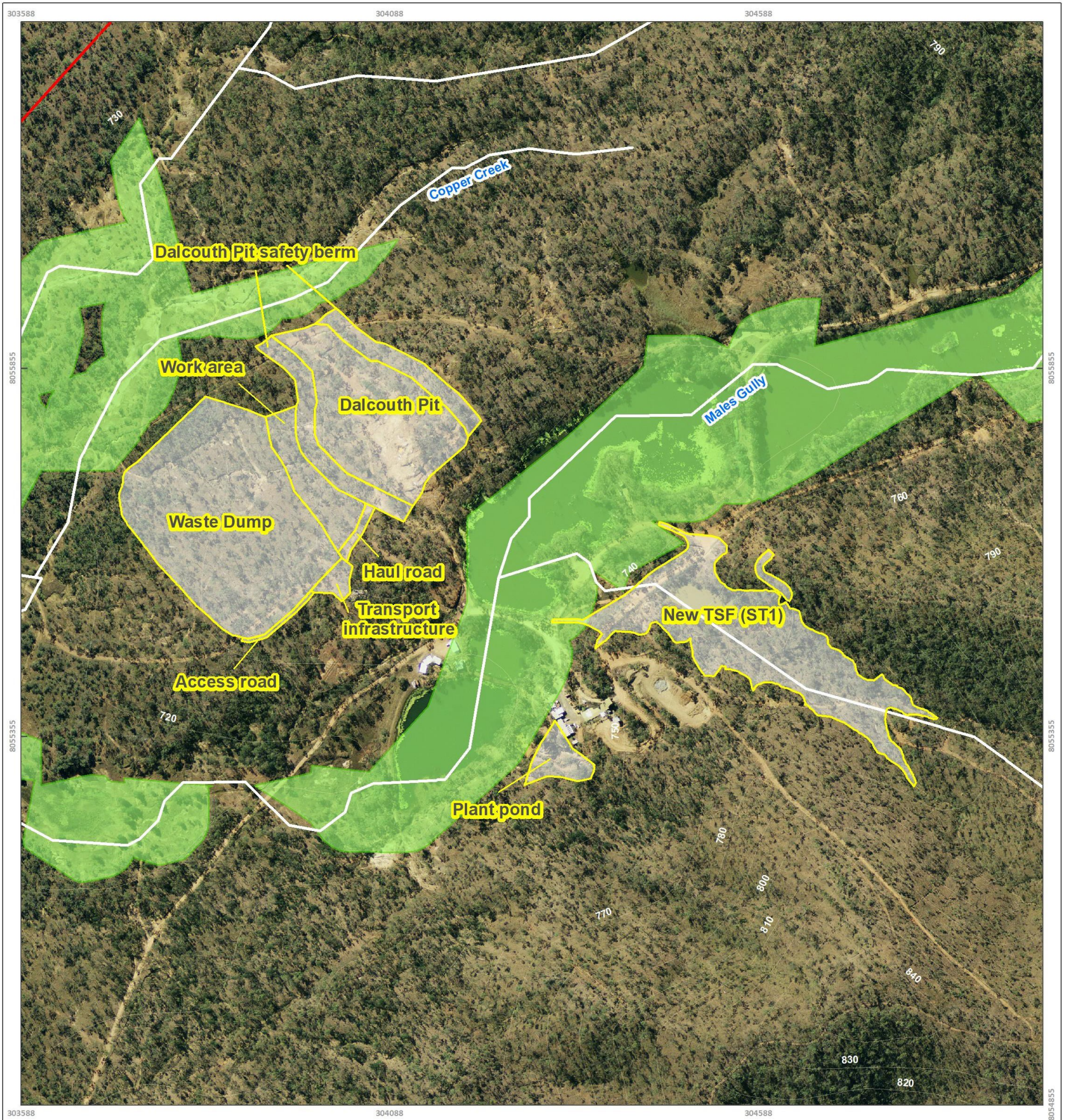


Biotropica Document Control

Project Manager: S.Holt
GIS & Maps: LK

Client Contact: H.Miller
Revision: 0
Date: August 2018





Legend

- Proposed new infrastructure requiring clearing (20180628)
 - 10m Contour Lines
 - ML20547 (outline_only)
 - MSES (SPP 2017) - Regulated vegetation (intersecting a watercourse)
 - MSES (SPP 2017) - Regulated vegetation (Cat R)
- Note: MSES data includes March/July 2018 Updates

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Mt Veteran Dalcouth Mine - MSES

Map 4

Location : Mine Leases 4349 (Mt Veteran) & 20547 (Summer Hills) - approx. 12km north of Mount Garnet

Client : MGT Minerals Pty Ltd

Datum: GDA 94 MGA55 (UTM)

Scale: 1 : 5,000

Native Print Size: A3

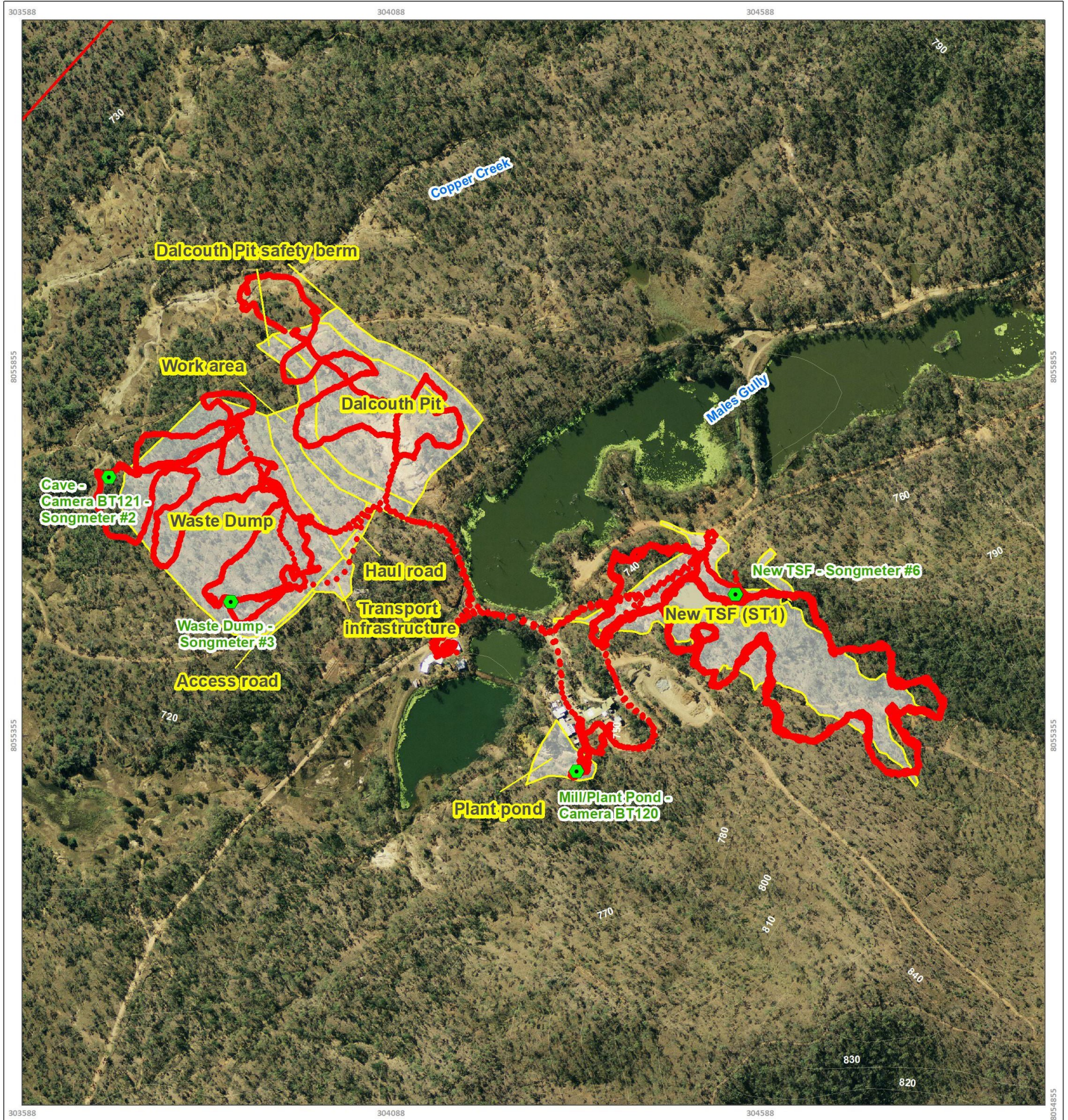
Metres
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Project Manager: S.Holt
GIS & Maps: LK

Client Contact: H.Miller
Revision: 0
Date: August 2018





Legend

- Remote Sensing Locations 14/15-MAR-2018
- Biotropica Tracklogs 2018
- Proposed new infrastructure requiring clearing (20180628)
- 10m Contour Lines
- ML20547 (outline_only)

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Mt Veteran Dalcouth Mine - 2018 Assessment

Map 5

Location : Mine Leases 4349 (Mt Veteran) & 20547 (Summer Hills) - approx. 12km north of Mount Garnet

Client : MGT Minerals Pty Ltd

Datum: GDA 94 MGA55 (UTM)

Scale: 1 : 5,000

Native Print Size: A3

Metres
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Biotropica Document Control

Project Manager: S.Holt

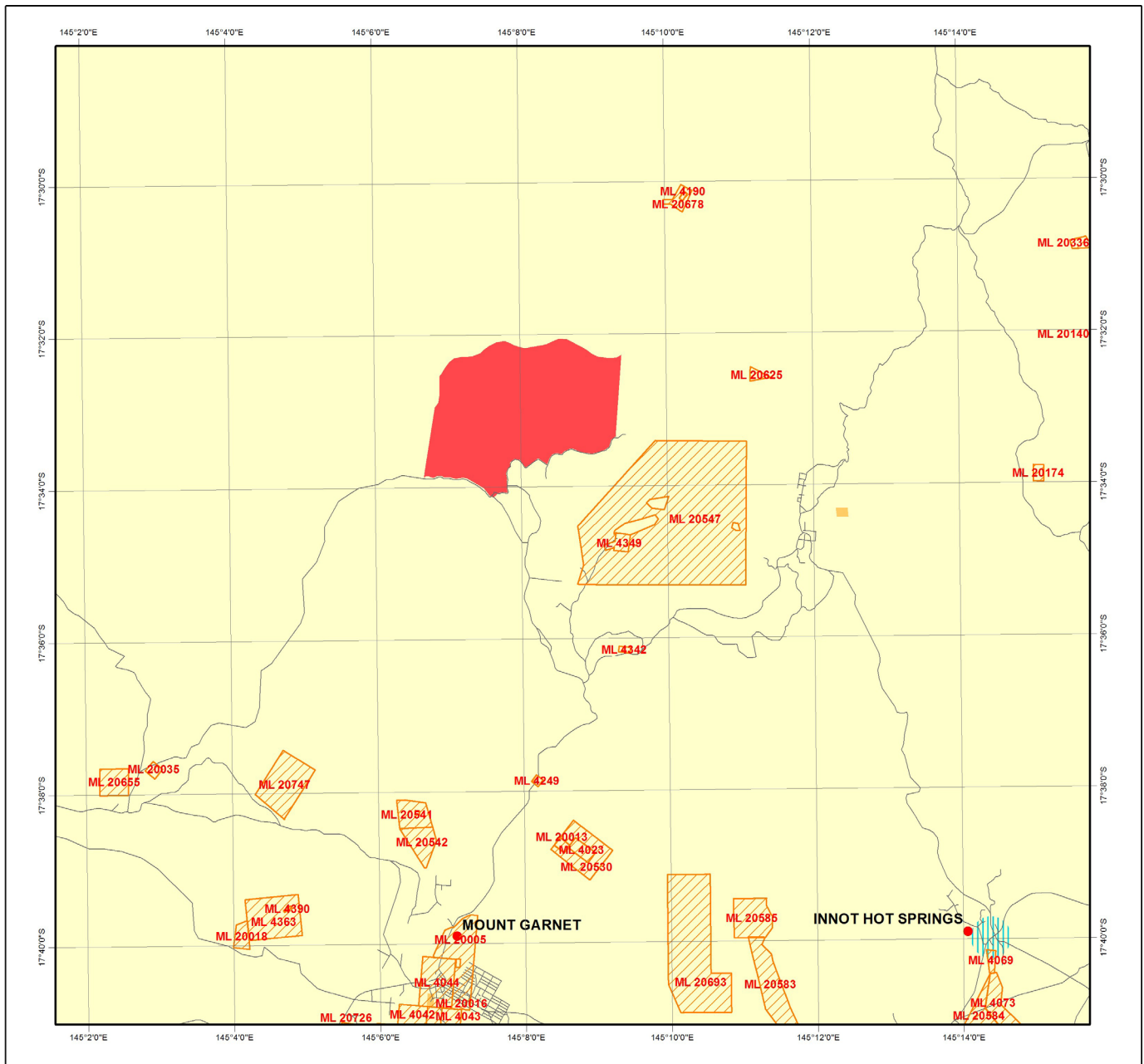
GIS & Maps: LK

Client Contact: H.Miller

Revision: 0

Date: August 2018

APPENDIX 3 – ESA STATUTORY MAP



ENVIRONMENTALLY SENSITIVE AREAS - Mining Activities



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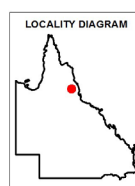
External contributors (non-government parties) of the data for this product are: Great Barrier Reef Marine Park Authority

Regional ecosystem mapping (remnant biodiversity status) may incorporate amendments, resulting from property level assessments, to the release version of the mapping available on QSpatial.

NOTE TO USER: Themes presented in this map are indicative only. Field survey may be required to verify the 'true' spatial extent and value. Not all environmentally sensitive areas are presented in this map. A user should refer to the particular circumstances relevant to their situation to assess the 'completeness' of themes provided.

The user should note that some boundaries and indicated values are ambient and may change over time (e.g. regional ecosystem boundaries and conservation status, watercourse mapping etc).

The user should be aware that due to multiple overlapping themes/ layers present, some themes/layers may be obscured by others. Ordering in the Legend does not accurately reflect the order by which themes/layers are displayed.



0 1,300 2,600 3,900 5,200 6,500 m

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APPENDIX 4 – CONSOLIDATED EVNT ONLINE SEARCHES (INCL. OCCURRENCE LIKELIHOOD)

Threatened Species

Scientific Name	Common Name	NCA 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Occurrence Likelihood	Potential Impact
Fauna						
<i>Calidris ferruginea</i>	Curlew sandpiper	E	CE MWS	Bird	Unlikely	No impact predicted.
<i>Dasyurus hallucatus</i>	Northern quoll	-	E	Mammal	Possible	No impact predicted.
<i>Erythroriorchis radiatus</i>	Red goshawk	E	V	Bird	Unlikely	No impact predicted.
<i>Erythrura gouldiae</i>	Gouldian finch	E	E	Bird	Unlikely	No impact predicted.
<i>Hipposideros diadema reginae</i>	Diadem leaf-nosed bat	NT	-	Mammal	Possible-	No impact predicted.
<i>Hipposideros semoni</i>	Semon's leaf-nosed bat	E	V	Mammal	Unlikely	No impact predicted.
<i>Litoria dayi</i> (syn. <i>Nyctimystes dayi</i>)	Australian lacelid	E	E	Amphibian	Unlikely	No impact predicted.
<i>Litoria nannotis</i>	Waterfall frog	E	E	Amphibian	Unlikely	No impact predicted.
<i>Litoria nyakalensis</i>	Mountain mistfrog	E	CE	Amphibian	Unlikely	No impact predicted.
<i>Litoria rheocola</i>	Common mistfrog	E	E	Amphibian	Unlikely	No impact predicted.
<i>Macroderma gigas</i>	Ghost bat	E	V	Mammal	Possible	No impact predicted.
<i>Mesembriomys gouldii rattoides</i>	Black-footed Tree-rat (north Queensland)	-	V	Mammal	Unlikely	No impact predicted.
<i>Numenius madagascariensis</i>	Eastern curlew	E	CE MWS	Bird	-	No impact predicted.
<i>Petauroides volans minor</i>	Greater glider (NQ subspecies)	V	V	Mammal	Occurs	No impact predicted.
<i>Petaurus australis</i> (Wet Tropics subspecies).	Yellow-bellied glider (northern subspecies)	V	V	Mammal	Unlikely	No impact predicted.
<i>Phascolarctos cinereus</i>	Koala	V	V	Mammal	Unlikely	No impact predicted.
<i>Poephila cincta cincta</i>	Black-throated finch (southern/ white-rumped subspecies)	E	E	Bird	Unlikely	No impact predicted.
<i>Pseudophryne covacevichae</i>	Magnificent broodfrog	V	V	Amphibian	Unlikely	No impact predicted.
<i>Pteropus conspicillatus</i>	Spectacled flying-fox	V	V	Mammal	Unlikely	No impact predicted.
<i>Pteropus poliocephalus</i>	Grey-headed flying-fox	-	V	Mammal	Unlikely	No impact predicted.

Scientific Name	Common Name	NCA 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Occurrence Likelihood	Potential Impact
<i>Rhinolophus robertsi</i> (large form) (syn. <i>Rhinolophus philippinensis</i>)	Greater large-eared horseshoe bat	E	V	Mammal	Unlikely	No impact predicted.
<i>Rostratula australis</i> (syn. <i>Rostratula benghalensis</i> (sensu lato))	Australian painted snipe	V	E	Bird	Unlikely	No impact predicted.
<i>Saccolaimus saccolaimus nudiclunatus</i>	Bare-rumped sheath-tail bat	E	V	Mammal	Unlikely	No impact predicted.
<i>Tyto novaehollandiae kimberli</i>	Masked owl (northern subspecies)	V	V	Bird	Possible	No impact predicted.
Flora						
<i>Acacia longipedunculata</i>	-	NT	-	Shrub	Possible	No impact predicted.
<i>Acacia purpureopetala</i>	-	V	CE	Shrub	Occurs	No impact predicted.
<i>Aponogeton bullosus</i>	-	E	E	Aquatic plant	Unlikely	No impact predicted.
<i>Cajanus mareebensis</i>	-	-	E	Trailing herb	Unlikely	No impact predicted.
<i>Corymbia rhodops</i>	Red-throated bloodwood	V	V	Tree	Possible	No impact predicted.
<i>Cycas platyphylla</i>	-	V	V	Cycad	Possible	No impact predicted.
<i>Dendrobium bigibbum</i> (syn. <i>Dendrobium lithocola</i> , <i>Vappodes lithocola</i>)	Cooktown orchid	E	E	Epiphytic or lithophytic orchid	Unlikely	No impact predicted.
<i>Dichanthium setosum</i>	Bluegrass	-	V	Grass	Unlikely	No impact predicted.
<i>Diuris oporina</i>	Northern white donkeys tails	NT	-	Ground orchid	Possible	No impact predicted.
<i>Euphorbia carissoides</i> (syn. <i>Chamaesyce carissoides</i>)	-	NT	V	Shrub	Possible	No impact predicted.
<i>Goodenia stirlingii</i>	-	V	-	Herb	Possible	No impact predicted.
<i>Grevillea glossadenia</i>	-	V	V	Shrub	Possible	No impact predicted.
<i>Homoranthus porteri</i>	-	V	V	Shrub	Possible	No impact predicted.
<i>Lastreopsis walleri</i>	-	V	V	Fern	Unlikely	No impact predicted.
<i>Macropteranthes montana</i>	-	V	V	Shrub	Possible	No impact predicted.
<i>Melaleuca sylvana</i>	-	E	-	Shrub to small tree	Possible	No impact predicted.
<i>Melaleuca uxorum</i>	-	E	-	Shrub to small tree	Possible	No impact predicted.

Scientific Name	Common Name	NCA 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Occurrence Likelihood	Potential Impact
<i>Micromyrtus delicata</i>	-	E	-	Shrub to small tree	Unlikely	No impact predicted.
<i>Phlegmariurus marsupiiiformis</i> (syn. <i>Huperzia marsupiiiformis</i>)	Water tassel-fern	V	V	Epiphytic fern	Unlikely	No impact predicted.
<i>Plectranthus amoenus</i>	-	V	-	Herb	Unlikely	No impact predicted.
<i>Prostanthera clotteniana</i>	Mint bush	E	CE	Shrub	Unlikely	No impact predicted.
<i>Samadera baileyana</i> (syn. <i>Quassia baileyana</i>)	-	NT	-	Shrub to small tree	Unlikely	No impact predicted.
<i>Stylidium trichopodium</i>	-	NT	-	Herb	Possible	No impact predicted.
<i>Triplarina nitchaga</i>	-	V	V	Shrub	Possible	No impact predicted.
<i>Tropilis callitrophilis</i> (syn. <i>Dendrobium callitrophilum</i>)	Thin feather orchid	V	V	Epiphytic or lithophytic orchid	Unlikely	No impact predicted.
<i>Zieria obovata</i>	-	V	V	Shrub	Unlikely	No impact predicted.
Ecological Community						
Broad leaf tea-tree (<i>Melaleuca viridiflora</i>) woodlands in high rainfall coastal north Qld RE equivalents: 7.3.8a, 7.3.8b, 7.3.8c, 7.3.8d, 7.5.4g, 8.3.2, 8.5.2a, 8.5.2c and 8.5.6	Broad Leaf Tea Tree Woodland	N/A	E	Woodland	Unlikely	No impact predicted.

Migratory Species

Scientific Name	Common Name	NCA 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Occurrence Likelihood	Potential Impact
Fauna						
<i>Actitis hypoleucos</i>	Common sandpiper	SLC	MWS	Bird	Unlikely	No impact predicted.
<i>Apus pacificus</i>	Fork-tailed swift	SLC	MMB	Bird	Unlikely	No impact predicted.
<i>Calidris acuminata</i>	Sharp-tailed sandpiper	SLC	MWS	Bird	Unlikely	No impact predicted.
<i>Calidris ferruginea</i>	Curlew sandpiper	E	CE MWS	Bird	Unlikely	No impact predicted.
<i>Calidris melanotos</i>	Pectoral sandpiper	SLC	MWS	Bird	Unlikely	No impact predicted.
<i>Crocodylus porosus</i>	Estuarine crocodile	V	MMS	Reptile	Unlikely	No impact predicted.

Scientific Name	Common Name	NCA 1992 (Qld) Status	EPBC Act 1999 (Federal) Status	Growth Form	Occurrence Likelihood	Potential Impact
<i>Cuculus optatus</i>	Oriental cuckoo	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Gallinago hardwickii</i>	Latham's snipe	SLC	MWS	Bird	Unlikely	No impact predicted.
<i>Hirundapus caudacutus</i>	White-throated needletail	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Hirundo rustica</i>	Barn swallow	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Monarcha melanopsis</i>	Black-faced monarch	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Monarcha trivirgatus</i> (syn. <i>Symposiachrus trivirgatus</i>)	Spectacled monarch	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Motacilla cinerea</i>	Grey wagtail	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Motacilla flava</i>	Yellow wagtail	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Myiagra cyanoleuca</i>	Satin flycatcher	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Numenius madagascariensis</i>	Eastern curlew	E	CE MWS	Bird	Unlikely	No impact predicted.
<i>Ornithorhynchus anatinus</i>	Platypus	SLC	-	Bird	Unlikely	No impact predicted.
<i>Pandion cristatus</i> (syn. <i>Pandion haliaetus leucocephalus</i>)	Eastern osprey	SLC	MWS	Bird	Unlikely	No impact predicted.
<i>Plegadis falcinellus</i>	Glossy ibis	SLC	-	Bird	Unlikely	No impact predicted.
<i>Rhipidura rufifrons</i>	Rufous fantail	SLC	MTS	Bird	Unlikely	No impact predicted.
<i>Tringa nebularia</i>	Common greenshank	SLC	MWS	Bird	Unlikely	No impact predicted.

APPENDIX 5 – BAT ECHOLOCATION CALL ANALYSIS REPORT



Microbat Call Identification Report

Prepared for ("Client"):	Biotropica
Survey location/project name:	Mt Garnet area, NE Qld
Survey dates:	14-15 March 2018
Client project reference:	MGM17.11.01 - MGM EA 2018
Job no.:	BIO-1802
Report date:	23 March 2018

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Methods

Data received & post-processing

Balance! Environmental received the following data recorded by three Song meter SM2BAT detectors (Wildlife Acoustics, USA):

- SM2 – 48 WAC (compressed audio) files recorded 14th & 15th March 2018
- SM3 – 48 WAC (compressed audio) files recorded 14th & 15th March 2018
- SM6 – 1430 WAV (full-spectrum audio) files recorded 14th & 15th March 2018

Wildlife Acoustics' *Kaleidoscope* software was used to convert all WAC and WAV data to bat call sequence files in both zero-crossing analysis format (ZC files) and full-spectrum format (WAV files). The advanced signal processing feature was enabled during the ZC conversion. This process yielded 3932 unique call sequence files for SM3 and 750 files for SM6; however, no bat calls were recorded by SM2.

An inspection of the Song Meter operating code in the "songmeter.set" file included with the SM2 data revealed a low sample rate setting of 96kHz, which was reflected in the log file produced during the conversion process. At this sample rate, signals with frequencies up to 48kHz should have been detected, which would account for most bats recorded by the other two detectors; however, the absence of bat calls in the WAC files suggests another deployment error (e.g. the microphone may have been incorrectly attached or an acoustic microphone was used instead of an ultrasonic microphone.)

Call analysis and identification

Zero-crossing analysis

All ZC sequence files were analysed using *AnaLookW* (Corben 2017). A subset of 803 files, representing all call types recorded by each detector on each night, was selected for call identification.

Species identification was achieved manually by comparing the ZC spectrograms of the selected calls with those of reference calls from northern Queensland and/or with published call descriptions (e.g. Reinhold et al. 2001; Milne 2002; Pennay et al. 2004). Consideration was also given to the probability of species' occurrence based on published distribution information (e.g. Churchill 2008; van Dyck *et al.* 2013) and on-line database records (e.g. <http://www.ala.org.au>).

Full-spectrum analysis

Full-spectrum copies of most call types were also viewed using the *Kaleidoscope Viewer* to confirm identities assigned to the ZC files. Complete feeding-buzz sequences are often visible in WAV files, but portions are lost in the ZC conversion process. Feeding-buzz characteristics can be useful for differentiating between some free-tailed (*Ozimops*), bent-winged (*Miniopterus*) and evening bats (e.g. *Pipistrellus*, *Chalinolobus*) that have similar search-phase call characteristics (Corben 2010).

The presence and pattern of harmonics, visible only in full-spectrum recordings, can be used to differentiate between *Saccolaimus* species and other bats that call in the 18-28 kHz frequency range.

Reporting standard

The format and content of this report follows Australasian Bat Society standards for the interpretation and reporting of bat call data (Reardon 2003), available on-line at <http://www.ausbats.org.au/>.

Species nomenclature follows Jackson & Groves (2015), who elevated the sub-genus names proposed by Reardon *et al.* (2014) for the *Mormopterus* free-tailed bats to genus level; hence *Ozimops* (*O. lumsdenae*, *O. halli* and *O. ridei*) is used herein.

Results

At least 14 species were recorded during this survey (**Table 1**). Thirteen call types were reliably attributed to unique species, while another call type was attributable to the *Nyctophilus* genus, of which at least two species probably occur in the study area (*N. bifax* and *N. geoffroyi*).

Sample spectrograms of all call types recorded during this survey are shown at **Appendix 1**.

Table 1. Microbats recorded during the Mt Garnet survey, 14-15 March 2018.

Detector: Date:	SM3		SM6	
	14/03/2018	15/03/2018	14/03/2018	15/03/2018
<i>Rhinolophus megaphyllus</i>	4	4	4	4
<i>Chalinolobus gouldii</i>	4	4	4	
<i>Chalinolobus nigrogriseus</i>	4	4	4	4
<i>Nyctophilus</i> sp.				4
<i>Scotorepens balstoni</i>	4	4		
<i>Scotorepens greyii</i>	4	4	4	4
<i>Scotorepens sanborni</i>	4	4	4	4
<i>Vespadelus troughtoni</i>	4		4	4
<i>Miniopterus australis</i>	4	4	4	4
<i>Miniopterus orianae oceanensis</i>	4	4	4	4
<i>Austronomus australis</i>	4		4	4
<i>Ozimops lumsdenae</i>	4		4	4
<i>Ozimops ridei</i>	4	4	4	4
<i>Saccolaimus flaviventris</i>	4		4	4

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- Jackson, S. and Groves, C. (2015). *Taxonomy of Australian Mammals*. CSIRO Publishing, Melbourne.
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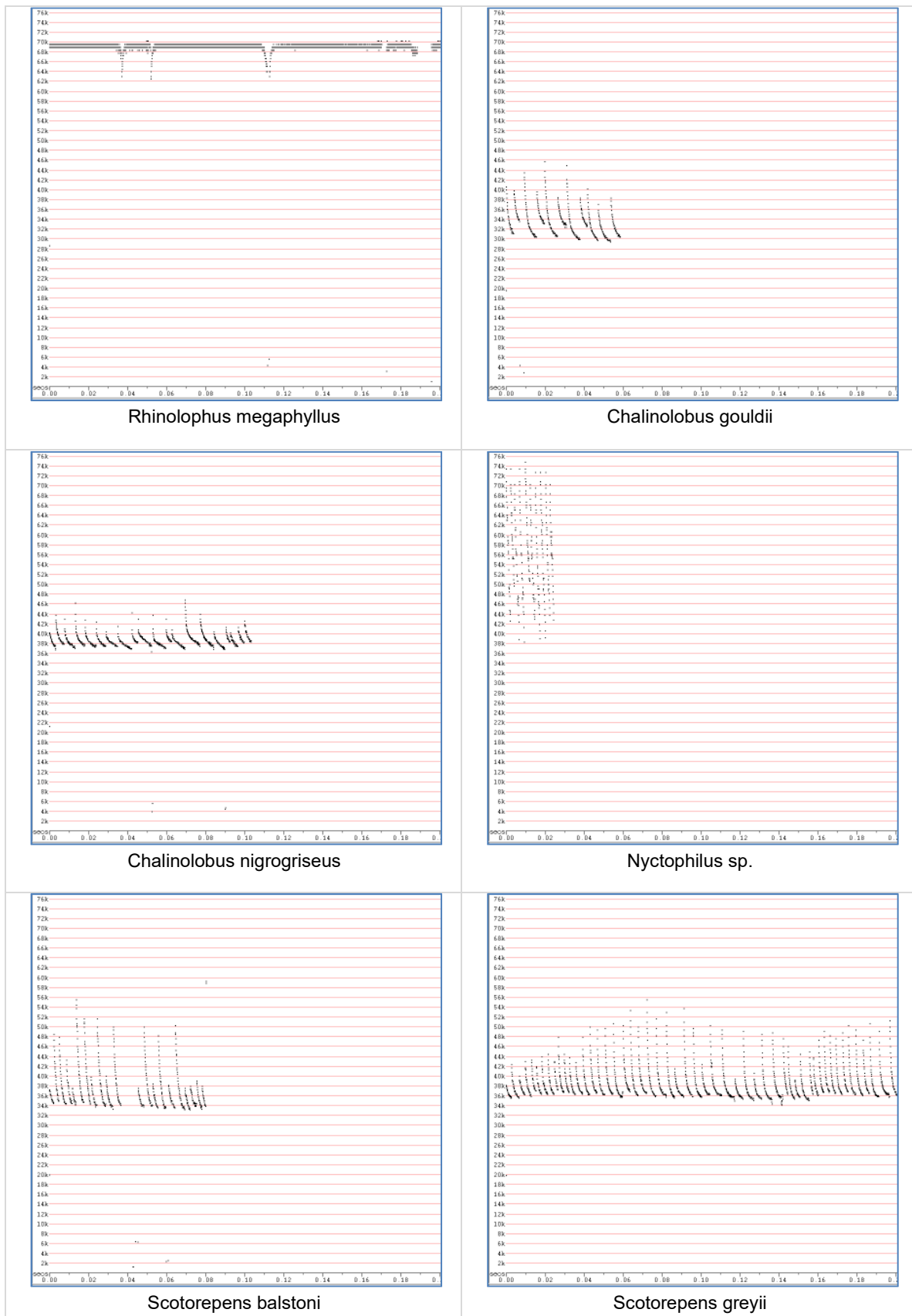
Glossary

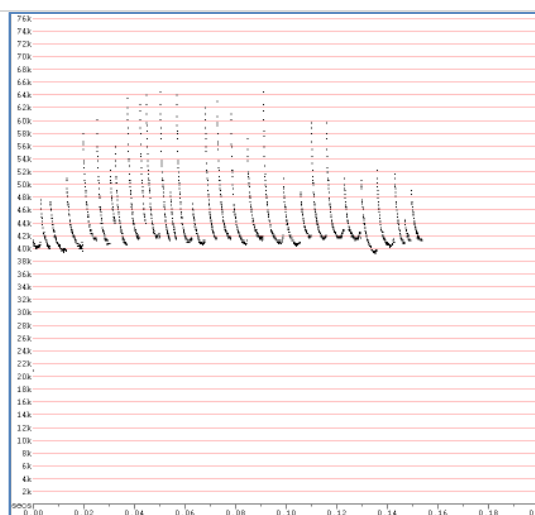
Technical terms used in this report are described in the following table.

Approach phase	The part of a bat <i>call</i> emitted as the bat starts to home in on a detected prey item; a transitional series of <i>pulses</i> between the <i>search phase</i> and <i>feeding buzz</i> , that become progressively steeper and shorter in duration.
Call	Refers to a single bat call, made up of a series of individual sound <i>pulses</i> in one or more <i>phases</i> (<i>search, approach, feeding buzz</i>).
CF (=Constant Frequency)	A type of <i>pulse</i> in which the dominant component consists of a more-or-less 'pure tone' of sound at a Constant Frequency; with <i>shape</i> appearing flat on the sonogram. Often also contains a brief <i>FM</i> component at the beginning and/or end of the CF component (<i>viz.</i> FM-CF-FM).
Characteristic frequency (Fc)	The frequency of the flattest part of a <i>pulse</i> ; usually the lowest frequency reached in the <i>qCF</i> component of a pulse. This is often the primary diagnostic feature for species identification.
Duration	The time period from the beginning of a <i>pulse</i> to the end of the pulse.
Feeding buzz	The terminal part of a <i>call</i> , following the <i>approach phase</i> , emitted as the bat catches a prey item; a distinctive, rapid series of very steep, very short-duration pulses.
FM (=Frequency Modulated)	A type of <i>pulse</i> in which there is substantial change in frequency from beginning to end; <i>shape</i> ranges from almost vertical and linear through varying degrees of curvature.
FC range	Refers to the range of frequencies occupied by the <i>characteristic frequency</i> section of <i>pulses</i> within a call or set of calls.
Frequency sweep or "band-width"	The range of frequencies through which a <i>pulse</i> sweeps from beginning to end; Maximum frequency (Fmax) – minimum frequency (Fmin).
Knee	The transitional part of a <i>pulse</i> between the initial (usually steeper) frequency sweep and the <i>characteristic frequency</i> section (usually flatter); time to knee (Tk) and frequency of knee (Fk) can be diagnostic for some species.
Pulse	An individual pulse of sound within a bat <i>call</i> ; the <i>shape, duration</i> and <i>characteristic frequency</i> of a pulse are the key diagnostic features used to differentiate species.
Pulse body	The part of the <i>pulse</i> between the <i>knee</i> and <i>tail</i> and containing the <i>characteristic frequency</i> section.
Pulse shape	The general appearance of a <i>pulse</i> on the sonogram, described using relative terms related to features such as slope and degree of curvature. See also <i>CF, qCF</i> and <i>FM</i> .
qCF (=quasi Constant Frequency)	A type of <i>pulse</i> in which there is very little change in frequency from beginning to end; <i>shape</i> appears to be almost flat. Some pulses also contain an <i>FM</i> component at the beginning and/or end of the qCF component (<i>viz.</i> FM-qCF).
Search phase	The part of a bat <i>call</i> generally required for reliable species diagnosis. A consistent series of <i>pulses</i> emitted by a bat that is searching for prey or and/or navigating through its habitat. Search phase pulses generally have longer duration, flatter slope and more consistent shape than <i>approach phase</i> and <i>feeding buzz</i> pulses.
Sequence	Literally, a sequence of <i>pulses</i> that may be from one or more bats; but generally refers to a <i>call</i> or part (e.g. <i>phase</i>) of a call.
Tail	The final component of a <i>pulse</i> , following the <i>characteristic frequency</i> section; may consist of a short or long sweep of frequencies either upward or downward from the Fc; or may be absent.

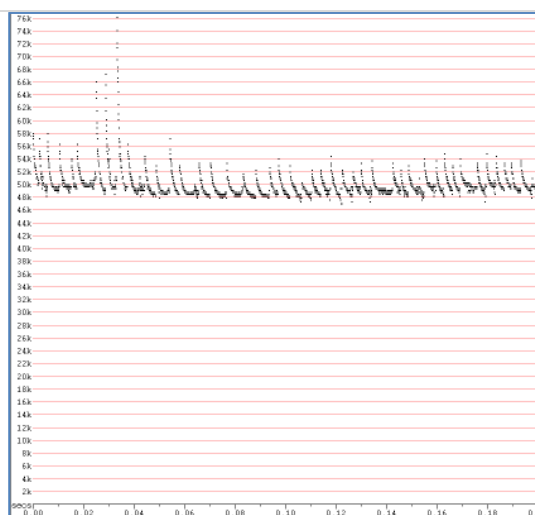
Appendix 1

Representative call sequences from the Mt Garnet EA survey, 14-15 March 2018.

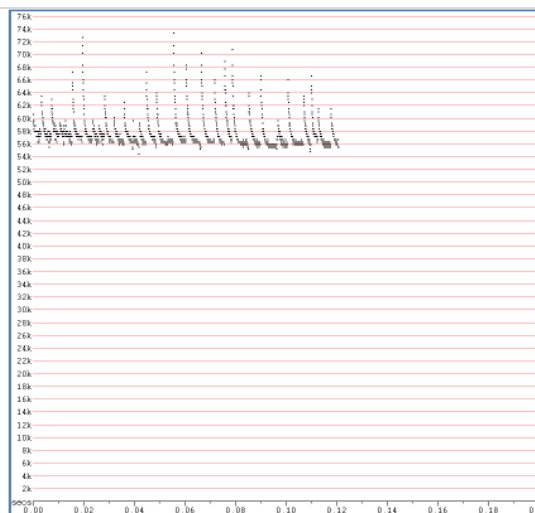




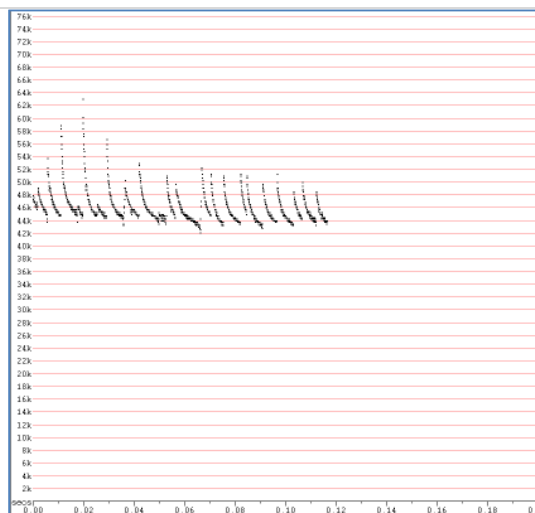
Scotorepens sanborni



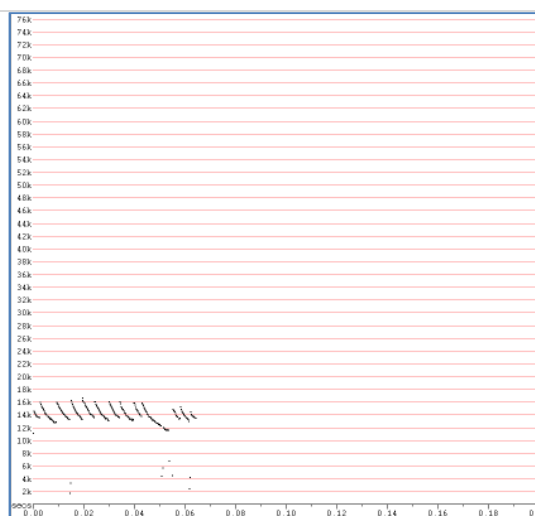
Vespadelus troughoni



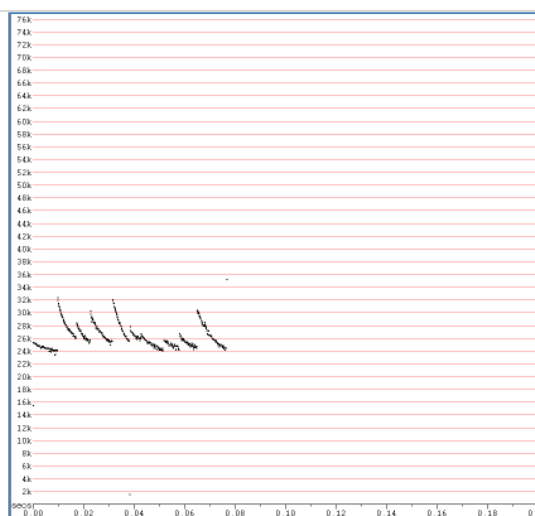
Miniopterus australis



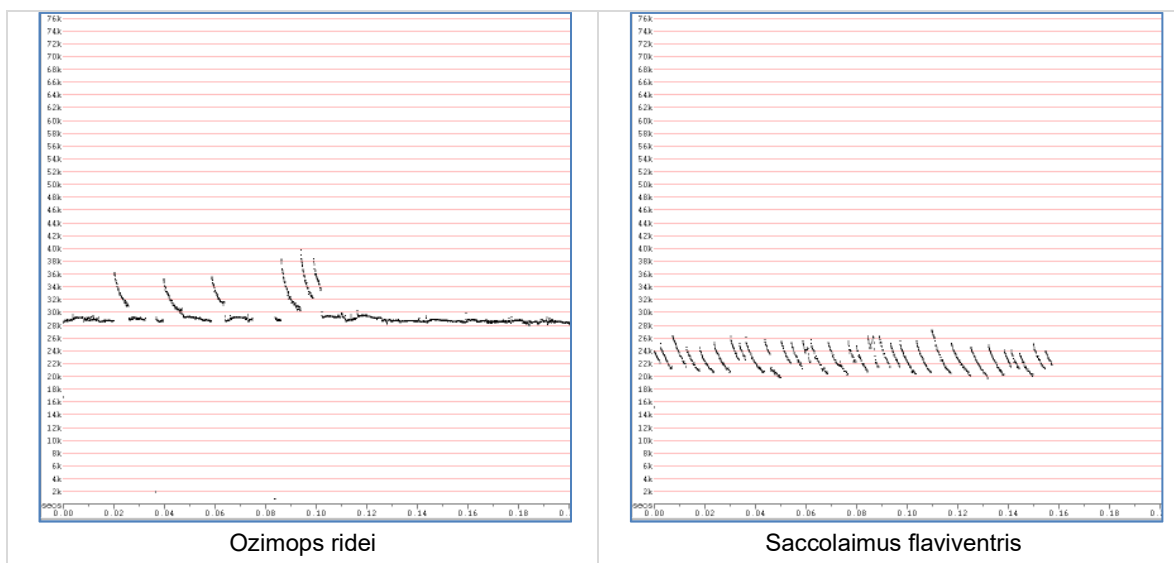
Miniopterus orianae oceanensis



Austronomus australis



Ozimops lumsdenae



APPENDIX 6 – ORIGINAL ONLINE SEARCHES



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 28/02/18 15:01:28

[Summary](#)

[Details](#)

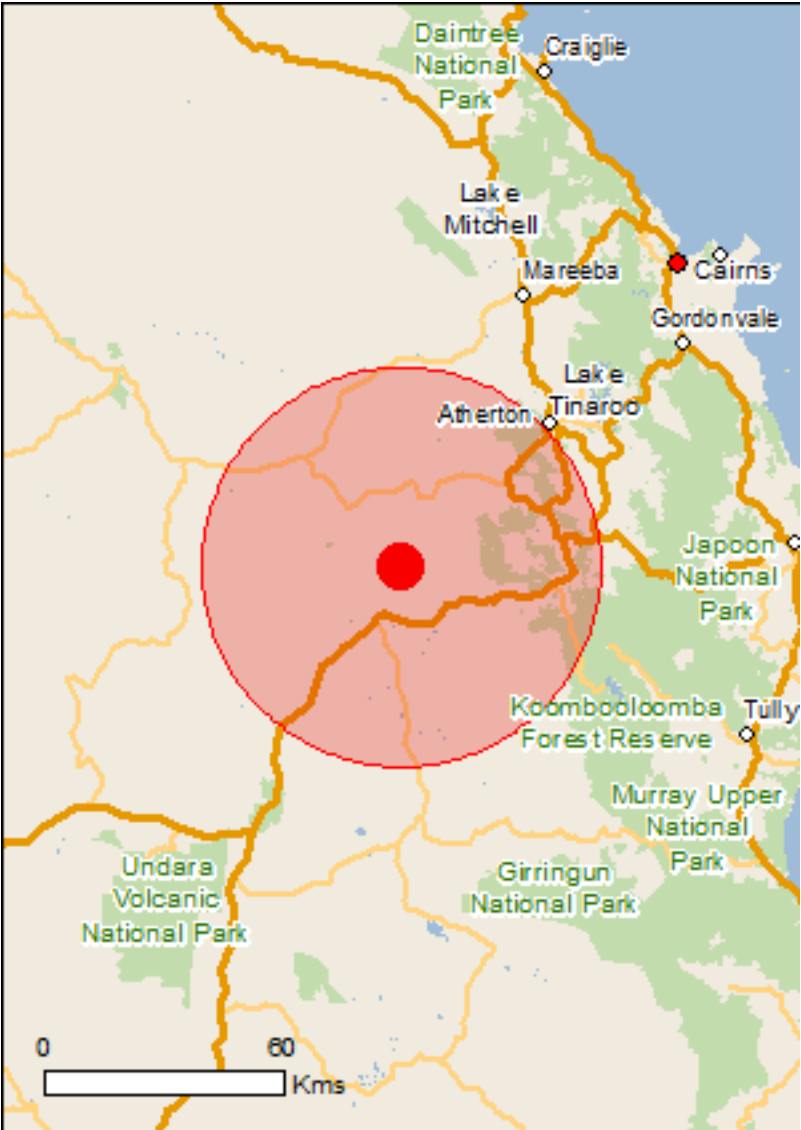
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)



This map may contain data which are
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[Coordinates](#)

Buffer: 50.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	1
National Heritage Places:	2
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	59
Listed Migratory Species:	20

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	2
Commonwealth Heritage Places:	None
Listed Marine Species:	27
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	40
Regional Forest Agreements:	None
Invasive Species:	39
Nationally Important Wetlands:	2
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

World Heritage Properties		[Resource Information]
Name	State	Status
Wet Tropics of Queensland	QLD	Declared property
National Heritage Properties		[Resource Information]
Name	State	Status
Natural		
Wet Tropics of Queensland	QLD	Listed place
Indigenous		
Wet Tropics World Heritage Area (Indigenous Values)	QLD	Within listed place

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Broad leaf tea-tree (Melaleuca viridiflora) woodlands in high rainfall coastal north Queensland	Endangered	Community likely to occur within area
Mabi Forest (Complex Notophyll Vine Forest 5b)	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Casuarius casuarius johnsonii Southern Cassowary, Australian Cassowary, Double-wattled Cassowary [25986]	Endangered	Species or species habitat known to occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat known to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Poephila cincta cincta Southern Black-throated Finch [64447]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Fish		
Melanotaenia eachamensis Lake Eacham Rainbowfish [26185]	Endangered	Species or species habitat known to occur within area
Frogs		
Litoria dayi Australian Lace-lid, Lace-eyed Tree Frog [86707]	Endangered	Species or species habitat likely to occur within area
Litoria nannotis Waterfall Frog, Torrent Tree Frog [1817]	Endangered	Species or species habitat known to occur within area
Litoria nyakalensis Mountain Mistfrog [1820]	Critically Endangered	Species or species habitat likely to occur within area
Litoria rheocola Common Mistfrog [1802]	Endangered	Species or species habitat likely to occur within area
Pseudophryne covacevichae Magnificent Brood Frog [64385]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Bettongia tropica Northern Bettong [214]	Endangered	Species or species habitat likely to occur within area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area
Dasyurus maculatus gracilis Spotted-tailed Quoll (North Queensland), Yarri [64475]	Endangered	Species or species habitat known to occur within area
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Breeding likely to occur within area
Mesembriomys gouldii rattoides Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat known to occur within area
Petaurus australis Wet Tropics subspecies Yellow-bellied Glider (Wet Tropics), Fluffy Glider [88022]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus conspicillatus Spectacled Flying-fox [185]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour may occur within area

[Rhinolophus robertsi](#)

Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat known to occur
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Name	Status	Type of Presence
		within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area
Plants		
Acacia purpureopetala [61156]	Critically Endangered	Species or species habitat known to occur within area
Alloxylon flammeum Red Silky Oak, Queensland Waratah, Tree Waratah [56400]	Vulnerable	Species or species habitat known to occur within area
Aponogeton bullosus [8299]	Endangered	Species or species habitat likely to occur within area
Arthraxon hispidus Hairy-joint Grass [9338]	Vulnerable	Species or species habitat likely to occur within area
Cajanus mareebensis [8635]	Endangered	Species or species habitat known to occur within area
Carronia pedicellata [24178]	Endangered	Species or species habitat likely to occur within area
Chingia australis [24603]	Endangered	Species or species habitat likely to occur within area
Corymbia rhodops [64015]	Vulnerable	Species or species habitat known to occur within area
Cycas platyphylla a cycad [55796]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphorbia carissoides [12431]	Vulnerable	Species or species habitat likely to occur within area
Grevillea glossadenia [7979]	Vulnerable	Species or species habitat known to occur within area
Homoranthus porteri [55196]	Vulnerable	Species or species habitat known to occur within area
Lastreopsis walleri a fern [18229]	Vulnerable	Species or species habitat known to occur within area
Macropteranthes montana [9003]	Vulnerable	Species or species habitat known to occur within area
Phaius australis Lesser Swamp-orchid [5872]	Endangered	Species or species habitat may occur within area
Phaius pictus [22564]	Vulnerable	Species or species habitat

likely to occur

Name	Status	Type of Presence
within area		
Phlegmariurus filiformis Rat's Tail Tassel-fern [86551]	Endangered	Species or species habitat likely to occur within area
Phlegmariurus marsupiiiformis Water Tassel-fern [86553]	Vulnerable	Species or species habitat likely to occur within area
Polyphlebium endlicherianum Middle Filmy Fern [87494]	Endangered	Species or species habitat known to occur within area
Prostanthera albohirta [82052]	Critically Endangered	Species or species habitat known to occur within area
Prostanthera clotteniana [76165]	Critically Endangered	Species or species habitat known to occur within area
Sauropus macranthus [13189]	Vulnerable	Species or species habitat likely to occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat likely to occur within area
Tomophyllum walleri [83507]	Vulnerable	Species or species habitat likely to occur within area
Triplarina nitchaga [64593]	Vulnerable	Species or species habitat likely to occur within area
Tropilis callitrophilis Thin Feather Orchid [82771]	Vulnerable	Species or species habitat likely to occur within area
Tylophora rupicola [55237]	Endangered	Species or species habitat likely to occur within area
Vappodes lithocola Dwarf Butterfly Orchid, Cooktown Orchid [78893]	Endangered	Species or species habitat known to occur within area
Zieria obovata [56758]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Delma mitella Atherton Delma, Legless Lizard [25931]	Vulnerable	Species or species habitat known to occur within area
Egernia rugosa Yakka Skink [1420]	Vulnerable	Species or species habitat may occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		

Name	Threatened	Type of Presence
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat likely to occur within area
Monarcha frater Black-winged Monarch [607]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur

Name	Threatened	Type of Presence
Tringa nebularia		within area
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land	[Resource Information]
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The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Defence - ATHERTON RIFLE RANGE
Defence - ATHERTON TRAINING DEPOT

Listed Marine Species	[Resource Information]
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* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		

Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area

Anseranas semipalmata		
Magpie Goose [978]		Species or species habitat may occur within area

Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat known to occur within area

Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area

Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area

Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area

Cuculus saturatus		
Oriental Cuckoo, Himalayan Cuckoo [710]		Species or species

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat known to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat likely to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha frater Black-winged Monarch [607]		Species or species habitat known to occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat known to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat known to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnston's River Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus		

Name	Threatened	Type of Presence
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Salt-water Crocodile, Estuarine Crocodile [1774]

Species or species

Invasive Species

[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur

Name	Status	Type of Presence
		within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Andropogon gayanus Gamba Grass [66895]		Species or species habitat likely to occur within area
Annona glabra Pond Apple, Pond-apple Tree, Alligator Apple, Bullock's Heart, Cherimoya, Monkey Apple, Bobwood, Corkwood [6311] Anredera cordifolia Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] Asparagus aethiopicus Asparagus Fern, Ground Asparagus, Basket Fern, Sprengi's Fern, Bushy Asparagus, Emerald Asparagus [62425] Asparagus plumosus		Species or species habitat likely to occur within area
Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Cenchrus ciliaris		Species or species habitat likely to occur within area
Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913] Dolichandra unguis-cati Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw Creeper, Funnel Creeper [85119]		Species or species habitat likely to occur within area
Eichhornia crassipes Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat likely to occur within area
Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507] Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area

Protasparagus densiflorus
Asparagus Fern, Plume Asparagus [5015]

Species or species

Name	Status	Type of Presence
Protasparagus plumosus		habitat likely to occur within area
Climbing Asparagus-fern, Ferny Asparagus [11747]		Species or species habitat likely to occur within area
Salvinia molesta		
Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Senecio madagascariensis		
Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]		Species or species habitat likely to occur within area

Reptiles		
Hemidactylus frenatus		
Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris		
Mourning Gecko [1712]		Species or species habitat likely to occur within area

Nationally Important Wetlands		[Resource Information]
Name		State
Bromfield Swamp		QLD
Innot Hot Springs		QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-17.5774 145.145

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

Search Crite Species List for a Specified Point

Species: All
Type: All
Status: All
Records: All
Date: All
Latitude: -17.5774
Longitude: 145.145
Distance: 50
Email: larskazmeier@biotropica.com.au
Date submitted: Wednesday 28 Feb 2018 13:55:27
Date extracted: Wednesday 28 Feb 2018 14:00:09

The number of records retrieved = 3955

Disclaimer

As the DSITIA is still in a process of collating and vetting data, it is possible the information given is not complete. The information provided should only be used for the project for which it was requested and it should be appropriately acknowledged as being derived from Wildlife Online when it is used.

The State of Queensland does not invite reliance upon, nor accept responsibility for this information. Persons should satisfy themselves through independent means as to the accuracy and completeness of this information.

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Feedback about Wildlife Online should be emailed to wildlife.online@science.dsitia.qld.gov.au

Description of the CODES

- I - Y indicates that the taxon is introduced to Queensland and has naturalised.
- Q - Indicates the Queensland conservation status of each taxon under the Nature Conservation Act 1992. The codes are Extinct in the Wild (PE), Endangered (E), Vulnerable (V), Near Threatened (NT), Least Concern (C) or Not Protected ().
- A - Indicates the Australian conservation status of each taxon under the Environment Protection and Biodiversity Conservation Act 1999. The values of EPBC are Conservation Dependent (CD), Critically Endangered (CE), Endangered (E), Extinct (EX), Extinct in the Wild (XW) and Vulnerable (V).

Records – The first number indicates the total number of records of the taxon for the record option selected (i.e. All, Confirmed or Specimens).
The second number located after the / indicates the number of specimen records for the taxon.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Sighting Rec	Specimen Records	
animals	amphibians	Hylidae	Litoria dayi	Australian lacelid		E	E	93	87	
animals	amphibians	Hylidae	Litoria nannotis	waterfall frog		E	E	23	17	
animals	amphibians	Hylidae	Litoria nyakalensis	mountain mistfrog		E	CE	24	24	
animals	amphibians	Hylidae	Litoria rheocola	common mistfrog		E	E	28	23	
animals	amphibians	Hylidae	Litoria serrata	tapping green eyed frog		V		109	33	
animals	amphibians	Myobatrachidae	Pseudophryne covacevichae	magnificent broodfrog		V	V	209	11	
animals	amphibians	Myobatrachidae	Taudactylus acutirostris	sharp snouted dayfrog		PE	EX	30	19	
animals	birds	Casuariidae	Casuarius casuarius johnsonii (southern population)	southern cassowary (southern population)		E	E	61	0	
animals	birds	Psittacidae	Cyclopsitta diophthalma macleayana	Macleay's fig-parrot		V		55	0	
animals	birds	Accipitridae	Erythrotriorchis radiatus	red goshawk		E	V	13	0	
animals	birds	Estrildidae	Erythrura gouldiae	Gouldian finch		E	E	5	0	
animals	birds	Estrildidae	Erythrura trichroa	blue-faced parrot-finch		NT		2	0	
animals	birds	Falconidae	Falco hypoleucos	grey falcon		V		1	0	
animals	birds	Meliphagidae	Grantiella picta	painted honeyeater		V	V	2	0	
animals	birds	Scolopacidae	Numenius madagascariensis	eastern curlew		E	CE	1	0	
animals	birds	Rostratulidae	Rostratula australis	Australian painted snipe		V	E	2	0	
animals	birds	Tytonidae	Tyto novaehollandiae kimberli	masked owl (northern subspecies)		V	V	3	2	
animals	mammals	Potoroidae	Bettongia tropica	northern bettong		E	E	15	1	
animals	mammals	Dasyuridae	Dasyurus maculatus gracilis	spotted-tailed quoll (northern subspecies)		E	E	9	3	
animals	mammals	Macropodidae	Dendrolagus lumholtzi	Lumholtz's tree-kangaroo		NT		229	18	
animals	mammals	Hipposideridae	Hipposideros diadema reginae	diadem leaf-nosed bat		NT		2	0	
animals	mammals	Megadermatidae	Macroderma gigas	ghost bat		E	V	3	0	
animals	mammals	Vespertilionidae	Murina florium	tube-nosed insectivorous bat		V		21	1	
animals	mammals	Pseudochiridae	Petauroides volans minor	northern greater glider		V	V	116	8	
animals	mammals	Petauridae	Petaurus australis unnamed subsp.	yellow-bellied glider (northern subspecies)		V	V	440	0	
animals	mammals	Phascolarctidae	Phascolarctos cinereus	koala		V	V	2	0	
animals	mammals	Pteropodidae	Pteropus conspicillatus	spectacled flying-fox		V	V	44	3	
animals	mammals	Rhinolophidae	Rhinolophus philippinensis	greater large-eared horseshoe bat		E	V	4	0	
animals	reptiles	Crocodylidae	Crocodylus porosus	estuarine crocodile		V		1	0	
animals	reptiles	Pygopodidae	Delma mitella	Atherton delma		NT	V	1	0	
plants	conifers	Araucariaceae	Agathis microstachya	bull kauri		NT		10	7	
plants	cycads	Cycadaceae	Cycas platyphylla			V	V	51	51	
plants	ferns	Dicksoniaceae	Calochlaena villosa			NT		3	3	
plants	ferns	Hymenophyllaceae	Crepidomanes majoriae			V		1	1	
plants	ferns	Grammitidaceae	Ctenopteris walleri			V	V	1	1	
plants	ferns	Cyatheaceae	Cyathea celebica			NT		7	7	
plants	ferns	Dryopteridaceae	Dryopteris sparsa			V		1	1	
plants	ferns	Lomariopsidaceae	Elaphoglossum callifolium			NT		1	1	
plants	ferns	Grammitidaceae	Grammitis albosetosa			V		1	1	
plants	ferns	Dryopteridaceae	Lastreopsis walleri			V	V	6	6	
plants	ferns	Hymenophyllaceae	Polyphlebium endlicherianum			V	E	1	1	

plants	ferns	Thelypteridaceae	Thelypteris confluens			V		1	1	
plants	higher dicots	Mimosaceae	Acacia guyeri			V		5	5	
plants	higher dicots	Mimosaceae	Acacia longipedunculata			NT		22	22	
plants	higher dicots	Mimosaceae	Acacia purpureopetala			V	CE	33	33	
plants	higher dicots	Proteaceae	Alloxylon flammeum			V	V	19	17	
plants	higher dicots	Proteaceae	Alloxylon pinnatum			NT		1	0	
plants	higher dicots	Sterculiaceae	Argyrodendron sp. (Boonjie B.P.Hyland RFK2139)			NT		12	12	
plants	higher dicots	Phyllanthaceae	Breynia macrantha			V	V	21	21	
plants	higher dicots	Byttneriaceae	Commersonia reticulata			V		1	1	
plants	higher dicots	Myrtaceae	Corymbia rhodops	red-throated bloodwood		V	V	26	26	
plants	higher dicots	Euphorbiaceae	Croton densivestitus			NT		2	2	
plants	higher dicots	Combretaceae	Dansiea elliptica			NT		1	1	
plants	higher dicots	Sapindaceae	Dodonaea uncinata			NT		1	1	
plants	higher dicots	Elaeocarpaceae	Elaeocarpus coorangooloo	brown quandong		NT		22	22	
plants	higher dicots	Euphorbiaceae	Euphorbia carissoides			V	V	4	4	
plants	higher dicots	Sterculiaceae	Firmiana papuana	lacewood		V		17	17	
plants	higher dicots	Goodeniaceae	Goodenia stirlingii			V		14	14	
plants	higher dicots	Acanthaceae	Graptophyllum excelsum			NT		3	3	
plants	higher dicots	Proteaceae	Grevillea glossadenia			V	V	44	43	
plants	higher dicots	Myrtaceae	Homoranthus porteri			V	V	30	30	
plants	higher dicots	Proteaceae	Lasjia grandis			V		1	1	
plants	higher dicots	Sapindaceae	Lepiderema largiflorens			NT		2	0	
plants	higher dicots	Combretaceae	Macropteranthes montana			V	V	19	19	
plants	higher dicots	Clusiaceae	Mammea touriga	brown touriga		NT		1	1	
plants	higher dicots	Apocynaceae	Marsdenia straminea			V		7	7	
plants	higher dicots	Myrtaceae	Melaleuca sylvana			E		18	18	
plants	higher dicots	Myrtaceae	Melaleuca uxorum			E		14	14	
plants	higher dicots	Myrtaceae	Micromyrtus delicata			E		11	10	
plants	higher dicots	Solanaceae	Nicotiana wuttkei			E		1	1	
plants	higher dicots	Apiaceae	Oenanthe javanica			NT		7	7	
plants	higher dicots	Apocynaceae	Parsonsia wildensis			V		6	6	
plants	higher dicots	Apocynaceae	Parsonsia wongabelensis			E		6	6	
plants	higher dicots	Elaeocarpaceae	Peripentadenia mearsii	buff quandong		NT		1	1	
plants	higher dicots	Apocynaceae	Phyllanthera grayi			V		12	12	
plants	higher dicots	Lamiaceae	Plectranthus amoenus			V		17	16	
plants	higher dicots	Lamiaceae	Prostanthera albohirta			E	CE	4	4	
plants	higher dicots	Lamiaceae	Prostanthera clotteniana			E	CE	12	12	
plants	higher dicots	Rubiaceae	Randia audasii			NT		1	1	
plants	higher dicots	Simaroubaceae	Samadera baileyana			NT		1	1	
plants	higher dicots	Solanaceae	Solanum angustum			E		4	4	
plants	higher dicots	Solanaceae	Solanum hamulosum			E		13	13	
plants	higher dicots	Myrtaceae	Sphaerantia discolor	Tully penda		V		1	1	
plants	higher dicots	Stylidiaceae	Stylidium trichopodium			NT		2	2	
plants	higher dicots	Myrtaceae	Triplarina nitchaga			V	V	5	5	
plants	higher dicots	Apocynaceae	Tylophora rupicola			E	E	2	2	

plants	higher dicots	Rutaceae	Zieria obovata			V	V	8	8	
plants	lower dicots	Piperaceae	Piper mestonii	long pepper		NT		1	1	
plants	lower dicots	Monimiaceae	Steganthera australiana			NT		13	13	
plants	monocots	Orchidaceae	Acianthus sublestus			NT		3	3	
plants	monocots	Orchidaceae	Anoetochilus yatesiae	jewel orchid		NT		1	1	
plants	monocots	Aponogetonaceae	Aponogeton bullosus			E	E	7	7	
plants	monocots	Orchidaceae	Chiloglottis longiclavata			NT		1	1	
plants	monocots	Corsiaceae	Corsia dispar			NT		6	6	
plants	monocots	Orchidaceae	Corybas abellianus	nodding helmet orchid		NT		4	4	
plants	monocots	Orchidaceae	Corybas cerasinus			NT		2	2	
plants	monocots	Orchidaceae	Dendrobium callitrophilum	cypress orchid		V	V	1	1	
plants	monocots	Orchidaceae	Diuris oporina	northern white donkeys tails		NT		19	19	
plants	monocots	Orchidaceae	Gastrodia urceolata			V		2	2	
plants	monocots	Orchidaceae	Genoplesium alticola			V		1	1	
plants	monocots	Arecaceae	Linospadix palmerianus			NT		1	1	
plants	monocots	Orchidaceae	Phaius australis			E	E	2	2	
plants	monocots	Orchidaceae	Taeniophyllum lobatum			NT		1	1	

PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 9 – Protected Plants Survey – 2022



Summerhill Pit - Protected Plant Survey

August 2022

Summerhill Pit - Protected Plant Survey

August 2022

Revision History

Version	Purpose	Issued by	Date	Reviewer	Date
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Appendix B	Potential Occurrence Assessment
Appendix C	Wildlife Online (NC Act 1992)
Appendix D	Protected Matters Search Tool (EPBC Act 1999)

1.0 Introduction

Four Elements Consulting was contracted by Ardent Group Pty Ltd, on behalf of MGT Minerals Pty Ltd, to undertake a Protected Plant Survey (PPS) within a Summerhill Pit extraction area. The proposed pit area is located within ML 20547 and is referred to as the Mount Garnet Dalcouth Project. The project is situated approximately 11 km north of the town of Mount Garnet.

This Protected Plant Survey is required as an outcome of the Protected Plants Flora Survey Trigger mapping overlay, issued by the Department of Environment and Science (DES). The DES vegetation management report (**Appendix A**) identified parts of the proposed site that fall within an area identified as high risk for protected flora. Areas defined as high-risk represent potential habitat for *Critically Endangered*, *Endangered*, *Vulnerable* or *Near Threatened* flora (EVNT flora), which may be known to exist at the locality or are considered likely to exist. This Protected Plant Survey was conducted over a single day (Wednesday 31 August 2022). Protected plants, as defined under the NC Act 1992 and EPBC Act 1999, were **NOT** recorded in this survey and, therefore, an Impact Management Plan is **NOT** required to be completed for this project.

1.1 Site Description

Much of the planned clearance area is mapped as category B, least concern remnant vegetation, under the *Vegetation Management Act 1999* (**Figure 1**). There exists very high regional connectivity of the property. The project site is located within a state-wide terrestrial biodiversity corridor that links through to the Wet Tropics Bioregion and out towards the Gulf of Carpentaria.

Land uses within the clearance impact area are restricted to cattle grazing and historic underground mining. The property is surrounded by an extensive area of remnant vegetation.

For the purpose of this report:

- ▶ The property is defined as ML 20547.
- ▶ The Clearing Impact Area (CIA) is the area of planned vegetation clearance within 100 m of Pit.
- ▶ The locality is within ~10 km of the property; and
- ▶ the region is the Einasleigh Bio-region.

1.2 Study Objectives

The objectives of this assessment are to:

- ▶ Review and identify species of protected/ threatened flora occurring or considered likely to occur on/or within the proposed clearing impact area.
- ▶ Identify all flora species within the clearing impact area, where access is permitted under the Flora Survey Guidelines - Protected Plants (2020).

-
- ▶ Identify likelihood of occurrence and subsequent impact for any EVNT flora species listed under the EPBC Act 1999 or the NC Act 1992 as a result of the protected plant survey.
 - ▶ Ground truth all regional ecosystems mapped under the Regional Ecosystem Description Database (REDD v 11.1).

1.3 Survey Limitations

The survey was undertaken in late August 2022 which is the early-mid dry season for the region. Despite this, significant rainfall was recorded near to site with 72.0 mm recorded at the Mount Garnet Alert weather station in July (BOM 2022). The total accumulated rainfall for the year (2022) at the time of survey was recorded at 595 mm at the Mount Garnet Alert weather station. These relatively high rainfall totals mean we can consider this to be a suitable time to survey most of the protected plants with the potential to occur within the clearing impact area. All potentially occurring protected plants are perennial woody shrubs or trees and may be surveyed at any time of the year. It was evident that the ground layer was diverse, intact, and readily identifiable throughout the surveyed area. Evidence of this was the frequent presence of herbs, grasses and sedges in flower or displaying mature seed heads.

As the site was only accessible on foot, to cover all areas of the clearance impact area, a single (1) continuous timed meander (~8 hours) was undertaken. The single continuous meander covered all areas of the clearance impact area which exceeded the requirement for a minimum of four (4) timed meanders as per the Flora Survey Guidelines – Protected Plants (see **Figure 2**). Care was given to ensure the meander covered as much of the clearing impact area as reasonable and practical.

1.4 Site Access

The entirety of the proposed clearance impact area was accessible during the PPS and no additional permission from neighbouring properties was required to complete the survey. All efforts were made to search as much of the 100 m buffer of vegetation adjoining the shared path alignment as was practical. Timed meander tracks are provided in **Figure 2**.

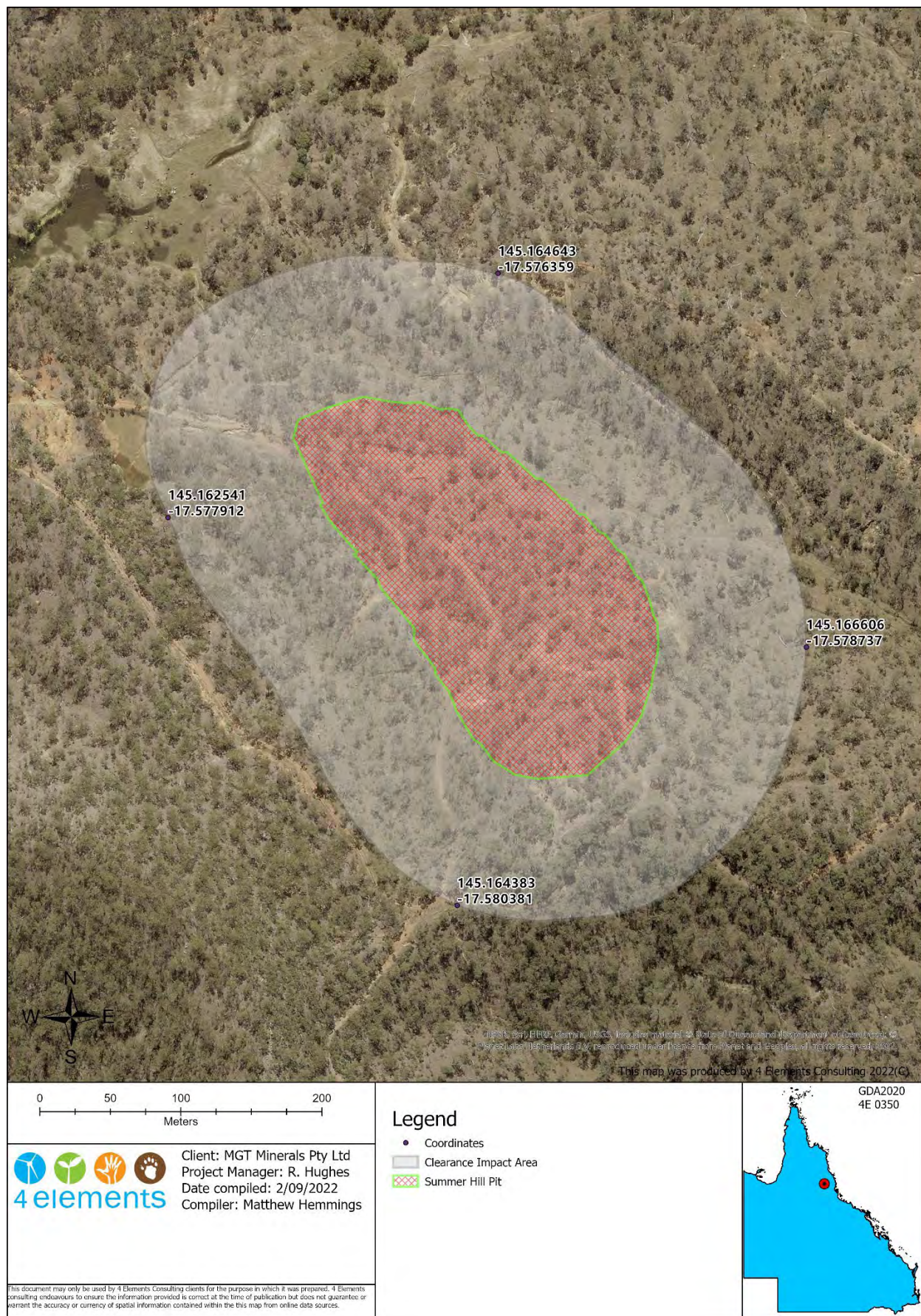


Figure 1. Location of the Clearance Impact Area

2.0 Methodology

2.1 Desktop review

4 Elements Consulting completed a review of relevant mapping, databases, legislation, and associated plans and policies to identify potential matters of ecological significance, including species and communities, and other ecological features, that may occur on or within proximity of the proposed Summerhill Pit. This review included an assessment of the following:

- ▶ Wildlife Online database of flora and fauna (DES 2022). This database holds records of plants and animals that have either been sighted or collected within a given radius of the site (a search parameter was prescribed limiting the search area to a 10 km radius around the site). The records held in this database are maintained by DES.
- ▶ Protected Matters database of matters of national environmental significance (MNES) (DCCEEW 2022). This database applies a range of bio-models to predict the presence of species of flora and fauna, and other MNES, cited under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), within a given radius of the site (a search parameter was prescribed limiting the search area to a 10 km radius).
- ▶ The Regional Ecosystem Description Database (REDD v11.1) (Department of Environment and Science 2022).
- ▶ Review of relevant legislation and associated plans and policies, including but not limited to the Qld *Nature Conservation Act 1992* (NC Act), *Vegetation Management Act 1999* (VM Act), EPBC Act, and the *Water Act 2000* (Water Act).
- ▶ Literature review. A range of scientific papers, recovery and conservation plans, and other literature were reviewed for a number of related matters (such as targeted threatened species).
- ▶ Digital geological mapping on GeoResGlobe which details surface geology; and
- ▶ Australian Virtual Herbarium (for voucher notes and distribution records of plant species).

2.2 Field Survey

The field survey was undertaken over a single day on Wednesday 31 August 2022. The primary aims of this investigation are explained below.

2.2.1 Timed Meander Survey

The Flora Survey Guidelines – Protected Plants (DES 2020) outline the requirements for undertaking protected plant surveys. The primary method for undertaking protected plant surveys is the timed meander. During a timed meander, the time is recorded approximately every 5 minutes while conducting a search for threatened or near threatened plants. If no threatened or near threatened species are recorded, the search continues for 30 min or when the entire area is surveyed, whichever happens sooner. If threatened or near threatened species are

recorded, the search must continue for at least 30 min after the last plants is recorded or when the entire area is surveyed, whichever happens sooner.

The Clearance Impact area (CIA) for the Summer Hill Pit totalled 14.76ha. Section 6.2.2 of the Flora Survey Guidelines (DES 2020) states that a minimum of four (4) timed meanders are required per area of habitat type when the CIA is between 10ha and 100ha. As the CIA had limited vehicle access, the entire extent was surveyed on foot using a continuous meander for approximately 8 hours. This meander provided extensive coverage of all habitat types present. Primary focus was applied within known habitat niches for potentially occurring threatened flora. This included rocky creeks and rocky upslope areas on low nutrient soils indicated by limited grass and herb cover. A single (1) timed meander (~8 hours) exceeded the minimum required effort and was conducted by a suitably qualified person (Ryan Hughes) (see **Section 6.0**) within a 100 m radius of the planned Summerhill Pit boundary, where reasonable and practical (see **Figure 2**).

All vascular plant species observed in this meander survey were recorded to compile a list of all species detected. All flora species were identified in the field by the suitably qualified person.

2.2.2 Weed Assessment

During field investigation, notes were taken of weed incursions to the project site. This included species presence as well as their distribution and abundance (see **Table 3**).

2.2.3 Describing Vegetation Communities

All vegetation communities were recorded within the clearing impact area. All discrete vegetation communities, within the 100 m clearance impact area, were sampled. Communities were recorded utilising a Quaternary level site assessment as per CORVEG methodology to verify their classification according to Regional Ecosystem mapping (Neldner et al. 2022).

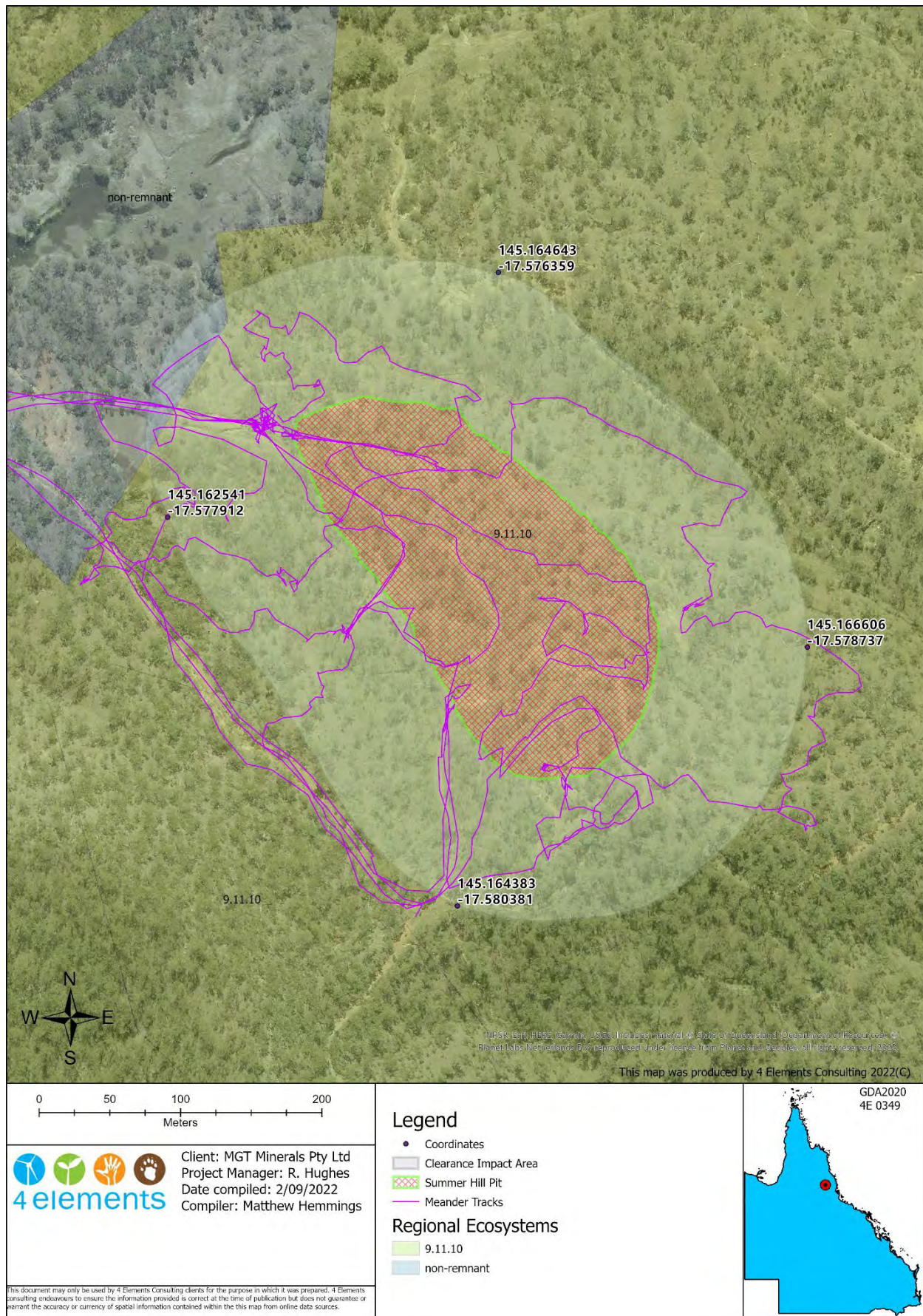


Figure 2. Timed Meander GPS Tracks

3.0 Desktop Analysis Results

3.1 Mapped Vegetation Communities

Descriptions of mapped vegetation communities, site values and location within the expansion area are listed in **Table 1.**

Table 1. Mapped Vegetation Communities (regional ecosystems)

RE & Biodiversity Status	Description (REDD v 11.1)	Location within Expansion Area	Site Value
Land Zone 3- Alluvial Soils			
RE 9.3.15 Least Concern/ Of Concern	Fringing woodland to open forest containing any combination of <i>Casuarina cunninghamiana</i> , <i>Eucalyptus tereticornis</i> and <i>E. platyphylla</i> +/- <i>Lophostemon suaveolens</i> +/- <i>Nauclea orientalis</i> +/- <i>Corymbia tessellaris</i> +/- <i>C. clarksoniana</i> . There is often a low sub-canopy layer which can include canopy species and <i>Ficus spp.</i> The open shrub layer contains juvenile canopy species and can include mesic species such as <i>Euroschinus falcatus</i> , <i>Acacia mangium</i> and <i>Syzygium spp.</i> The ground layer is medium to dense grassy and contains <i>Imperata cylindrica</i> , <i>Crotalaria sp.</i> , <i>Heteropogon contortus</i> , <i>Cyperus spp.</i> and <i>Paspalum spp.</i> Occurs on stream banks and channels in areas of higher rainfall in the central east of the bioregion	Not Present	Significant habitat as drought refuge, wildlife corridors and for arboreal animals. and mining. Pre-clear extent = 21 000 ha; 2019 extent = 20 000 ha
Land Zone 11 – Metamorphic Soils			

RE & Biodiversity Status	Description (REDD v 11.1)	Location within Expansion Area	Site Value
RE 9.11.10 Least Concern/ Of Concern	Mixed woodland to open forest including combinations of the species <i>Eucalyptus cloeziana</i> , <i>Corymbia citriodora</i> subsp. <i>citriodora</i> , <i>C. leichhardtii</i> , <i>E. portuensis</i> , <i>E. cullenii</i> , <i>E. atrata</i> , <i>E. crebra</i> and <i>C. clarksoniana</i> +/- <i>Callitris intratropica</i> . There can be an open sub-canopy of canopy species, <i>Grevillea glauca</i> and <i>Allocasuarina inophloia</i> . The shrub layer varies from scattered plants to mid-dense and can include juvenile canopy species, <i>Grevillea</i> spp., <i>Acacia</i> spp., <i>Persoonia falcata</i> , <i>Melaleuca viridiflora</i> , <i>Cycas platyphylla</i> and <i>Xanthorrhoea johnsonii</i> . The grassy ground layer is mid-dense to dense and often dominated by <i>Themeda triandra</i> , <i>Arundinella</i> spp. and occasionally <i>Triodia</i> spp. Occurs on steep dissected hills and flats on highly metalliferous metamorphic rocks, often with shallow soils.	Category B: Throughout the entire Clearance Impact Area	Habitat for geographically restricted and vulnerable flora species including <i>Goodenia stirlingii</i> , <i>Acacia purpureopetala</i> , <i>Grevillea glossadenia</i> and <i>Corymbia rhodops</i> Past and current land use within the clearance impact area has included historic mining and cattle grazing. Pre-clear extent = 35 000 ha; 2019 extent = 34 000 ha

3.2 Matters of National and State Environmental Significance

Desktop searches for potentially occurring threatened species and habitats were conducted under both the *Nature Conservation Act 1992* (NC Act) and the *Environment Protection and Biodiversity Act 1999* (EPBC Act). Results from both databases (Wildlife Online Database and Protected Matters Search Tool) are detailed in **Appendix C** and **Appendix D**

3.3 NC Act Wildlife Online

The Wildlife Online database search tool returned records for 17 NC Act listed plant species. A search perimeter of 20 km was utilised for this search. See **Appendix C** for the complete search results.

3.4 EPBC Act Protected Matters Search Tool (Species)

Database searches under the Protected Matters Search Tool (PMST) returned a result of 13 listed threatened plant species. **Appendix D** provides the complete search results for the PMST search tool.

An assessment for the potential occurrence of these species on the project site, for both the EPBC and NC threatened species, is provided in **Appendix B. Table 2** below lists these species and their relevant state and federal legislative classifications.

Table 2. Potentially Occurring Species Listed under the NC act 1992 and EPBC act 1999

Common Name	Scientific Name	Status EPBC	Status NCA
Threatened Flora			
-	<i>Acacia longipedunculata</i>	-	NT
Purple Acacia	<i>Acacia purpureopetala</i>	CE	V
-	<i>Aponogeton bullosus</i>	E	E
-	<i>Coleus amoenus</i>	-	V
-	<i>Commersonia reticulata</i>	-	V
Red-throated Bloodwood	<i>Corymbia rhodops</i>	V	V
A cycad	<i>Cycas platyphylla</i>	V	V
Bluegrass	<i>Dichanthium setosum</i>	V	V
-	<i>Diuris oporina</i>	-	NT
-	<i>Euphorbia carissoides</i>	V	V
-	<i>Goodenia stirlingii</i>	-	V
-	<i>Grevillea glossadenia</i>	V	V
-	<i>Homoranthus porteri</i>	V	V

Common Name	Scientific Name	Status EPBC	Status NCA
-	<i>Macropteranthes montana</i>	V	V
-	<i>Melaleuca sylvana</i>	-	E
-	<i>Melaleuca uxorum</i>	-	E
Water Tassel Fern	<i>Phlegmariurus marsupiiiformis</i> syn <i>Phlegmariurus delbrueckii</i>	V	V
Mint Bush	<i>Prostanthera clotteniana</i>	CE	E
-	<i>Tephrosia leveillei</i>	V	V
-	<i>Triplarina nitchaga</i>	V	V
Cooktown Orchid	<i>Vappodes lithocola</i> syn <i>Dendrobium biggibum</i>	E	E
-	<i>Vincetoxicum rupicola</i>	E	E
Key: Ex: Extinct; CE: Critically Endangered; E: Endangered; V: Vulnerable; NT: Near Threatened			

4.0 Field Survey Results

A field investigation was undertaken over a single day on the 31 August 2022. The entire proposed alignment and an additional 100 m buffer (clearance impact area) was traversed on foot by a botanist (Ryan Hughes). The purpose was to assess the ecological condition of the clearance impact area and provide information on the following:

- ▶ Presence of any threatened flora populations or individuals.
- ▶ Presence of invasive weed species and the likely impact on threatened flora habitat values.
- ▶ Determine the presence of any regulated vegetation (VMA 1999) and/or threatened ecological communities (EPBC Act 1999).

4.1 Vegetation Communities

The vegetation throughout much of the clearance impact area (CIA) was consistent remnant vegetation (category B). The entire study area was located on steep metamorphic hills with surface rock occasionally present (see **Plate 1**). Elevation ranged from ~740 m to ~830 m asl. A single vegetation type/ regional ecosystem was recorded across the entire clearing impact area (RE 9.11.10) (see **Figure 2** & **Plate 2**).

The dominant canopy component consisted of *Eucalyptus crebra*, *E. cloeziana*, *Corymbia citriodora* subsp. *citriodora*, *C. clarksoniana* open forest to 20 m. Some *E. cloeziana* trees had a diameter at breast height (DBH) of up to 80 cm which was a clear indication of the remnant status of vegetation in this area. The average DBH across the clearance impact area for canopy species was ~30 cm. An understory of *Callitris intratropica*, *Grevillea glauca*, *G. parallela* and *Acacia disparrima* (5-10m) was consistently present. A sparse low shrub layer was present consisting of *Lamprolobium fruticosum*, *Acacia calyculata* and *Stylosanthes spp.* (0.5-1m). A dense grassy ground layer consisted of *Themeda triandra*, *Arundinella setosa*, *Heteropogon spp.* and *Cymbopogon refractus*. Some steep rocky slopes were observed with a sparse grassy layer dominated by *Cleistochloa subjuncea*, these areas had low soil nutrient levels and a high rock content was present on the ground surface which can reduce fire intensity. In these specific locations additional efforts were applied for searching for threatened species which are generally associated with this specific habitat niche.

Impacts of grazing were moderate with weed incursions related to grazing disturbance. Much of the clearing impact area had *Stylosanthes spp.* present in the shrub and ground layer. Weed cover was mostly associated with ephemeral waterways that dissected the clearing impact area.

Plate 1. Metamorphic Surface Rock Indicating Correct Land Zone Within the Clearance Impact Area



Plate 2. Vegetation Community Present Within the Clearance Impact Area (RE 9.11.10)



4.2 Flora

A total of 112 flora species were recorded within the clearing impact area (see **Table 3**). A total of 95 species were considered native and 17 were non-native weeds (15%). The weed cover was mostly represented by ground layer herbs and grasses and was present continuously throughout all areas of the survey area.

4.3 Site EVNT Flora

The timed meander survey did not record any EVNT flora species within the project alignment and associated 100 m buffer. No threatened flora species are considered likely to occur based on the potential occurrence assessment provided in **Appendix B**.

4.4 Invasive Weeds

Of the 16 species encountered during the survey, all were encountered within the ground layer which had been impacted by grazing or the construction of road cuttings.

No Weeds of National Significance (WoNS) species were recorded during the survey.

No prohibited invasive weeds listed under the *Biosecurity Act 2014* were recorded during the survey

No restricted invasive *Biosecurity Act 2014* species were recorded during the survey.

Table 3. List of all Flora Species Recorded During the Timed Meander Survey

Common Name	Species Name	NC Act	EPBC Act
Trees			
Hickory Wattle	<i>Acacia disparrima</i> subsp. <i>disparrima</i>	LC	-
Spotted Gum	<i>Corymbia citriodora</i> subsp. <i>citriodora</i>	LC	-
Cypress Pine	<i>Callitris intratropica</i>	LC	-
Clarkson's Bloodwood	<i>Corymbia clarksoniana</i>	LC	-
Dallachys Ghost Gum	<i>Corymbia dallachiana</i>	LC	-
Gum-topped Bloodwood	<i>Corymbia erythrophloia</i>	LC	-
Rusty Jacket	<i>Corymbia leichhardtii</i>	LC	-
Gympie Messmate	<i>Eucalyptus cloeziana</i>	LC	-
Narrow-leaved Ironbark	<i>Eucalyptus crebra</i>	LC	-
White Stringybark	<i>Eucalyptus portuensis</i>	LC	-
Blue Gum	<i>Eucalyptus tereticornis</i>	LC	-
Opposite Leaved Fig	<i>Ficus opposita</i>	LC	-
Clothes Peg Grevillea	<i>Grevillea glauca</i>	LC	-
Silver Oak	<i>Grevillea parallela</i>	LC	-
Silky Grevillea	<i>Grevillea pteridifolia</i>	LC	-

Common Name	Species Name	NC Act	EPBC Act
Bootlace Oak	<i>Hakea lorea</i> subsp. <i>lorea</i>	LC	-
-	<i>Lophostemon grandiflorus</i>	LC	-
Swamp Box	<i>Lophostemon suaveolens</i>	LC	-
Wild Pear	<i>Persoonia falcata</i>	LC	-
Corkwood Wattle	<i>Vachellia bidwillii</i>	LC	-
Shrub Layer			
-	<i>Acacia calyculata</i>	LC	-
Silver Wattle	<i>Acacia decora</i>	LC	-
-	<i>Acacia hemignosta</i>	LC	-
-	<i>Acacia nesophila</i>	LC	-
Red Ash	<i>Acacia falcata</i>	LC	-
Red Ash	<i>Alphitonia excelsa</i>	LC	-
Coffee Bush	<i>Breynia oblongifolia</i>	LC	-
Prickly Pine	<i>Bursaria incana</i>	LC	-
Wild Orange	<i>Capparis canescens</i>	LC	-
Medicine Bush	<i>Coelospermum reticulatum</i>	LC	-
Lollybush	<i>Clerodendrum longiflorum</i>	LC	-
Rattlepod	<i>Crotalaria lanceolata</i> subsp. <i>lanceolata</i>	*	*
-	<i>Daviesia filipes</i>	LC	-
Yellowberry Bush	<i>Denhamia cunninghamiana</i>	LC	-
Orange Boxwood	<i>Denhamia disperma</i>	LC	-
Brush Cherry	<i>Exocarpos cupressiformis</i>	LC	-
Dysentery Bush	<i>Grewia savannicola</i>	LC	-
-	<i>Grevillea dryandri</i>	LC	-
-	<i>Hibiscus meraukensis</i>	LC	-
Forest Indigo	<i>Indigofera pratensis</i>	LC	-
-	<i>Jacksonia thesioides</i>	LC	-
-	<i>Lamprolobium fruticosum</i>	LC	-
Quinine Bush	<i>Petalostigma pubescens</i>	LC	-
-	<i>Platysace valida</i>	LC	-
Purple Snakeweed	<i>Stachytarpheta jamaicensis</i>	*	*
Common Stylo	<i>Stylosanthes guianensis</i>	*	*
-	<i>Stylosanthes scabra</i>	*	*
-	<i>Tephrosia juncea</i>	LC	-
Woody pear	<i>Xylomelum scottianum</i>	LC	-

Common Name	Species Name	NC Act	EPBC Act
Epiphytes			
Apostle Mistletoe	<i>Dendrophthoe vitellina</i>	LC	-
Mistletoe	<i>Dendrophthoe homoplastica</i>	LC	-
Vines and Lianas			
-	<i>Desmodium rhytidophyllum</i>	LC	-
Scrambling lily	<i>Geitonoplesium cymosum</i>	LC	-
Wonga Vine	<i>Pandorea pandorana</i>	LC	-
Stinking Passionfruit	<i>Passiflora foetida</i>	*	*
Monkey Rope	<i>Parsonsia straminea</i>	LC	-
Ground Herbs			
Orange Spade Flower	<i>Afrohybanthus stellarioides</i>	LC	-
-	<i>Cheilanthes brownii</i>	LC	-
Rock Fern	<i>Cheilanthes sieberi</i>	LC	-
-	<i>Crotalaria brevis</i>	LC	-
Scurvy Weed	<i>Commelina ensifolia</i>	LC	-
-	<i>Coronidium newcastlianum</i>	LC	-
-	<i>Cyanthillium cinereum</i>	LC	-
Rusty Tick Tree-foil	<i>Desmodium rhytidophyllum</i>	LC	-
Blue Flax-lily	<i>Dianella caerulea</i>	LC	-
Winter Apple	<i>Eremophila debilis</i>	LC	-
Fleabane	<i>Erigeron bonariensis</i>	*	*
-	<i>Flemingia parviflora</i>	LC	-
	<i>Glycine clandestina</i>	LC	-
Glycine Pea	<i>Glycine tabacina</i>	LC	-
-	<i>Hovea nana</i>	LC	-
-	<i>Melichrus adpressus</i>	LC	-
Sensitive Weed	<i>Mimosa pudica</i>	*	*
-	<i>Poranthera microphylla</i>	LC	-
Praxelis	<i>Praxelis clematidea</i>	*	*
	<i>Pterocaulon spathaceus</i>	LC	-
	<i>Rhynchosia minima</i>	LC	-
	<i>Salvia plebeia</i>	*	*
	<i>Scoparia dulcis</i>	*	*
-	<i>Sida rhombifolia</i>	*	*
Flannel Weed	<i>Sida cordifolia</i>	*	*

Common Name	Species Name	NC Act	EPBC Act
-	<i>Tephrosia filipes</i>	LC	-
	<i>Tricoryne anceps</i>	LC	-
-	<i>Vittadinia</i> sp.	LC	-
-	<i>Wahlenbergia queenslandica</i>	LC	-
-	<i>Zornia</i> sp.	LC	-
Sedges and Rushes			
Navua sedge	<i>Cyperus aromatica</i>	*	*
Rough Saw-sedge	<i>Gahnia aspera</i>	LC	-
Common Rush	<i>Juncus usitatus</i>	LC	-
-	<i>Lomandra confertifolia</i>	LC	-
Wattle Mat-rush	<i>Lomandra filiformis</i>	LC	-
Many-flowered Mat-rush	<i>Lomandra multiflora</i>	LC	-
Long leaved Mat-rush	<i>Lomandra longifolia</i>	LC	-
	<i>Scleria brownii</i>	LC	-
Grasses			
	<i>Aristida queenslandica</i>	LC	-
	<i>Arundinella setosa</i>	LC	-
	<i>Cleistochloa subjuncea</i>	LC	-
Barbed-wire Grass	<i>Cymbopogon refractus</i>	LC	-
Wiry Panic	<i>Entolasia stricta</i>	LC	-
Brown's Lovegrass	<i>Eragrostis brownii</i>	LC	-
-	<i>Eragrostis schultzei</i>	LC	-
Black Spear Grass	<i>Heteropogon contortus</i>	LC	-
Giant Spear Grass	<i>Heteropogon triticeus</i>	LC	-
Blady Grass	<i>Imperata cylindrica</i>	LC	-
Molasses Grass	<i>Melinis minutiflora</i>	*	*
Red natal	<i>Melinis repens</i>	*	*
Giant Cane Grass	<i>Mnesithea rottboellioides</i>	LC	-
Two-colour Panic	<i>Panicum simile</i>	LC	-
Rats Tail Grass	<i>Sporobolus jacquemontii</i>	*	*
Kangaroo Grass	<i>Themeda triandra</i>	LC	-
Grader Grass	<i>Themeda quadrivalvis</i>	*	*
Signal Grass	<i>Urochloa decumbens</i>	*	*
NT: Near Threatened <i>NC Act 1992</i> LC: Least Concern <i>NC Act 1992</i> * Denotes invasive species			

5.0 Conclusion

The Protected Plant Survey undertaken on Wednesday 31 August 2022, within the planned Summerhill Pit, within ML 20547. The survey concluded that there were not any threatened or near threatened flora, listed under the EPBC Act 1999 or the NC Act 1992, present on site at the time of survey.

5.1 General Requirements

A copy of this report and a completed Exempt Clearing Notification (protected plants) form must be submitted to the Department of Environment and Science (DES) at least one (1) week prior to planned vegetation clearance and no more than 12 months after the completion of the PPS (31 August 2022).

Due to the absence of any protected plant individuals or populations within the clearing impact area, a protected plant clearing permit is **NOT** required prior to clearing commencing.

6.0 Suitably Qualified Person

Ryan is recognised as a suitably qualified person by the Qld Department of Environment and Science and has regularly performed the role of project lead in Protected Plant Surveys in the last five (5) years. Ryan has graduated with a Bachelor of Science (Hons I) Griffith University Queensland 2008 and has worked as a Field Ecologist and Botanist since that time. He has been working as a full time Ecological Consultant for the past 8 years. He has formal training in plant taxonomy and ecology from both his tertiary qualifications and completion of an Advanced Botanical Identification post-graduate course with UNSW. He is an experienced leader, specialising in flora surveys, ecological assessment and monitoring, vegetation mapping, threatened flora translocation and site rehabilitation. He has been involved in threatened flora surveys across the NSW Mid-north Coast, Southeast Queensland, Brigalow Belt North, Wet Tropics, Einasleigh Uplands, Cape York Peninsular and the Darwin Coastal Bioregion.

The ability to identify flora in a range of habitats, understand their ecology and how this may be impacted (directly and indirectly) by an activity or development proposal is a core part of Ryan's profession and expertise. He has detected highly cryptic threatened species including *Acacia purpureopetala*, *Acacia attenuata*, *Macrozamia pauli-guilielmi* and *Prostanthera clotteniana* during site investigations and routinely assesses sites for the presence of threatened species from major urban growth projects to highway upgrades and other linear infrastructure.

Ryan has the necessary skills to undertake a wide array of ecological surveys including vegetation community mapping, identification and condition assessments, baseline monitoring surveys, bio-condition assessments, threatened species/ community identification and management.

An assessment of Ryan Hughes' skills and experience against the self-assessment criteria provided in the guideline is presented in **Table 4** below. To be determined a suitably qualified person a minimum total of 100 points is required.

Table 4. Details of Suitably Qualified Person

Component 1- Qualification Knowledge and Ability	Conditions	Points Allocated
A relevant qualification from a recognised institution that results in a thorough knowledge of plant identification and flora surveys	Bachelor of Science – Terrestrial Ecology Griffith University Gold Coast Queensland Focused	50 points
Component 2: Field Experience		
Experience within the last two years and a total of at least 5 years leading flora surveys in a field-based environment at a rate of no less than 5 comprehensive botanical surveys that focus on locating and identifying <i>threatened plant</i> or <i>near threatened plant</i> .	Qld based field flora surveys. Ryan Hughes has been undertaking the lead role in flora surveys	60 points
Number of plant specimens that have been collected by the suitably qualified person that have been retained/ incorporated into the Queensland herbarium collection.	5 points per 5 plant specimens retained/ incorporated to a maximum of 40 points	15 points
Total points	Must be greater than 100 points	125 points

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Appendix A Regulated Vegetation Report



Vegetation management report

For Lot: 230 Plan: AP4557

15/09/2022

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 230 Plan: AP4557, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
230	AP4557	Lands Lease	70,000,000

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 230 Plan: AP4557, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Tablelands Regional

Bioregion(s)	Subregion(s)
Einasleigh Uplands	Herberton - Wairuna

Catchment(s)
Herbert
Mitchell

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at

<https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions>.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at

<https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes>

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at

<https://apps.dnrm.qld.gov.au/vegetation/>

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.

<https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans>

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at

<https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development>

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:

Phone 135VEG (135 834)

Email vegetation@resources.qld.gov.au

Visit <https://www.resources.qld.gov.au/?contact=vegetation> to submit an online enquiry.

3. Vegetation management framework for Lot: 230 Plan: AP4557

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 6976.13ha

Vegetation category	Area (ha)
Category B	6649.0
Category C	< 0.1
Category R	100.4
Category Water	37.5
Category X	189.2

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

There is no Property Map of Assessable Vegetation (PMAV) present on this property.

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at

<https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/>

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
9.11.10	Least concern	B	3,893.69	Eucalyptus cloeziana, Corymbia citriodora subsp. citriodora, E. portuensis and E. cullenii mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks	Sparse
9.11.10	Least concern	C	0.05	Eucalyptus cloeziana, Corymbia citriodora subsp. citriodora, E. portuensis and E. cullenii mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks	Sparse
9.11.10	Least concern	R	56.58	Eucalyptus cloeziana, Corymbia citriodora subsp. citriodora, E. portuensis and E. cullenii mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks	Sparse
9.12.17	Least concern	B	721.43	Eucalyptus atrata +/- Corymbia citriodora subsp. citriodora +/- E. portuensis woodland on mountains and hills on igneous rocks	Sparse
9.12.17	Least concern	R	2.12	Eucalyptus atrata +/- Corymbia citriodora subsp. citriodora +/- E. portuensis woodland on mountains and hills on igneous rocks	Sparse
9.12.20	Least concern	B	791.45	Eucalyptus pachycalyx +/- E. cloeziana +/- Corymbia leichhardtii woodland on steep igneous hills	Sparse
9.12.20	Least concern	R	2.12	Eucalyptus pachycalyx +/- E. cloeziana +/- Corymbia leichhardtii woodland on steep igneous hills	Sparse
9.12.30	Least concern	B	961.90	Corymbia leichhardtii and Eucalyptus cloeziana mixed woodland on igneous hills	Sparse
9.12.30	Least concern	R	2.83	Corymbia leichhardtii and Eucalyptus cloeziana mixed woodland on igneous hills	Sparse
9.3.15	Least concern	B	280.55	Eucalyptus tereticornis +/- Casuarina cunninghamiana +/- Melaleuca spp. fringing woodland on channels and levees	Sparse
9.3.15	Least concern	C	0.01	Eucalyptus tereticornis +/- Casuarina cunninghamiana +/- Melaleuca spp. fringing woodland on channels and levees	Sparse
9.3.15	Least concern	R	36.74	Eucalyptus tereticornis +/- Casuarina cunninghamiana +/- Melaleuca spp. fringing woodland on channels and levees	Sparse
non-rem	None	X	189.22	None	None
water	None	Water	37.46	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a

different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

Vegetation management wetlands are present on this property and are shown on the vegetation management supporting map in section 4.2 of this report.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

- 1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or
- 2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
6446	Corymbia rhodops	red-throated bloodwood	V	woodland to open forest with Eucalyptus and Corymbia spp.	500 to 1200 m	sand or loam, often shallow, derived from granite or metamorphic substrates	steep rocky or stony hill slope, stony ridge line

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
7946	Diuris oporina	northern white donkeys tails	NT	woodland of Eucalyptus portuensis and Corymbia citriodora; open woodland with Eucalyptus portuensis, E. granitica, Corymbia citriodora; open forest of Eucalyptus spp. with grassy or shrubby understorey, sometimes with Melaleuca sp. in seepage area	600 to 1100 m	grey clay loam	ridge line or hill slope in rocky rhyolite hills
13209	Grevillea glossadenia	None	V	woodland or open forest of Eucalyptus spp. and/or Corymbia spp. occasionally with open heathy understorey. Tree species frequently present include Eucalyptus cloeziana, E. pachycalyx, Corymbia leichhardtii and C. trachyphloia. Other species often present include Callitris intratropica, Corymbia abergiana, C. citriodora, C. dallachiana, E. crebra, E. granitica, E. portuensis and E. reducta	400 to 1100 m	shallow to skeletal, sand, gravelly sand, clay or rocky	hill slope, ridge line, gentle valley slope, creek bank and terrace
14873	Acacia purpureopetala	purple-flowered wattle	V	heathlands; shrublands; woodlands to open forests with Eucalyptus spp. and Corymbia spp.	700 to 1100 m	shallow stony derived from granite, rhyolite, metamorphic or sedimentary substrates	steep rocky hill slope, hill crest, rock outcrop, low hill

Label	Regional Ecosystem (mandatory unless otherwise specified)
6446	7.12.30, 7.12.57, 7.12.65, 9.11.10, 9.12.4, 9.12.20
7946	7.3.45, 7.12.27, 7.12.30, 7.12.53, 7.12.65, 9.12.7, 9.12.20
13209	7.11.51, 7.12.30, 7.12.34, 7.12.57, 7.12.58, 7.12.65, 9.11.2, 9.11.10, 9.12.7, 9.12.20
14873	7.12.30, 7.12.57, 7.12.65, 9.11.3, 9.11.10, 9.11.25, 9.12.20

3.6 Area Management Plan(s)

Area Management Plan for the control of pest plants in the Dry Tropics region

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

Class A (with urban areas masked as per SPP): 9.15ha

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 230 Plan: AP4557.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:

<https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form>

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new [property maps of assessable vegetation \(PMAV\)](#).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

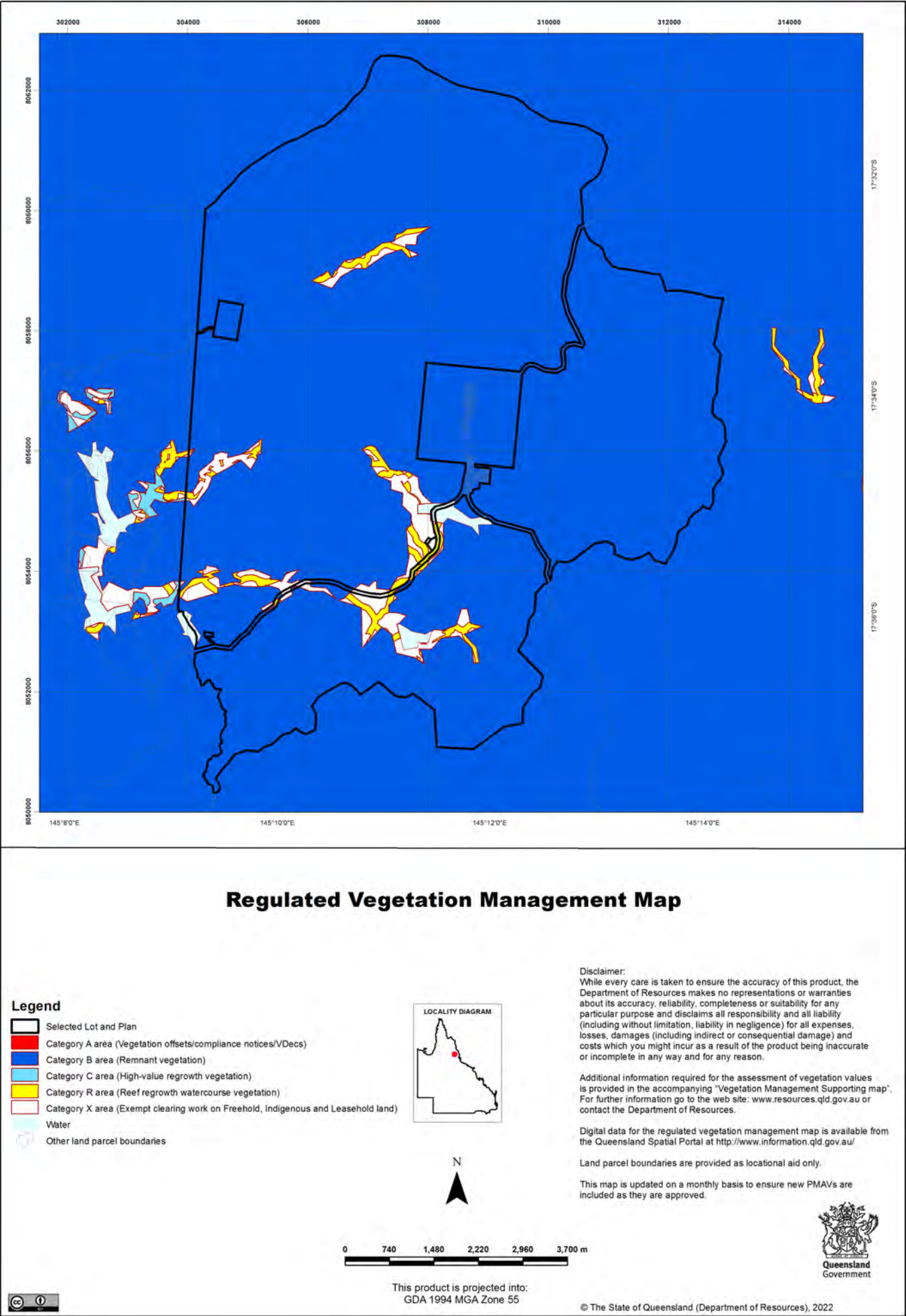
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

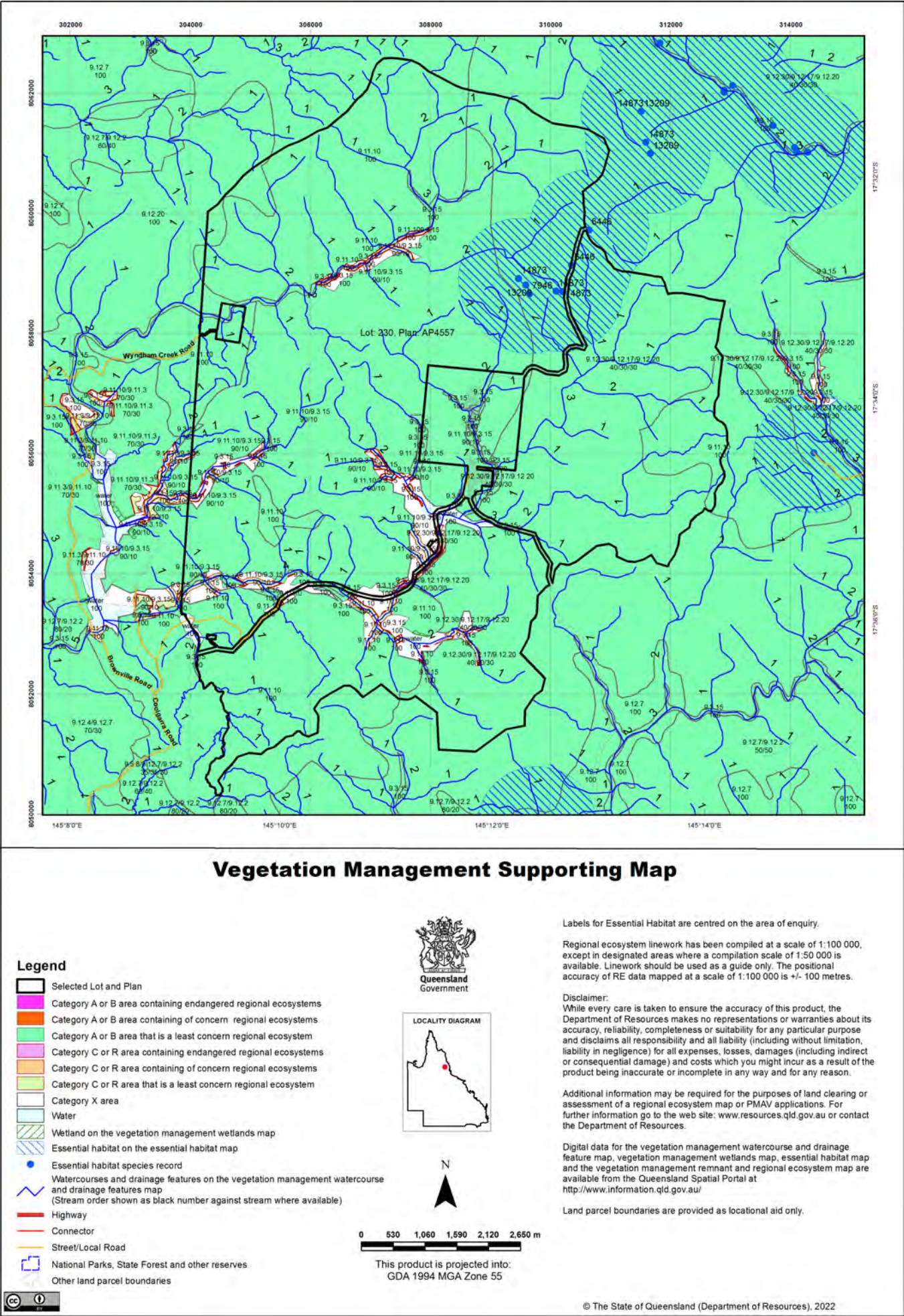
Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

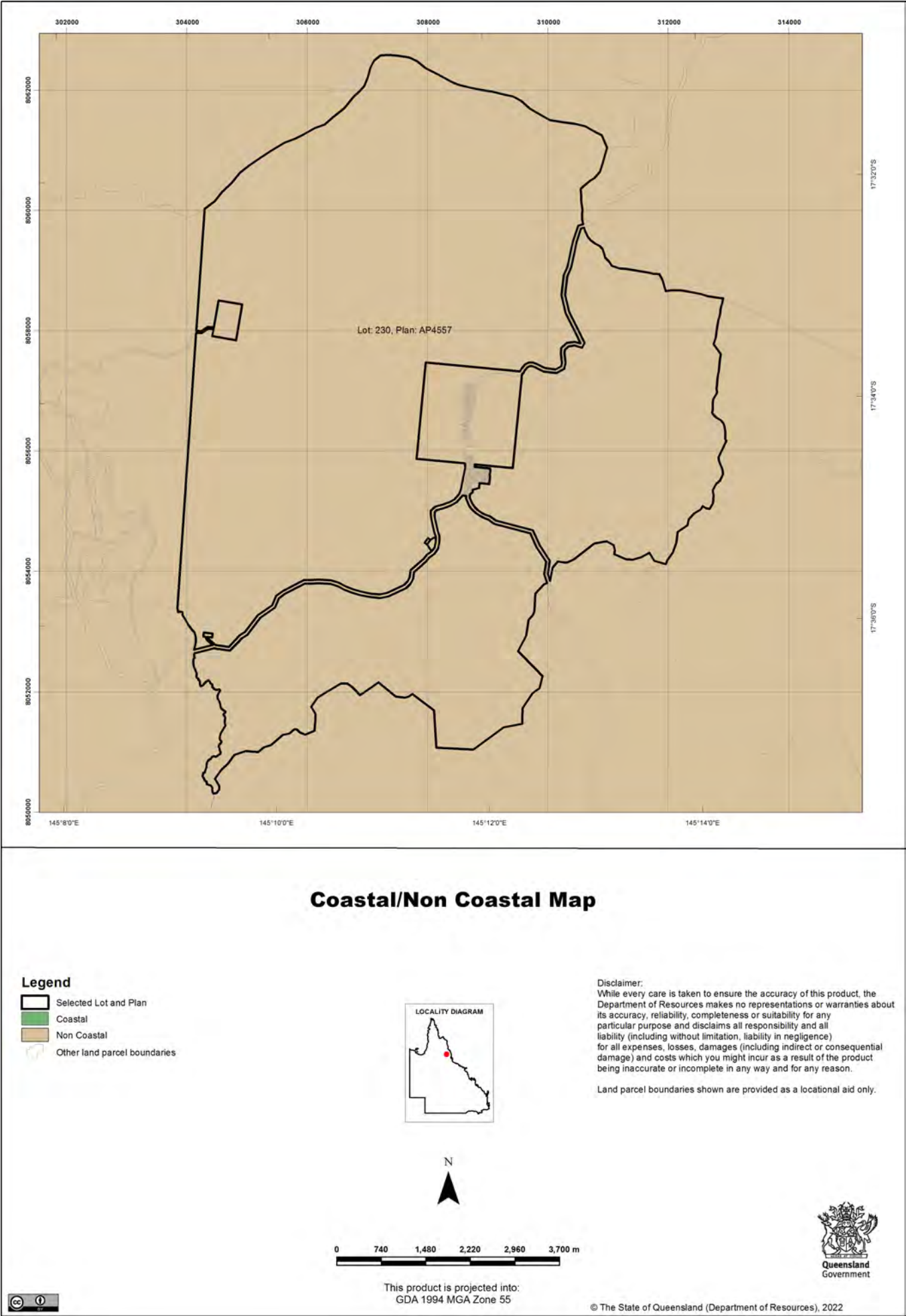
4.1 Regulated vegetation management map



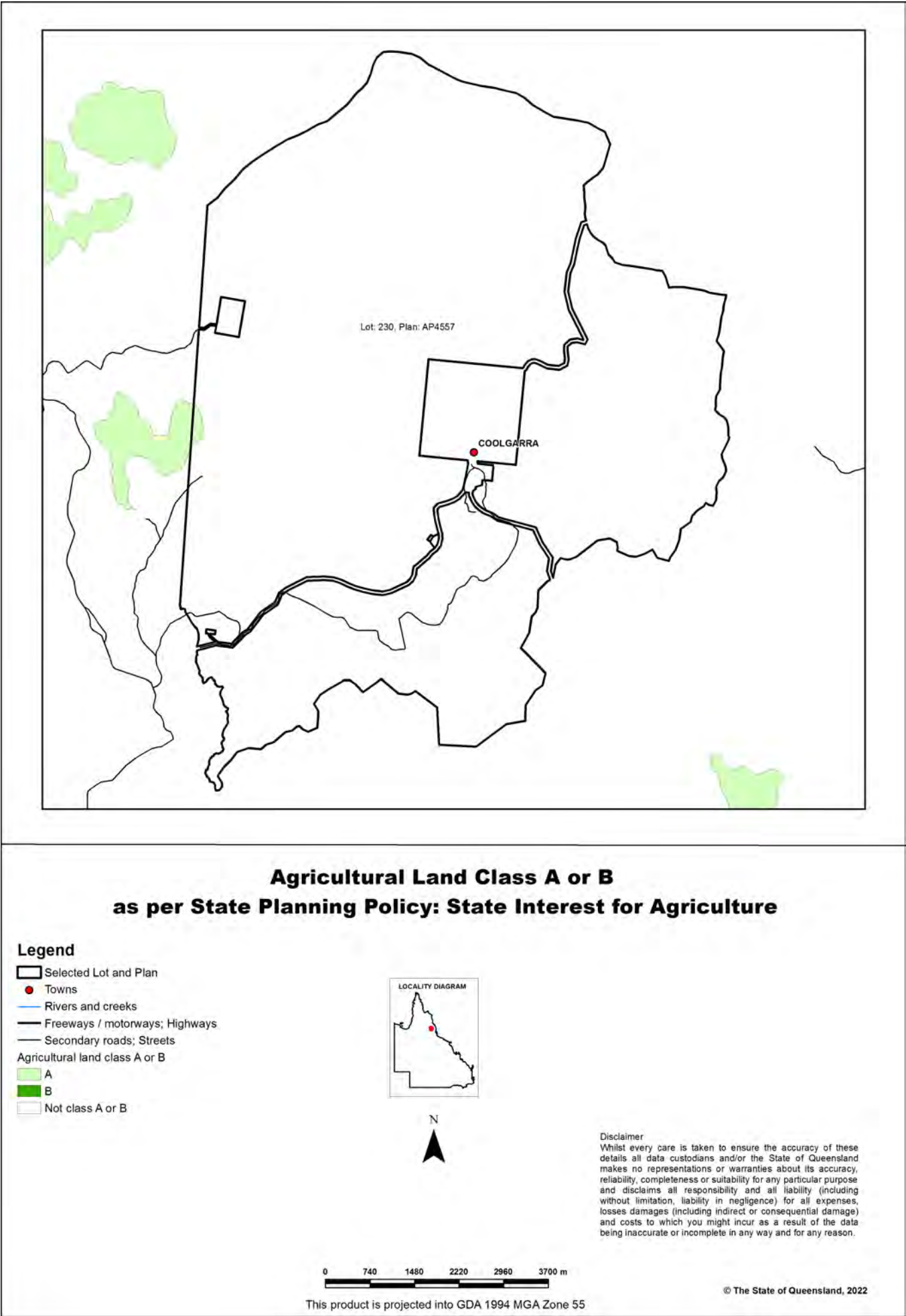
4.2 Vegetation management supporting map



4.3 Coastal/non-coastal map



4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the [Nature Conservation Act 1992](#) (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see [Operational policy: When a protected plant in Queensland is considered to be 'in the wild'](#)) that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the [Flora survey guidelines](#). The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An [exempt clearing notification form](#) must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the [clearing permit application form](#).

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:

Phone 1300 130 372 (and select option four)

Email palm@des.qld.gov.au

Visit <https://www.qld.gov.au/environment/plants-animals/plants/protected-plants>

5.5 Protected plants flora survey trigger map

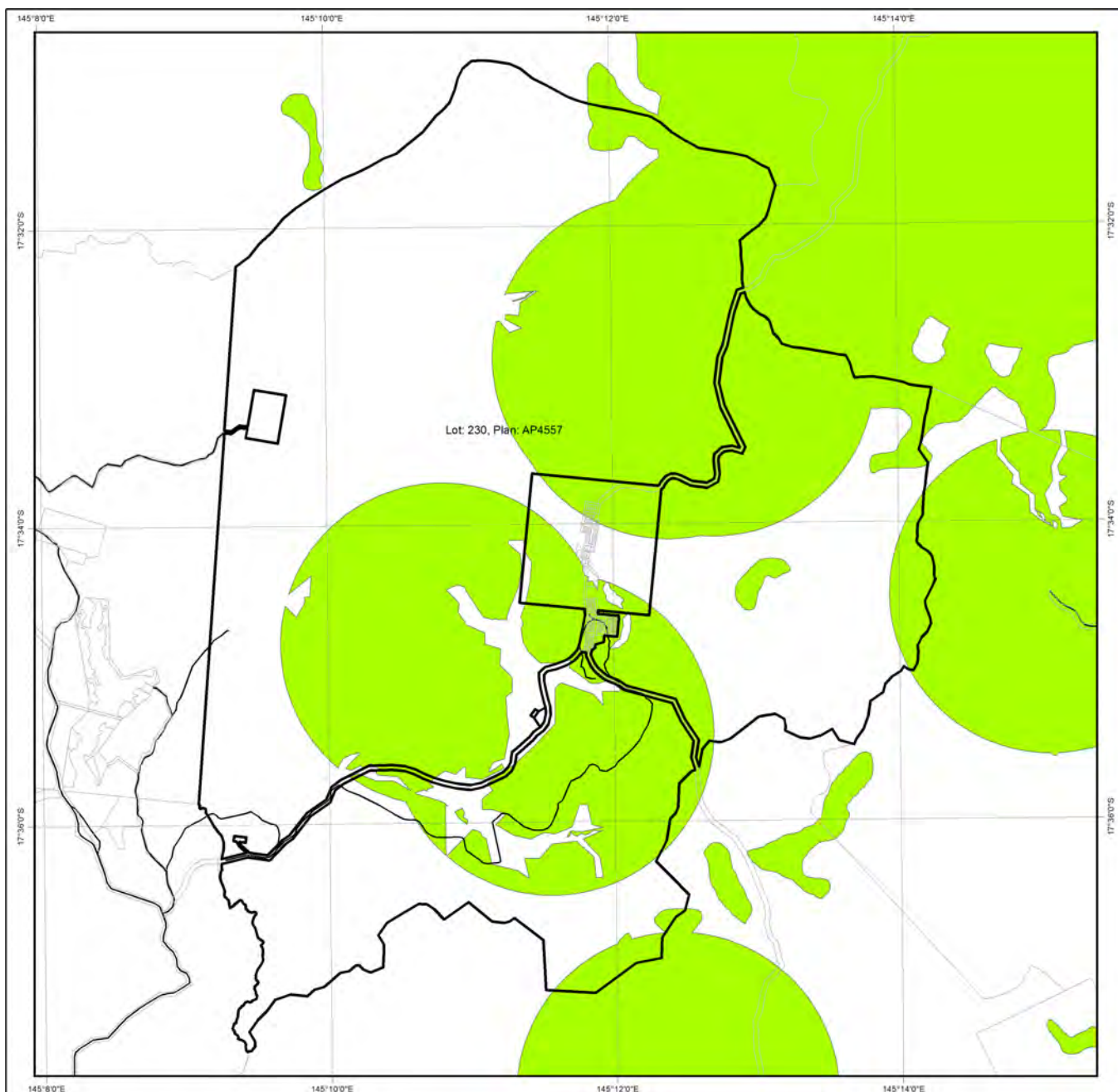
This map included may also be requested individually at: <https://apps.des.qld.gov.au/map-request/flora-survey-trigger/>.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the [Queensland Spatial Catalogue](#), the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the [clearing of protected plants](#) for more information.



Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets



0 490 980 1,470 1,960 2,450 m

This product is projected into:
GDA 1994 MGA Zone 55

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

Disclaimer:
While every care is taken to ensure the accuracy of the data used to generate this product, the Queensland Government makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaim all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damages) and costs which might be incurred as a consequence of reliance on the data, or as a result of the data being inaccurate or incomplete in any way and for any reason.

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as vulnerable by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document [Spatial modelling in South East Queensland](#).

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document [Guideline - Requests to make, amend or revoke a koala habitat area determination](#).

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: <https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps>. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:

<https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy>.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

- 1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
- 2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the [Planning Regulation 2017](#). More information on exempted development can be found here:

<https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy>.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
 - the local government planning scheme makes the development assessable;
 - the premises includes an area that is both a koala priority area and a koala habitat area; and
 - the development does not involve interfering with koala habitat (defined above); and
- development in identified koala broad-hectare areas.

The [Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks](#) outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the [Nature Conservation \(Koala\) Conservation Plan 2017](#) prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:

Phone 13 QGOV (13 74 68)

Email koala.assessment@des.qld.gov.au

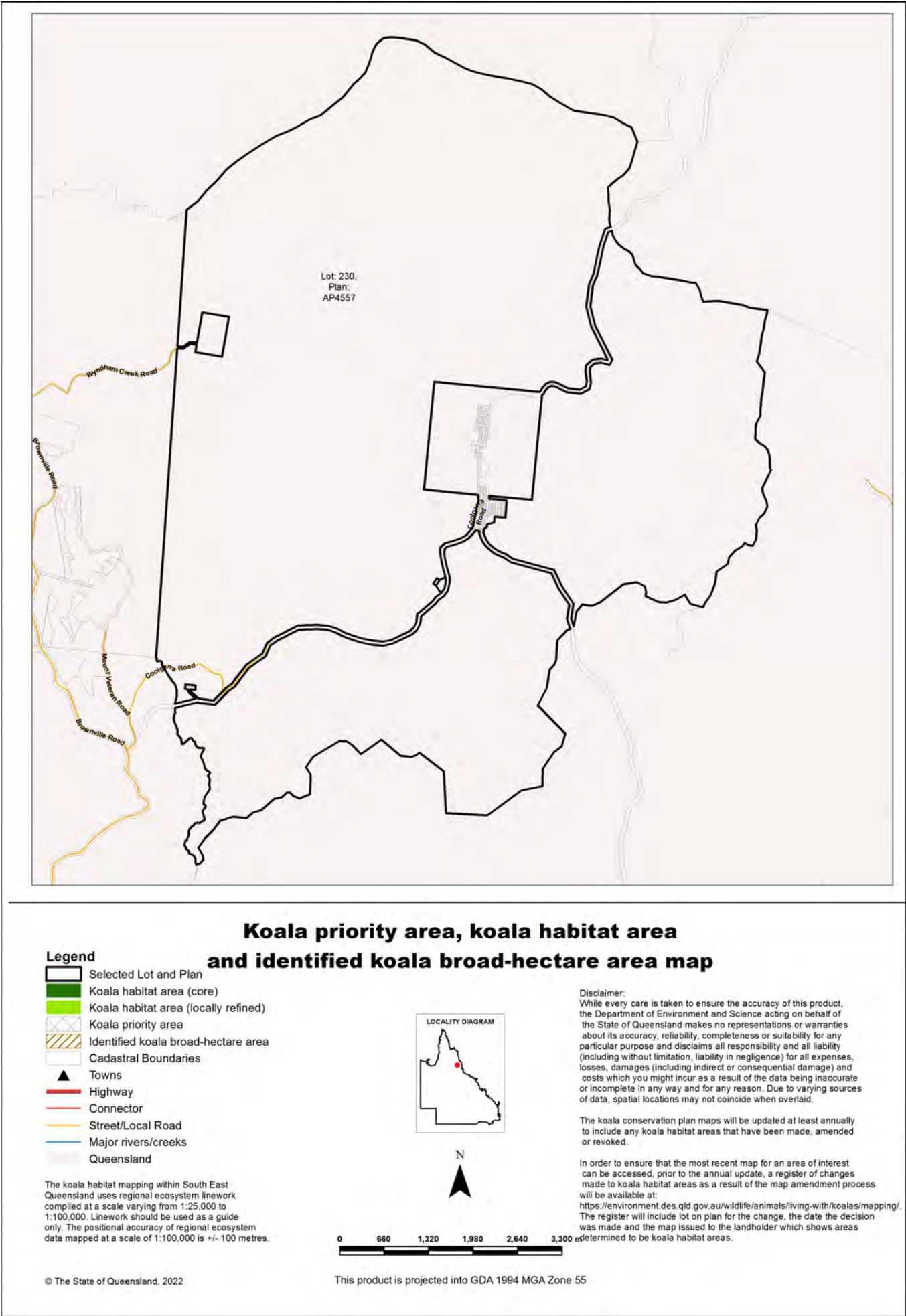
Visit <https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping>

7. Koala protection framework details for Lot: 230 Plan: AP4557

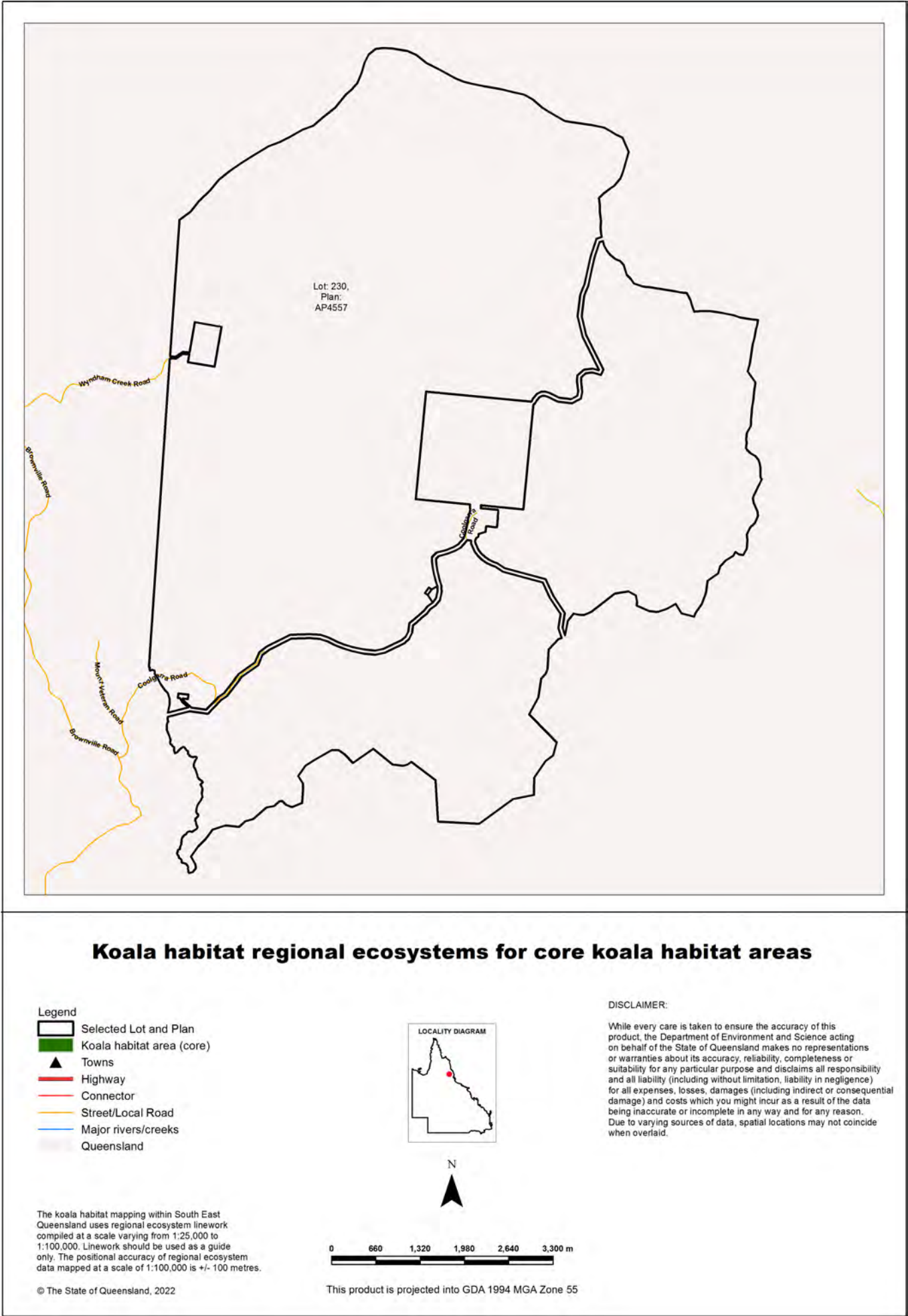
7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map



7.3 Koala habitat regional ecosystems for core koala habitat areas



8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	<i>Water Act 2000</i> <i>Soil Conservation Act 1986</i>	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	<i>Aboriginal Cultural Heritage Act 2003</i> <i>Torres Strait Islander Cultural Heritage Act 2003</i>	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	<i>Environmental Protection Act 1994</i> <i>Coastal Protection and Management Act 1995</i> <i>Queensland Heritage Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	<i>Nature Conservation Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	<i>Nature Conservation Act 1992</i>	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	<i>Fisheries Act 1994</i> <i>Forestry Act 1959</i>	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	<i>Environment Protection and Biodiversity Conservation Act 1999</i>	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	<i>Planning Act 2016</i> <i>State Development and Public Works Organisation Act 1971</i>	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	<i>Local Government Act 2009</i> <i>Planning Act 2016</i>	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	<i>Wet Tropics World Heritage Protection and Management Act 1993</i>	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au

Appendix B Potential Occurrence Assessment

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
PLANTS					
-	<i>Acacia longipedunculata</i>	-	NT	Restricted to the dry western slopes of the Herberton and Paluma Range (AVH 2022). Grows in shallow sandy and rocky soils in open forest, associated with <i>Corymbia abergiana</i> , <i>Eucalyptus cloeziana</i> , <i>C. citriodora</i> , <i>E. portuensis</i> , <i>Xanthorrhoea johnsonii</i> , <i>Grevillea glauca</i> (AVH 2022).	Unlikely The nearest record is located immediately south of the township of Irvinebank which has a similar landform and vegetation community as the clearance impact area (AVH 2022). The protected plant survey targeted this species directly.
Purple Acacia	<i>Acacia purpureopetala</i>	CE	V	A small sprawling shrub with purple flowers. It is confined to the Herberton-Irvinebank-Watsonville area, and from Mt Emerald, where it grows in small populations on ridges and mountain tops, usually above 800 m, in eucalypt woodland or heathland. It also occurs in disturbed areas, including roadsides and the faces and benches of mine sites (DCCEEW 2022a).	Unlikely This clearance impact area is outside the known extent for this species. The nearest record is located approximately 5 km to the NE in a similar vegetation community to the clearance impact area (<i>Eucalyptus cloeziana</i> woodland), however, the land form is mapped as granite (land zone 12).

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Aponogeton bullosus</i>	E	E	An aquatic plant restricted to the Wet Tropics bioregion, known to occur in cool, rapidly flowing freshwater rivers and streams (DCCEEW 2022b).	Unlikely Distinct lack of suitable habitat was present within the clearance impact area for this species. Generalised records (~10km) show no records west of the town of Millstream.
-	<i>Coleus amoenus</i>	-	V	An aromatic sub-shrub restricted to the region between Mt Emerald and Ravenshoe, where it occurs on granite and sandstone rock pavement, steep to precipitous slopes, and among boulders, in dry sclerophyll open forest and woodland (AVH, 2022).	Unlikely Records are generally located east of the Wild River ~15 km to the east. General lack of suitable landform is present within the clearance impact area.
-	<i>Commersonia reticulata</i> syn <i>Androcalva reticulata</i>	-	V	Erect shrub 30-100 cm in height. Tomentose young stems. Linear stipules at the base of petioles up to 7.5 cm in length. Leaf blades with an unequal base covered in stellate hairs (Wilkins & Whitlock 2011). <i>Androcalva reticulata</i> grows in mixed open forest or woodland, on shallow soils of grey sandy loam, on metamorphic hills and ranges, close to the scarp.	Unlikely The nearest record is located at ~9 km west on a similar landform and vegetation community as the clearance impact area (AVH 2022). The nearest record is within a similar vegetation community to the clearance impact area (<i>Eucalyptus cloeziana</i> woodland).

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
Red-throated Bloodwood	<i>Corymbia rhodops</i>	V	V	This species has been recorded from the Irvinebank-Herberton area west to Petford and north to the Mt Windsor Tableland. It is recorded growing on ridges or hill slopes with coarse sandy soils in dry sclerophyll forest with other eucalypt species including <i>E. cloeziana</i> , <i>E. mediocris</i> , <i>E. atrata</i> and <i>C. citriodora</i> (DCCEEW 2022c). In the Irvinebank-Herberton area, it has been recorded in association with <i>C. leichhardtii</i> , <i>E. lockyeri</i> , <i>E. pachycalyx</i> , <i>C. abergiana</i> and <i>E. portuensis</i> (AVH, 2018).	Unlikely This clearance impact area is outside the known extent for this species. The nearest record is located approximately 6 km to the NE in a similar vegetation community to the clearance impact area (<i>Eucalyptus cloeziana</i> woodland), however, the land form is mapped as granite (land zone 12)
A cycad	<i>Cycas platyphylla</i>	V	V	This cycad occurs in a very limited range in north Queensland, with populations occurring in the Petford district in the Atherton Tablelands region and 250 km South of Wandovale station. Both populations occur in grassy iron bark dominated woodlands (DES 2022a).	Unlikely Regional records are located near to the township of Petford, 35 km to the northwest of the clearance impact area. This species is highly distinctive in its open woodland habitat and was not recorded during the PPS survey.

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
Bluegrass	<i>Dichanthium setosum</i>	V	V	This grass species is known predominantly from New South Wales, however, scattered records occur across Queensland to near Laura on the Cape York Peninsular. This grass species grows on heavy black basalt soils and stony red-brown hard setting loam soils. Vegetation types where this species is found consists of grasslands, woodlands and cleared areas (DCCEW 2022d)	Unlikely No proximate records. Lack of suitable soils present within the clearance impact area.
-	<i>Diuris oporina</i>	-	NT	This species is found in dry sclerophyll grassy forests on rhyolite hills, ridges and slopes, in shallow stony soil (DES 2022b).	Unlikely Lack of suitable landform. Records all located to the east of the clearance impact area.
-	<i>Euphorbia carissoides</i>	V	V	This subshrub species is known primarily from the Georgetown to Stannary Hills area, where it grows in shrubland and low open woodland in shallow soil derived from sandstone, granite or rhyolite (DCCEW 2022).	Unlikely Lack of suitable landform (granite or sandstone) present. Records all located to the west (>20km) of the clearance impact area.

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Goodenia stirlingii</i>	-	V	A sub-shrub to 1.3 m tall, recorded from rocky granite and metamorphic substrates in dry sclerophyll forest, associated with <i>Corymbia abergiana</i> , <i>C. leichhardtii</i> , <i>Eucalyptus acmenoides</i> , <i>E. cloeziana</i> , <i>Allocasuarina inophloia</i> , <i>Xanthorrhoea johnsonii</i> , <i>Tricoryne anceps</i> (AVH, 2022).	Unlikely This clearance impact area is outside the known extent for this species. The nearest record is located approximately 12 km to the NE in a similar vegetation community to the clearance impact area (<i>Eucalyptus cloeziana</i> woodland), however, the land form is mapped as granite (land zone 12)
-	<i>Grevillea glossadenia</i>	V	V	This species grows in dry sclerophyll woodland and low open forest in shallow to skeletal granitic soils. It has been recorded from rolling hills, stream beds and in disturbed areas beside roads and tracks. It may favour disturbed sites, and has been associated with <i>Eucalyptus cloeziana</i> , <i>E. reducta</i> , <i>E. atrata</i> , <i>Corymbia abergiana</i> , <i>C. leichhardtii</i> , <i>C. citriodora</i> , <i>Callitris intratropica</i> , <i>Homoranthus porteri</i> and <i>Xanthorrhoea johnsonii</i> (DES 2022c).	Unlikely Two records located 2 km to the east of the clearance impact area on a similar landform, soil type and vegetation community. This species was thoroughly targeted during the PPS. This species is a large perennial shrub and is readily detectable throughout the year.

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Homoranthus porteri</i>	V	V	This shrub species occurs from the Mareeba region to the Paluma Range on and among rhyolite and sandstone rock pavement, outcrops, hillsides and scree slopes, in dry sclerophyll open woodland (DCCEEW 2022e).	Unlikely All records located to the northeast of the township of Millstream. Not known to occur on metamorphic landforms.
-	<i>Macropteranthes montana</i>	V	V	Shrub recorded in low woodland or vine thicket often associated with shallow soil comprised of limestone or granite parent material (DCCEEW 2022f).	Unlikely No proximate records. Nearest plant located on granite soils northwest of the township of Irvinebank.
-	<i>Melaleuca sylvana</i>	-	E	Records from the search radius indicate this species is found in heath, shrubland and vine thicket/woodland on rhyolite and among rock pavement, in association with <i>Callitris</i> sp., <i>Acacia umbellata</i> , <i>Micromyrtus</i> sp., <i>Acacia leptostachya</i> , <i>Corymbia abergiana</i> , <i>Allocasuarina inophloia</i> and <i>Eucalyptus shirleyi</i> , among others (AVH, 2018).	Unlikely This clearance impact area is outside the known extent for this species. The nearest record is located approximately 12 km to the NE a similar vegetation community to the clearance impact area (<i>Eucalyptus cloeziana</i> woodland), however, the landform is mapped as granite (land zone 12).

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Melaleuca uxorum</i>	-	E	<i>Melaleuca uxorum</i> is a low growing shrub of restricted to montane heathland within the Atherton tablelands (Ford & Hardesty 2012).	Unlikely A disjunct population is located approximately 10 km to the NE of the clearance impact area. Potentially has been misidentified and may be an additional <i>M. sylvana</i> record.
Water Tassel Fern	<i>Phlegmariurus marsupiiiformis</i>	V	V	A tassel-fern found on rocks and trees in rainforest above 800 m elevation (DCCEEW 2022g).	Unlikely Distinct lack of suitable habitat present within the clearance impact area.
Mint Bush	<i>Prostanthera clotteniana</i>	CE	E	A small shrub to 1 m tall, found in dry woodlands on steep, rocky rhyolite hills. At Mt Emerald it occurs in a small, discrete population in a rocky, mostly treeless area on the side of a steep hill. Most records are from woodlands immediately to the west of Ravenshoe, with scattered records north to Mt Emerald. Little is known of its ecology, but it is likely to prefer acidic rocks (e.g., rhyolite) that weather to coarse sandy soils, and to be fire sensitive. Populations tend to be small (DCCEEW 2022h).	Unlikely All local records located immediately west of Ravenshoe. Distinct lack of rhyolitic landforms present within the proposed clearance impact area.

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Tephrosia leveillei</i>	V	V	This low growing perennial herb is known from an area between Chillagoe and Forty Mile Scrub National Park, west of Cairns. Another occurrence has been recorded further west near Ravenswood. This plant has been recorded growing on alluvial plains in eucalypt woodland (DCCEEW 2022i).	Unlikely No proximate records for this species. Nearest record located at Undara Volcanic National Park.
-	<i>Triplarina nitchaga</i>	V	V	A shrub known from two populations south of Ravenshoe, where it grows in open forest of <i>Syncarpia glomulifera</i> , <i>Eucalyptus resinifera</i> and <i>Leptospermum brachyandrum</i> near a creek, on granite outcrops, and on a rhyolite hillside and gully in open forest of <i>Corymbia citriodora</i> , <i>Eucalyptus acmenoides</i> , <i>Eucalyptus abergiana</i> , <i>Homoranthus porteri</i> and <i>Labichea nitida</i> (DCCEEW 2022j).	Unlikely Distinct lack of suitable habitat
Cooktown Orchid	<i>Vappodes lithocola</i> syn <i>Dendrobium biggibum</i>	E	E	A lithophytic orchid recorded from coastal ranges between Daintree and Cairns (DCCEEW 2022k).	Unlikely Distinct lack of suitable habitat

Common Name	Scientific Name	Status EPBC Act	Status NC Act	Preferred Habitat	Likelihood of Occurrence Within Project site
-	<i>Vincetoxicum rupicola</i>	E	E	This species is known to occur amongst rocks and grass, above permanent water, in grassy open forest associated with species such as <i>Allocasuarina torulosa</i> , <i>Corymbia rhodops</i> , <i>E. granitica</i> , <i>E. portuensis</i> and <i>Syncarpia glomulifera</i> (AVH, 2018; DOTEE, 2018).	Unlikely Distinct lack of suitable habitat

Appendix C Wildlife Online (NC Act 1992)



Queensland Government

WildNet species list

Search Criteria: Species List for a Specified Point
Species: Plants (including other non-animals such as fungi and protists)
Type: Native
Queensland status: Rare and threatened species
Records: All
Date: All
Latitude: -17.5762
Longitude: 145.1645
Distance: 20
Email: ryan@4ec.com.au
Date submitted: Friday 26 Aug 2022 15:09:56
Date extracted: Friday 26 Aug 2022 15:10:05

The number of records retrieved = 17

Disclaimer

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Information about your Species lists request is logged for quality assurance, user support and product enhancement purposes only.

The information provided should be appropriately acknowledged as being derived from WildNet database when it is used. As the WildNet Program is still in a process of collating and vetting data, it is possible the information given is not complete. Go to the WildNet database webpage (<https://www.qld.gov.au/environment/plants-animals/species-information/wildnet>) to find out more about WildNet and where to access other WildNet information products approved for publication. Feedback about WildNet species lists should be emailed to wildlife.online@des.qld.gov.au.

Kingdom	Class	Family	Scientific Name	Common Name	I	Q	A	Records
plants	land plants	Apocynaceae	<i>Vincetoxicum rupicola</i>			E	E	1/1
plants	land plants	Byttneriaceae	<i>Commersonia reticulata</i>			V		1/1
plants	land plants	Combretaceae	<i>Macropteranthes montana</i>			V	V	15/15
plants	land plants	Cycadaceae	<i>Cycas platyphylla</i>			V	V	6/6
plants	land plants	Euphorbiaceae	<i>Euphorbia carissoides</i>			V	V	1/1
plants	land plants	Goodeniaceae	<i>Goodenia stirlingii</i>			V		8/8
plants	land plants	Lamiaceae	<i>Coleus amoenus</i>			V		2/2
plants	land plants	Lamiaceae	<i>Prostanthera clotteniana</i>			E	CE	1/1
plants	land plants	Leguminosae	<i>Acacia longipedunculata</i>			NT		18/18
plants	land plants	Leguminosae	<i>Acacia purpureopetala</i>	purple-flowered wattle		V	CE	36/36
plants	land plants	Myrtaceae	<i>Corymbia rhodops</i>	red-throated bloodwood		V	V	12/12
plants	land plants	Myrtaceae	<i>Homoranthus porteri</i>			V	V	3/3
plants	land plants	Myrtaceae	<i>Melaleuca sylvana</i>			E		7/7
plants	land plants	Myrtaceae	<i>Melaleuca uxorum</i>			E		2/2
plants	land plants	Myrtaceae	<i>Triplarina nitchaga</i>			V	V	3/3
plants	land plants	Orchidaceae	<i>Diuris oporina</i>	northern white donkeys tails		NT		7/7
plants	land plants	Proteaceae	<i>Grevillea glossadenia</i>			V	V	31/31

CODES

I - Y indicates that the taxon is introduced to Queensland and has naturalised.

Q - Indicates the Queensland conservation status of each taxon under the *Nature Conservation Act 1992*.

The codes are Extinct (EX), Extinct in the Wild (PE), Critically Endangered (CR), Endangered (E), Vulnerable (V), Near Threatened (NT), Special Least Concern (SL) and Least Concern (C).

A - Indicates the Australian conservation status of each taxon under the *Environment Protection and Biodiversity Conservation Act 1999*.

The values of EPBC are Extinct (EX), Extinct in the Wild (XW), Critically Endangered (CE), Endangered (E), Vulnerable (V) and Conservation Dependent (CD).

Records - The first number indicates the total number of records of the taxon (wildlife records and species listings for selected areas).

This number is output as 99999 if it equals or exceeds this value. A second number located after a / indicates the number of specimen records for the taxon.

This number is output as 999 if it equals or exceeds this value.

Appendix D Protected Matters Search Tool (EPBC Act 1999)



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 26/08/22 15:08:53

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

No Image
Available

This map may contain data which are
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[Coordinates](#)

[Buffer: 20.0Km](#)

No Image
Available

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	34
Listed Migratory Species:	19

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	25
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	26
Nationally Important Wetlands:	1
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat likely to occur within area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Turnix olivii Buff-breasted Button-quail [59293]	Endangered	Species or species habitat likely to occur within area
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat may occur within area
Frogs		
Litoria dayi Australian Lace-lid, Lace-eyed Tree Frog, Day's Big-eyed Treefrog [86707]	Vulnerable	Species or species habitat may occur within area
Pseudophryne covacevichae Magnificent Brood Frog [64385]	Vulnerable	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Hipposideros semoni Semon's Leaf-nosed Bat, Greater Wart-nosed Horseshoe-bat [180]	Vulnerable	Species or species habitat may occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Mesembriomys gouldii rattoides Black-footed Tree-rat (north Queensland), Shaggy Rabbit-rat [87620]	Vulnerable	Species or species habitat likely to occur within area
Petauroides minor Greater Glider (northern), Greater Glider (north-eastern Queensland) [92008]	Vulnerable	Species or species habitat known to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat likely to occur within area
Pteropus conspicillatus Spectacled Flying-fox [185]	Endangered	Species or species habitat known to occur within area
Rhinolophus robertsi Large-eared Horseshoe Bat, Greater Large-eared Horseshoe Bat [87639]	Vulnerable	Species or species habitat likely to occur within area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat may occur within area
Plants		
Acacia purpureopetala Purple-flowered Wattle [61156]	Critically Endangered	Species or species habitat known to occur within area
Aponogeton bullosus [8299]	Endangered	Species or species habitat likely to occur within area
Corymbia rhodops [64015]	Vulnerable	Species or species habitat known to occur within area
Cycas platyphylla a cycad [55796]	Vulnerable	Species or species habitat known to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphorbia carissoides [12431]	Vulnerable	Species or species habitat likely to occur within area
Grevillea glossadenia [7979]	Vulnerable	Species or species habitat known to occur within area
Homoranthus porteri [55196]	Vulnerable	Species or species habitat known to occur within area
Macropteranthes montana [9003]	Vulnerable	Species or species habitat known to occur within area
Phlegmariurus marsupiiiformis Water Tassel-fern [86553]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Prostanthera clotteniana [76165]	Critically Endangered	Species or species habitat known to occur within area
Tephrosia leveillei [16946]	Vulnerable	Species or species habitat may occur within area
Triplarina nitchaga [64593]	Vulnerable	Species or species habitat likely to occur within area
Vappodes lithocola Dwarf Butterfly Orchid, Cooktown Orchid [78893]	Endangered	Species or species habitat known to occur within area

Listed Migratory Species

[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Marine Species		
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Cuculus optatus Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]		Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area

Name	Threatened	Type of Presence
Calidris acuminata Sharp-tailed Sandpiper [874]	Critically Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]		Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]	Not Threatened	Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]	
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.			
Name	Threatened	Type of Presence	
Birds			
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area	
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area	
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area	
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area	
Calidris ferruginea Curlew Sandpiper [856]		Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]			Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]			Species or species habitat may occur within area

Name	Threatened	Type of Presence
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]	Vulnerable	Species or species habitat known to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat may occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Monarcha melanopsis Black-faced Monarch [609]	Critically Endangered	Species or species habitat likely to occur within area
Monarcha trivirgatus Spectacled Monarch [610]		Species or species habitat known to occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Endangered*	Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat known to occur within area
Rhipidura rufifrons Rufous Fantail [592]		Species or species habitat known to occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]		Species or species habitat likely to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat may occur within area
Reptiles		
Crocodylus johnstoni Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves		[Resource Information]
Name		State
Evelyn Creek		QLD
Wyndham Sandy Creek		QLD

Invasive Species[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Anas platyrhynchos Mallard, Northern Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Lonchura punctulata Nutmeg Mannikin [399]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove, Spotted Dove [780]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Frogs		
Rhinella marina Cane Toad [83218]		Species or species habitat known to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Plants		
Acacia nilotica subsp. indica Prickly Acacia [6196]		Species or species habitat may occur within area
Asparagus plumosus Climbing Asparagus-fern [48993]		Species or species habitat likely to occur within area
Cabomba caroliniana Cabomba, Fanwort, Carolina Watershield, Fish Grass, Washington Grass, Watershield, Carolina Fanwort, Common Cabomba [5171] Cryptostegia grandiflora Rubber Vine, Rubbervine, India Rubber Vine, India Rubbervine, Palay Rubbervine, Purple Allamanda [18913] Hymenachne amplexicaulis Hymenachne, Olive Hymenachne, Water Stargrass, West Indian Grass, West Indian Marsh Grass [31754]		Species or species habitat likely to occur within area
Jatropha gossypifolia Cotton-leaved Physic-Nut, Bellyache Bush, Cotton-leaf Physic Nut, Cotton-leaf Jatropha, Black Physic Nut [7507] Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892] Parthenium hysterophorus Parthenium Weed, Bitter Weed, Carrot Grass, False Ragweed [19566]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Reptiles		
Hemidactylus frenatus Asian House Gecko [1708]		Species or species habitat likely to occur within area
Lepidodactylus lugubris Mourning Gecko [1712]		Species or species habitat likely to occur within area
Nationally Important Wetlands		[Resource Information]

Name	State
Innot Hot Springs	QLD

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-17.57636 145.16468

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [Office of Environment and Heritage, New South Wales](#)
- [Department of Environment and Primary Industries, Victoria](#)
- [Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [Department of Environment, Water and Natural Resources, South Australia](#)
- [Department of Land and Resource Management, Northern Territory](#)
- [Department of Environmental and Heritage Protection, Queensland](#)
- [Department of Parks and Wildlife, Western Australia](#)
- [Environment and Planning Directorate, ACT](#)
- [Birdlife Australia](#)
- [Australian Bird and Bat Banding Scheme](#)
- [Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [Museum Victoria](#)
- [Australian Museum](#)
- [South Australian Museum](#)
- [Queensland Museum](#)
- [Online Zoological Collections of Australian Museums](#)
- [Queensland Herbarium](#)
- [National Herbarium of NSW](#)
- [Royal Botanic Gardens and National Herbarium of Victoria](#)
- [Tasmanian Herbarium](#)
- [State Herbarium of South Australia](#)
- [Northern Territory Herbarium](#)
- [Western Australian Herbarium](#)
- [Australian National Herbarium, Canberra](#)
- [University of New England](#)
- [Ocean Biogeographic Information System](#)
- [Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [Geoscience Australia](#)
- [CSIRO](#)
- [Australian Tropical Herbarium, Cairns](#)
- [eBird Australia](#)
- [Australian Government – Australian Antarctic Data Centre](#)
- [Museum and Art Gallery of the Northern Territory](#)
- [Australian Government National Environmental Science Program](#)
- [Australian Institute of Marine Science](#)
- [Reef Life Survey Australia](#)
- [American Museum of Natural History](#)
- [Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

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PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 2 – EA EPVL00864413

Permit

Environmental Protection Act 1994

Environmental authority EPVL00864413

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPVL00864413

Environmental authority takes effect on 22 July 2022

Environmental authority holder(s)

Name(s)	Registered address
MGT MINERALS PTY LTD	First Floor, Suite 6 119A John Street CABRAMATTA NSW 2166

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
ERA 31 - Mineral processing 2: Processing, in a year, the following quantities of mineral products, other than coke (a) 1000t to 100,000t Schedule 3 19: Mining metal ore, other than a metal ore mentioned in items 11, 12, 14, 15, 16, 17 or 18	ML20547, ML4349

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

- a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or
- b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or
- c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Planning Act 2016* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.



Dean Sharpe
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Enquiries:
Minerals Business Centre
PO Box 7230, Cairns QLD 4870
Phone: (07) 4222 5352
Email: escairns@des.qld.gov.au

Date issued: 22 July 2022

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Conditions of environmental authority

Schedule A - General

- A1 This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
- A2 Contaminants with the potential to cause environmental harm must not be released directly or indirectly to the receiving environment, except as permitted under the conditions of this environmental authority.
- A3 The environmental authority holder must ensure that the activity is carried out in accordance with **Table A1 – Authorised mining activities and locations** and the locations detailed in **Schedule I – Map 1 Location of authorised disturbance** and **Map 2 - Location of authorised disturbance around the TSF**.

Table A1 – Authorised mining activities and locations

Mine Domain	Mine feature name	Location (centroid) (MGA94 Zone 55)		Maximum disturbance area (ha)
		Latitude	Longitude	
Mine area	Dalcouth Pit	17°34.582'S	145°9.241'E	4.7
	Summerhill Pit	17°34.605'S	145°9.942'E	3.79
	Waste Dump	17°34.622'S	145°9.179'E	6.0
	Work area between pit and waste dump	17°34.610'S	145°9.206'E	0.9
	Transport infrastructure	17°34.651'S	145°9.230'E	0.3
	Office and Camp	17°34.726'S	145°9.281'E	0.5
	Process Plant	17°34.771'S	145°9.378'E	1.6
	ROM Pad	17°34.757'S	145°9.454'E	0.6
Tailings Storage Facility (TSF)	Existing TSF	17°34.797'S	145°9.280'E	4.6
	New TSF	17°34.708'S	145°9.524'E	4.5
Haul and Access Roads	Haul road	17°34.625'S	145°9.223'E	0.1
	Other access roads	17°34.648'S	145°9.278'E	0.3
Water infrastructure	Clean water dam 1	17°34.531'S	145°9.574'E	7.1
	Clean water dam 2	17°34.642'S	145°9.334'E	14.4
	Process water ponds	17°34.688'S	145°9.452'E	0.2
	Settling pond	17°34.676'S	145°9.467'E	0.5
	Plant pond	17°34.795'S	145°9.342'E	0.4
Total				50.49

- A4 The holder of this environmental authority must install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority;
- (a) Maintain such measures, plant and equipment in a proper and efficient condition;
 - (b) Operate such measures, plant and equipment in a proper and efficient manner; and
 - (c) Ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.

Monitoring

- A5 Except where specified in another condition of this environmental authority, all monitoring data, records and reports required by this environmental authority or related to environmental management of the activities must be:
- (a) Carried out by an appropriately qualified person;
 - (b) Kept for a period of not less than five years; and
 - (c) Provided to the administering authority in the specified format within 10 business days of a request.
- A6 The following information must be recorded in relation to all monitoring required under the conditions of the environmental authority:
- (a) The date and time at which the sample was taken;
 - (b) The location or monitoring point at which the sample was taken;
 - (c) The results of all monitoring and details of any exceedances of the conditions of this environmental authority;
 - (d) Any other pertinent details of relevance to interpreting the sampling results (i.e stream flow, wind conditions or any unusual observations such as odour or colouration).

Financial assurance

- A7 Financial assurance must be lodged with the administering authority in the amount, the form and within the time required by the administering authority.

Risk management

- A8 The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management, 3 months prior to the commencement of mining activities.

Notification of emergencies, incidents and exceptions

- A9 The holder of this environmental authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.

Complaints

- A10 The holder of this environmental authority must record all environmental complaints received about the mining activities including:
- (a) Name, address and contact number of the complainant;
 - (b) Time and date of complaint;
 - (c) Reasons for the complaint;

- (d) Investigations undertaken;
- (e) Conclusions formed;
- (f) Actions taken to resolve the complaint;
- (g) Any abatement measures implemented; and
- (h) Person responsible for resolving the complaint.

Third-party reporting

A11 The holder of this environmental authority must:

- (a) Within one year of the commencement of this environmental authority, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority;
- (b) Obtain further such reports at regular intervals, not exceeding three-yearly intervals, from the completion of the report referred to above; and
- (c) Provide each report to the administering authority within 90 days of its completion.

Exploration

A12 All exploration activities carried out on the mining leases must comply with each of the standard environmental conditions contained in the latest version of the *Eligibility criteria and standard conditions for exploration and mineral development projects*.

End of Conditions for Schedule A

Schedule B – Air

General

- B1 Air emissions resulting from mining activities must not cause environmental harm to any sensitive place or commercial place.

Dust and particulate matter monitoring

- B2 The environmental authority holder shall ensure that dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:
- (a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of *Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method*.
 - (b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than five exceedances recorded each year, when monitored in accordance with the most recent version of either:
 - i. *Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 high volume sampler with size-selective inlet – Gravimetric method*, or
 - ii. *Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM10 low volume sampler—Gravimetric method*.
 - (c) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres (PM2.5) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.10 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM (sub)2.5 (/sub) low volume sampler—Gravimetric method*.
 - (d) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method*.

End of Conditions for Schedule B

Schedule C – Waste Management

General

- C1 All general waste generated in conducting the mining activities must be disposed of in a lawful manner at an off-site facility, with the exception of waste rock and tailings, which must be characterised, handled and disposed of in accordance with the Waste Management Plan (WMP).
- C2 By **1 July 2020**, the environmental authority holder must develop and implement a Waste Management Plan (WMP), which includes:
- (a) Effective characterisation of mine waste to predict under the proposed placement and disposal strategy the quality of runoff and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;
 - (b) A program of progressive sampling and characterisation to identify dispersive and non-dispersive material, salinity, acid and alkali producing potential, and metals concentrations of mine waste;
 - (c) A material balance and disposal plan demonstrating how potentially acid forming mine waste will be identified, selectively placed and/or encapsulated to minimise potential generation of acid and metalliferous drainage;
 - (d) Where relevant, a sampling program to verify encapsulation and/or placement of potentially acid forming mine waste;
 - (e) How often the performance of the plan will be assessed;
 - (f) The indicators or other criteria of which the performance of the plan will be assessed; and
 - (g) A rehabilitation strategy for mine waste.
- C3 All mine waste with the potential to generate contaminants, including potentially acid forming material must be:
- (a) Identified, quantified and selectively disposed of in a manner that minimises the potential generation and/or release of contaminants to the receiving environment;
 - (b) Where there is uncertainty as to whether mine waste is potentially acid forming, this material must be treated as potentially acid forming until demonstrated otherwise; and
 - (c) Details pertaining to meeting the requirements of this condition must be recorded and retained until this environmental authority is surrendered.

End of Conditions for Schedule C

Schedule D - Noise

Noise limits

- D1 The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table D1 – Noise limits** to be exceeded at a sensitive place or commercial place.

Table D1 – Noise limits

Sensitive place						
Noise level dB(A) measured as:	Monday to Saturday			Sundays and public holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	9am to 6pm	6pm to 10pm	10pm to 9am
L_{Aeq} , adj, 15 mins	CV = 50 AV = 5	CV = 45 AV = 5	CV = 40 AV = 0	CV = 45 AV = 5	CV = 40 AV = 5	CV = 35 AV = 0
L_{A1} , adj, 15 mins	CV = 55 AV = 10	CV = 50 AV = 10	CV = 45 AV = 5	CV = 50 AV = 10	CV = 45 AV = 10	CV = 40 AV = 5
Commercial place						
Noise level dB(A) measured as:	Monday to Saturday			Sundays and public holidays		
	7am to 6pm	6pm to 10pm	10pm to 7am	7am to 6pm	6pm to 10pm	10pm to 7am
L_{Aeq} , adj, 15 mins	CV = 55 AV = 10	CV = 50 AV = 10	CV = 45 AV = 5	CV = 50 AV = 10	CV = 45 AV = 10	CV = 40 AV = 5

Table D1 – Noise limits notes:

- CV = Critical Value
- AV = Adjustment Value
- bg = background noise level (**LA90, adj, 15 mins**) measured over 3-5 days at the nearest sensitive receptor
- To calculate noise limits in Table D1:
If $bg \leq (CV - AV)$:
Noise limit = $bg + AV$
If $(CV - AV) < bg \leq CV$:
Noise limit = CV
If $bg > CV$:
Noise limit = $bg + 0$
- In the event that measured bg (**LA90, adj, 15 mins**) is less than 30 dB(A), then 30 dB(A) can be substituted for the measured background level
- If the project is unable to meet the noise limits as calculated above alternative limits may be calculated using the processes outlined in the "Planning for Noise Control" guideline.

Airblast overpressure nuisance

- D2 Blasting must:
- Only be undertaken between 7am to 6pm; and
 - Not cause an exceedance of the limit for air blast overpressure or ground vibration peak particle velocity specified in **Table D2 – Blasting noise limits** at a sensitive place or commercial place.

Table D2 – Blasting noise limits

Parameter	Limits	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No blasting

Monitoring and reporting

D3 Noise monitoring and recording must include the following descriptor characteristics and matters:

- (a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins)
- (b) background noise LA90
- (c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels
- (d) atmospheric conditions including temperature, relative humidity and wind speed and directions
- (e) effects due to any extraneous factors such as traffic noise
- (f) location, date and time of monitoring
- (g) if the complaint concerns low frequency noise, Max $L_{pLIN,T}$ and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.

End of Conditions for Schedule D

Schedule E – Water

Receiving surface water environment monitoring

- E1 The receiving waters must be monitored at the locations specified in **Table E1 - Surface waters reference and compliance monitoring sites**

Table E1 – Surface waters reference and compliance monitoring sites

Monitoring sites	Monitoring site description	Location		Monitoring Frequency
		Easting (GDA94 – Zone 55)	Northing (GDA94 – Zone 55)	
Reference sites				
SW10 ³	Upstream Copper Creek	304127	8056133	Monthly
SW4 ²	Upstream Males Gully	305840	8056772	
SW4a ²	Upstream Mayday Creek	305630	8055650	
SW11 ²	Upstream Males Gully	305190	8056045	
Compliance sites				
SW3	Copper Creek	303595	8055564	Monthly
SW1 ¹	Spillway of the existing tailings storage facility (TSF)	304105	8055230	
SW8	Compliance point in Males Creek downstream of the existing TSF	303898	8055283	
SW9	Boundary compliance point in Males Gully	303366	8055166	
SW12 ⁴	Un-named watercourse	305077	8055840	

¹SW1 sample is to be taken from discharge along the existing TSF spillway.

² Sites SW4, SW4a and SW11 are Reference Sites for Compliance Sites SW1, SW8 and SW9.

³Site SW10 is a Reference Site for Compliance Site SW3 and SW9.

⁴Site SW12 is designated as a reference site until topsoil clearing commences at Summerhill Pit. The holder of this environmental authority must notify the administering authority at least 20 business days before topsoil clearing for Summerhill Pit commences.

- E2 The receiving waters must be monitored at the frequency specified in **Table E1 - Surface waters reference and compliance monitoring sites**
- E3 The receiving waters must be monitored for the contaminants listed in **Table E2 - Receiving waters quality objectives**.

Table E2 - Receiving Waters Quality Objectives

Contaminant ¹	Unit	SW1, SW8, SW12		SW3		SW9	
		Water quality objective	Compliance limit	Water quality objective	Compliance limit	Water quality objective	Compliance limit
pH	pH units	-	6 -7.9 ⁴	-	6 -8.0 ⁴	-	6 -7.9 ⁴
Electrical conductivity ⁶	µS/cm	106 ²	185 ⁴	90 ⁴	106 ²	106 ²	170 ⁴
Turbidity ⁶	NTU	70 ³	96 ⁴	61 ³	73 ⁴	60 ³	100 ⁴
Sulphate	mg/L	2 ²	8.2 ⁴	1.2 ⁴	2 ²	2 ²	3 ⁴
Fluoride	mg/L	0.3 ³	0.67 ⁴	0.33 ³	0.4 ⁴	0.66 ³	0.88 ⁴
Aluminium	mg/L	0.02 ³	0.6 ⁴	2.1 ³	6.9 ⁴	1.4 ³	3.2 ⁴
Arsenic	mg/L	0.009 ⁴	0.013 ⁵	0.011 ⁴	0.013 ⁵	0.008 ³	0.013 ⁵
Cadmium	mg/L	0.001 ³	0.003 ⁴	-	0.0002 ⁵	0.001 ³	0.002 ⁴
Chromium	mg/L	-	0.001 ⁵	0.001 ^{3, 5}	0.002 ⁴	0.001 ^{3, 5}	0.002 ⁴
Cobalt	mg/L	0.005 ³	0.007 ⁴	-	0.0014 ⁵	0.003 ³	0.005 ⁴
Copper	mg/L	0.18 ³	0.342 ⁴	0.012 ⁴	0.03 ²	0.13 ³	0.19 ⁴
Lead	mg/L	0.01 ³	0.022 ⁴	0.002 ⁴	0.0034 ⁵	0.005 ³	0.012 ⁴
Manganese	mg/L	0.057 ⁴	1.9 ⁵	0.012 ⁴	1.9 ⁵	0.04 ⁴	1.9 ⁵
Mercury (inorganic)	mg/L	0.001 ³	0.002 ⁴	0.0001 ⁴	0.0006 ⁵	-	0.001 ⁴
Nickel	mg/L	0.003 ⁴	0.011 ⁵	0.002 ⁴	0.011 ⁵	0.003 ⁴	0.011 ⁵
Selenium	mg/L	0.001 ⁴	0.011 ⁵	0.003 ⁴	0.011 ⁵	0.003 ⁴	0.011 ⁵
Silver	mg/L	-	0.002 ⁴	0.0001 ³	0.0009 ⁴	-	0.002 ⁴
Zinc	mg/L	0.01 ³	0.024 ⁴	0.008 ⁴	0.02 ⁵	0.014 ⁴	0.02 ⁵
Hardness	mg/L	For interpretation purposes only					
Major cations and Anions	mg/L						

¹All samples for metals/metalloids must be analysed for both the total (from analysis of an unfiltered sample) and dissolved (from analysis of a field filtered sample) fractions.

²Environmental Protection (Water) Policy 2009 Herbert River Basin Environmental Values and Water Quality Objectives.

³80th percentile surface water data. Measured as 'dissolved'.

⁴95th percentile surface water data. Measured as 'dissolved'.

⁵ANZECC (2000) trigger levels for 95% aquatic ecosystem protection for slightly to moderately disturbed ecosystems.

⁶water quality objectives and compliance limits based off laboratory results.

- E4 If a water quality objective measured at a compliance site specified in **Table E1 – Surface waters reference and compliance monitoring sites** exceeds any water quality objective specified in **Table E2 - Receiving Waters Quality Objectives** during a monitoring event required under condition **E1** the holder of this environmental authority must compare this result to the applicable upstream reference site(s) and:
- (a) If the contaminant concentration measured at the compliance site is equal to or less than the contaminant concentration measured at the applicable upstream reference site(s), no further action is required; or
 - (b) If the contaminant concentration measured at the compliance site is greater than the contaminant concentration measured at the applicable upstream reference site(s) complete an investigation into the potential for environmental harm and provide a written report to the administering authority's pollution hotline within 90 days, outlining
 - (i) Details of the investigations carried out
 - (ii) Actions taken to prevent environmental harm.

*Note: Where a contaminant level exceedance has occurred and is under investigation in accordance with **E4**, no further reporting is required for subsequent exceedance events of that contaminant during the course of the investigation.*

- E5 Water quality at the compliance sites listed in **Table E1 – Surface waters reference and compliance monitoring sites** must not exceed any compliance limit specified in **Table E2 - Receiving Waters Quality Objectives**.
- E6 Monitoring and sampling must be carried out in accordance with written procedures and must address the requirements of the latest version of the following documents unless otherwise approved by the administering authority:
- (a) for waters and aquatic environments, the Queensland Government's Monitoring and Sampling Manual 2009 – Environmental Protection (Water) Policy 2009
 - (b) for groundwater, Groundwater Sampling and Analysis – A Field Guide (2009:27 GeoCat#6890.1) and Australian Standard AS/NZS 5667.11:1998 Water Quality – Sampling – Guidance on sampling of groundwaters;
 - (c) for subterranean aquatic fauna, the Guideline for the Environmental Assessment of Subterranean Aquatic Fauna.

Groundwater

- E7 The holder of this environmental authority must not release contaminants to groundwater.
- E8 Groundwater quality and standing water level must be monitored at the locations and frequencies specified in **Table E3 - Groundwater monitoring locations and frequency**.

Table E3 – Groundwater monitoring locations and frequency

Monitoring Bore	Co-ordinate (MGA94 Zone 55)		Surface RL (m) ¹	Screened interval RL (m)	Monitoring Frequency
	Easting	Northing			Standing Water Level and Groundwater Quality
Monitoring bores					
MB1	303565	8055354	707	16 - 22	Quarterly
MB2	305195	8056085	742	16 – 22	
MB3	307009	8055921	762	25 – 31	
MB4	306163	8056927	777	40 - 52	
MB5	303911	8055490	729	35 - 48	
MB6	303850	8056032	727	13 - 19	
MB7	303916	8055778	726	18 - 40	
MB8	304080	8055641	740	30 - 42	
MB9	304319	8055592	731	5 - 7	
MB10	304019	8055944	733	23 - 47	
MB11	304176	8055858	756	36 - 48	
MB12	304292	8056030	749	31 - 42	
MB13	305110	8055880	752	25 - 35	
Shallow Groundwater bores					
SB01	304384	8055540	735	4 - 10	Quarterly
SB02	304408	8055568	734	3 - 6	
SB03	304424	8055595	731	4 - 7	
SB04	304483	8055609	734	1.5 - 5	
SB05	304503	8055586	738	2 - 6	

¹ RL must be measured at the top of the bore casing to the nearest 5cm.

E9 Groundwater quality must be monitored for the quality characteristics identified in **Table E4 – Groundwater Quality Objectives**.

Table E4 – Groundwater Quality Objectives

Monitoring Bores Water Quality Objectives ¹																	
Quality Characteristic	Unit	MB1		MB2		MB3 and MB8		MB4 and MB5		MB6 and MB10		MB7 and MB11		MB12 and MB13		MB9	
		Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B
pH	pH units	6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²	
EC	µS/cm	-	997 ²	1380 ⁴	1400 ⁵	810 ⁴	829 ⁵	-	997 ²	1400 ⁴	1600 ⁵	-	1200 ⁵	-	1200 ⁵	444 ⁴	512 ⁵
Sulfate	mg/L	8.9 ⁴	9.7 ⁵	12 ²	13.5 ⁵	7.4 ⁴	8.0 ⁵	5.8 ⁴	6.5 ⁵	45	72 ⁵	23 ⁴	25.9 ⁵	37.0 ⁴	38.3 ⁵	1.5 ⁴	3.8 ⁵
Aluminium	mg/L	-	0.055 ³	-	0.055 ³	-	0.055 ³	-	0.055 ³	0.052 ³	0.245 ⁵	-	0.055 ³	-	0.055 ³	0.06 ⁴	0.075 ⁵
Arsenic	mg/L	-	0.013 ³	-	0.013 ³	0.011 ³	0.017 ⁵	0.039 ⁴	0.093 ⁵	0.065 ⁴	0.084 ⁵	0.022 ⁴	0.036 ⁵	0.017 ⁴	0.022 ⁵	-	0.013 ³
Cadmium	mg/L	0.0005 ⁴	0.0007 ⁵	0.0002 ³	0.0004 ⁵	-	0.0002 ³	0.0003 ⁴	0.0004 ⁵	-	0.0002 ³	0.0003 ³	0.0004 ⁵	0.0002 ³	0.0004 ⁵	-	0.0002 ³
Chromium	mg/L	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³
Cobalt	mg/L	-	0.001 ³	-	0.002 ⁵	0.004 ³	0.006 ⁵	0.001 ³	0.002 ⁵	0.006 ³	0.008 ⁵	-	0.001 ³	-	0.002 ⁵	-	0.001 ³
Copper	mg/L	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²
Fluoride	mg/L	2.60 ⁴	2.64 ⁵	3.70 ⁴	4.15 ⁵	3.34 ⁴	3.69 ⁵	2.70 ⁴	3.10 ⁵	2.70 ⁴	2.9 ⁵	3.54 ⁴	4.04 ⁵	4.20 ⁴	4.66 ⁵	0.40 ⁴	0.45 ⁵
Lead	mg/L	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³
Manganese	mg/L	-	0.037 ³	0.19 ⁴	0.20 ⁵	0.364 ⁴	0.453 ⁵	0.412 ⁴	0.491 ⁵	1.10 ⁴	1.70 ⁵	0.240 ⁴	0.440 ⁵	1.00 ⁴	1.10 ⁵	0.248 ⁴	0.330 ⁵
Mercury (inorganic)	mg/L	-	0.006 ³	-	0.006 ³	-	0.006 ³	-	0.006 ³	-	0.006 ³	-	0.006 ³	-	0.006 ³	-	0.006 ³
Nickel	mg/L	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³
Selenium	mg/L	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³
Silver	mg/L	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³
Zinc	mg/L	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³
Other major ions	mg/L	For interpretive purpose															

¹ All metals and metalloids must be measured as 'dissolved' (from analysis of a field filtered sample).

² 80th percentile (moderate depth) - Table 4.3 Water quality objectives to protect aquatic ecosystem EVs for Groundwater Chemistry Group (refer to Plan WQ1083) – Sodic – 10 Granitic uplands and slopes, Environmental Protection (Water) Policy 2009 Herbert River Basin Environmental Values and Water Quality Objectives.

³ ANZECC (2000) trigger levels for 95% aquatic ecosystem protection for slightly to moderately disturbed ecosystems.

⁴ 80th percentile bore data

⁵ 95th percentile bore data

- E10 Groundwater measured from any monitoring bore specified in **Table E3 - Groundwater monitoring locations and frequency** must not exceed the corresponding Limit A specified in **Table E4 – Groundwater quality objectives** on any **five** consecutive sampling occasions.
- E11 Groundwater measured from any monitoring bore specified in **Table E3 - Groundwater monitoring locations and frequency** must not exceed the corresponding Limit B specified in **Table E4 – Groundwater quality objectives** on any **three** consecutive sampling occasions.
- E12 If groundwater measured from any monitoring bore specified in **Table E3 - Groundwater monitoring locations and frequency** exceeds the corresponding Limit B specified in **Table E4 – Groundwater quality objectives** on any one sampling occasion the environmental authority holder must resample the groundwater within the bore for all exceeding parameters within ten business days of receipt of results.

Groundwater Management Program

- E13 By **1 May 2020** a Groundwater Management Program must be developed, documented and implemented by appropriately qualified persons.
- E14 The Groundwater Management Program must:
- (a) identify potential sources of contamination to groundwater from the activity; and
 - (b) ensure that all potential groundwater impacts due to the activity are identified, monitored and mitigated; and
 - (c) document sampling and monitoring methodology; and
 - (d) ensure that adequate groundwater monitoring and data analysis is undertaken to achieve the following objectives:
 - i. detect any impacts to groundwater levels due to the activity;
 - ii. detect any impacts to groundwater quality due to the activity;
 - iii. determine compliance with condition E8; and
 - iv. determine trends in groundwater quality; and
 - (e) include an appropriate quality assurance and quality control program; and
 - (f) include a conceptual groundwater model; and
 - (g) include a review process to identify improvements to the program that includes addresses any comments provided by the administering authority.
- E15 The Groundwater Management Program must be reviewed and updated to ensure it meets the requirements specified in condition E14 on an annual basis by an appropriately qualified person.

- E16 The construction, maintenance and decommissioning of groundwater monitoring bores must be undertaken in a manner that:
- (a) prevents contaminants entering the groundwater; and
 - (b) ensures the integrity of the bores to obtain representative groundwater samples from the target aquifer; and
 - (c) maintains the hydrogeological environment within the aquifer.
- E17 A bore drill log must be kept for each groundwater monitoring bore which includes:
- (a) bore identification reference and geographic coordinate location;
 - (b) specific construction information including but not limited to depth of bore, depth and length of casing, depth and length of screening and bore sealing details;
 - (c) standing groundwater level and water quality parameters including physical parameters and results of laboratory analysis for the possible trigger parameters;
 - (d) lithological data and stratigraphic interpretation by an appropriately qualified person to identify important features associated with groundwater monitoring; and
 - (e) target aquifer formation of the bore.

Receiving environment monitoring program

- E18 The environmental authority holder must develop, document and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to environmental values of receiving waters by **1 May 2020**. The REMP must include at minimum:
- (a) Monitoring the effects of the mining activities on the receiving environment periodically under natural flow conditions and while contaminants are being released (if applicable);
 - (b) Encompass the waters of Herbert River and connected or surrounding waterways within 2.5km downstream of the mining activities;
 - (c) Identification of all environmental values of receiving waters;
 - (d) An assessment of background reference water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current environmental authority conditions to protect downstream environmental values; and
 - (e) Application of biological monitoring if required to determine whether the mining activities are being conducted in a manner that enhances or protects the environmental values of receiving waters;
- E19 A report outlining the findings of the REMP, including all monitoring results and any interpretations or assumptions relied upon, must be prepared by an appropriately qualified person annually and submitted to the Administering Authority on request.

Water Management

- E20 A Water Management Plan must be developed by an appropriately qualified person, documented and implemented for all stages of the mining activity. The Water Management Plan should be developed in accordance with Department of Environment and Science guideline *Preparation of water management plans for mining activities* and include:
- (a) a study of the source of contaminants
 - (b) a water balance model for the site
 - (c) a water management system for the site
 - (d) measures to manage and prevent saline drainage
 - (e) measures to manage and prevent acid rock drainage
 - (f) contingency procedures for emergencies
 - (g) a program for monitoring and review of the effectiveness of the water management plan.

Erosion and Sediment Control

- E21 An Erosion and Sediment Control Plan must be developed, documented and implemented by an appropriately qualified person for all stages of the mining activities to minimise erosion and the release of sediment to receiving waters.

End of Conditions for Schedule E

Schedule F – Land and rehabilitation

F1 Land disturbed by mining activities must be rehabilitated in accordance with **Table F1 - Rehabilitation requirements**.

Table F1 - Rehabilitation requirements

Mine domain	Rehabilitation goal	Rehabilitation objectives	Indicators ¹	Completion criteria ¹
Open cut pit	Safe	No hazardous materials and structurally sound with limited slopes.	TBA	TBA
	Non-polluting	No groundwater contamination or overflow.	TBA	TBA
	Stable	Long term geotechnical stability of the low and high walls.	TBA	TBA
	Able to sustain an agreed post mining land use	Native vegetation and habitat.	TBA	TBA
Waste Rock Dump	Safe to humans and wildlife	Structurally safe with no hazardous materials; and site is safe now and for foreseeable future.	TBA	TBA
	Non-polluting	Contaminants contained onsite; and no release of contaminants to the receiving environment.	TBA	TBA
	Stable	Landform design achieves appropriate erosion rates.	TBA	TBA
	Able to sustain an agreed post-mining land use	Native vegetation and habitat.	TBA	TBA
Mine infrastructure	Safe to humans and wildlife	Structurally safe with no hazardous materials; and site is safe now and for foreseeable future.	TBA	TBA
	Non-polluting	No residual contaminants that could be released to the receiving environment.	TBA	TBA
	Stable	No erosion and sediment loss.	TBA	TBA
	Able to sustain an agreed post mining land use	Native vegetation and habitat.	TBA	TBA
Water infrastructure (dams and drains)	Safe to humans and wildlife	Structurally safe with no hazardous materials and safe for the foreseeable future.	TBA	TBA
	Non-polluting	No residual contaminants that could be released to the receiving environment.	TBA	TBA
	Stable	Landform design achieves appropriate erosion rates.	TBA	TBA
	Able to sustain an agreed post mining land use	Rehabilitate and return to native vegetation and habitat; or water storage where landholder statement for ongoing use has been provided.	TBA	TBA

Haul Road	Safe to humans and wildlife	Structurally safe with no hazardous materials and safe for the foreseeable future.	TBA	TBA
	Non-polluting	No residual contaminants that could be released to the receiving environment.	TBA	TBA
	Stable	No erosion and sediment loss.	TBA	TBA
	Able to sustain an agreed post mining land use	Rehabilitate and return to native vegetation and habitat.	TBA	TBA
New TSF	Safe to humans and wildlife	Structurally safe with no hazardous materials and safe for the foreseeable future.	TBA	TBA
	Non-polluting	Residual contaminants are contained and contaminant release to the receiving environment is prevented.	TBA	TBA
	Stable	Vegetation cover to minimise erosion	TBA	TBA
	Able to sustain an agreed post mining land use	Rehabilitate and return to native vegetation and habitat.	TBA	TBA
Existing TSF	Safe to humans and wildlife	Structurally safe with no hazardous materials and safe for the foreseeable future.	TBA	TBA
	Non-polluting	Residual contaminants are contained and contaminant release to the receiving environment is prevented.	TBA	TBA
	Stable	Vegetation cover to minimise erosion	TBA	TBA
	Able to sustain an agreed post mining land use	Remove all tailings and place in New TSF, decommission and return to native vegetation and watercourse.	TBA	TBA

¹ Rehabilitation indicators and completion criteria must be provided to the administering authority within 2 years from the commencement of mining as an environmental authority amendment application.

Post Mine Land-use Management Plan

F2 Two years from commencement of mining the environmental authority holder must develop and document a Post Mine Land-use Plan ('PMLUP') that describes how the rehabilitation objectives will be achieved. The PMLUP must at minimum include:

- (a) Schematic representation of the proposed final land form inclusive of site drainage features;
- (b) Details of proposed slope design and erosion and sediment controls;
- (c) Proposed cover designs for encapsulation of waste material, including performance criteria;
- (d) Proposed re-vegetation methods inclusive of plant species selection, propagation methods and establishment of suitable plant growth medium (i.e. top soil);
- (e) Materials balance for all rehabilitation requirements including available top soil and material suitable for encapsulating waste in accordance with the proposed encapsulation methodology;
- (f) Geotechnical, geochemical and hydrological studies necessary to demonstrate likely success of proposed rehabilitation methodology to achieve the required rehabilitation outcomes;

- (g) An investigation of proposed residual voids including potential for generation/mobilisation of contaminants, potential pathways for release of contaminants to waters (including groundwater) and a long-term void water balance model; and
- (h) A rehabilitation monitoring program sufficient to identify if required rehabilitation outcomes have been achieved.

Note: Commencement of mining is taken to be the date that extraction of material from the pit commences.

- F3 The environmental authority holder must review and update the PMLUP in the following circumstances:
- (a) The rehabilitation schedule changes with the mine plan schedule;
 - (b) Based on the outcomes of on-site revegetation trials; and
 - (c) Based on the outcomes of rehabilitation monitoring programs.
- F4 Rehabilitation must commence progressively in accordance with the Plan of Operations.

Chemical and flammable or combustible liquids

- F5 Spillage of all chemicals, waste oils and flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm.
- F6 All piping and infrastructure associated with the loading and unloading of petroleum and diesel products must be designed, constructed and maintained in accordance with the latest edition of AS1940—The storage and handling of flammable and combustible liquids.
- F7 All waste materials, explosives, hazardous chemicals, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the current Australian standard. Where no relevant Australian Standard exists, all materials must be stored within an effective on-site containment system that prevents contamination of land or waters.

Impacts to Prescribed Environmental Matters

- F8 Significant residual impacts to prescribed environmental matters, are not authorised under this environmental authority or the *Environmental Offsets Act 2014*.
- F9 Records demonstrating that each impact to a prescribed environmental matter did not, or is not likely to, result in a significant residual impact to that matter must be:
- (a) completed by an appropriately qualified person; and
 - (b) kept for the life of the environmental authority.

End of Conditions for Schedule F

Schedule G – Regulated Structures

- G1 The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* at the following times:
- (a) prior to the design and construction of the structure, if it is not an existing structure; or
 - (b) if it is an existing structure, prior to the adoption of this schedule; or
 - (c) prior to any change in its purpose or the nature of its stored contents.
- G2 A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
- G3 Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

Design and construction of a regulated structure

- G4 All regulated structures must be designed by, and constructed under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.
- G5 Construction of a regulated structure is prohibited unless:
- (a) The holder has submitted a consequence category assessment report and
 - (b) Certification to the administering authority has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures in compliance with the relevant condition of this authority.
- G6 Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, and must be recorded in the Regulated Dams/Levees register.
- G7 Regulated structures must:
- (a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*;
 - (b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:
 - i. floodwaters from entering the regulated dam from any watercourse or drainage line; and
 - ii. possible erosion by floodwaters arising from any watercourse or drainage line.

- G8 Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that:
- (a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure;
 - (b) construction of the regulated structure is in accordance with the design plan.

Operation of a regulated structure

- G9 Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority:
- (a) one paper copy and one electronic copy of the design plan and certification of the 'design plan', and
 - (b) a set of 'as constructed' drawings and specifications, and
 - (c) certification of those 'as constructed drawings and specifications', and
 - (d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan.
 - (e) the requirements of this authority relating to the construction of the regulated structure have been met;
 - (f) the holder has entered the details required under this authority, into a Register of Regulated Dams; and
 - (g) there is a current operational plan for the regulated structures.
- G10 Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.

Mandatory reporting level

- G11 The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.
- G12 The holder must, as soon as practical and within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
- G13 The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated structure.
- G14 The holder must record any changes to the MRL in the Register of Regulated Structures.

Design storage allowance

- G15 The holder must assess the performance of each regulated structure or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated structure taken prior to **1 July** of each year.

- G16 By **1 November** of each year, storage capacity must be available in each regulated structure, to meet the Design Storage Allowance (DSA) volume for the dam.
- G17 The holder must, as soon as possible and within forty-eight (48) hours of becoming aware that the regulated structure will not have the available storage to meet the DSA volume on **1 November** of any year, notify the administering authority.
- G18 The holder must, immediately on becoming aware that a regulated structure will not have the available storage to meet the DSA volume on **1 November** of any year, act to prevent the occurrence of any unauthorised discharge from the regulated structure.

Annual inspection report

- G19 Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
- G20 At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.
- G21 The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.
- G22 The holder must:
- (a) Within 20 business days of receipt of the annual inspection report, provide to the administering authority:
 - i. The recommendations section of the annual inspection report; and
 - ii. If applicable, any actions being taken in response to those recommendations; and
 - (b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within 10 business days of receipt of the request.

Transfer arrangements

- G23 The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

Decommissioning and rehabilitation

- G24 Regulated structures must not be abandoned but be either:
- (a) decommissioned and rehabilitated; or
 - (b) be left in-situ for a beneficial use(s) provided that:
 - i. it no longer contains contaminants that will migrate into the environment; and

- ii. it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and

(c) The holder of the environmental authority and the landholder agree in writing that the:

- i. dam will be used by the landholder following the cessation of the environmentally relevant activity(ies); and
- ii. the landholder is responsible for the dam, on and from an agreed date.

G25 Before surrendering this environmental authority the site must be rehabilitated to achieve a safe, stable, non-polluting landform and final land use in accordance with condition **F1** of this environmental authority.

Hydraulic Performance of Regulated Structures

G26 All regulated structures must be specified in **Table G1 – Regulated structures hydraulic performance criteria**.

G27 Each regulated structure specified in **Table G1 – Regulated structures hydraulic performance criteria** must meet the applicable hydraulic performance criteria listed in **Table G1 – Regulated structures hydraulic performance criteria** for that structure.

Table G1 – Regulated structures hydraulic performance criteria

Regulated structure	Consequence category	Hydraulic performance criteria		
		Spillway Capacity	Design Storage Allowance (DSA) ¹	Mandatory Reporting Level (MRL)
New TSF	Significant	1: 1,000 AEP rainfall event	1:20 AEP 3 month wet season plus process inputs	1:10 AEP 72 hour duration storm event
Existing TSF	Significant	1: 1,000 AEP rainfall event	N/A	N/A

¹ Must be achieved on 1 November of each year.

G28 The New TSF must be constructed and operated in a manner that prevents the release of contaminants to receiving waters and includes at minimum a:

- a) Low permeability liner system that prevents the release of contaminants from the New TSF; and
- b) Leak detection system capable of identifying any release of seepage from the New TSF.

G29 The hydraulic performance criteria specified in this environmental authority are the minimum mandatory performance requirements, regulated structures must be managed in a manner that ensures compliance with all conditions of this environmental authority.

END OF CONDITIONS FOR SCHEDULE G

Schedule H – Definitions

Words and phrases used throughout this Environmental Authority are defined below except where identified in the *Environmental Protection Act 1994* or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies.

Administering Authority is the agency that administers the environmental authority provisions under the *Environmental Protection Act 1994*.

Airblast overpressure means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dBL).

Annual inspection report means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

- (a) against recommendations contained in previous annual inspections reports;
- (b) against recognised dam safety deficiency indicators;
- (c) for changes in circumstances potentially leading to a change in consequence category;
- (d) for conformance with the conditions of this authority;
- (e) for conformance with the 'as constructed' drawings;
- (f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the dam (or network of linked containment systems);
- (g) for evidence of conformance with the current operational plan.

Annual exceedance probability or AEP means the probability that at least one event in excess of a particular magnitude will occur in any given year.

ANZECC (2000) means the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000)* published by the *Australian and New Zealand Environment and Conservation Council* and the *Agriculture and Resource Management Council of Australia and New Zealand* or any equivalent update/replacement guidelines.

Appropriately qualified person means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature.

Assessed or assessment by a suitably qualified and experienced person in relation to a consequence assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment:

- (a) exactly what has been assessed and the precise nature of that determination;
- (b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- (c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and

- (d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

Associated works in relation to a dam, means:

- (a) operations of any kind and all things constructed, erected or installed for that dam; and
- (b) any land used for those operations.

Authority means an environmental authority or a development approval.

Background, with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

Blasting means the use of explosive materials to fracture:

- (a) rock, coal and other minerals for later recovery, or
- (b) structural components or other items to facilitate removal from a site or for reuse.

Certified with respect to watercourse diversions, means assessed and approved by a suitably qualified and experienced person. In relation to 'as constructed' drawings and specifications, the certification must be by the suitably qualified person who supervised the construction of the watercourse diversion, or re-establishment of the watercourse.

Certification, Certifying or Certified by an appropriately qualified and experienced person in relation to a design plan or an annual report regarding dams/structures, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- (a) exactly what is being certified and the precise nature of that certification
- (b) the relevant legislative, regulatory and technical criteria on which the certification has been based
- (c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts
- (d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

Chemical means:

- (a) an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth), or
- (b) a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council, or
- (c) a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997, or
- (d) a drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth, or
- (e) any substance used as, or intended for use as:
 - i. a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product, or

- ii. a surface active agent, including, for example, soap or related detergent, or
- iii. a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide, or
- iv. a fertiliser for agricultural, horticultural or garden use, or
- v. a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater, or
- vi. manufacture of plastic or synthetic rubber.

Commercial place means a workplace used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees' accommodation or public roads.

Construction or constructed in relation to a regulated structure includes building a new regulated structure and lifting or otherwise modifying an existing regulated structure, but does not include investigations and testing necessary for the purpose of preparing a design plan.

Construction or constructed, in relation to watercourse diversions, is the process of building, or modifying an existing diversion, but does not include investigations and testing necessary for the purpose of preparing a design plan.

Consequence in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

Consequence category means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*. The relevant category is specified in **Table G1 – Regulated structures hydraulic performance criteria**

Dam means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.

Dam crest volume means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).

Design plan is a document that contains the design, operation, monitoring and revegetation criteria of a watercourse diversion that addresses the outcomes stated in conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

- (a) required information under a functional design
- (b) the location, function and description of geomorphic and riparian vegetation features within the proposed watercourse diversion
- (c) results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion
- (d) a revegetation and vegetation management plan (a revegetation plan) for the diversion
- (e) engineering drawings depicting the physical attributes and dimensions of the diversion
- (f) (if relevant) the staged development of a permanent watercourse diversion including the proposed use of temporary watercourse diversions with identified lifespans

- (g) all investigation and other reports relied on by the design
- (h) plans and specifications sufficient to complete construction and revegetation in accordance with the design.

Design storage allowance or DSA means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority, that must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an annual exceedance probability (AEP) specified in that Manual. The applicable DSA for regulated structures authorised under this environmental authority are detailed in **Table G1 – Regulated structures hydraulic performance criteria**.

Designer for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

Disturbance of land includes:

- (a) compacting, removing, covering, exposing or stockpiling of earth
- (b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion
- (c) carrying out mining within a watercourse, waterway, wetland or lake
- (d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls
- (e) temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after the mining activity has ceased
- (f) releasing of contaminants into the soil, or underlying geological strata.

However, the following areas are not included when calculating areas of 'disturbance':

- (a) areas off lease (e.g. roads or tracks which provide access to the mining lease)
- (b) areas previously disturbed which have achieved the rehabilitation outcomes
- (c) by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions)
- (d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner
- (e) disturbance that pre-existed the grant of the tenure.

EC means electrical conductivity.

Environmental offset has the meaning in section 7 of the *Environmental Offsets Act 2014*.

Equilibrium: A state where 'balance' is achieved despite changing variables.

Existing authority has the meaning in section 94 of the *Environmental Offsets Act 2014*.

Existing structure means a structure that was in existence prior to the adoption of this schedule of conditions under the authority.

Flowable substance means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

Functional design is a document that contains 'conceptual' information about the design, operation and revegetation criteria of a watercourse diversion that addresses the outcomes stated in the conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

- (a) geomorphic and vegetation assessment of the existing watercourse
- (b) hydrologic conditions of the existing watercourse
- (c) the proposed watercourse diversion route
- (d) results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion.

Functionality means the purpose that something is designed or expected to fulfil.

Hazard category means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*.

Holder, for a mining tenement, means a holder of the tenement under the *Mineral Resources Act 1989*, and the holder of the associated environmental authority under the *Environmental Protection Act 1994*.

Hydraulic performance means the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

Infrastructure means water storage dams, levees,, roads and tracks, buildings and other structures built for the purpose of the mining activity.

Land in the 'land schedule' of this document means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in this environmental authority relates to physical land and not to interests in land.

Land use means the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

Leachate means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

Levee means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times.

Licensed place means the mining activities carried out at the mining tenements.

Low consequence dam means any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

Low impact activities means activities which do not result in the clearing of native vegetation, cause disruption to soil profiles through earthworks or excavation, or result in significant disturbance to land which cannot be

rehabilitated immediately using hand tools after the activity is completed. Examples of such activities include but are not necessarily limited to soil surveys (excluding test pits), topographic surveys, cadastral surveys and ecological surveys, the installation of monitoring equipment provided that it is within the meaning of low impact and traversing land by car or foot via existing access tracks or routes or in such a way that does not result in permanent damage to vegetation.

Mandatory reporting level or MRL means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

Manual means the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

Maximum extent of impacts means the total maximum, unabated, impact to a prescribed environmental matter that could occur over the whole-of-project life.

Measures includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

Mine waste includes any waste produced from mining activities and includes but is not limited to spoil, overburden, waste rock and tailings.

Minimise is to reduce to the smallest possible amount or degree.

Modification or modifying (see definition of 'construction')

NATA means National Association of Testing Authorities, Australia.

Natural flow means the flow of water through waters caused by natural processes (*i.e.* rainfall in the catchment area and subsequent runoff into watercourses).

Non polluting means having no adverse impacts upon the receiving environment.

Operational plan includes:

- (a) Normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);
- (b) Contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

Peak particle velocity (ppv) means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mm/s).

Permanent watercourse diversion is a man-made structure that incorporates the geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained according to an engineering standard that ultimately achieves a self-sustaining watercourse able to function without features or characteristics that rely on ongoing maintenance or that impose a financial or other burden on the proponent, government or the community.

Potentially acid forming (PAF) waste rock means potentially acid forming waste rock and includes any mined material with the potential for nett generation of acidity; where there is uncertainty regarding the materials acid-forming potential, it must be treated as PAF waste rock until demonstrated otherwise.

Pre-existing watercourse is the section of watercourse from which the flow of water will be diverted as a result of the construction and operation of a watercourse diversion.

Prescribed environmental matters has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of State environmental significant listed in schedule 2 of the *Environmental Offsets Regulation 2014*.

Protected area means – a protected area under the *Nature Conservation Act 1992*, or

- (a) a marine park under the *Marine Parks Act 1992*, or
- (b) a World Heritage Area.

Receiving environment in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

- (a) Waters;
- (b) Land;
- (c) Air; and
- (d) Any area that is not specified in Table A1 of this environmental authority.

Receiving waters means the waters into which this environmental authority authorises releases of contaminated water.

Regulated dam means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

Register of Regulated Dams includes:

- (a) Date of entry in the register;
- (b) Name of the dam, its purpose and intended/actual contents;
- (c) The consequence category of the dam as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*;
- (d) Dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;
- (e) Name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;
- (f) For the regulated dam, other than in relation to any levees –
 - i. The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;
 - ii. Coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area
 - iii. Dam crest volume (megalitres);
 - iv. Spillway crest level (metres AHD).
 - v. Maximum operating level (metres AHD);
 - vi. Storage rating table of stored volume versus level (metres AHD);

- vii. Design storage allowance (megalitres) and associated level of the dam (metres AHD);
- viii. Mandatory reporting level (metres AHD);
- (g) The design plan title and reference relevant to the dam;
- (h) The date construction was certified as compliant with the design plan;
- (i) The name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;
- (j) Details of the composition and construction of any liner;
- (k) The system for the detection of any leakage through the floor and sides of the dam;
- (l) Dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;
- (m) Dates when recommendations and actions arising from the annual inspection were provided to the administering authority;
- (n) Dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

Regulated structure includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.

Rehabilitation means the process of reshaping and revegetating land to restore it to a stable landform.

Release event means a discharge of water contaminated by the mining activity.

Representative means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

Revegetation is the re-establishment of vegetation of a species and density of cover similar to surrounding undisturbed areas or the landform that existed before mining activities on soil surfaces associated with the construction or rehabilitation of a watercourse diversion.

RL means reduced level, relative to mean sea level as distinct from depths to water.

Self-sustaining means not requiring on-going intervention and maintenance to maintain functional riverine processes and characteristics

Sensitive place means:

- (a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises, or
- (b) a motel, hotel or hostel, or
- (c) an educational institution, or
- (d) a medical centre or hospital, or
- (e) a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area, or
- (f) a public park or gardens.

Significant residual impact has the meaning in section 8 *Environmental Offsets Act 2014*.

Spillway means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

Structure means dam or levee.

Suitably qualified and experienced person means a person who is a Registered Professional Engineer of Queensland under the provisions of the *Professional Engineers Act 2002*, who has an **appropriate level of expertise** in the structures, geomechanics, hydrology, hydraulics and environmental impact of watercourse diversions.

An **appropriate level of expertise** includes:

- demonstrable competency, experience and expertise in:
 - investigation, design or construction of watercourses diversions
 - operation and maintenance of watercourse diversions
 - geomechanics with particular emphasis on channel equilibrium, geology and geochemistry
 - hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology
 - hydraulics with particular reference to sediment transport and deposition and erosion control
 - hydrogeology with particular reference to seepage and groundwater
 - solute transport processes and monitoring thereof, or
- sufficient knowledge and experience to certify that where the **suitably qualified and experienced person** has relied on advice and information provided by other **persons with relevant expertise***,
 - they consider it reasonable to rely on that advice and information
 - the expert providing the advice and information has knowledge, competency, suitable experience and demonstrated expertise in the matters related to watercourse diversions.

Persons with relevant expertise include:

- Geomorphologist: person who has demonstrated competency and relevant experience in stream geomorphology and watercourse diversions.
- Geotechnical Expert: person who has demonstrated competency and relevant experience in geotechnical assessment of soil characteristics suitable for watercourse diversions.
- Vegetation Expert: person who has demonstrated competency and relevant experience in the identification, role and function of vegetation with watercourses and adjoining floodplains, and has demonstrated competency and relevant experience in revegetation of watercourse diversions and adjoining floodplains. .
- Groundwater Expert: person who has demonstrated competency and relevant experience in groundwater systems.
- Surface Water Expert: person who has demonstrated competency and relevant experience in hydrology.

- **Engineer:** person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Persons Act 2002* or has similar qualifications under a respected professional registration association, and has demonstrated competency and relevant experience in design and construction of watercourse diversions.
- **Soils Expert:** person who has demonstrated competency and relevant experience in soil classification including the physical, chemical and hydrologic analysis of soil.

System design plan means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

Temporary watercourse diversion is a man-made structure that may incorporate geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained to an engineering standard that ensures the diversion does not compromise the equilibrium and performance of the diversion and adjoining watercourses. A temporary diversion is replaced by a permanent diversion, or the re-establishment of the pre-existing watercourse, within the timeframe specified in the design plan.

the Act means the *Environmental Protection Act 1994*.

Void means any constructed, open excavation in the ground.

Water is defined under Schedule 4 of the *Water Act 2000*.

Watercourse has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means a river, creek or stream in which water flows permanently or intermittently—

- (a) in a natural channel, whether artificially improved or not; or
- (b) in an artificial channel that has changed the course of the watercourse.

Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water.

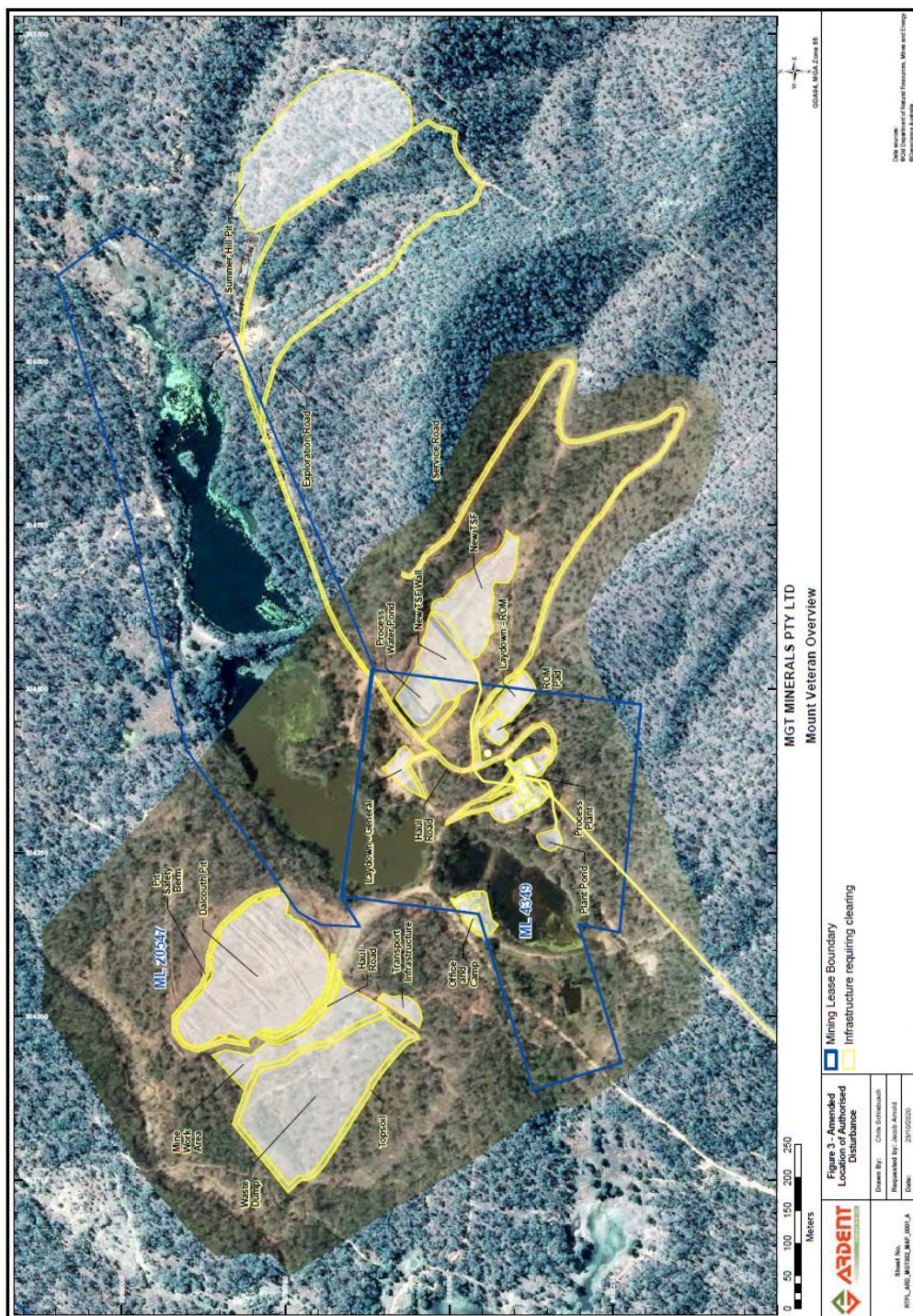
Water quality means the chemical, physical and biological condition of water.

Waters includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

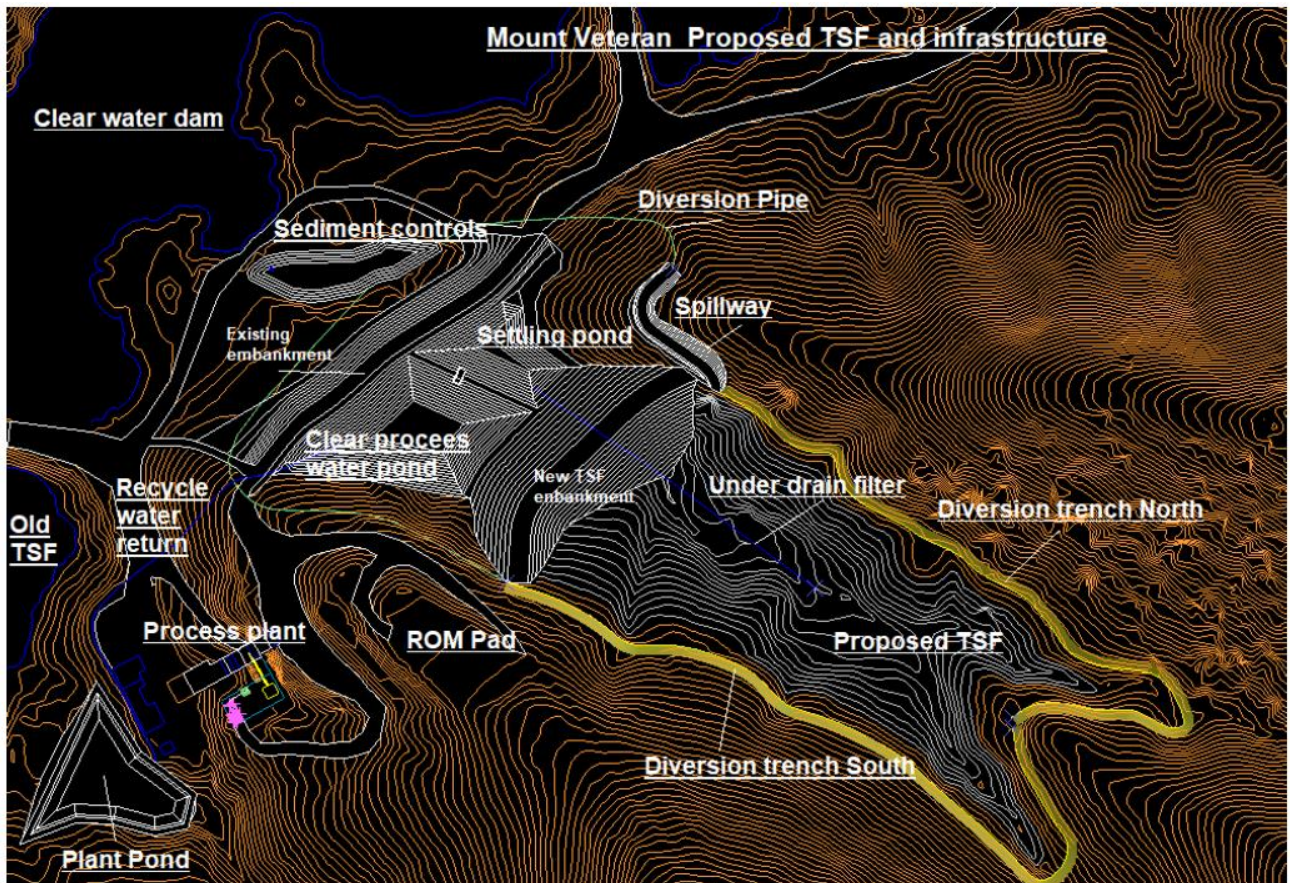
Wet season means the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

END OF SCHEDULE H

Schedule I – Figures



Map 1: Location of authorised disturbance



Map 2: Location of authorised disturbance around the TSF.

END OF SCHEDULE I

END OF ENVIRONMENTAL AUTHORITY

PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

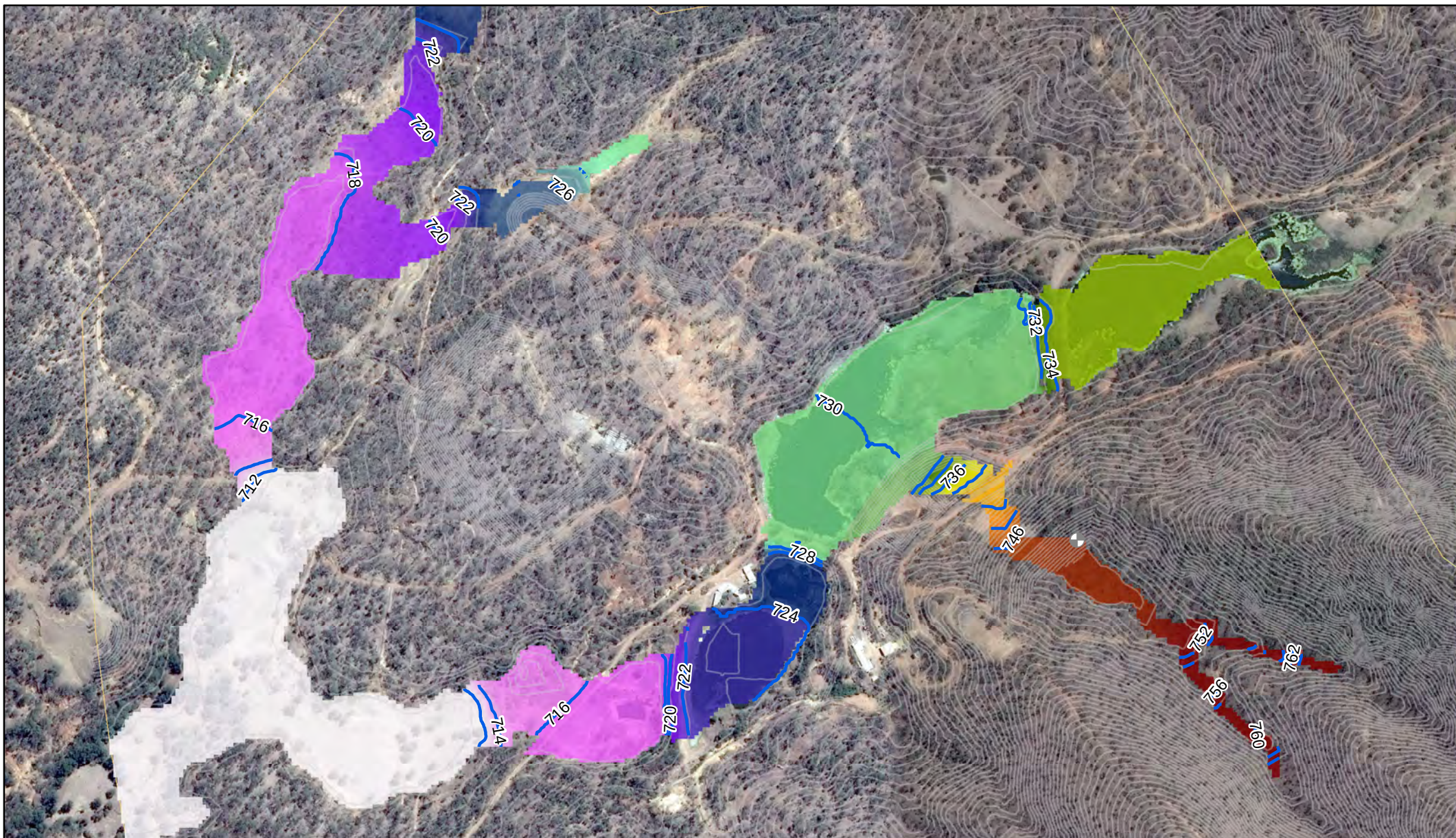
MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 3 – Flood Model Results (CDM Smith 2018)

FLOOD MODEL RESULTS

Overview

Figure A2-1	Existing Case Peak Flood Level – 0.1% AEP
Figure A2-2	Existing Case Peak Flood Level – 1% AEP
Figure A2-3	Existing Case Peak Flood Level – 5% AEP
Figure A2-4	Existing Case Peak Flood Level – 10% AEP
Figure A2-5	Existing Case Peak Flood Level – 18% AEP
Figure A2-6	Existing Case Peak Flood Depth – 0.1% AEP
Figure A2-7	Existing Case Peak Flood Depth – 1% AEP
Figure A2-8	Existing Case Peak Flood Depth – 5% AEP
Figure A2-9	Existing Case Peak Flood Depth – 10% AEP
Figure A2-10	Existing Case Peak Flood Depth – 18% AEP
Figure A2-11	Existing Case Peak Flood Speed – 0.1% AEP
Figure A2-12	Existing Case Peak Flood Speed – 1% AEP
Figure A2-13	Existing Case Peak Flood Speed – 5% AEP
Figure A2-14	Existing Case Peak Flood Speed – 10% AEP
Figure A2-15	Existing Case Peak Flood Speed – 18% AEP
Figure A2-16	Developed Case Peak Flood Level – 0.1% AEP
Figure A2-17	Developed Case Peak Flood Level – 1% AEP
Figure A2-18	Developed Case Peak Flood Level – 5% AEP
Figure A2-19	Developed Case Peak Flood Level – 10% AEP
Figure A2-20	Developed Case Peak Flood Level – 18% AEP
Figure A2-21	Developed Case Peak Flood Depth – 0.1% AEP
Figure A2-22	Developed Case Peak Flood Depth – 1% AEP
Figure A2-23	Developed Case Peak Flood Depth – 5% AEP
Figure A2-24	Developed Case Peak Flood Depth – 10% AEP
Figure A2-25	Developed Case Peak Flood Depth – 18% AEP
Figure A2-26	Developed Case Peak Flood Speed – 0.1% AEP
Figure A2-27	Developed Case Peak Flood Speed – 1% AEP
Figure A2-28	Developed Case Peak Flood Speed – 5% AEP
Figure A2-29	Developed Case Peak Flood Speed – 10% AEP
Figure A2-30	Developed Case Peak Flood Speed – 18% AEP
Figure A2-31	Developed Case Peak Flood Level Difference – 0.1% AEP
Figure A2-32	Developed Case Peak Flood Level Difference – 1% AEP
Figure A2-33	Developed Case Peak Flood Level Difference – 5% AEP
Figure A2-34	Developed Case Peak Flood Level Difference – 10% AEP
Figure A2-35	Developed Case Peak Flood Level Difference – 18% AEP



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- 2m Contour

Peak Flood Level (mAHD)

High : 750



Low : 712

2m Contour

Figure A2-1

Existing Case Peak Flood Level 0.1% AEP

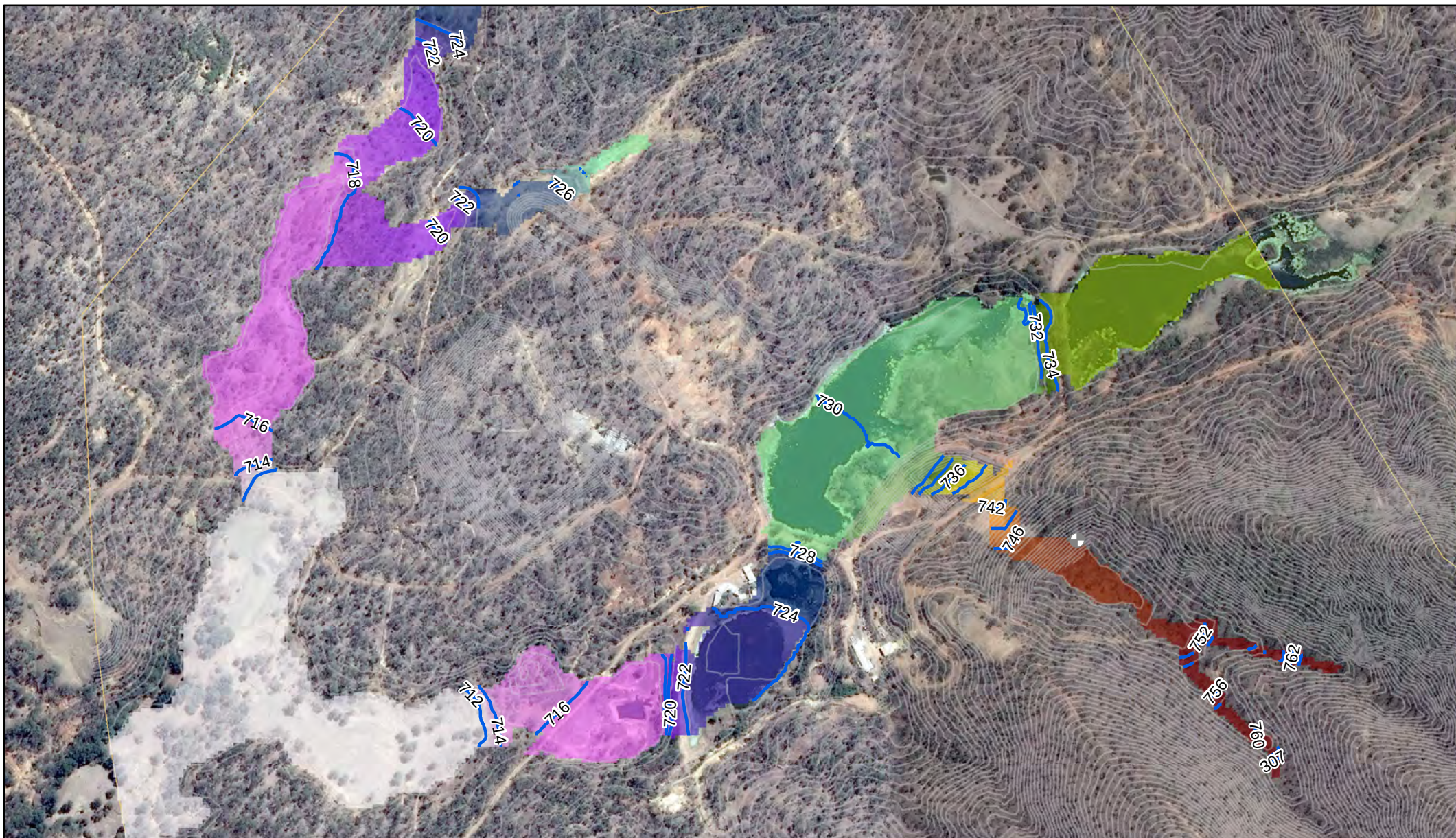
Dalcouth Tin Mine

Flood Impact Assessment

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

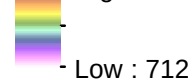
Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- 2m Contour

Peak Flood Level (mAHD)

High : 750



Low : 712

2m Contour

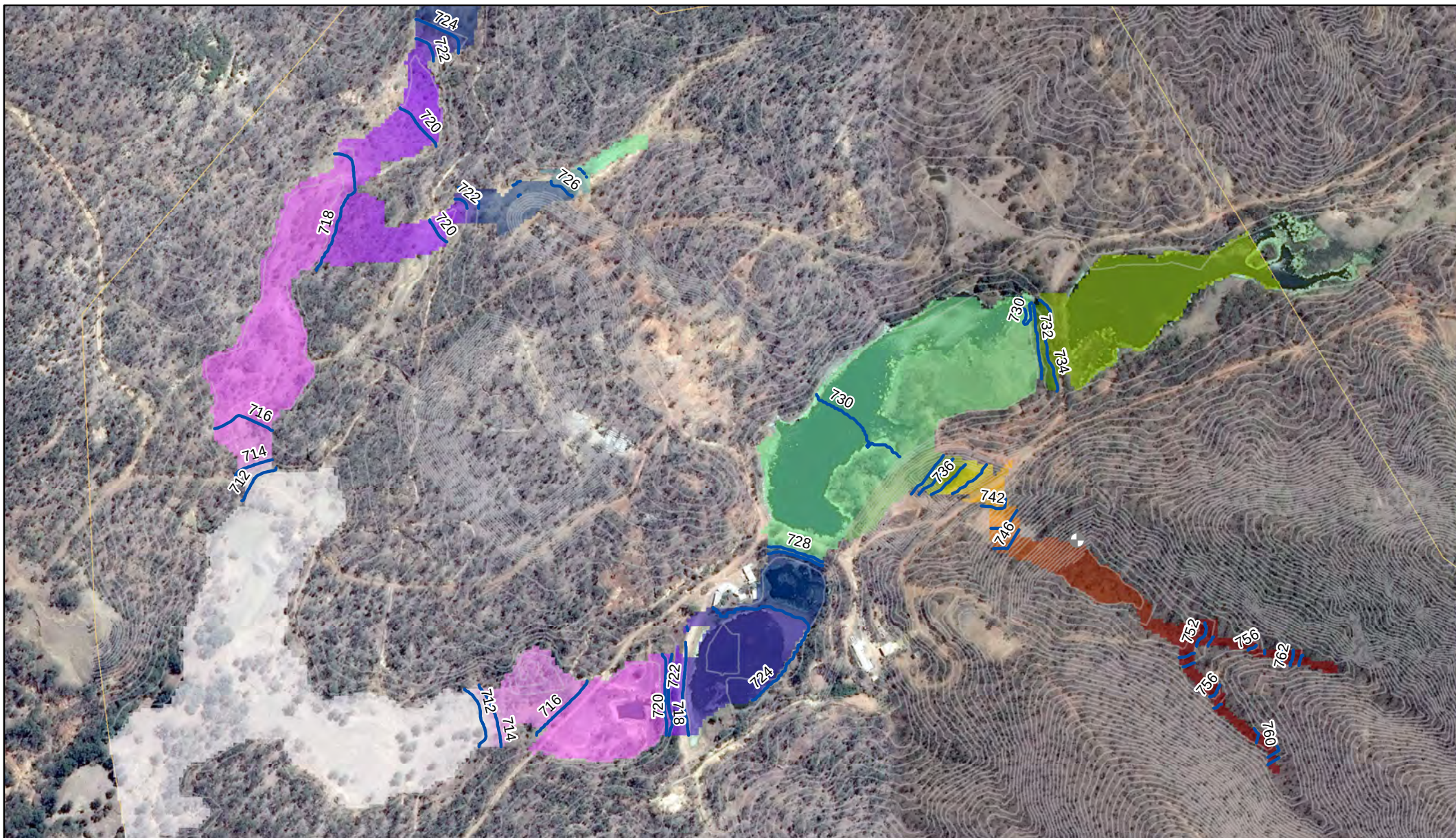
Figure A2-2

Existing Case Peak Flood Level 1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- 2m Contour

Peak Flood Level (mAHD)

High : 750
Low : 712

2m Contour

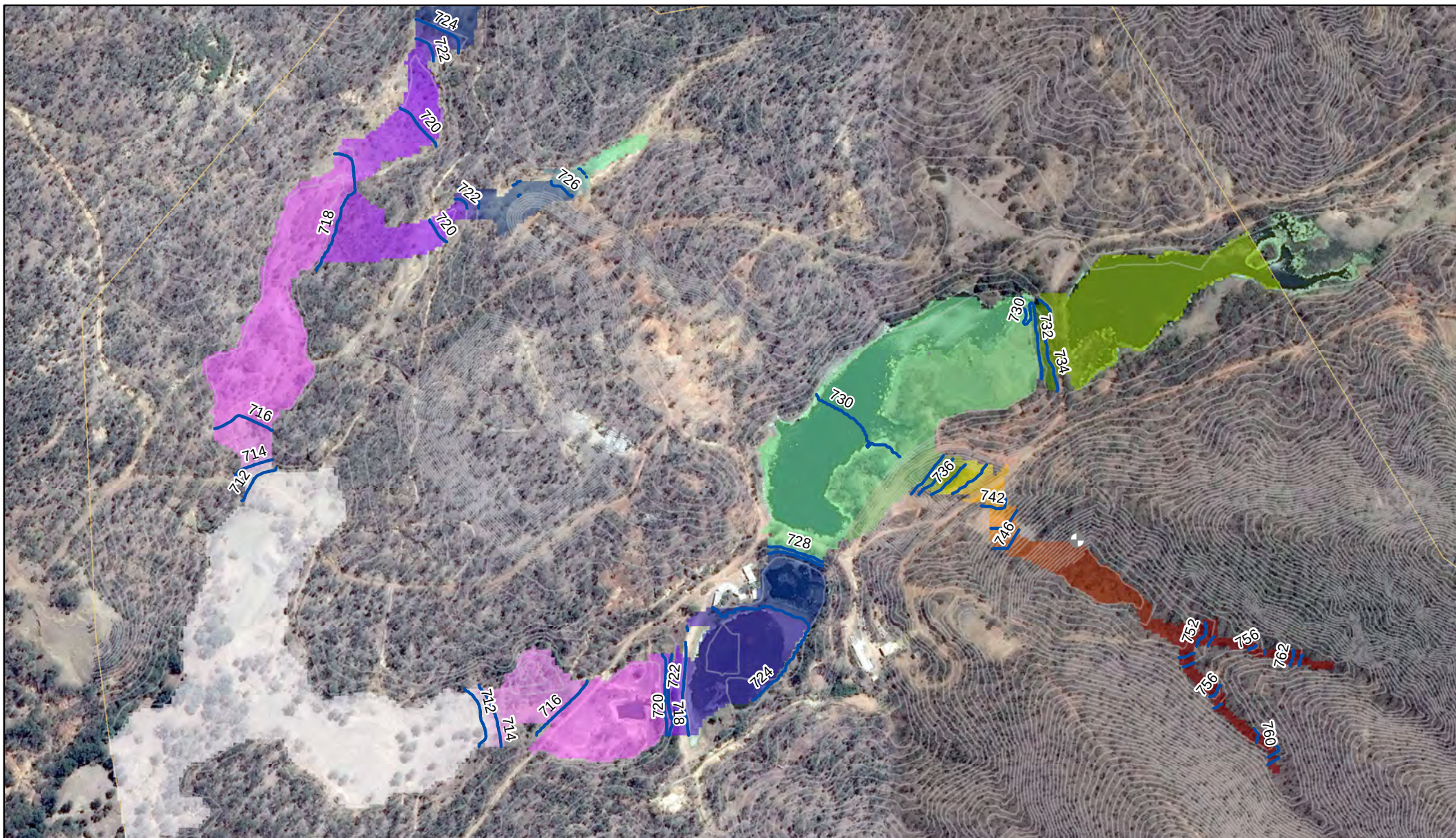
DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

Figure A2-3

Existing Case Peak Flood Level 5% AEP
Flood Impact Assessment
Dalcouth Tin Mine

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Level (mAHD)

High : 750

Low : 712

2m Contour

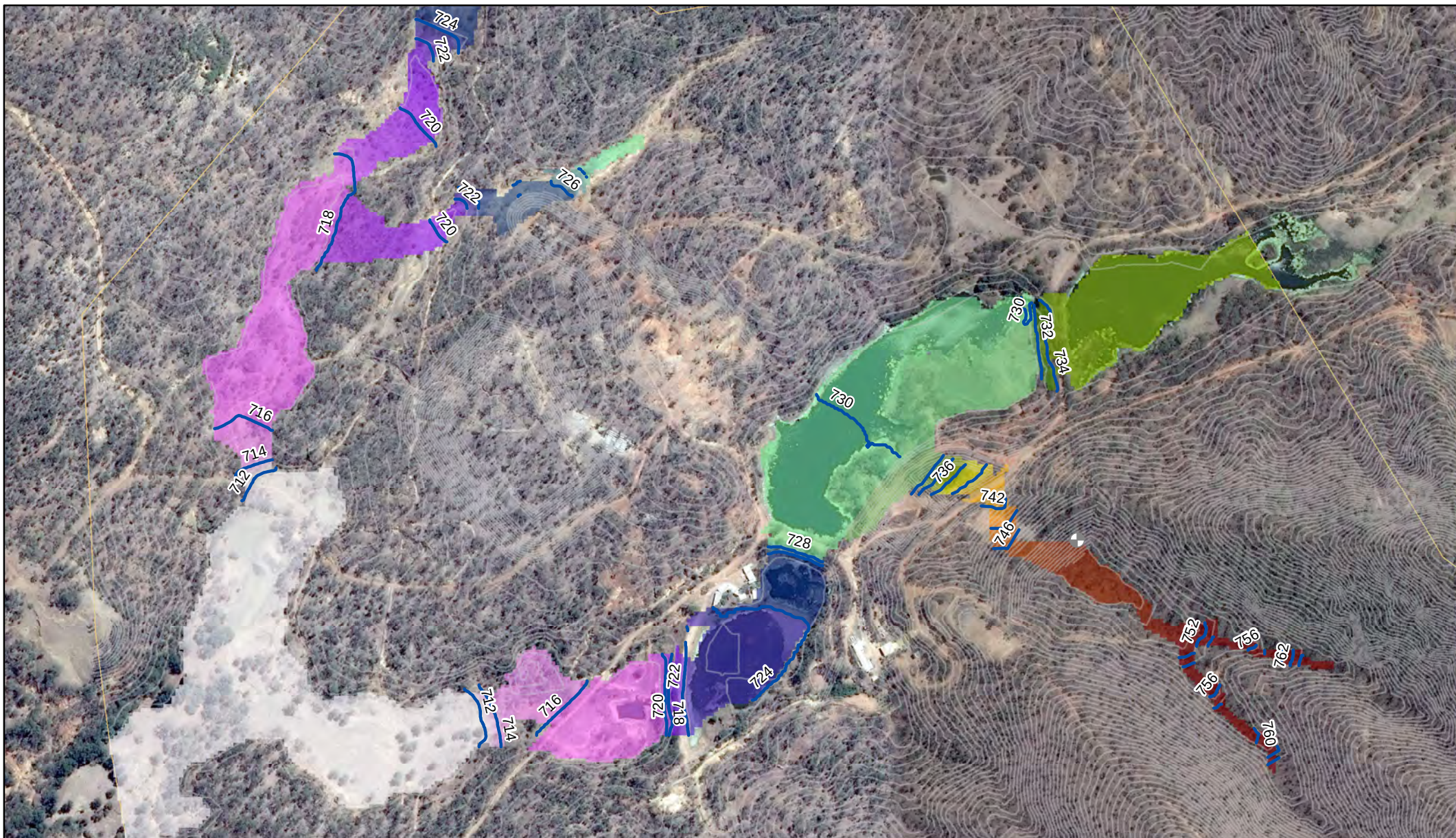
Figure A2-4

Existing Case Peak Flood Level 10% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Level (mAHD)

High : 750

Low : 712

2m Contour

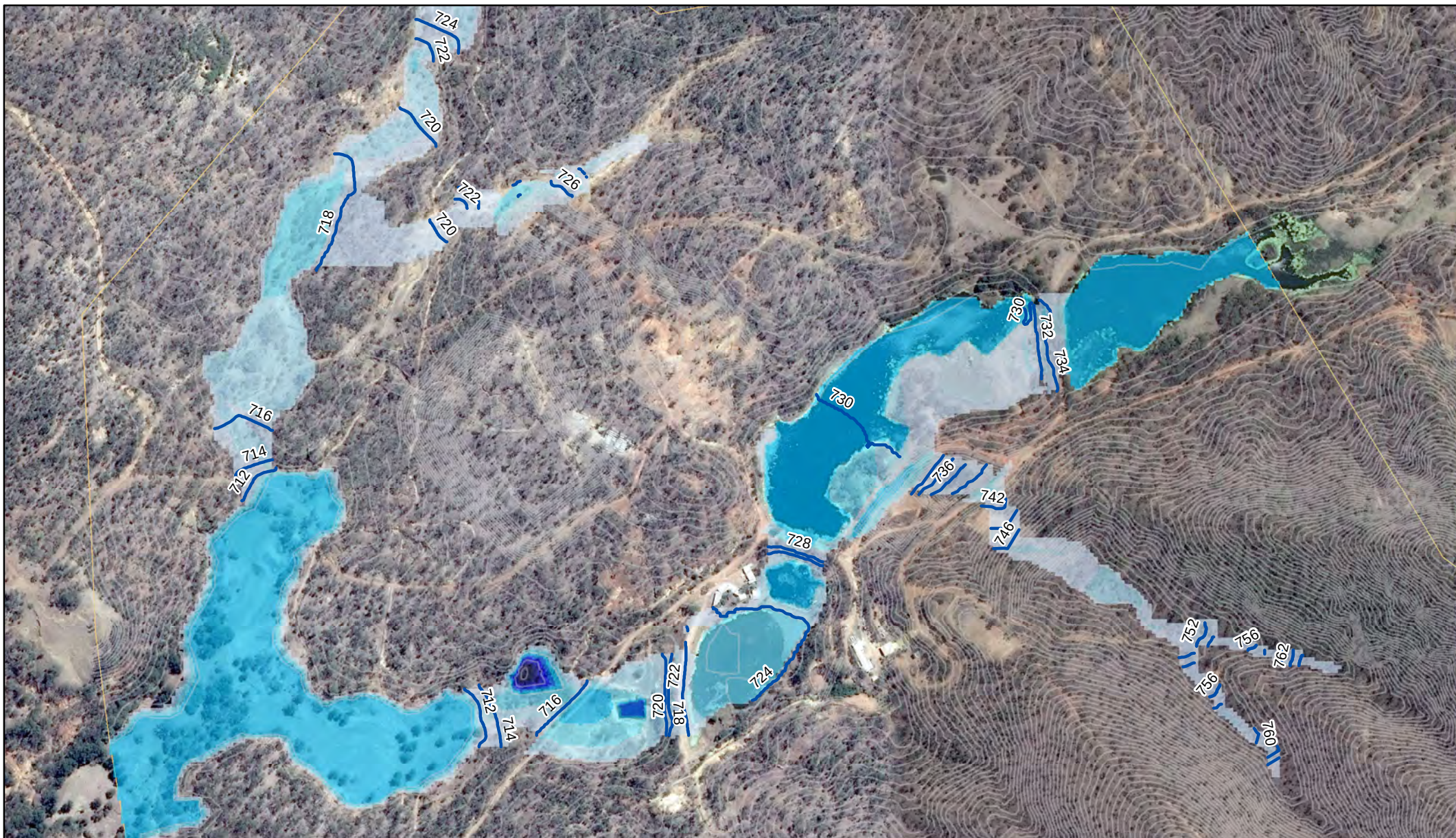
DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

Figure A2-5

Existing Case Peak Flood Level 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Depth (m)

<= 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1

1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3

2m Contour

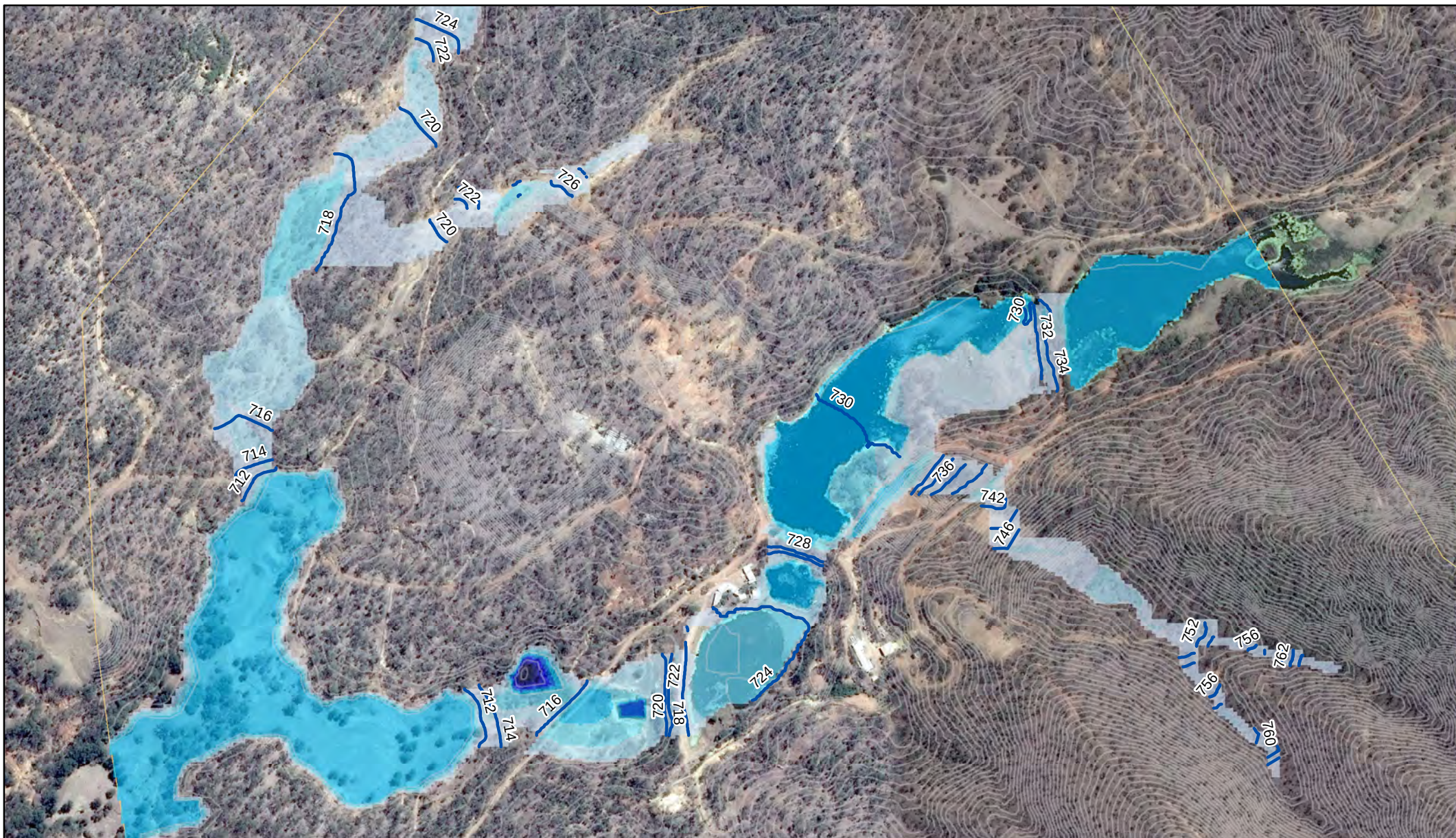
DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

Figure A2-6

Existing Case Peak Flood Depth 0.1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Depth (m)

<= 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1

1 - 1.5
1.5 - 2
2 - 3
> 3.00

2m Contour

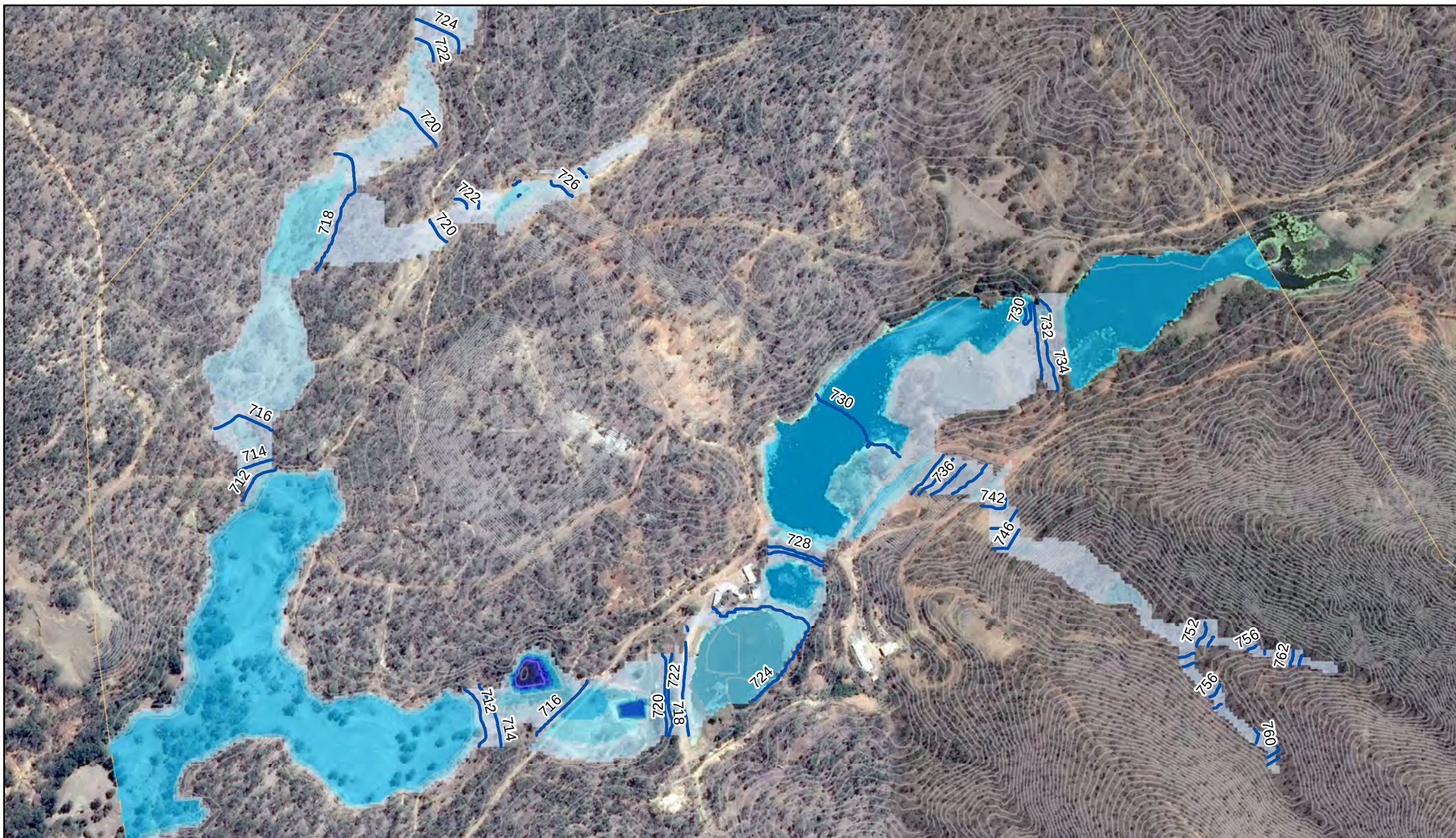
DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

Figure A2-7

Existing Case Peak Flood Depth 1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Depth (m)

<= 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1

1 - 1.5

1.5 - 2

2 - 2.5

2.5 - 3

> 3

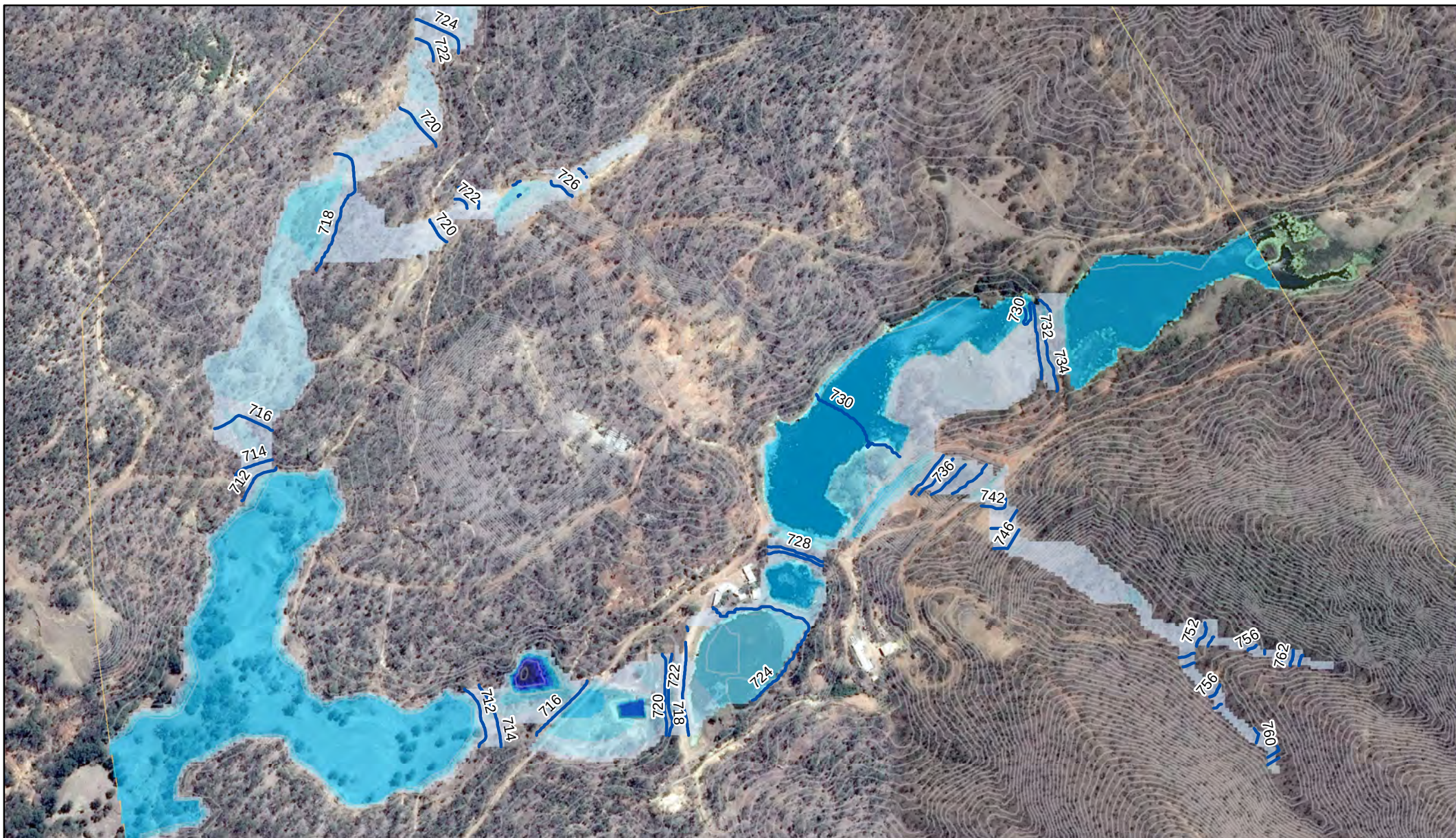
2m Contour

Figure A2-8
Existing Case Peak Flood Depth 5% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
 2m Contour

Peak Flood Depth (m)

≤ 0.25
 0.25 - 0.5
 0.5 - 0.75
 0.75 - 1

1 - 1.5

1.5 - 2

2 - 2.5

2.5 - 3

> 3

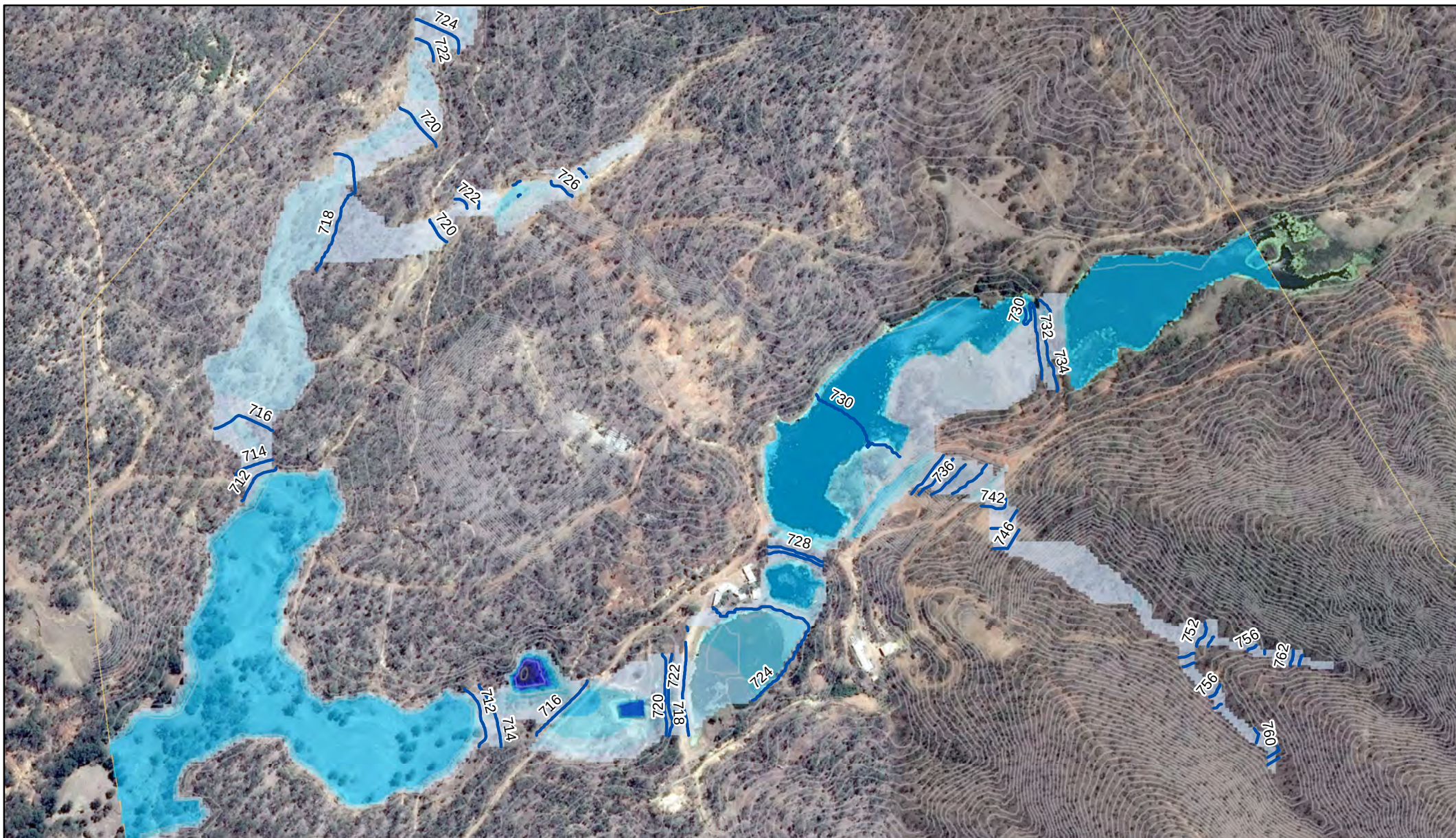
2m Contour

Figure A2-9
Existing Case Peak Flood Depth 10% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Depth (m)

<= 0.25
0.25 - 0.5
0.5 - 0.75
0.75 - 1

1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
> 3

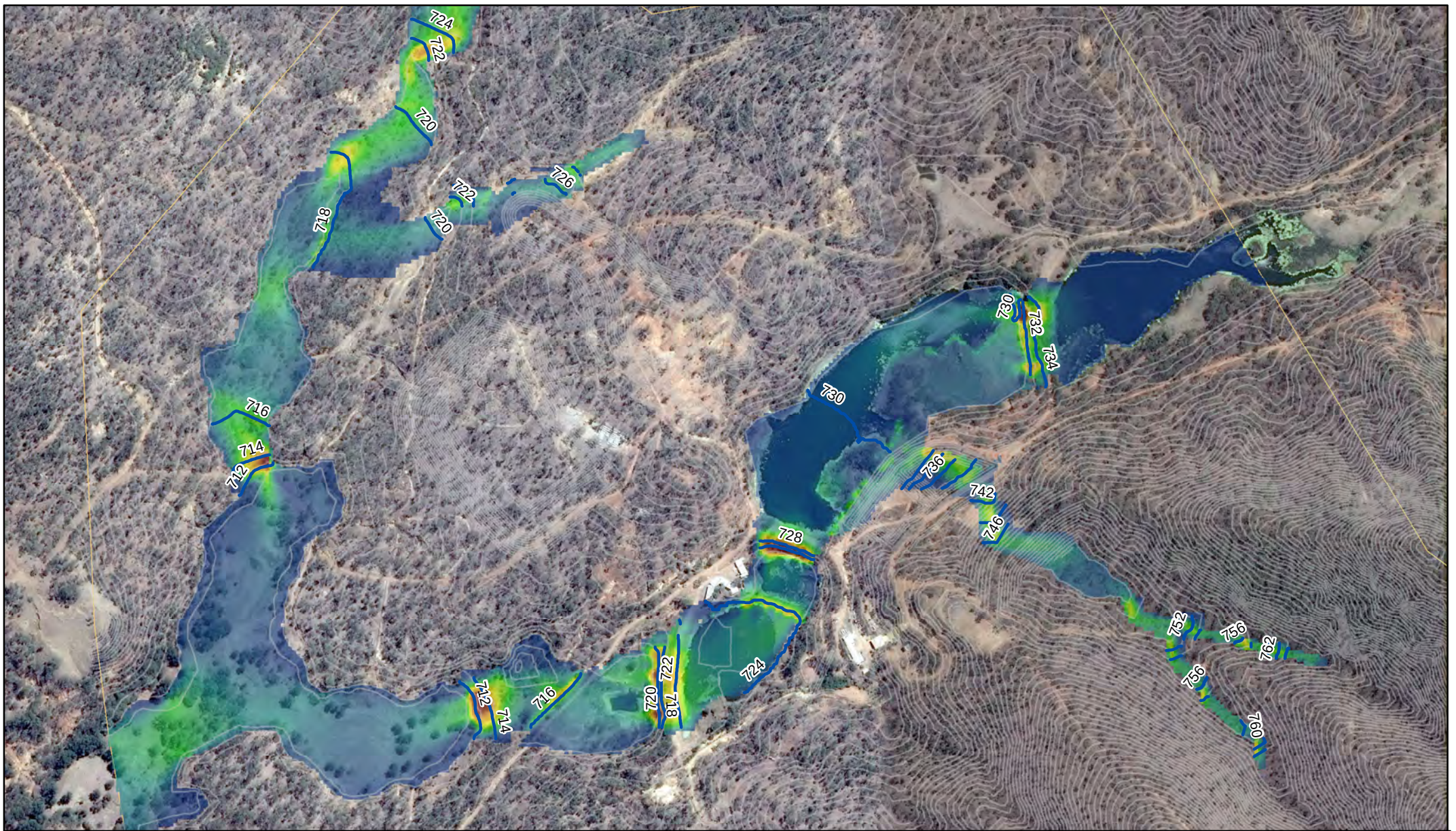
2m Contour

Figure A2-10
Existing Case Peak Flood Depth 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

2m Contour

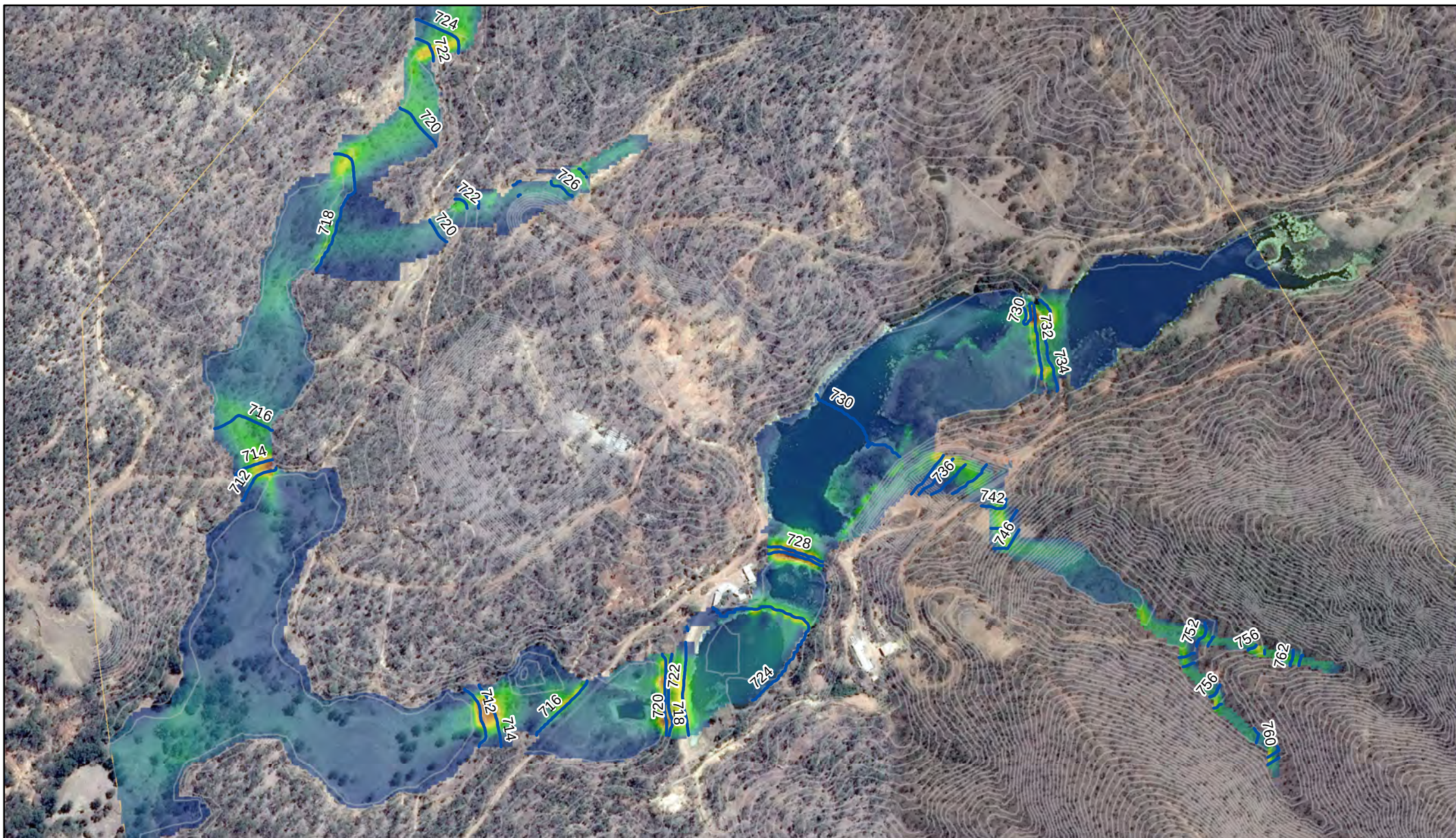
Figure A2-11

Existing Case Peak Flood Speed 0.1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

2m Contour

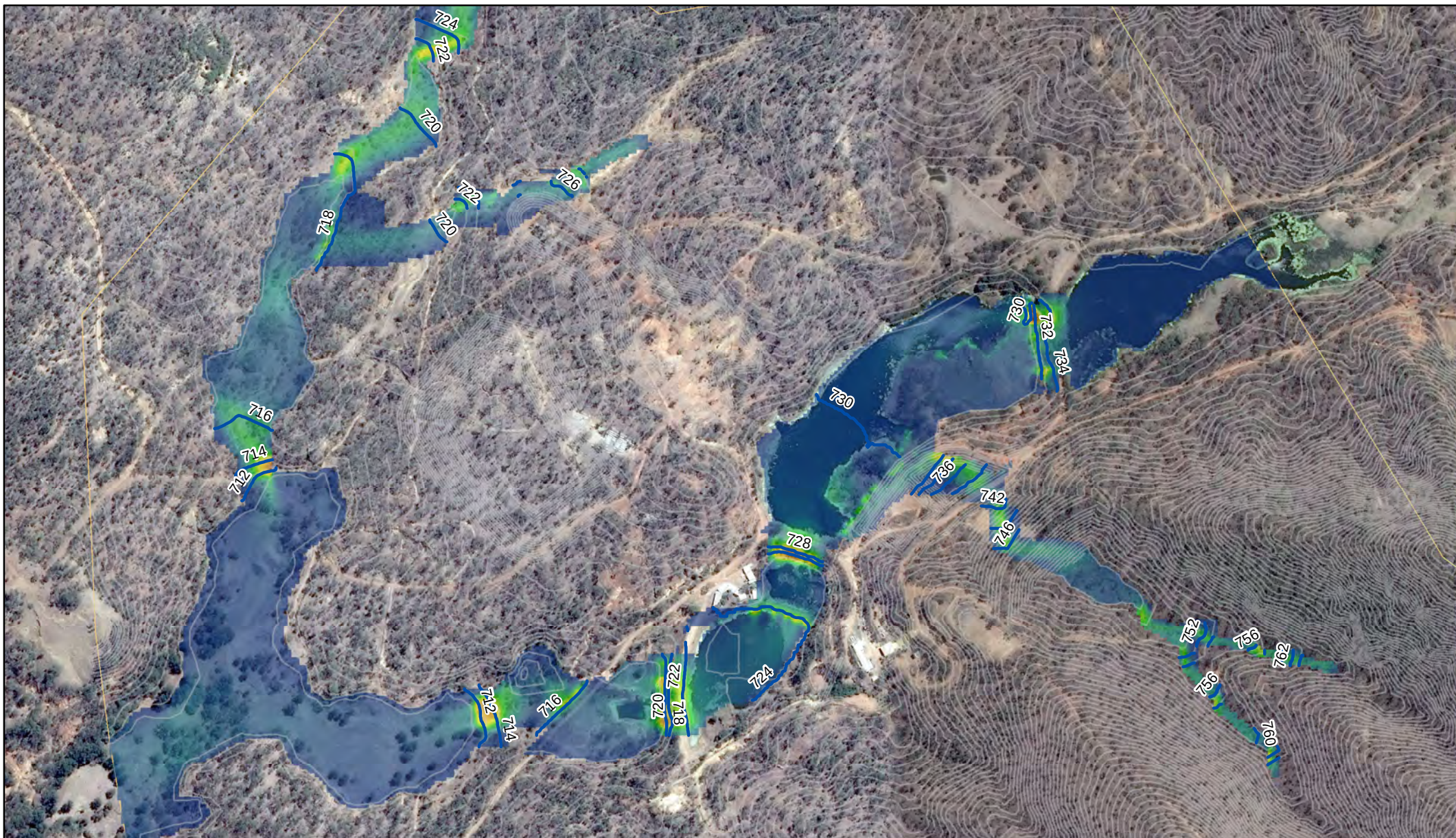
Figure A2-12

Existing Case Peak Flood Speed 1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

2m Contour

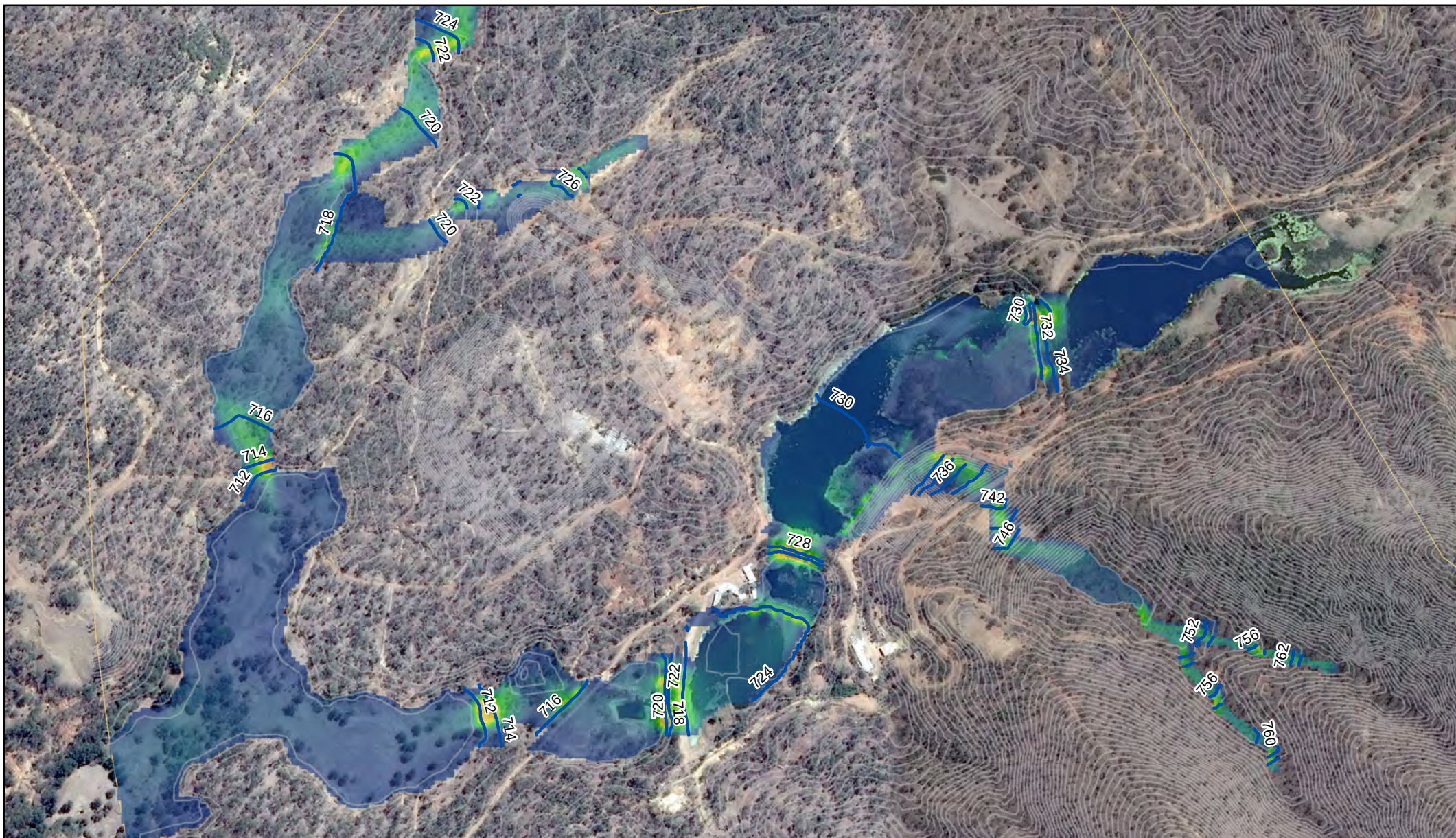
Figure A2-13

Existing Case Peak Flood Speed 5% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peek Flood Speed (m/s)
High : 4
Low : 0

2m Contour

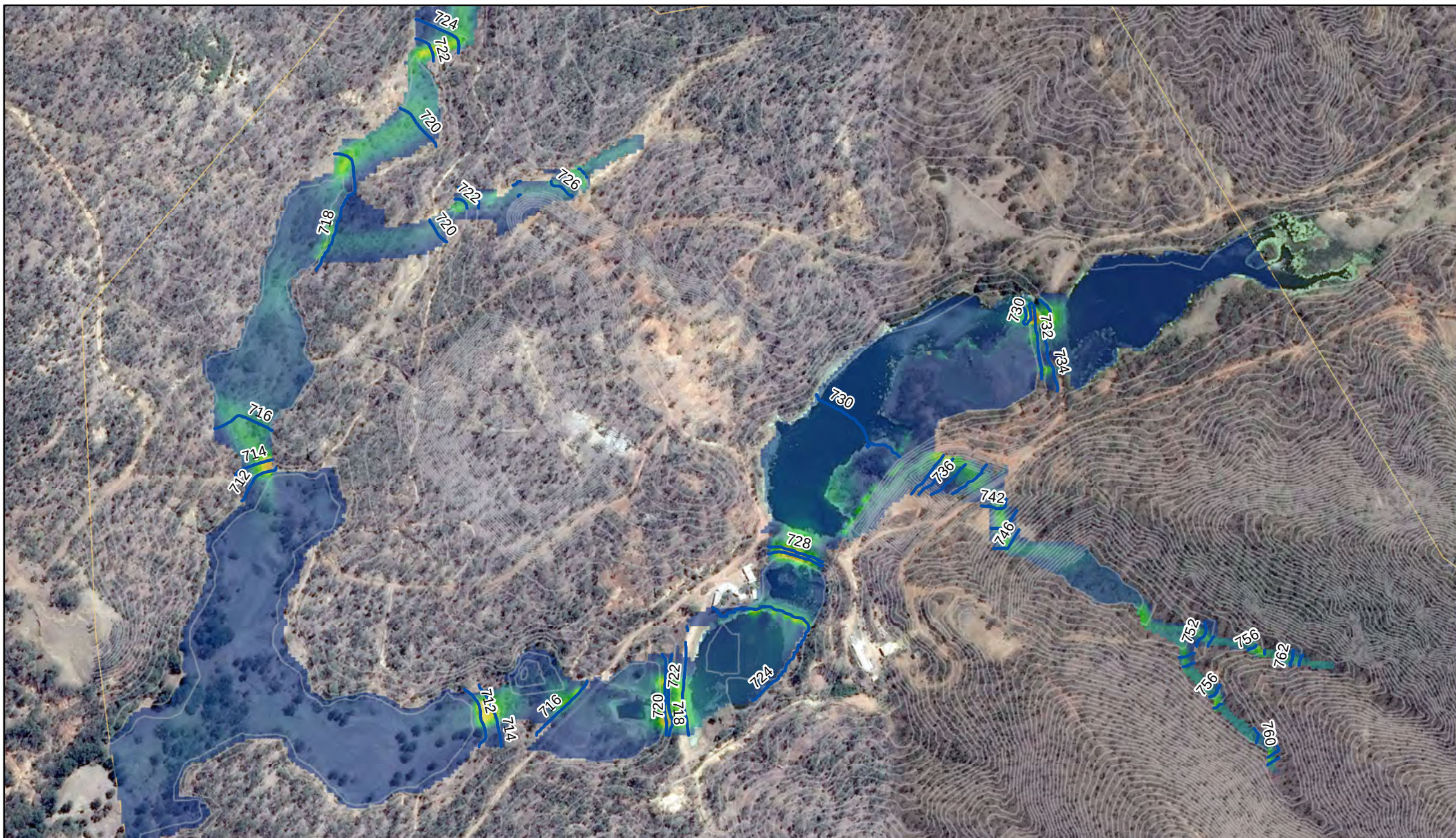
Figure A2-14

Existing Case Peak Flood Speed 10% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 04/09/18
Drawn: Stuart B.

Legend

TUFLOW Extents
2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

2m Contour

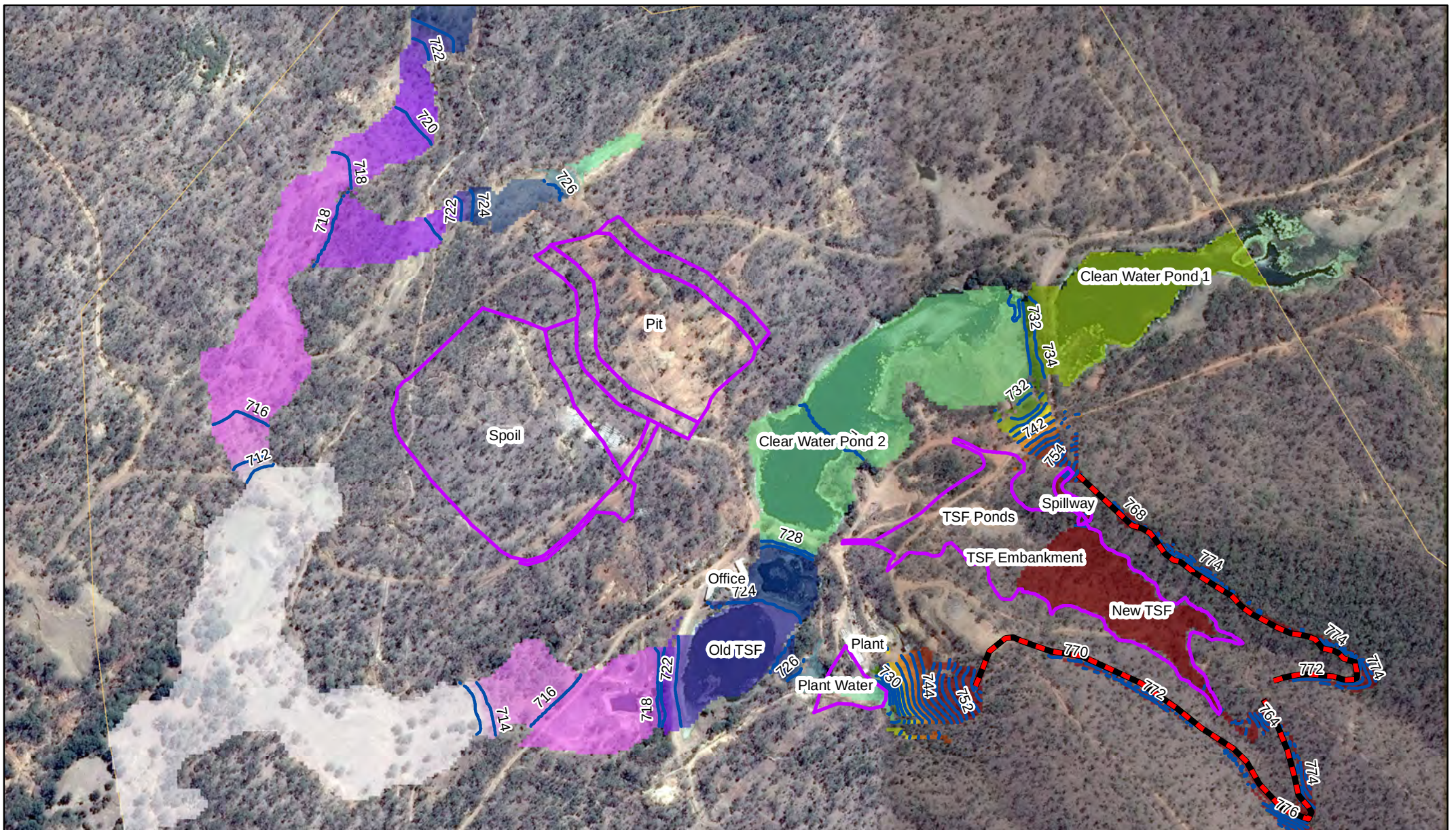
Figure A2-15

Existing Case Peak Flood Speed 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Level (mAHD)
High : 750

Low : 712

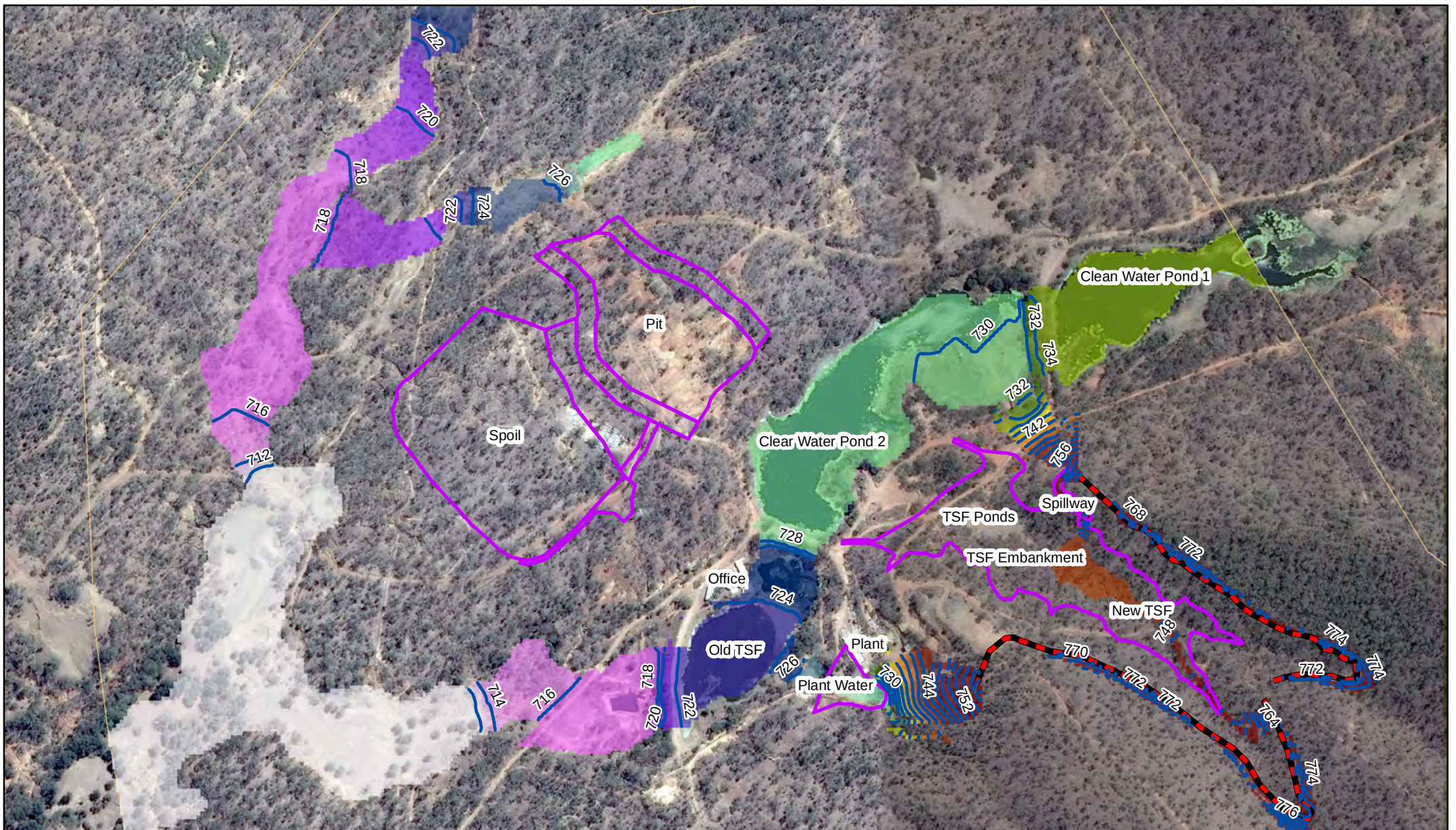
Figure A2-16

Developed Case Peak Flood Level 0.1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- 2m Contour

Peak Flood Level (mAHD)
High : 750
Low : 712

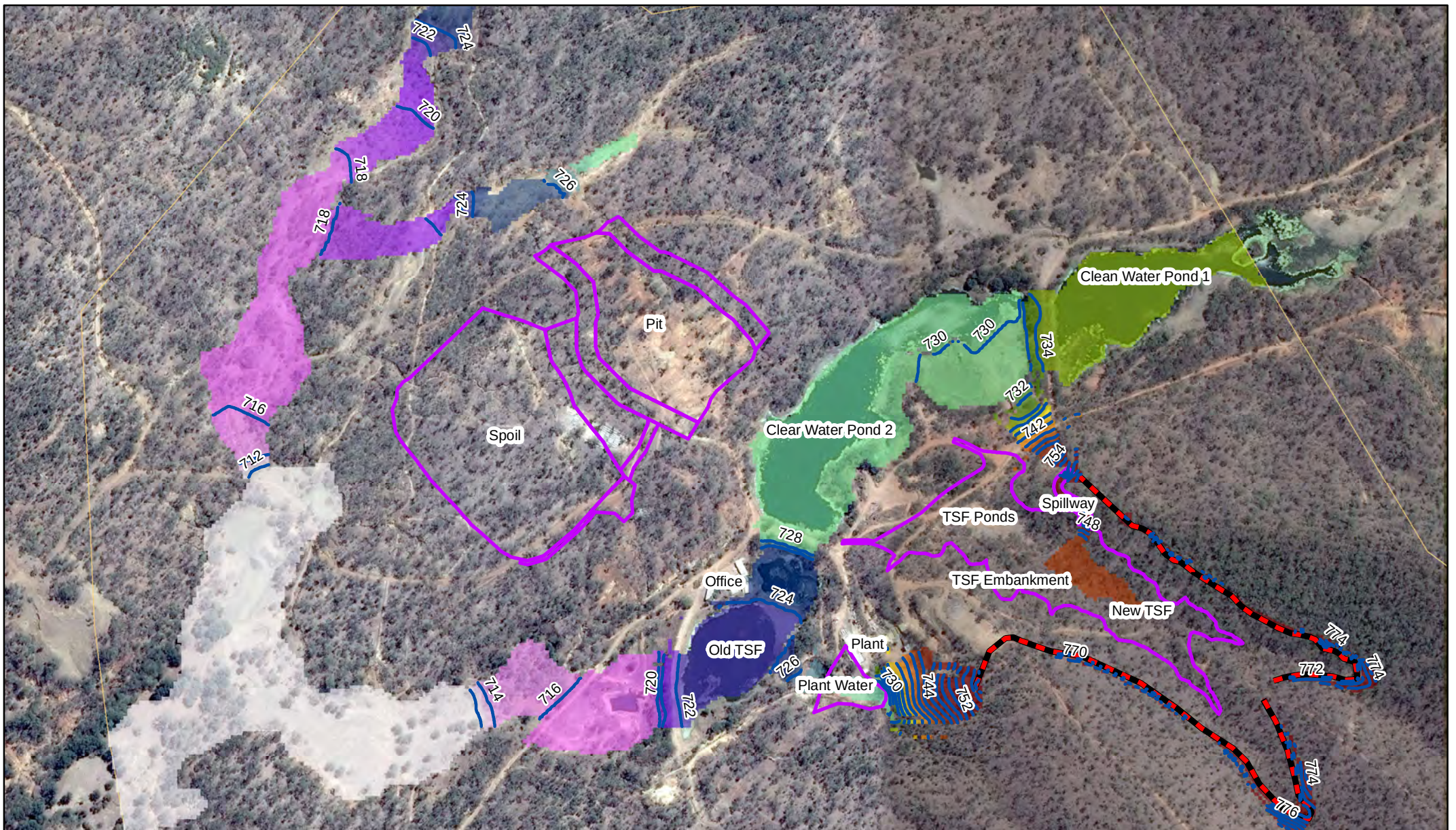
Figure A2-17

Developed Case Peak Flood Level 1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Level (mAHD)
High : 750

Low : 712

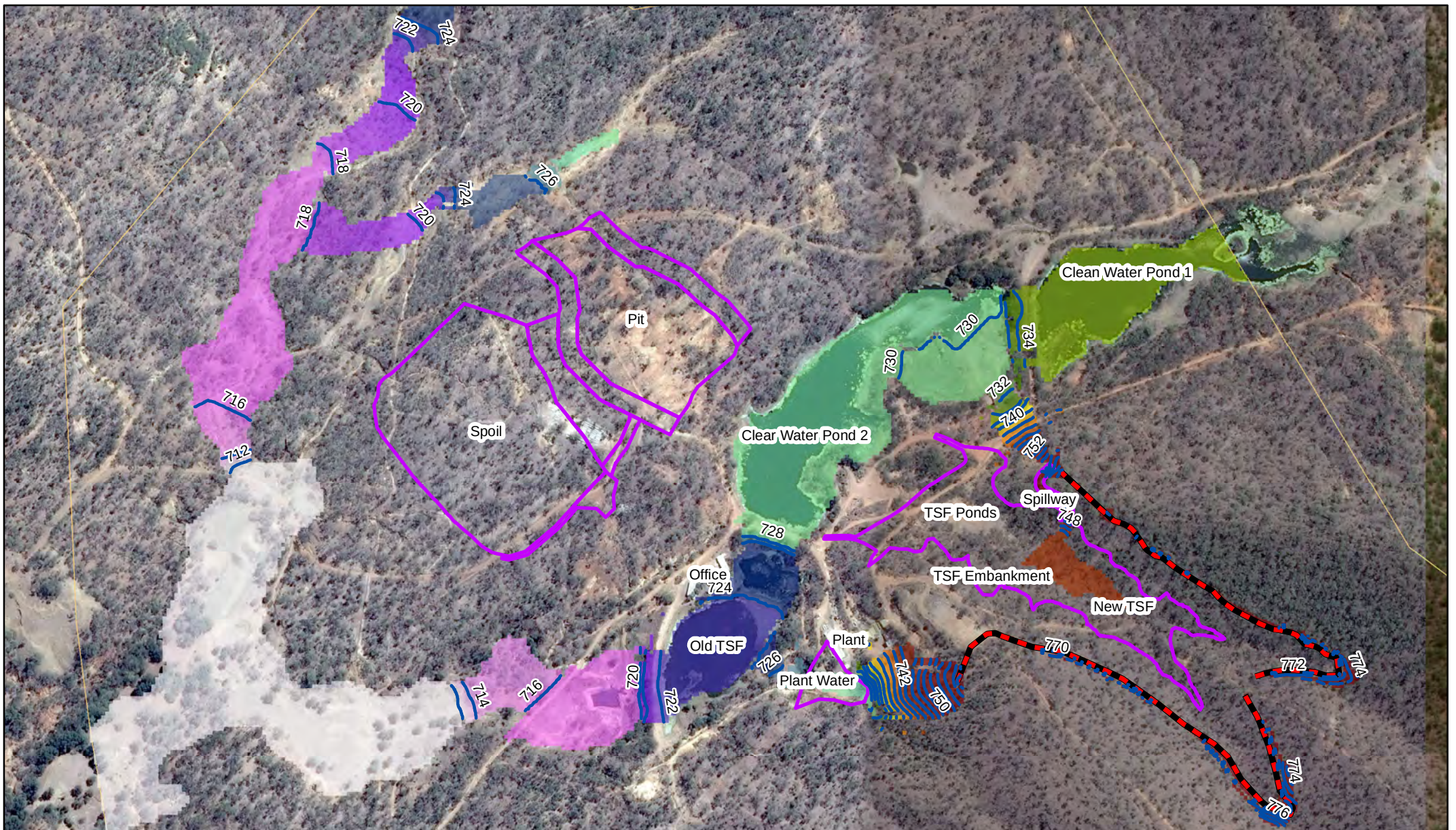
Figure A2-18

Developed Case Peak Flood Level 5% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Level (mAHD)

High : 750
Low : 712

Figure A2-19

Developed Case Peak Flood Level 10% AEP

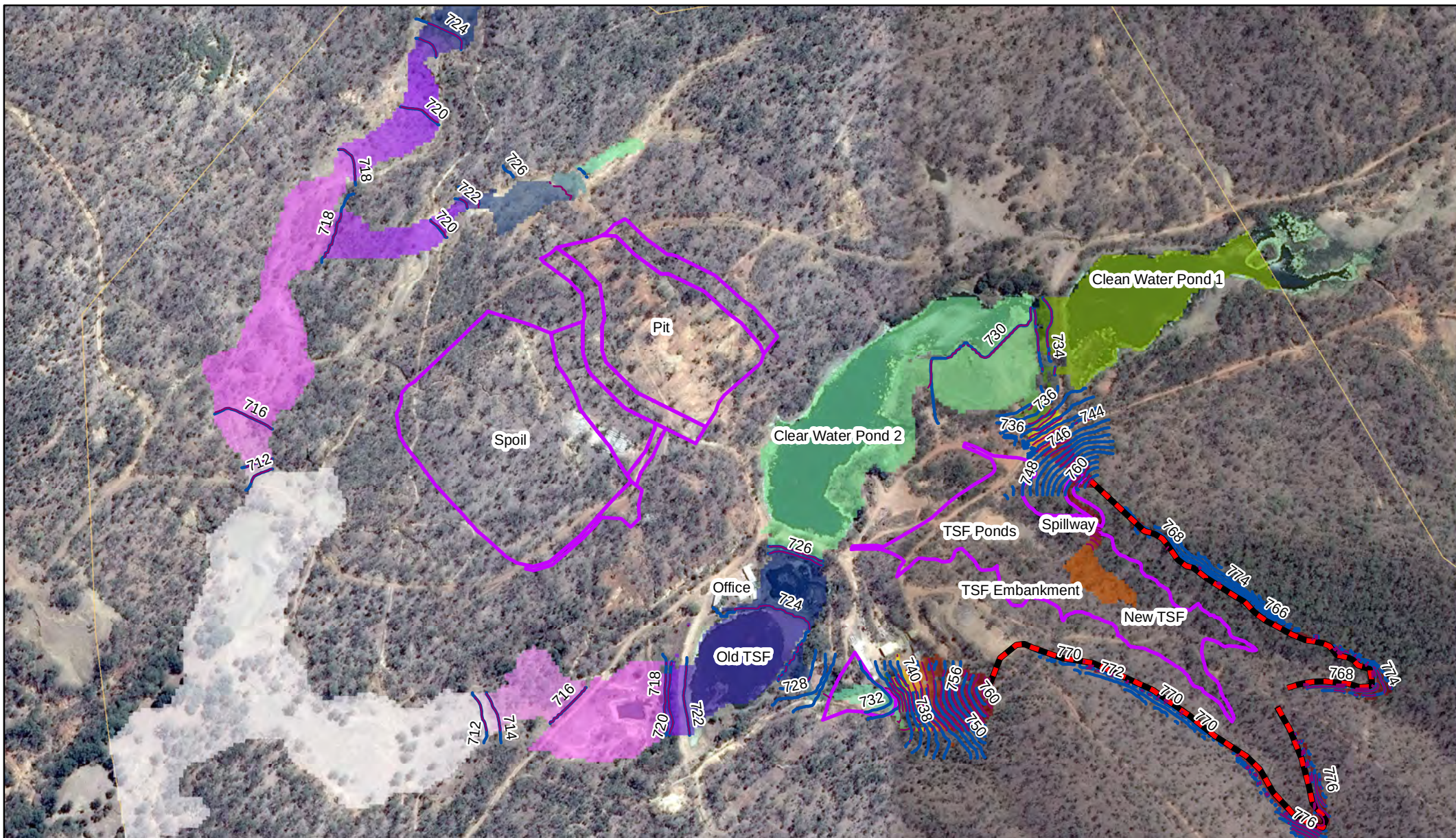
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Level (mAHD)
High : 750

Low : 712

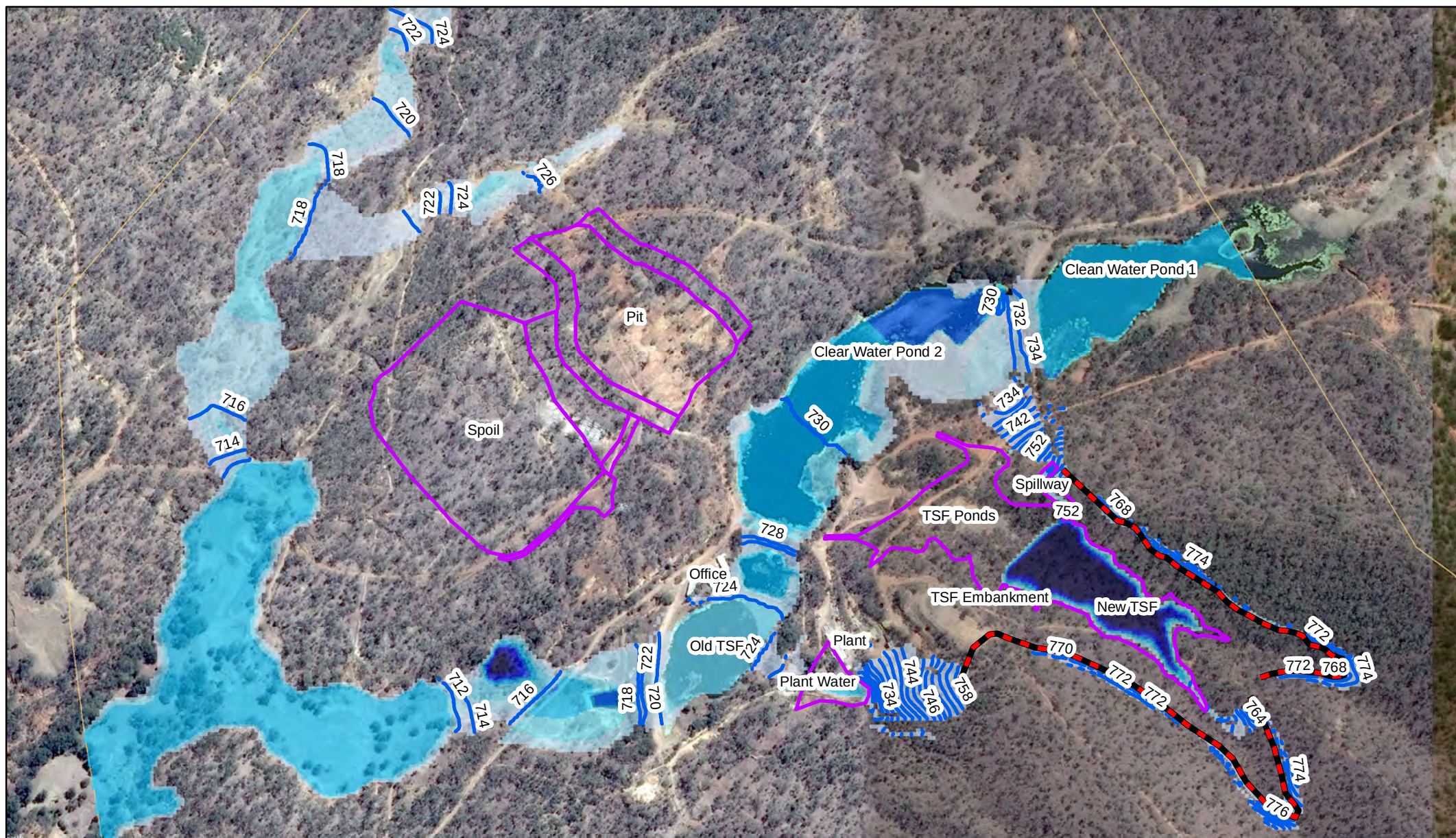
Figure A2-20

Developed Case Peak Flood Level 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Depth (m)

 ≤ 0.25	 1 - 1.5
 0.25 - 0.5	 1.5 - 2
 0.5 - 0.75	 2 - 2.5
 0.75 - 1	 2.5 - 3
	 > 3

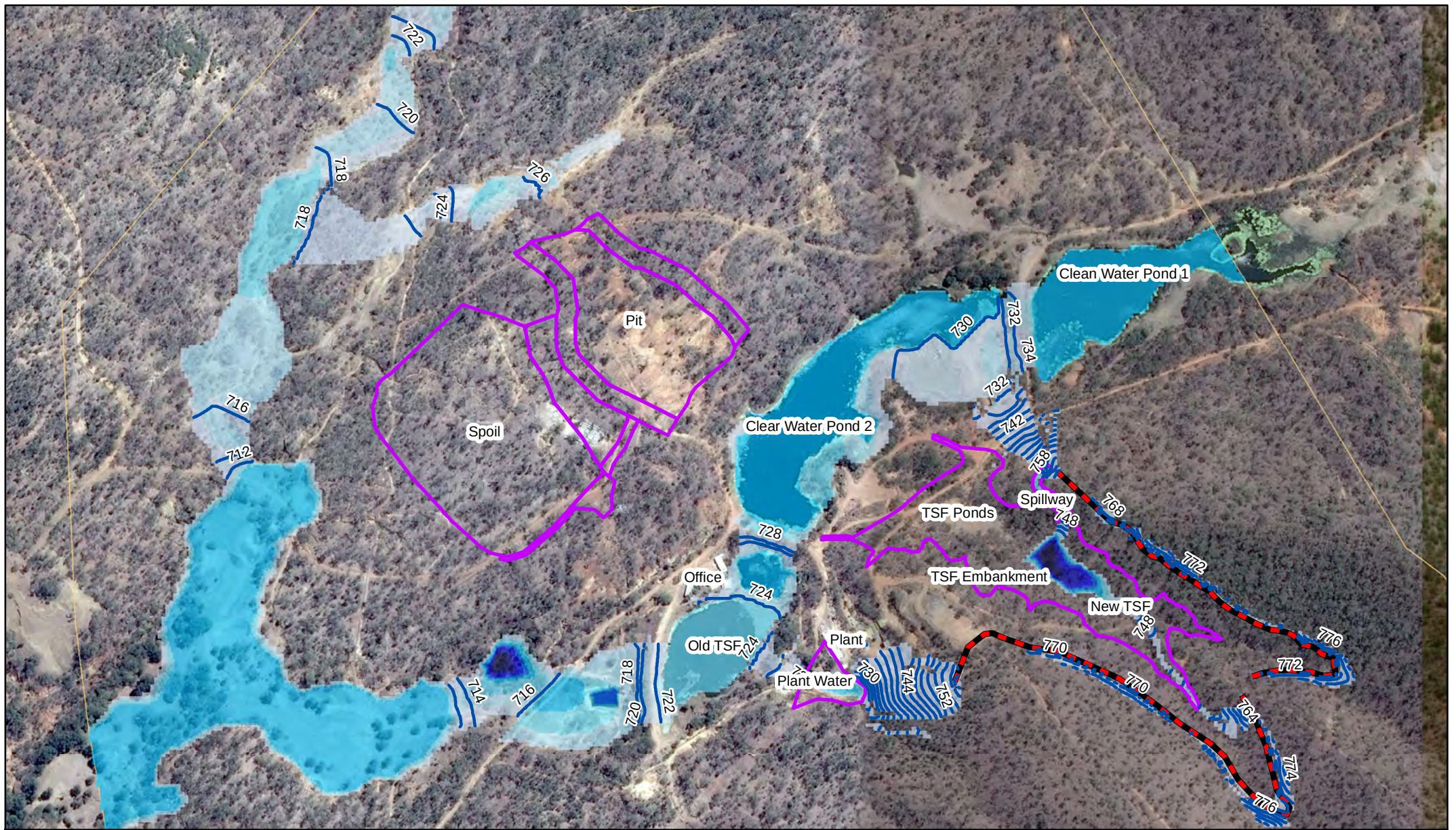
Figure A2-21

Developed Case Peak Flood Depth 0.1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Depth (m)

- | | |
|---|--|
| ≤ 0.25 | 1 - 1.5 |
| 0.25 - 0.5 | 1.5 - 2 |
| 0.5 - 0.75 | 2 - 2.5 |
| 0.75 - 1 | 2.5 - 3 |
| | > 3 |

Figure A2-22

Developed Case Peak Flood Depth 1% AEP

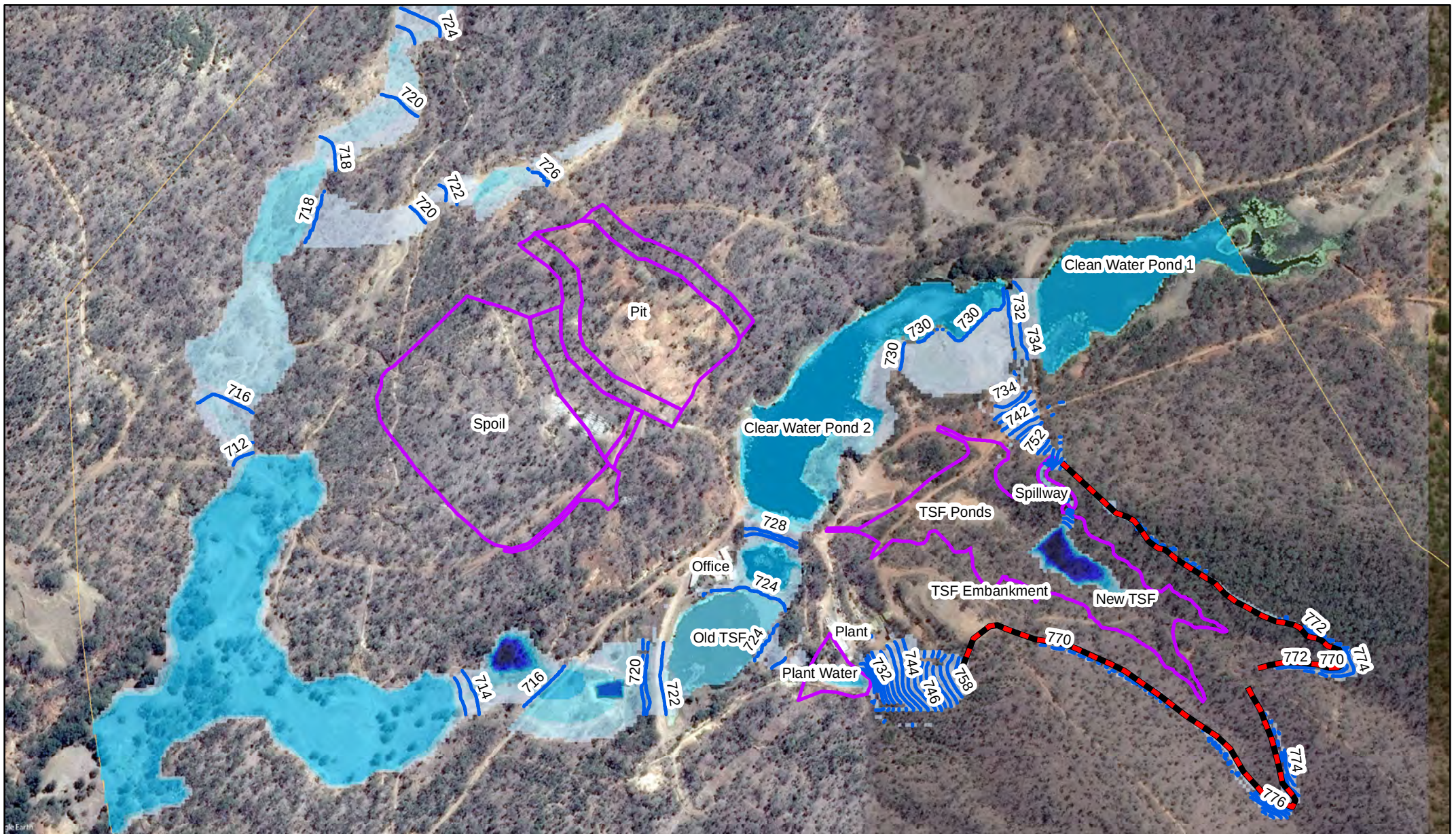
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Depth (m)

- | | |
|---|---|
| ≤ 0.25 | 1 - 1.5 |
| 0.25 - 0.5 | 1.5 - 2 |
| 0.5 - 0.75 | 2 - 2.5 |
| 0.75 - 1 | 2.5 - 3 |
| | > 3 |

Figure A2-23

Developed Case Peak Flood Depth 5% AEP

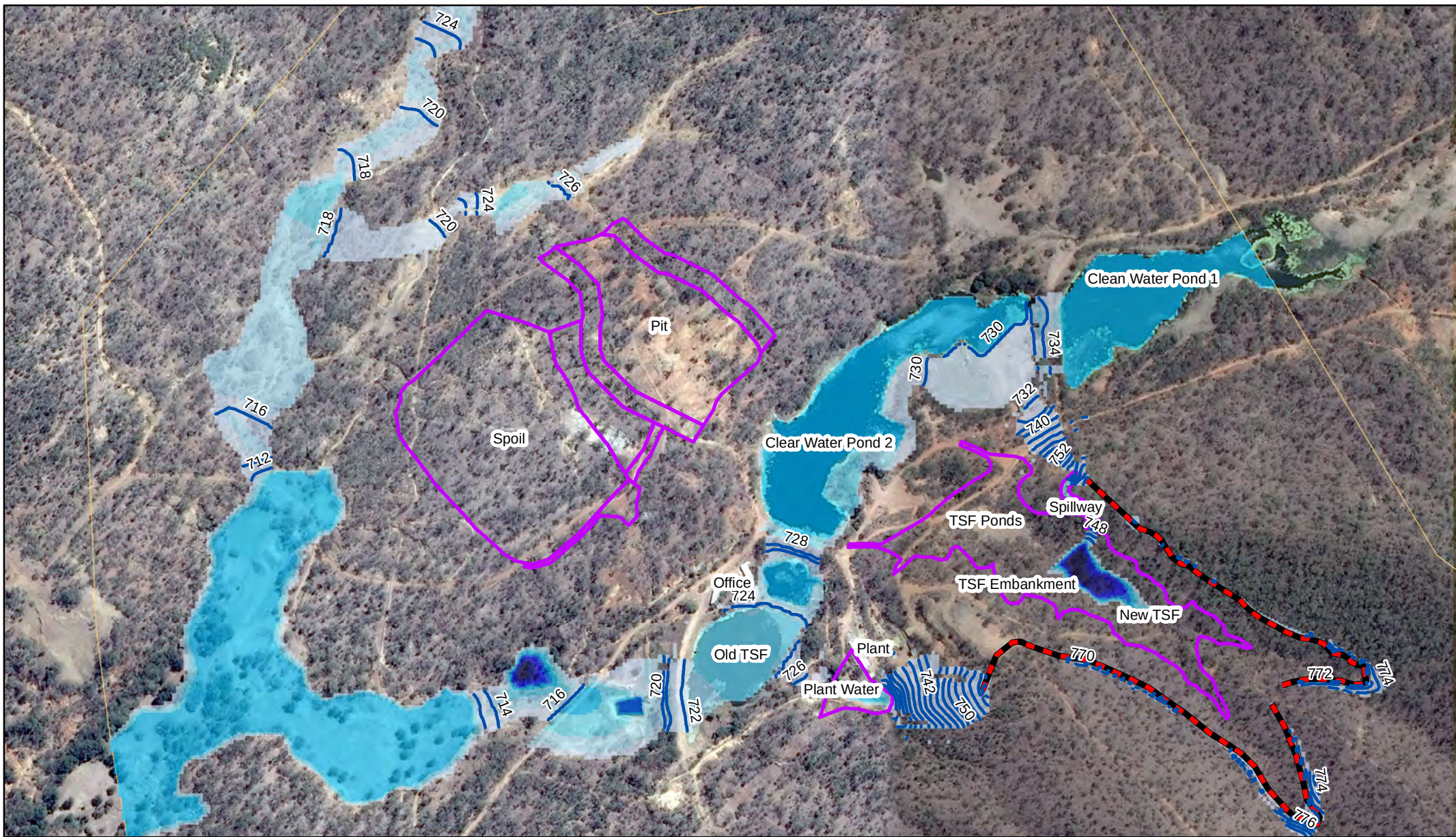
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05





0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Depth (m)

- | | |
|---|---|
| ≤ 0.25 | 1 - 1.5 |
| 0.25 - 0.5 | 1.5 - 2 |
| 0.5 - 0.75 | 2 - 2.5 |
| 0.75 - 1 | 2.5 - 3 |
| | > 3 |

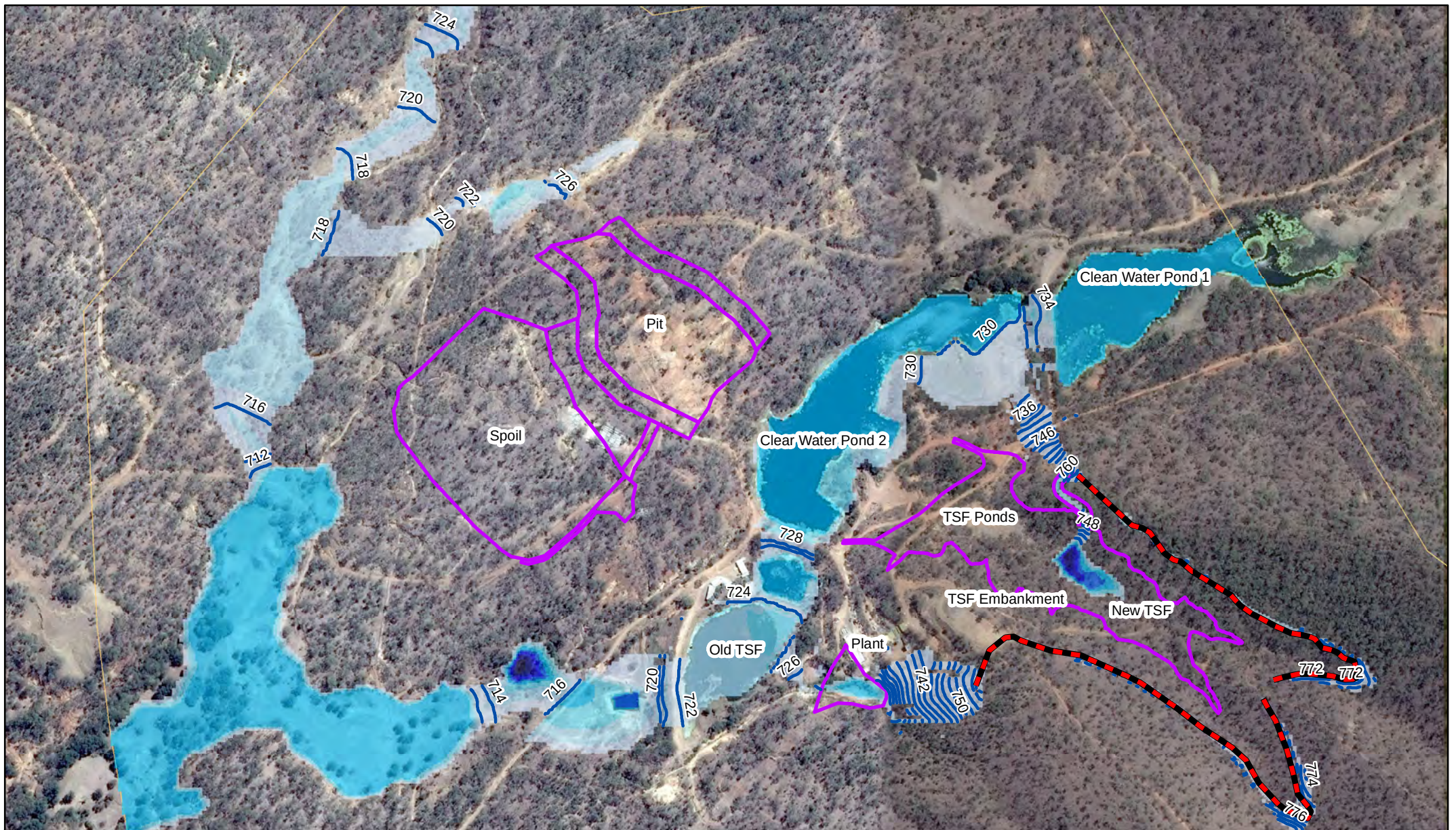
Figure A2-24

Developed Case Peak Flood Depth 10% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Depth (m)

- | | |
|--|--|
| ≤ 0.25 | 1 - 1.5 |
| 0.25 - 0.5 | 1.5 - 2 |
| 0.5 - 0.75 | 2 - 2.5 |
| 0.75 - 1 | 2.5 - 3 |
| | > 3 |

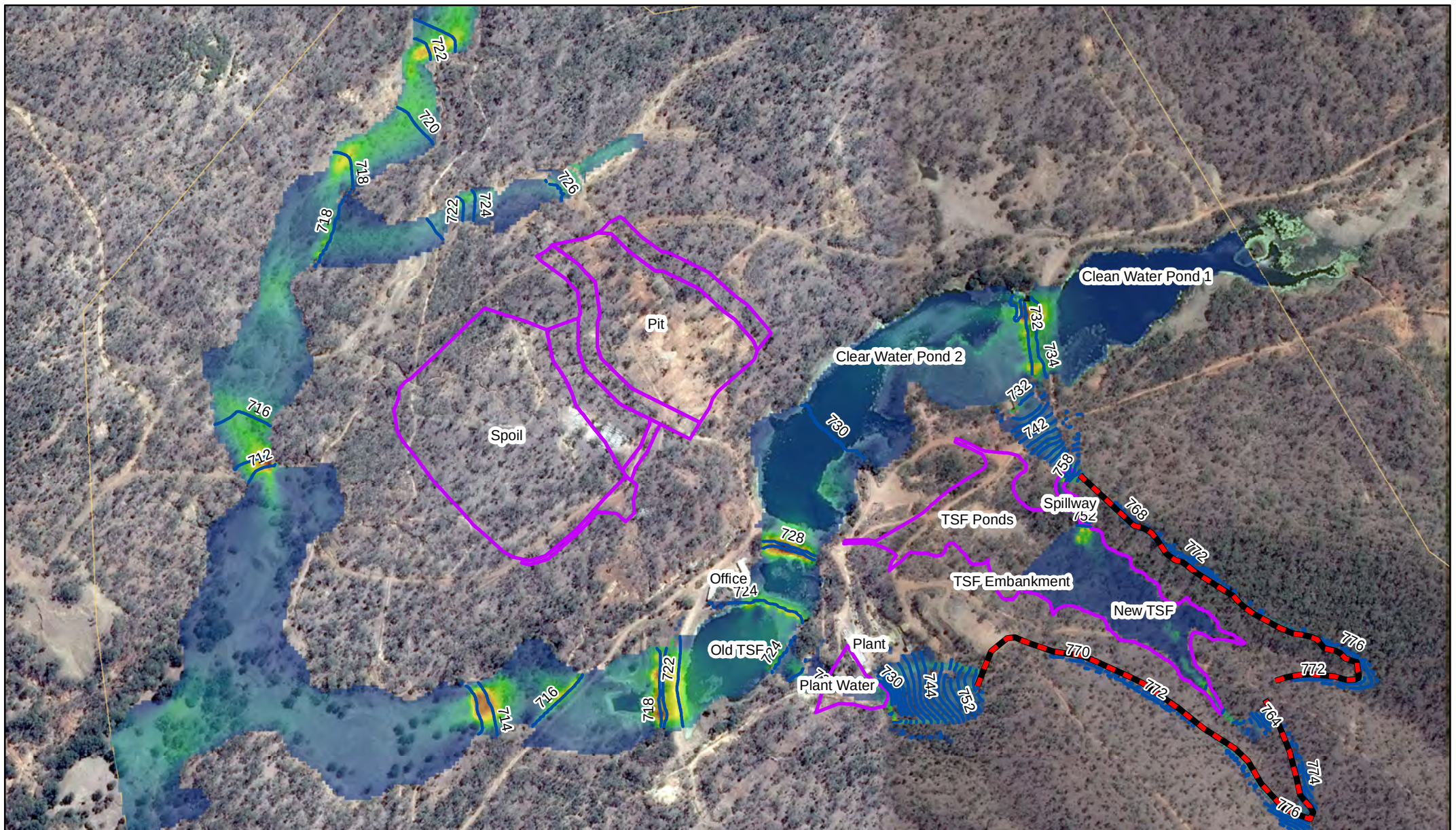
Figure A2-25

Developed Case Peak Flood Depth 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

Figure A2-26

Developed Case Peak Flood Speed 0.1% AEP

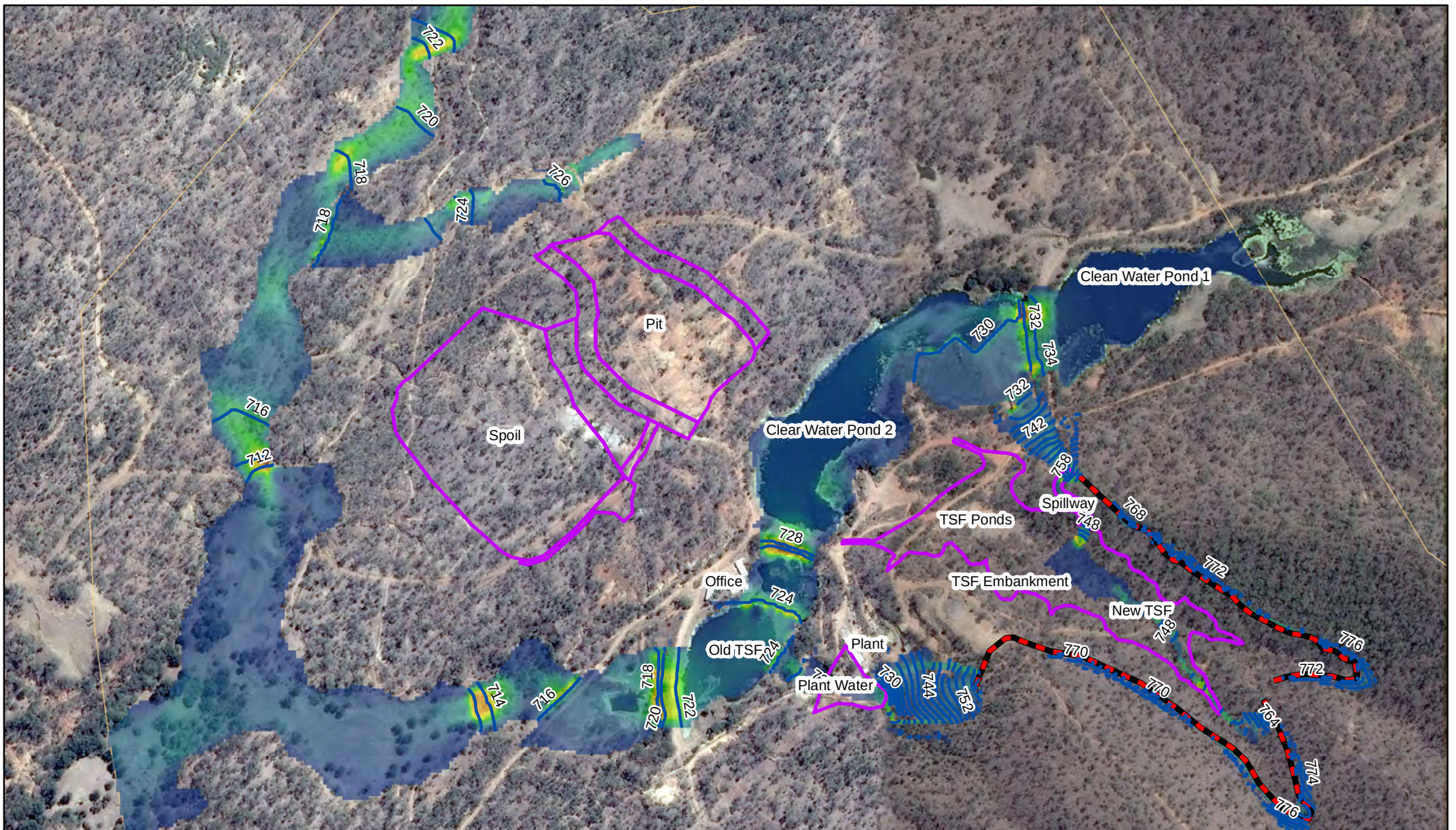
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

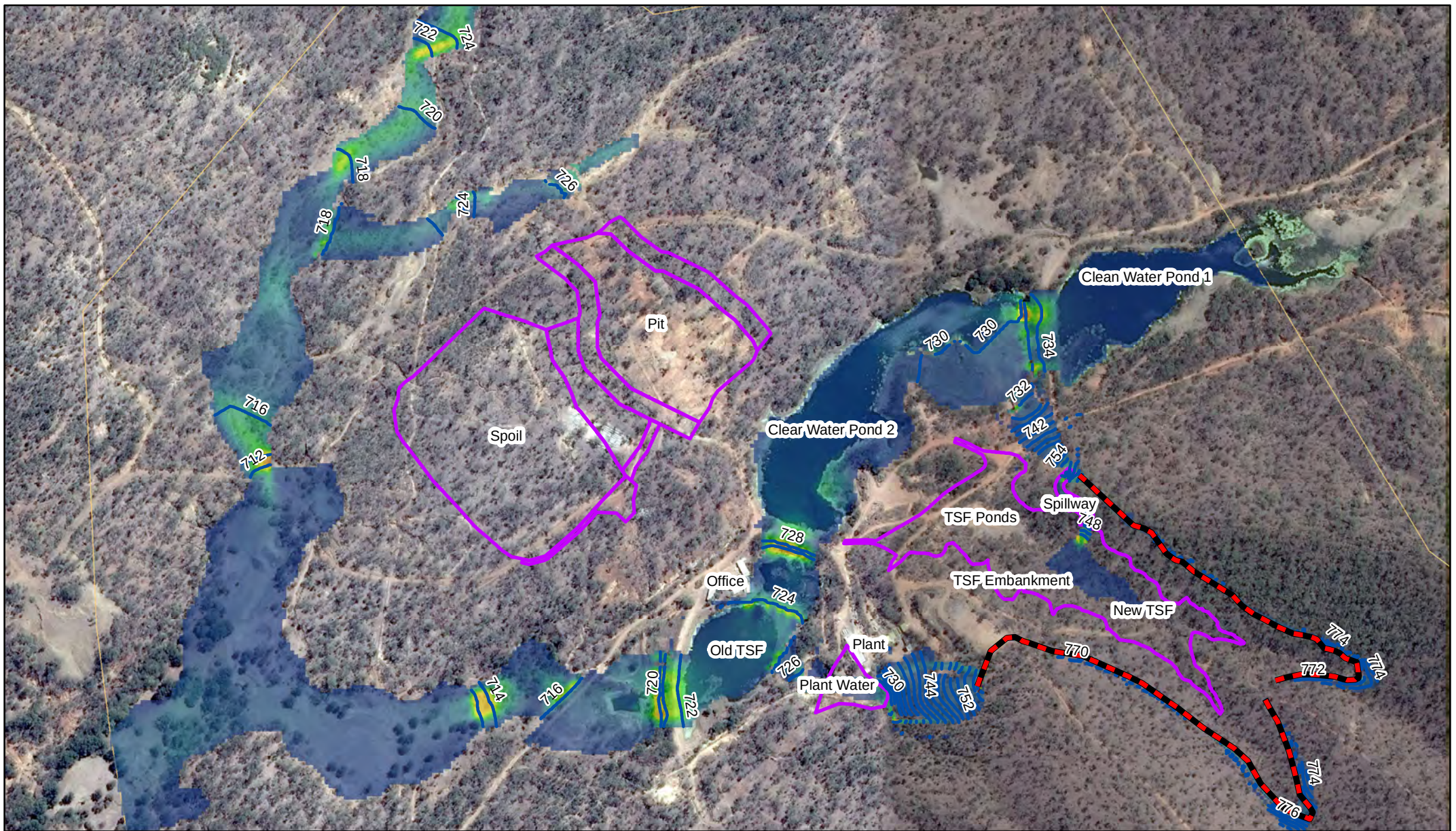
Figure A2-27

Developed Case Peak Flood Speed 1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

Figure A2-28

Developed Case Peak Flood Speed 5% AEP

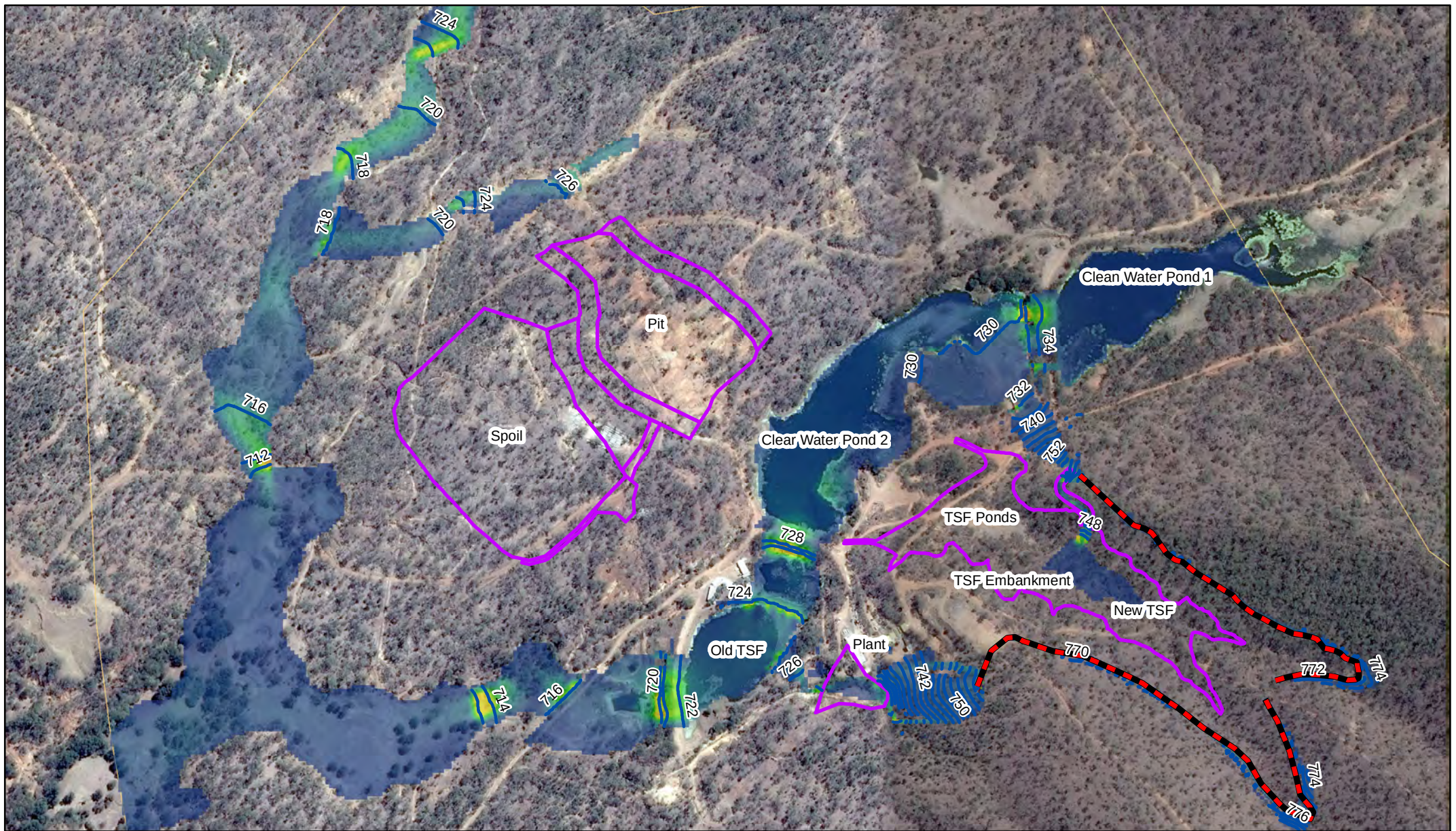
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Speed (m/s)
High : 4

Low : 0

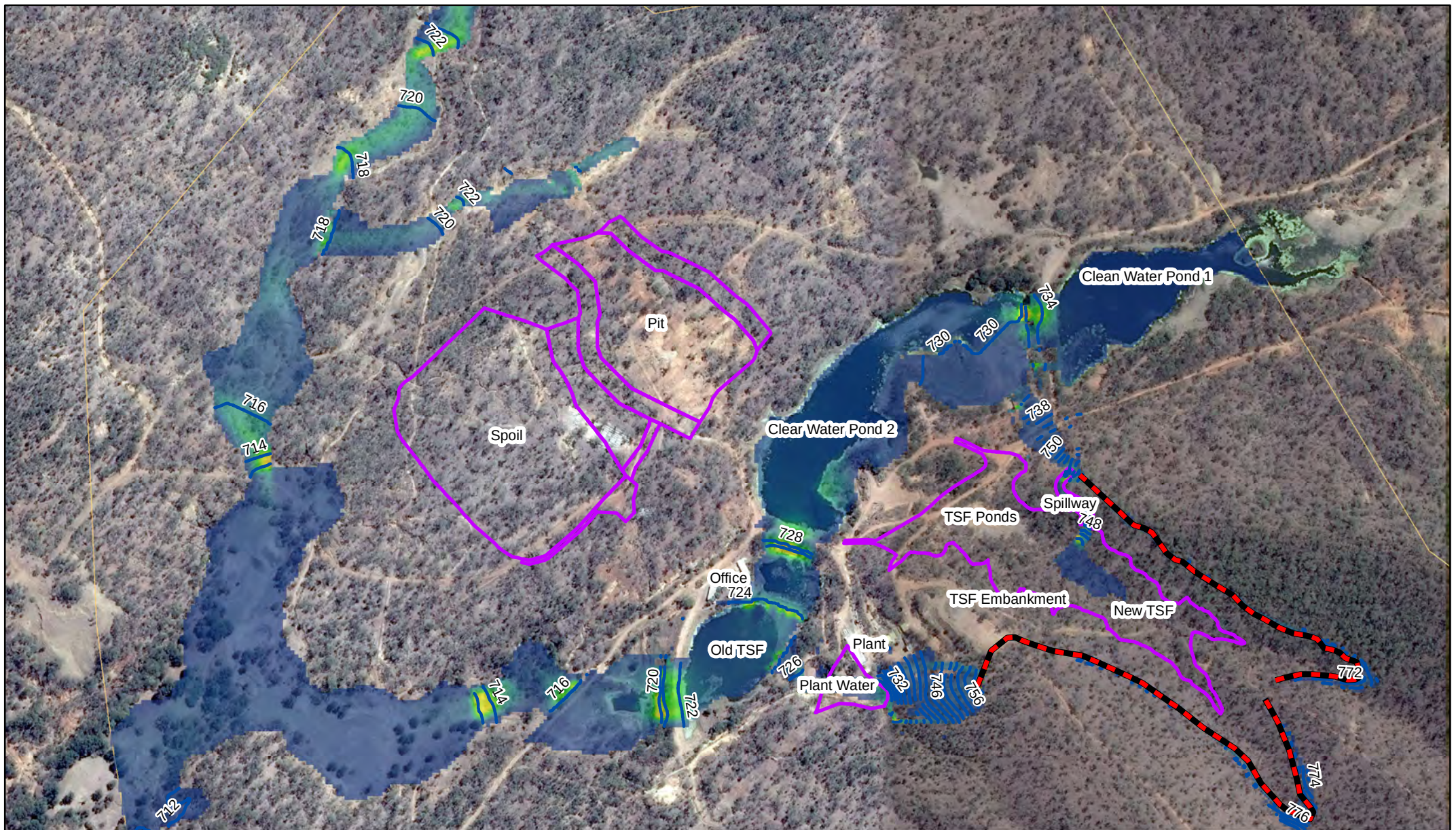
Figure A2-29

Developed Case Peak Flood Speed 10% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion
- 2m Contour

Peak Flood Speed (m/s)
High : 4
Low : 0

Figure A2-30

Developed Case Peak Flood Speed 18% AEP

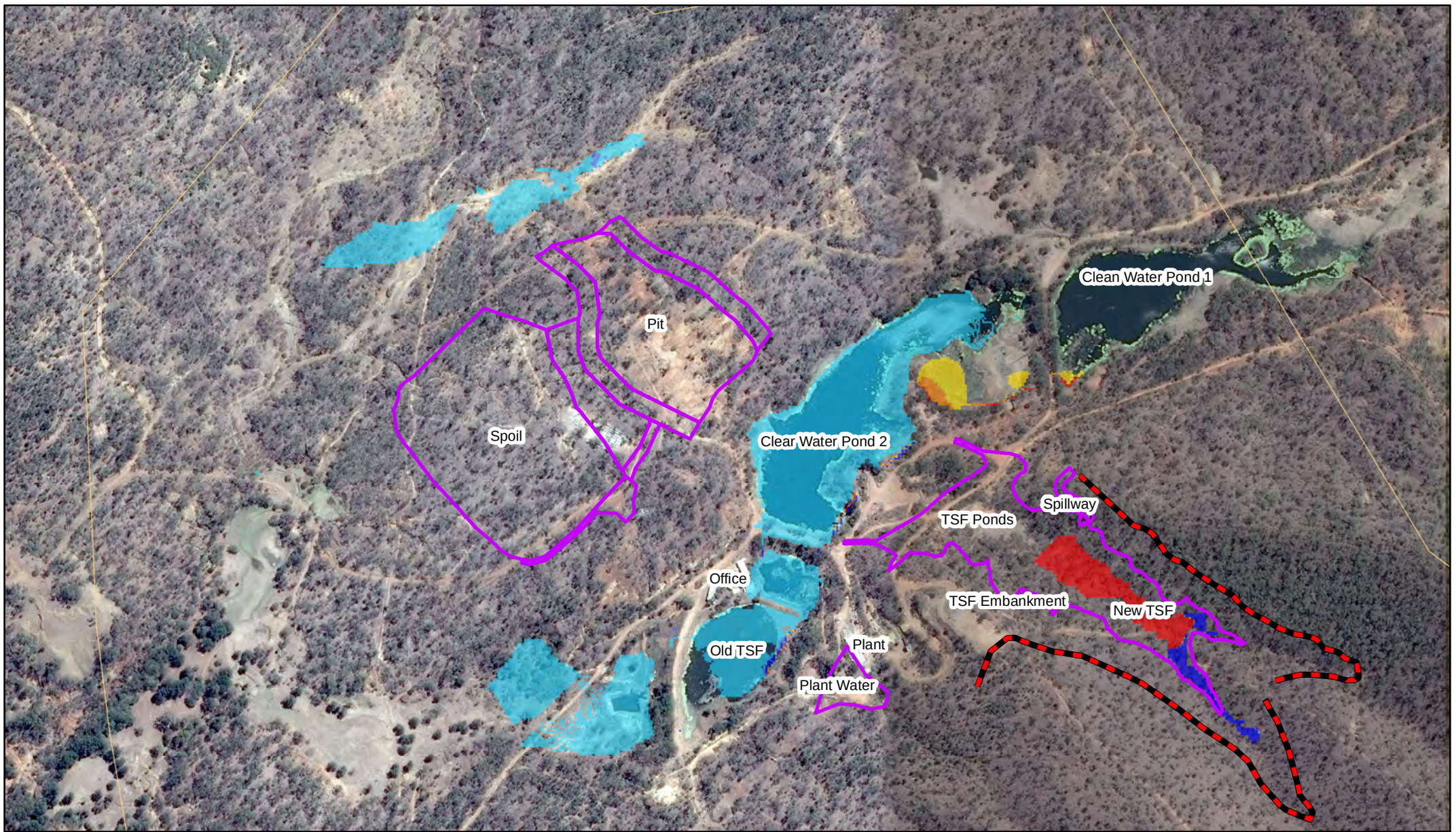
Flood Impact Assessment

Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Legend

TUFLOW Extents

Diversion Channels

Proposed Expansion

Difference (m)

< -0.1

-0.1 - -0.05

-0.05 - -0.02

-0.02 - 0.00

0.00 - 0.02

0.02 - 0.05

0.05 - 0.10

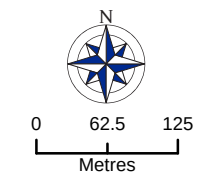
> 0.1

Figure A2-31
Developed Case Peak Flood Level Difference 0.1% AEP
Flood Impact Assessment
Dalcouth Tin Mine

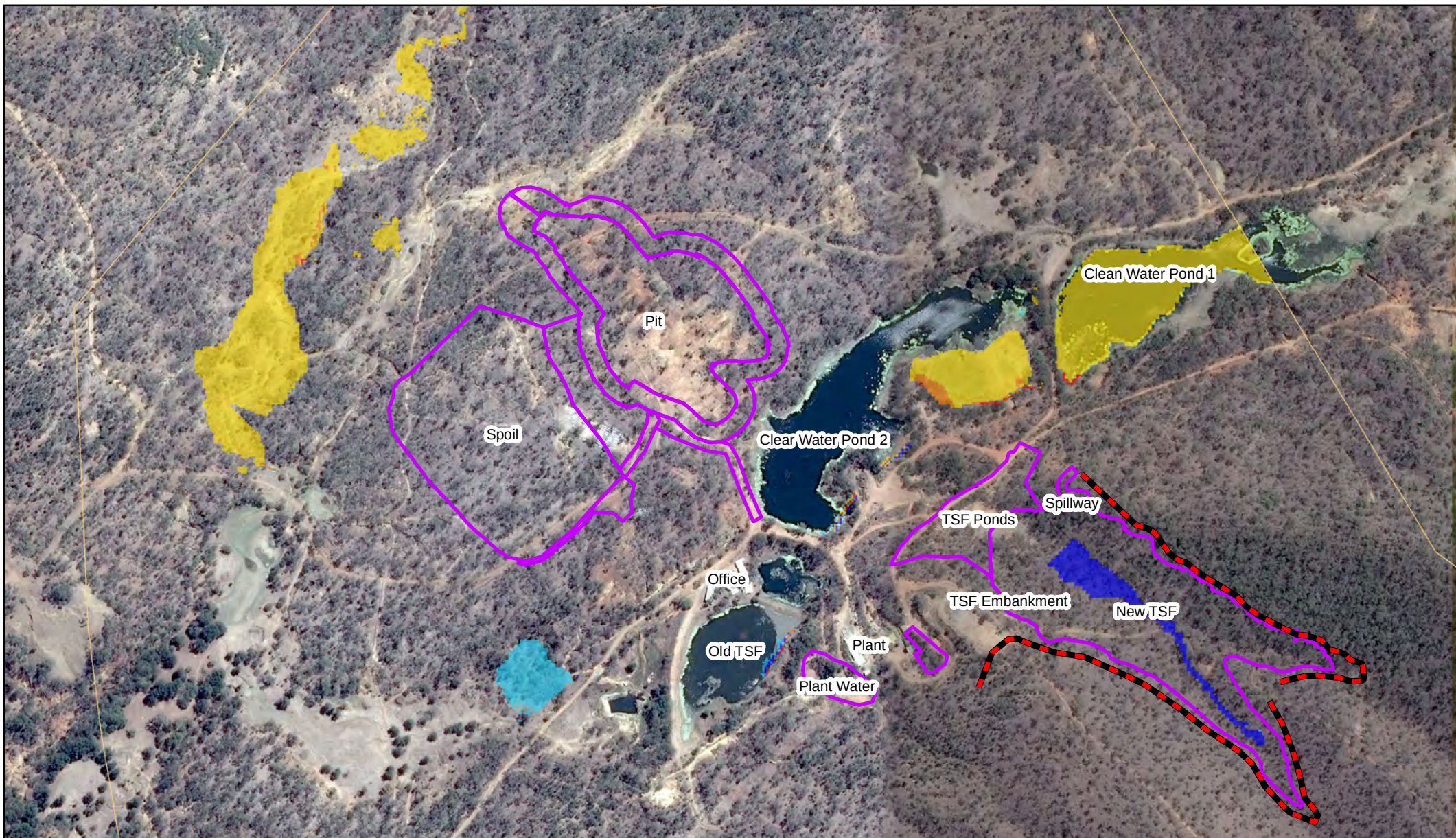
DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.



Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion

Difference (m)

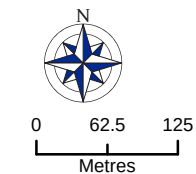
- | | |
|---|---|
| < -0.1 | 0.00 - 0.02 |
| -0.1 - -0.05 | 0.02 - 0.05 |
| -0.05 - -0.02 | 0.05 - 0.10 |
| -0.02 - 0.00 | > 0.1 |

Figure A2-32
 Developed Case Peak Flood Level Difference 1% AEP
 Flood Impact Assessment
 Dalcouth Tin Mine

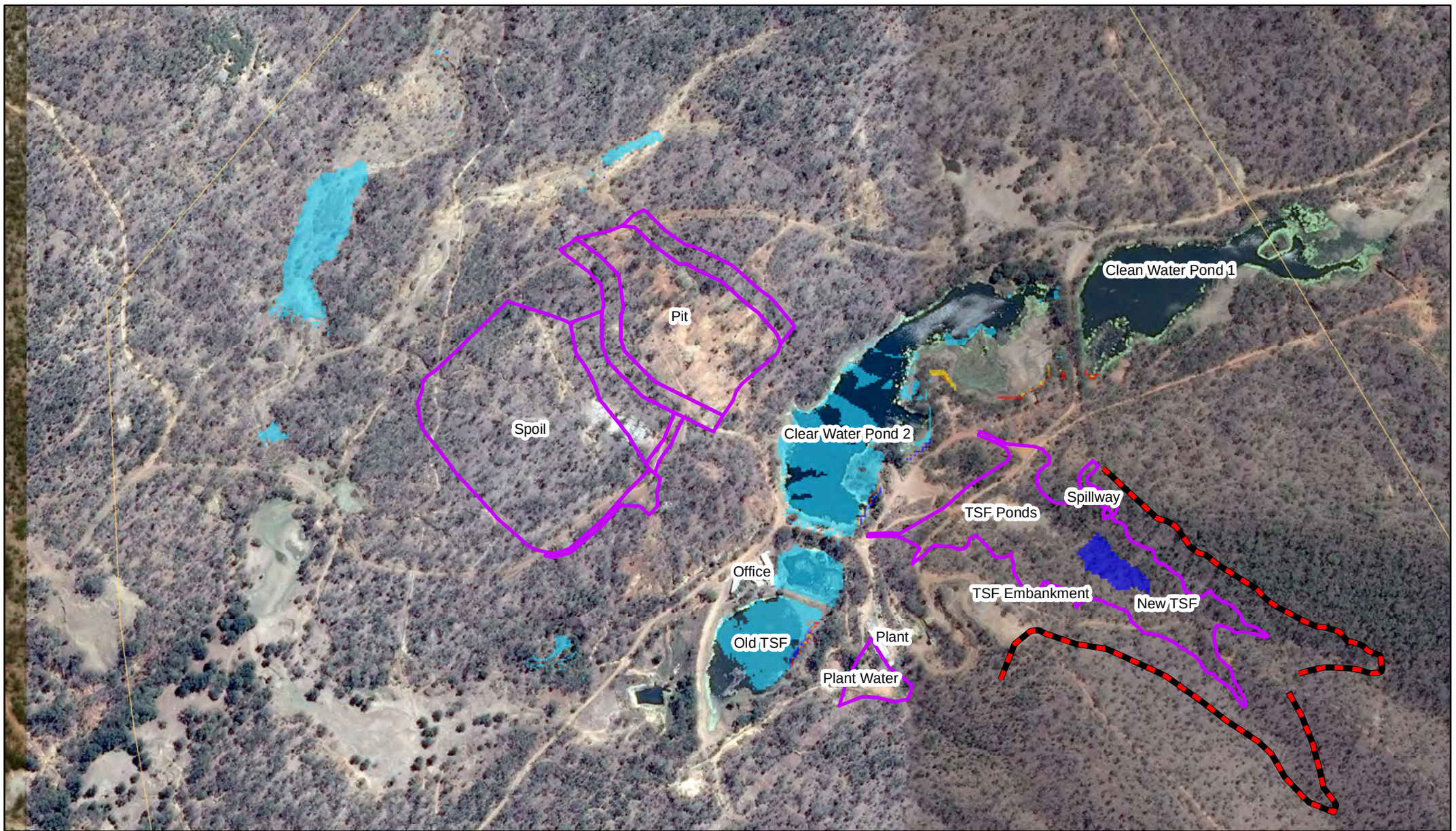
DATA SOURCE:

Client: MGT Minerals
 Project: BES170407.05

**CDM
 Smith**



Scale @ A4 1:6,700
 Date: 05/09/18
 Drawn: Stuart B.



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion

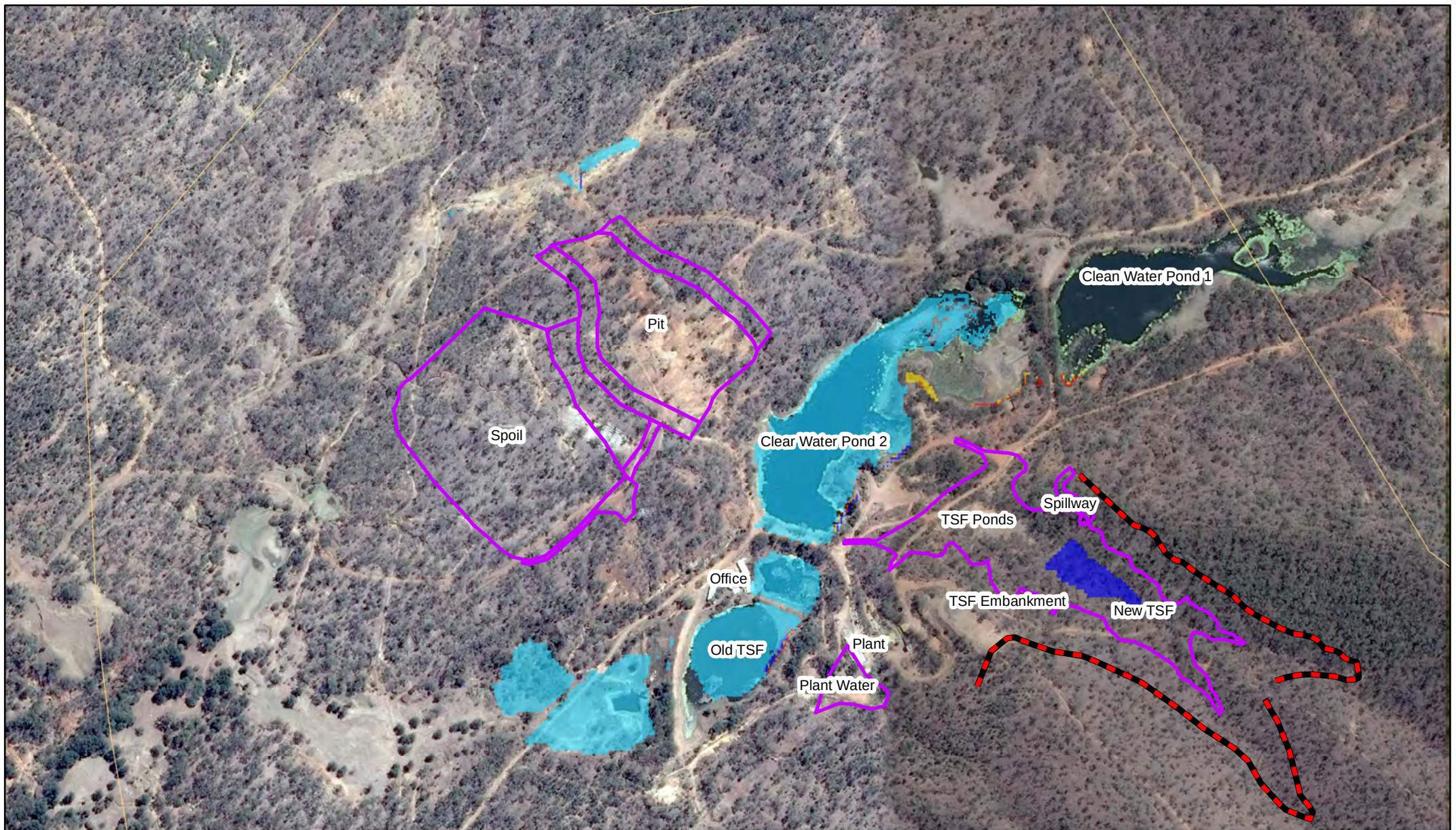
Difference (m)	
 < -0.1	 0.02 - 0.05
 -0.1 - -0.05	 0.05 - 0.10
 -0.05 - -0.02	 > 0.1
 -0.02 - 0.00	

Figure A2-33
Developed Case Peak Flood Level Difference 5% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**



Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion

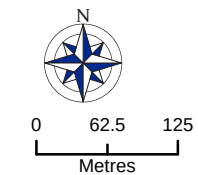
Difference (m)	
 < -0.1	 0.02 - 0.05
 -0.1 - -0.05	 0.05 - 0.10
 -0.05 - -0.02	 > 0.1
 -0.02 - 0.00	

Figure A2-34
 Developed Case Peak Flood Level Difference 10% AEP
 Flood Impact Assessment
 Dalcouth Tin Mine

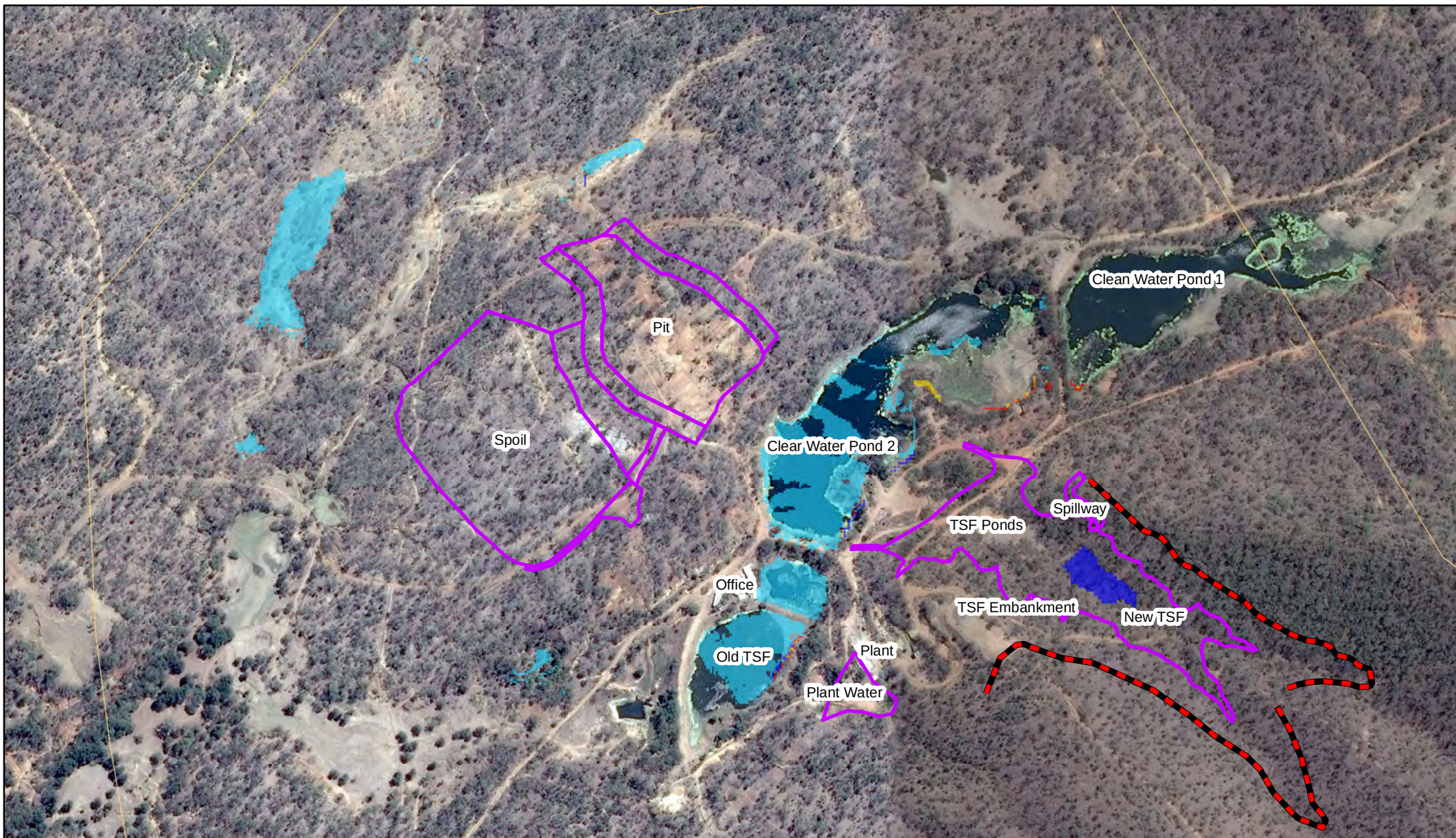
DATA SOURCE:

Client: MGT Minerals
 Project: BES170407.05

**CDM
Smith**



Scale @ A4 1:6,700
 Date: 05/09/18
 Drawn: Stuart B.



0 62.5 125
Metres

Scale @ A4 1:6,700
Date: 05/09/18
Drawn: Stuart B.

Legend

- TUFLOW Extents
- Diversion Channels
- Proposed Expansion

Difference (m)	
< -0.1	0.00 - 0.02
-0.1 - -0.05	0.02 - 0.05
-0.05 - -0.02	0.05 - 0.10
-0.02 - 0.00	> 0.1

Figure A2-35
Developed Case Peak Flood Level Difference 18% AEP
Flood Impact Assessment
Dalcouth Tin Mine

DATA SOURCE:

Client: MGT Minerals
Project: BES170407.05

**CDM
Smith**

PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)



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W: ardent-group.com.au
ABN: 38 609 696 764

GROUNDWATER ASSESSMENT REPORT

Mining Leases 4349 and 20547

ENVIRONMENTAL AUTHORITY EPVL00864413

MGT MINERALS PTY LTD
25 January 2022

Version 1

Document Control Sheet

Ardent Group Pty Ltd	
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Postal Address:	PO Box 320 Red Hill Qld 4059
Phone:	+61 7 3368 1033
Email:	information@ardent-group.com.au
Web:	www.ardent-group.com.au

Project:	MGT002	Issue Date:	25 January 2022
Title:	Groundwater Assessment Report		
Project Manager:	Richard Davis		
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Appendix 1 Monitoring Bore Log and Construction Details

Appendix 2 Registered Bore Records

Appendix 3 Summary Statistics Results Tables

Appendix 4 Groundwater Chemistry Graphs

Appendix 5 Hodgkinson Formation Aquifer – Historical Results and proposed new Site-Specific Guideline

1. Introduction and Scope

This report has been prepared to address the following scope:

- document the groundwater environmental values;
- describe the hydrogeology of the site;
- describe the groundwater monitoring bore characteristics;
- assess the groundwater monitoring quality data;
- propose site specific groundwater quality guidelines for the site; and
- be suitable to accompany an Environmental Authority amendment application.

Ardent Group Pty Ltd (Ardent Group) have been commissioned by MGT Minerals Pty Ltd (MGT Minerals), the holders of Mining Lease (ML) 4349 and ML 20547, to prepare a Groundwater Assessment Report. ML 4349 and ML 20547 are operated in accordance with EA EPVL00864413.

This report has been prepared generally in accordance with the following references:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000;
- Queensland Water Quality Guidelines, version 3 (Department of Environment and Heritage Protection, 2009);
- Australian Groundwater Manual; and
- Using Monitoring Data to assess groundwater quality and potential environmental impacts, version 2 (Department of Environment and Science, Queensland Government, Brisbane, 2021).

Much of the background project description information has been sourced from MGT Minerals' 2018 EA amendment application documentation.

1.1 Description of Location and Activity

Collectively, ML 4349 and ML 20547 is referred to as the Mt Garnet Dalcouth Project (the Project) and is located approximately 11 km north of Mount Garnet.

No mining has taken place in recent history in the Mining Lease area. The mining areas, waste rock dump and new tailings dam approved by the EA have not been mined, contain no waste rock and no tailings have been deposited.

Historical narrow adits are noted in some surrounding hills. Alluvial tin has been dredged from local drainage lines historically, and the resulting landform has been modified in the gully areas of the site, including the remnant clean water ponds along Males Gully. There is a water storage, referred to as the Old TSF, located in Males Gully, generally downstream of the site groundwater bores. Exploration activities have taken place in recent years, restricted to drilling and shallow costeans. Preparation for mining has included upgrade to the processing plant and civil earthworks for a tailings dam. There have

been no recent activities that have extracted groundwater, nor anticipated to impact on groundwater levels or chemistry.

The Project is currently on pre-production care and maintenance.

Tenement details about this project are set out in **Table 1** and the general location is shown in **Figure 1**.

Table 1 Tenement Details

Specifications	Details	
ML Number	4349	20547
Tenement name	Mt Veteran	Summer Hills
Grant Date	28 March 1985	23 January 2013
Expiry Date	31 March 2027	31 January 2034
Area	18 ha	1163.3955 ha
Environmental Authority	EPVL00864413	EPVL00864413
Purpose	Treatment plant / mill site, Water supply	-
Mineral	Antimony Ore, Bismuth Ore, Copper Ore, Gold, Lead Ore, Palladium, Platinum, Silver Ore, Tantalum, Tantalite, tin Ore, Tungsten / Wolfram / Scheelite, Zinc Ore	Gold, Tin Ore, Tungsten / Wolfram / Scheelite

Current components of the Project include:

- Shallow exploration costeans in the area of the future Dalcouth Pit;
- Newly constructed tailings storage facility (TSF), currently undergoing modification;
- Internal haul roads and access roads;
- Crushing, milling and Gravitational process plant;
- Electrical supply upgrade;
- Ore preparation area, general workshop, laboratory and equipment storage area;
- Mine offices;
- Accommodation camp; and
- Raw and potable water supply.

The Project area has been extensively disturbed by historic mining activities dating back to the 1880's and there are a number of identified tin deposits which have previously been worked on a small scale within the Project boundaries.

The real property description and underlying land is described in **Table 2** and illustrated in **Figure 2**.

Table 2 Real Property Description Underlying EA location

Specifications	Land Parcel 1	Land Parcel 2
Background Tenure	Lot 230 on AP4557	Lot 220 on CP903610
Tenure type	Lands Lease	Lands Lease
Registered Lessee / Owner	Simon Garry William Renshaw Rosemary Anne Burtenshaw	Garth Anthony Dunford
Local government area	Tablelands Regional Council	Tablelands Regional Council

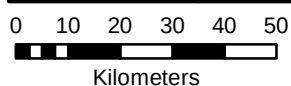
1.2 Historic Events

During the period of project ownership by MGT Minerals, there are no recorded events or spills that may have affected groundwater. Prior to ownership of the project by MGT Minerals, there are no records available to determine if there have been any “historic events” that may have affected groundwater.

The potential for influence of historical and current mining activities on groundwater are further described in **Section 3.5.3**.



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Mount Veteran Overview



Figure 1
Regional Location of Project

Legend

-  Mining Lease Boundary
-  Highway
-  Secondary Road

Sheet No.

RTPL_ARD_MGT001_MAP_0005_B

Drawn By: Chris Schlebusch

Requested by: Richard Davis

Date: 24/07/2020

Data sources:
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Mount Veteran Overview



Figure 2
Mining Lease and Land
Title

- Mining Lease Boundary
- Property Boundary
- Powerline
- Farm Road

- Camp
- Laydown
- Building

Drawn By:	Chris Schlebusch
Requested by:	Richard Davis
Date:	17/07/2020

Sheet No.
RTPL_ARD_MGT001_MAP_0004_A

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2. Description of Environmental Values and Water Quality Objectives

2.1 Groundwater Environmental Values

This report identifies and describes the groundwater EVs that must be protected. EVs are specified in the EP Act, the EP Regulation, and relevant guidelines. The Project is wholly contained within the Herbert River Basin. Specific EVs and WQOs for the Herbert River Basin were released in 2014 as part of the *'Herbert River Basin Environmental Values and Water Quality Objectives (EHP 2014)'*.

Groundwater EVs are assessed based on the hydrogeological conceptualisation presented in Section 3.6 utilising all available information from desktop assessment, onsite groundwater investigations and a literature review.

Groundwater EVs are defined by their contribution to the water requirements of ecological systems and or anthropogenic water users. The suitability of groundwater for supporting dependant ecosystems and/or the purposes for which it is abstracted are key indicators of EVs. The EVs of groundwater must be protected from pollution, depletion and flow modification such that habitats are unaltered and to ensure that groundwater continues to meet the requirements of the community both in terms of quantity and quality.

To protect the aquifers of the Project area and associated EVs, WQOs are established for different indicators such as pH, nutrients and toxicants. The EPP (Water) provides provisions to protect and enhance the suitability of Queensland's groundwaters for various beneficial uses. In consultation with communities (including industry and commerce sectors), regional natural resource management groups and local governments, DES has established EVs and WQOs for a number of Basins including the Herbert River Basin.

The Project is located within the Queensland Government's Groundwater Zone; Herbert River Basin Groundwaters (Tableland). The EVs defined for this zone and therefore applicable to the Project are outlined in **Table 3**, and include:

- Aquatic ecosystems – these occur where groundwater baseflow supports permanent streams and water holes to some extent (e.g. seasonally or permanently). This interaction can occur in tidal and estuarine zones, as well as in freshwater areas;
- Irrigation – where groundwater is used to grow crops and pastures for commercial purposes;
- Farm supply / use – where groundwater is used to provide domestic supply and support growing of domestic produce;
- Stock water – where groundwater is used to provide stock water supplies;
- Drinking water – where groundwater is used for potable water supply;
- Industrial use – where groundwater is used for industrial purposes; and
- Cultural and spiritual – where groundwater supports both indigenous and non-indigenous values, e.g. recreational fishing, heritage, ecology. This interaction can occur in tidal and estuarine zones, as well as in freshwater areas.

Table 3 EPP (water) Environmental values for groundwaters associated with the Project

Environmental Values											
Aquatic Ecosystems	Irrigation	Farm supply / Use	Stock water	Aquaculture	Human consumer	Primary recreation	Secondary recreation	Visual recreation	Drinking water	Industrial use	Cultural and Spiritual values
✓	✓	✓	✓	-	-	-	-	-	✓	✓	✓

2.2 Groundwater Quality Objectives

The purpose of defining WQOs, which are long-term goals for water quality management, is to support and protect EVs (EHP, 2009). Notably, where groundwater and surface water interaction occur it is important that the WQOs of either resource are not compromised by degradation of water quality in either resource.

WQOs vary across the Herbert Basin and are defined on the basis of Groundwater Chemistry Zones (GCZs; refer [Figure 3](#)). The applicable GCZ for the Project is Granitic Uplands and Slopes (zone 10).

The WQOs for this zone are presented in [Table 4](#).

Table 4 Water Quality Objectives for Groundwater Resources having potential to be impacted by the Project

Depth	Percentile	Indicator/ Water Quality Objective																		
		Na	Ca	Mg	HCO ₃	Cl	SO ₄	NO ₃	EC (µS/cm)	Hardness	pH (units)	Alkalinity	SiO ₂	F	Fe	Mn	Zn	Cu	SAR (unitless)	RAH (meq/L)
GCZ		Herbert Basin: Sodic - 10 Granitic uplands and slopes																		
S	20th	16	10	3	68	13	1	0	158	38	6.9	56	30.6	0.100	0	0	0.010	0	1.10	0.13
	50th	109	16	7	194	125	5	2	800	72	7.6	161	70.0	0.200	0.020	0.010	0.030	0.02	3.15	1.07
	80th	168	45	21	254	175	12	7	997	195	7.9	208	101.1	0.550	0.422	0.037	0.054	0.02	8.47	2.04
M	20th	64	9	5	135	47	2	0	440	46	7.3	113	82.0	0.270	0	0	0.005	0.01	2.00	0.30
	50th	102	21	10	200	103	4	1	772	95	7.7	165	96.0	0.375	0.010	0.010	0.020	0.05	4.25	1.67
	80th	160	46	24	280	210	12	3	1003	210	8.2	230	110.0	0.500	0.020	0.020	0.023	0.05	8.40	2.70
D	20th	27	12	5	118	20	1	-	257	53	6.7	97	79.0	0.280	0.003	0.004	0.007	0.01	1.30	0.43
	50th	32	18	7	147	26	2	0	300	76	7.0	120	93.0	0.360	0.020	0.010	0.020	0.05	1.60	0.72
	80th	113	24	10	219	54	16	1	572	99	7.8	182	107.0	0.600	0.100	0.050	0.050	0.05	5.81	2.16

Note; all values mg/L unless indicated. "Depth" defined as S= shallow (<15m), M = moderate (15-40m), D = deep (40-50m)

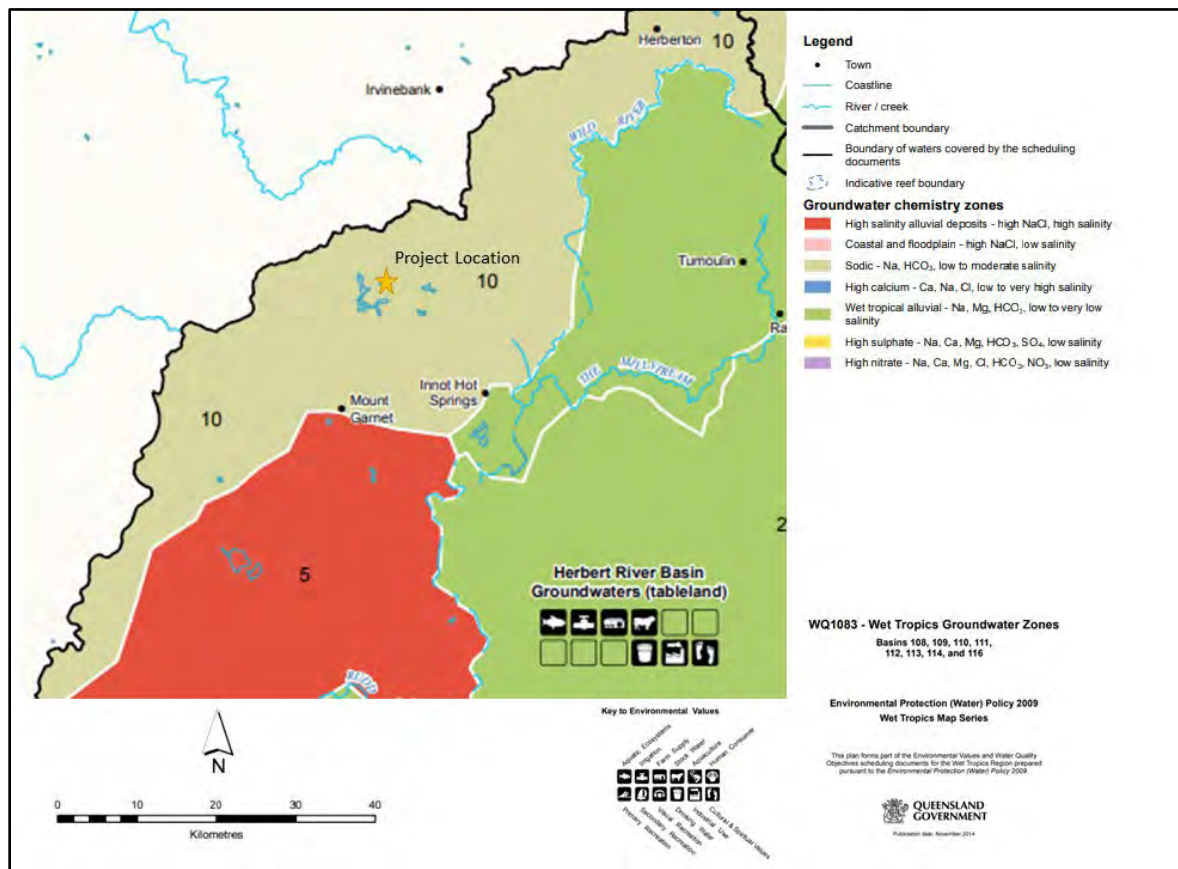


Figure 3 Herbert Basin – Wet Tropics Groundwater Zones (compiled from map WQ1083- Qld Govt)

2.3 Environmentally and Culturally Sensitive Areas

Vegetation to be disturbed by the development of the project is dominated by Regional Ecosystem (RE) 9.11.10 and is classed as ‘least concern’ under the *Vegetation management Act 1999*. This RE is classified as “of concern” biodiversity status. RE 9.11.10 is described as *Eucalyptus cloeziana*, *Corymbia citriodora* subsp. *citriodora*, *E. portuensis* and *E. cullenii* mixed woodland on steep dissected hills on highly metalliferous metamorphic rocks.

The assessment of the potential impacts of the project on Matters of National Environmental Significance (MNES), and Matters of State Environmental Significance (MSES) undertaken for the EA amendment application in 2018 determined that there were no significant impacts on MNES or MSES. This assessment was updated in 2020 when an EA amendment application was approved to include the Summerhill Pit. There have been no changes to the project since the amended Environmental Authority was granted that would change the result of this impact assessment.

There are no designated Cultural Heritage Landscape areas or Cultural Heritage Management Plans registered in the project area or vicinity. Cultural Heritage assessment of the project area has not recorded any culturally significant artifacts or locations in pre disturbance surveys.

Historical cultural heritage area (Coolgarra Battery, reference number 601791) is located approximately 5.5 km east of the processing plant (outside the Mining Lease area). This area is distant to the project area and will not be impacted by the project.

2.4 Groundwater Dependent Ecosystems

Whilst regional groundwater systems can provide water sources for pastoral and other anthropogenic uses, groundwater is also expected to support surface (above ground) and subsurface (below ground) ecosystems that are assessed as beneficial users of groundwater resources. The Australian groundwater dependent-ecosystem (GDE) toolbox (Richardson et al. 2011a) provides a framework to assist with the identification of GDEs and the management of their water requirements. The toolbox adopts the approach of Eamus et al. (2006) and classifies GDEs based on the role groundwater plays in maintaining biodiversity and ecological condition. Three types of GDEs are defined:

- Aquifer and flooded cave ecosystems (Type 1 GDEs, e.g. stygofauna). These ecosystems typically include karst aquifer systems, coarse clastic and fractured rock groundwater environments;
- Ecosystems dependent on the surface expression of groundwater (Type 2 GDEs), including wetlands, lakes, seeps, springs, and river baseflow systems. In these cases, surface expression of groundwater exists, providing water that can support aquatic biodiversity through access to habitat (especially when surface run-off is low) and regulation of water chemistry and temperature; and
- Ecosystems dependent on subsurface presence of groundwater (Type 3 GDEs), including terrestrial vegetation that depends on groundwater either seasonally, episodically or permanently to prevent water stress and avoid adverse impacts to their condition. Type 3 GDEs can exist wherever the water table and capillary fringe is within the root zone of the plants, either permanently or episodically. The capillary fringe is the semi-saturated zone of soil above the water table.

There are two sources of information pertaining to the presence of GDEs - the National Atlas of GDEs (GDE Atlas) and the Queensland Wetland GDE Layer, which provides information regarding Type 2 and 3 GDEs. The GDE Atlas presents the current knowledge of ecosystems that may depend on groundwater across Australia. The Queensland Wetland GDE Layer presents the current knowledge of ecosystems reliant on groundwater across Queensland. The GDE Atlas is updated with the latest information pertaining to GDEs from the Queensland Wetland GDE Layer, and therefore can be considered as the primary data source for this assessment.

2.4.1 GDEs Reliant on Aquifers and Caved (Type 1 GDEs)

No Type 1 GDEs (Subterranean GDEs) are listed in the GDE Atlas in the local area. In addition, the absence of any karstic or extensive interconnected fractured rock aquifers makes the presence of this type of GDE local to the Project unlikely.

2.4.2 GDEs Reliant on the Surface Expression of Groundwater (Type 2 GDEs)

Potential GDEs for the area around the proposed Dalcouth pit are shown in **Figure 4**. No Type 2 GDEs (such as rivers, springs and wetlands) are listed in the GDE Atlas for the Males Creek Valley. The closest Type 2 GDE listed in the GDE Atlas is in the headwaters of Copper Creek, approximately 0.6 km north of the Dalcouth Pit and is listed as a riverine wetland ecosystem type. It is classified as having high potential for interaction with groundwater, most likely hosted by alluvial sediments associated with the creekline.

Another Type 2 GDE is some 2.7 km north of the Dalcouth Pit, in another drainage catchment, along the line of Wyndham Creek. This is also a riverine wetland ecosystem of high potential for interaction with groundwater that is also likely hosted by alluvial sediments associated with the creekline. Type 2 GDEs are also shown along the Nanyetta (Return) Creek, approximately 1.8 km south of the proposed Dalcouth pit.

It appears the presence of Type 2 GDEs are confined to the riverine environments of water courses (Wyndham Creek, Copper Creek and Nanyetta (Return) Creek), but not along the Males Creek valley. Streamflow events supporting the shallow, semi-perched Quaternary aquifers are likely to be the dominant source of groundwater for any Type 2 GDEs that might occur in the Project area.

2.4.3 GDEs Reliant on the Subsurface Expression of Groundwater (Type 3 GDEs)

The GDE Atlas identifies potential GDEs that are reliant on the subsurface expression of groundwater (Type 3 GDEs) along the Nanyetta (Return) Creek and over much of the local area, and these are shown as having moderate to low potential for groundwater interaction in **Figure 4**. The moderate potential GDEs along Nanyetta Creek are described as Eucalyptus dominated open forest and woodlands along drainage lines and alluvial plains. The low potential GDEs that cover much of the eastern half of the figure are described in the GDE Atlas as being dry to moist Eucalypt woodlands and open forests, mainly on undulating to hilly terrain of mainly metamorphic and acid igneous zones. It is almost certain the vegetation is strongly reliant on the soil water reservoir rather than groundwater (as depth to groundwater in the Hodgkinson Formation is at least 20m below surface).

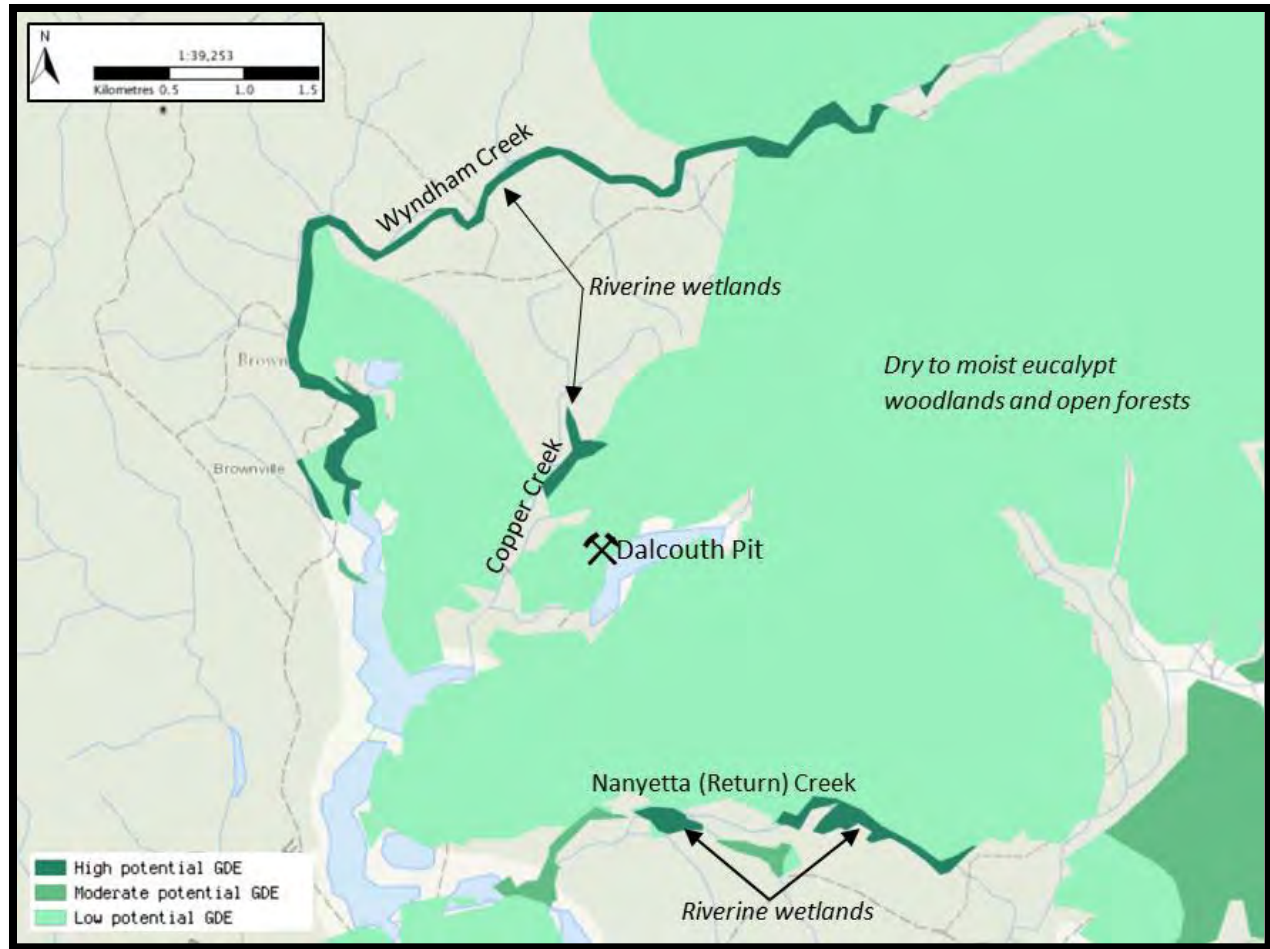


Figure 4 Potential Groundwater Dependant Ecosystems in Project Area

3. Description of Site Hydrogeological Characteristics

3.1 Climate

The local climate at the Project site is described by Landline Consulting (2013) as being modified by altitude with a Köppen climatic classification category of sub-tropical with a pronounced winter dry season. Mean monthly rainfall is described as varying between 7 mm in September to a high of 200 mm in February. Landline Consulting (2013) describes total annual rainfall over a 100-year period as varying from 239 to 1,453 mm with a mean of 811 mm and an average of 73 rain days per year.

The closest rainfall recording site to the project is at Mount Garnet Post Office (Queensland Bureau of Meteorology Station number 31046), approximately 11.5km south-southwest of the Project and at an elevation of 658 m Australian Height Datum (AHD). This station has a continuous rainfall record from March 1901 to January 2018. At this station mean monthly rainfall varies between 6.9 mm in September to a high of 198 mm in February. Annual rainfall during the period 1901 to 2017 has varied between 237mm in 1915 to 1,453 mm in 1991 with a mean annual value of 817.2 mm.

The closest BoM station that is operational and recording a full range of climate data, including evaporation, is at Walkamin Research Station (station 031108). This station is approximately 57 km northeast of the Project and at an elevation of 594 m AHD. This weather station opened in 1965 and has rainfall records for the period 1965 to 2021 and temperature and evaporation records from 1968 to 2021.

Mean monthly values for rainfall, evaporation and minimum and maximum temperatures for Station 031108 are shown in **Figure 5**. Key climatic data indicate the study area experiences a distinct wet season with the highest rainfall occurring during the summer months (December to March) and drier periods predominating in the winter and early spring months (June to October). Average annual evaporation (around 1,850 mm) is considerably higher than average annual rainfall, except for the period January to March, with the latter period being when precipitation recharge to groundwater is likely to occur.

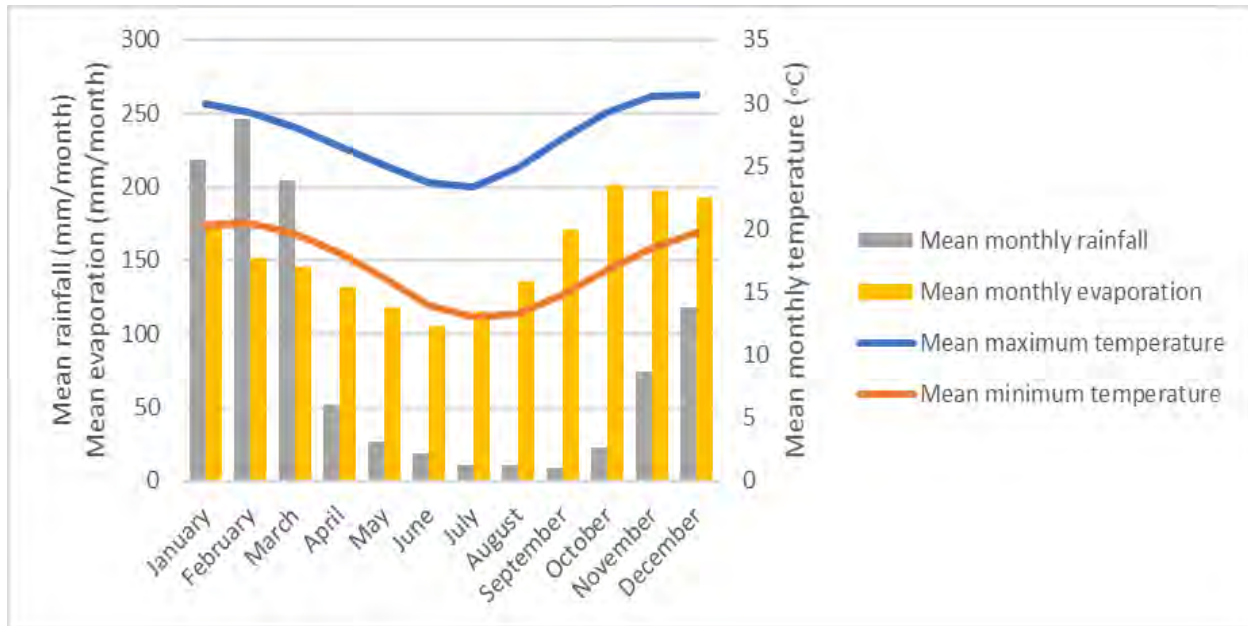


Figure 5 Mean Climatic Condition - Walkamin Research Station (source data; BOM)

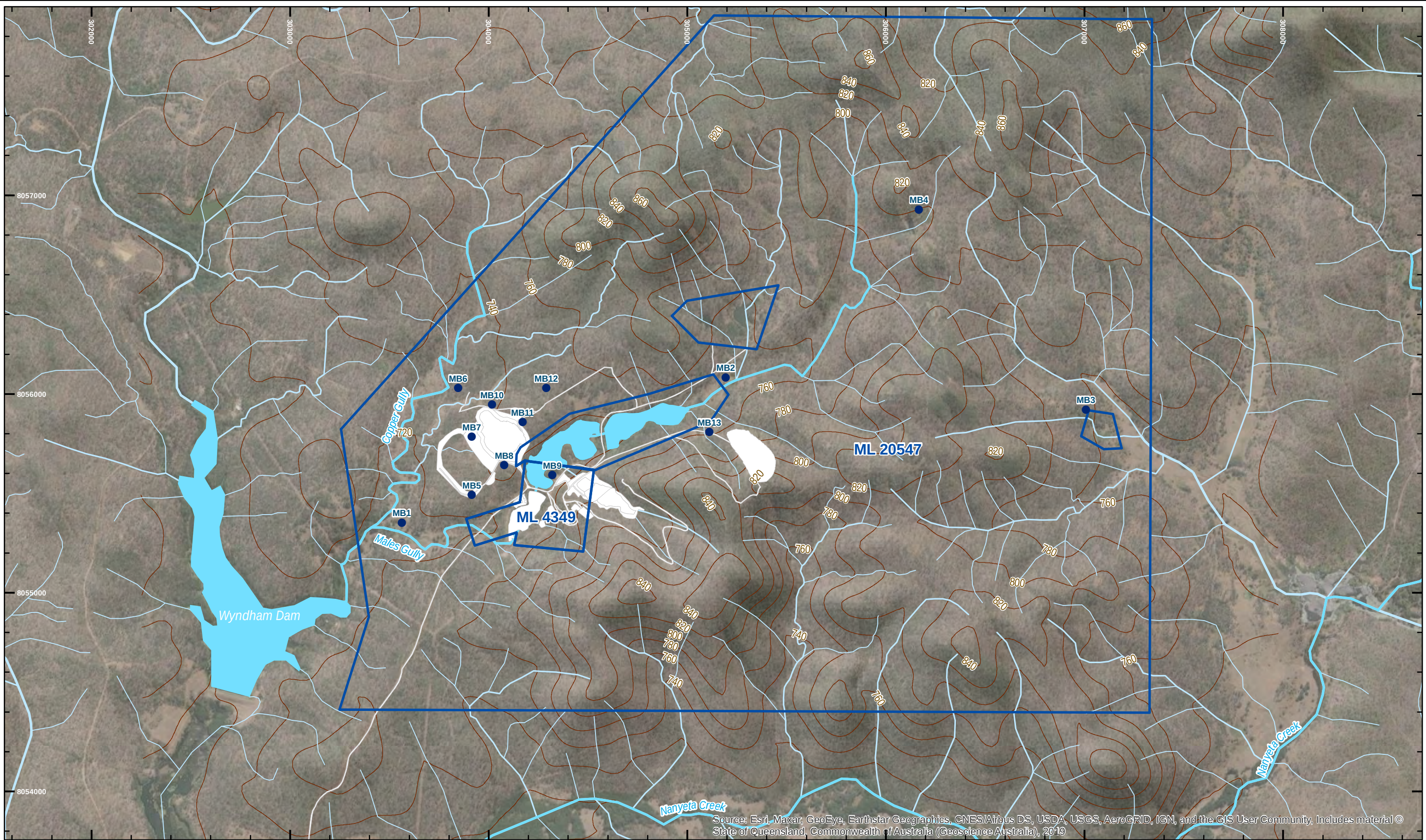
3.2 Topography and Hydrology

The Project is situated near to the Great Divide within the upper reaches of the Herbert River catchment, approximately 4 km south of the Herbert River northern catchment boundary. The area is characterised by small valleys and ridges, with the Dalcouth deposit located in the bottom of the Males Creek valley at a surface elevation of between 740 to 750 m AHD. Northeast to southwest trending ridges bound the Males Creek valley on both its northern and southern sides. To the south the land rises to approximately 850 m AHD and to the north it rises to about 860 m AHD.

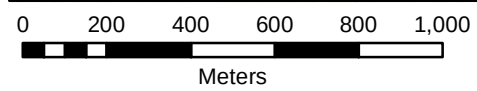
The Project is wholly contained within the upper reaches of the Herbert River Basin and is located around 4km south of the northern catchment boundary. The Project is within the Nanyetta (Return) Creek sub-catchment (Landline Consulting, 2013) and within this, the Dalcouth deposit is in the catchment of the minor Males Creek watercourse.

Males Creek runs in a northeast to southwest direction to discharge into Wyndham Dam on Return Creek. Copper Creek is to the northwest of the proposed Dalcouth pit and runs from north-northeast to south-southwest and meets Males Creek before it discharges into Wyndham Dam.

Minor tributary gullies to Males Creek occur in the area of the Dalcouth deposit, the most pronounced of which is aligned southeast of Clearwater Pond 2, where the new valley fill TSF is to be located (see [Figure 6](#)). The main mine infrastructure and existing Cleanwater Ponds 1 and 2, and the TSF Overflow Containment Pond are situated on or immediately adjacent to Males Creek.



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community, Includes material © State of Queensland, Commonwealth of Australia (Geoscience Australia), 2019



MGT MINERALS PTY LTD
Mount Veteran Overview



GDA2020, MGA Zone 55



Figure 6 - General Topography and Project Elements

- Mining Lease Boundary
- Project Footprint
- Watercourse
- Elevation Contour
- Groundwater Monitoring Bore

Sheet No. RTPL_ARD_MGT002_MAP_0008_B	Drawn By: Chris Schlebusch
	Requested by: Richard Davis
	Date: 23/09/2021

Data sources:
Elevation = SRTM from QDR DEM,
Webservice 2021-07015
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3.3 Geology

The local geology and the main existing elements of the project are shown in **Figure 7**.

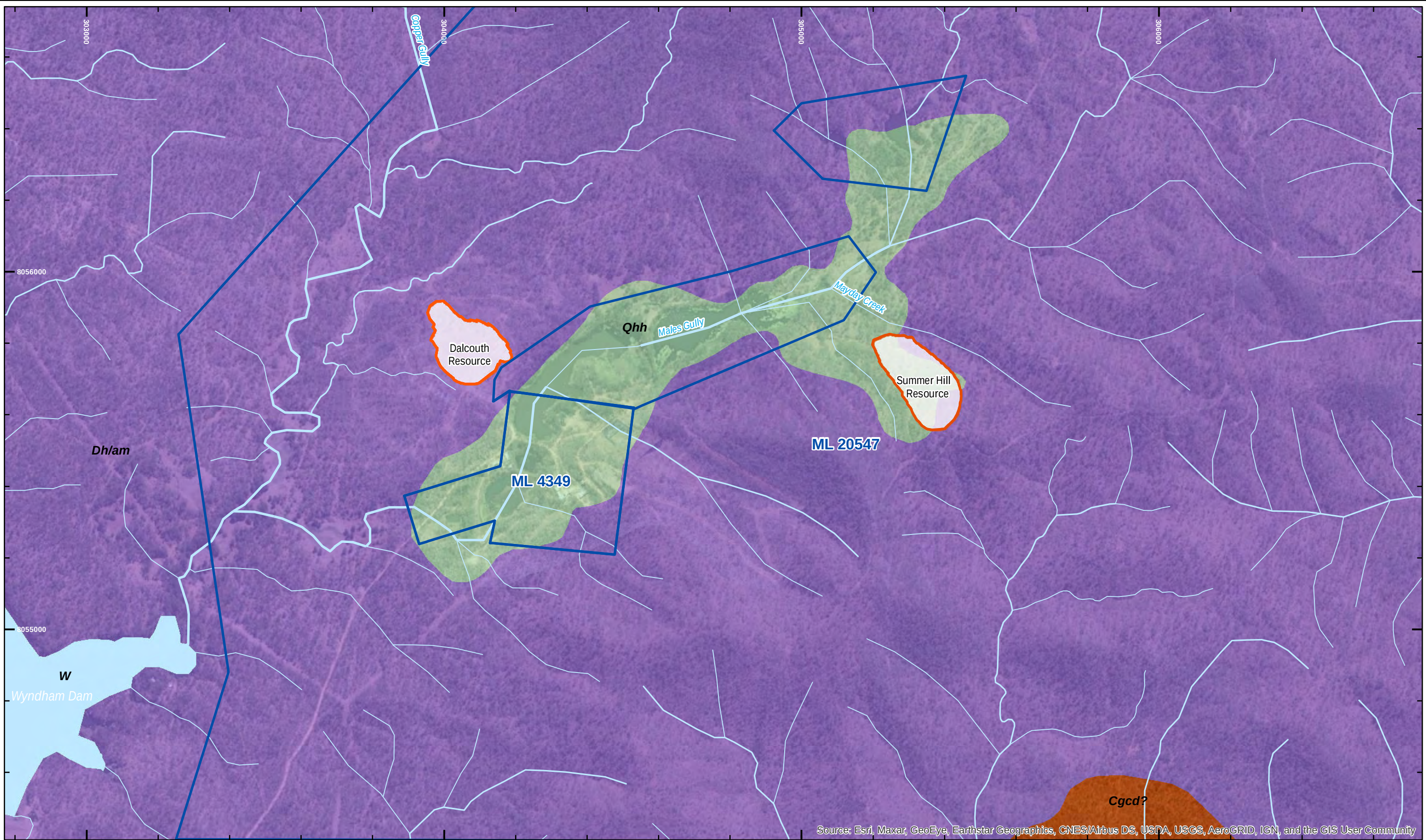
The stratigraphy of the local area is summarised in **Table 5**.

A geological cross section is shown in **Figure 8**, which is taken from the Mount Garnet 1:63,360 Geological Series, Sheet 67, Zone 7 (Yates and Blake 1970) geological map and runs from east-northeast to west-southwest approximately 1 km north of the Dalcouth deposit.

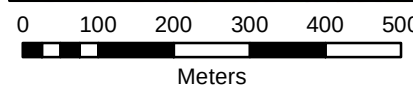
Table 5 Local Stratigraphic Description

Age (Ma)	Group	Formation (code)	Description1
Quaternary (0 to 2)	-	Quaternary deposits(Qhh, Qa, Qr)	Alluvium, colluvium, sand, silt and gravel
Unconformity			
Upper Carboniferous (279 to 299)	-	Nanyetta Volcanics (Cyt)	Rhyolitic ignimbrite and lava, volcanic breccia; minor conglomerate(at base), andesite, tuff, tuffaceous sediments
Unconformity			
Carboniferous (318 to 326)	O'Briens Creek Supersuite	Elizabeth Creek Granite (Cgb/33)	Pink and pale grey leucocratic, biotite, adamellite granite, apliteand greisen
Unconformity			
Devonian to Late Silurian (360 to 414)	-	Hodgkinson Formation (Dh/am)	Thin bedded greywacke, sandstone, siltstone, shale and conglomerate

1 Australian Stratigraphic Units Database; <http://www.ga.gov.au/data-pubs/data-standards/reference-databases/stratigraphic-units>



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



MGT MINERALS PTY LTD
Mount Veteran Overview



**Figure 7 Surface Geology
and Project Elements
(State Detailed June 2018)**

- Mining Lease Boundary
- Resource Boundary
- ~~~~~ Watercourse
- Devon Microgranite?
- Hodgkinson Formation/am
- Qhh-QLD

Sheet No.
RTPL_ARD_MGT002_MAP_0013_B

Drawn By: Chris Schlebusch

Requested by: Richard Davis

Date: 23/09/2021

Data sources:
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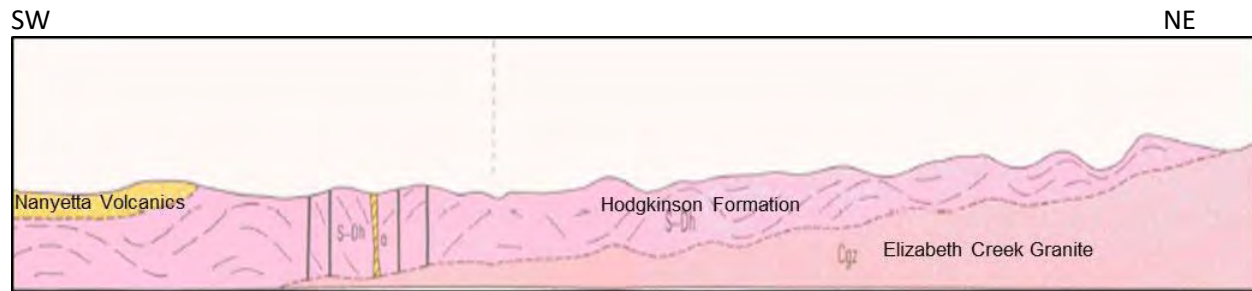


Figure 8 Schematic Geological Cross Section

The Dalcouth deposit is located within the Hodgkinson-Broken River Fold Belt, which is part of the larger Tasman Fold Belt system of eastern Australia. The Hodgkinson-Broken River Fold Belt is largely composed of a continental margin quartz to intermediate turbidite sequence, which was strongly deformed during Silurian to Devonian tectonic events, forming complex north to south and northeast to southwest trending faults, folds and thrusts (MGT Minerals 2018).

Mid-Carboniferous to late-Permian granitic intrusions and associated silicic intrusive strata underlie and outcrop throughout much of the region. Tin mineralisation is largely restricted to intrusive roof top alteration zones, extending into adjacent country rocks (MGT Minerals 2018). The Dalcouth mine pit is situated within Hodgkinson Formation strata. Carboniferous age Elizabeth Creek Granite (part of the O'Briens Creek Supersuite) was intruded beneath this and the contact between the two dips to the west, as shown in **Figure 8**. The Nanyetta Volcanics are extrusive igneous rocks that were extruded to overlie the Hodgkinson Formation to the southwest of the proposed Dalcouth deposit.

3.3.1 Quaternary Deposits

Quaternary deposits of clay, silt, sand and gravel occur along the valley floors in the local area. Much of this material has been derived from weathering of the underlying and surrounding Hodgkinson Formation strata. These sediments contain alluvial tin placer deposits and were sporadically mined for tin from the 1890s through to the 1980s. This resulted in significant disturbance of the Quaternary deposits, as observed along the Males Creek immediately south of the proposed Dalcouth Pit. These disturbed sediments form a mixture of clay, gravel and sand.

3.3.2 Nanyetta Volcanics

The Upper Carboniferous Nanyetta Volcanics are an extrusive igneous deposit that unconformably overlies the Hodgkinson Formation and outcrop approximately 3km southwest of the proposed Dalcouth pit. The Australian Stratigraphic Units Database describes the Nanyetta Volcanics as rhyolitic ignimbrite and lava, volcanic breccia with minor conglomerate at its base, andesite, tuff and tuffaceous sediments. The rocks are of andesitic to rhyolitic composition, are cream, buff, pink, red, purple, brown, green, or grey in colour and can be porphyritic. The Nanyetta Volcanics can be up to 150m thick (Yates and Blake 1970).

3.3.3 Elizabeth Creek Granite

The late-Carboniferous (318 to 326 Ma) Elizabeth Creek Granite forms part of the O'Brians Creek Supersuite of acidic intrusive igneous strata. It is described in the Australian Stratigraphic Units Database as pink, coarse, equigranular to seriate biotite granite; minor porphyritic biotite granite and microgranite. The granite was intruded as a batholith throughout the area and underlies the Hodgkinson Formation at depth beneath the Dalcouth deposit. The intrusive edges of the granite are generally well defined where they abut the country rock they were intruded into. In places, fine grained porphyritic granite/microgranite occurs near the intrusive contacts, probably representing a chilled margin. The Elizabeth Creek Granite is strongly jointed. In the Herberton/Mount Garnet area the Elizabeth Creek Granite is mostly a leucocratic biotite adamellite with an average grainsize of 2 to 5mm (Yates and Blake 1970).

3.3.4 Hodgkinson Formation

The Hodgkinson Formation is described in the Australian Stratigraphic Units Database as mainly pale to dark or greenish grey, fine to medium-grained, medium to thick-bedded, quartz-intermediate arenite. It is rhythmically interbedded with siltstone and mudstone with minor conglomerate and conglomeratic arenite and is sparsely fossiliferous. It is considered to be Devonian to late Silurian.

The Dalcouth mine pit will be excavated into Hodgkinson Formation strata, where it forms an extensive sequence of marine siliclastic rocks, which are dominated by deep water turbidite sequences, (Rob Lait and Associates, 2013). It includes greywackes and subordinate chert layers, and metabasalts occur locally. It has undergone numerous phases of deformation, having been folded and faulted and the Elizabeth Granite has intruded beneath it.

Rob Lait and Associates (2013) report that, in the vicinity of the proposed Dalcouth pit, the Hodgkinson Formation comprises a metamorphosed shale with a strong, near vertical cleavage and a well-developed slaty cleavage in the turbidite sequences. This cleavage dips to the southwest at between 70° and 90° and has a northwest to southeast strike. Deformation fractures are generally infilled with quartz veins associated with felsic igneous intrusions. There are many cross-cutting faults at a local scale and one major regional north trending fault zone.

Tin mineralisation of the Dalcouth deposit is hosted within the Hodgkinson Formation turbidite sandstones and siltstones in fine anastomosing quartz-cassiterite veins and fractures associated with strong chlorite alteration of the host rock (MGT Minerals, 2018).

Application of acid to some Hodgkinson Formation chip samples collected during drilling for the 2018 monitoring bore installations resulted in slight effervescence, suggesting the presence of carbonate minerals within the rock matrix. Keyser and Lucas (1968) notes that a small proportion of the Hodgkinson Formation turbidites are calcareous.

3.4 Groundwater Monitoring Bores

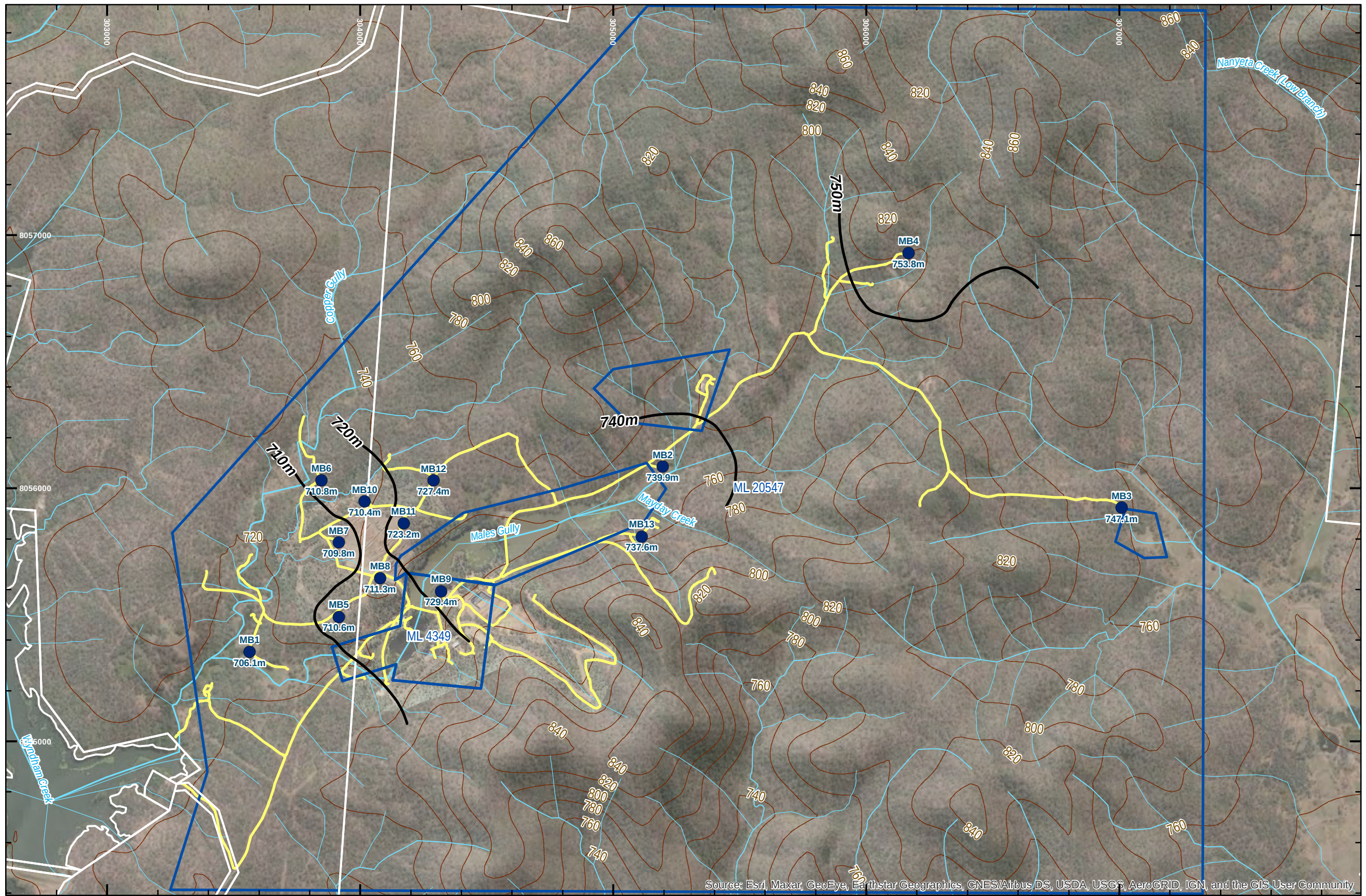
Groundwater bores have been installed in 2009 (MB1 to 3), 2012 (MB4) and 2018 (MB 5 to 12). Groundwater bore MB13 was installed in August 2021. The details of these bores are summarised on **Table 6**. Drill log and other relevant information is included in **Appendix 1**. Note that registered bore #148103 is bore MB1, but has listed the incorrect longitude on the bore register. The bore locations are illustrated in **Figure 9**. The lithological logs show the dominant lithology in the project area is comprised sandstone, siltstone, mudstone and shale, as well as minor rhyolitic extrusives and minor granitic intrusives.

Table 6 Groundwater Monitoring Bore Summary Details

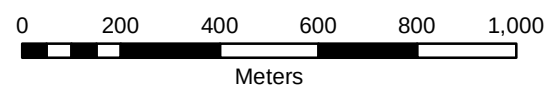
Bore ID	Easting (m)	Northing (m)	Collar Ground Level (m, AHD)	Completion Depth (m)	Top of Casing (m)	Depth to groundwater (m, bTOC)	Standing Water Level (m, AHD)	Screened Interval	Screened Unit
MB1	303565	8055354	707	22	0.5	1.41	706.09	16 - 22	Hodkinson Formation sandstone
MB2	305195	8056085	742	22	0.5	2.56	739.94	16 – 22	Hodkinson Formation sandstone
MB3	307009	8055921	762	31	0.5	15.38	747.12	25 – 31	Hodkinson Formation sandstone and minor granite
MB4	306163	8056927	777	52	0.62	23.79	753.83	40- 52	Granite
MB5	303911	8055490	729	48	0.54	18.9	710.64	35 – 48	Hodkinson Formation sandstone
MB6	303850	8056032	727	19	0.57	16.8	710.77	13 – 19	Hodkinson Formation
MB7	303916	8055778	726	60	0.68	16.88	709.8	18 – 40	Hodkinson Formation sandstone
MB8	304080	8055641	740	72	0.63	29.37	711.26	30 – 42	Hodkinson Formation sandstone and minor rhyolite
MB9	304319	8055592	731	9	0.6	2.19	729.41	5 – 7	Gravel
MB10	304019	8055944	733	55		22.57	710.43	23 – 47	Hodkinson Formation Quartzite
MB11	304176	8055858	756	88	0.67	33.52	723.15	36 – 48	Hodkinson Formation sandstone and minor siltstone
MB12	304292	8056030	749	43	0.59	22.15	727.44	31 – 42	Hodkinson Formation sandstone and minor granite

MB13	305111	8055807	752	35	0.64	14.43	737.57	25-35	Hodkinson Formation sandstone
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Elevation measured to nearest metre. Water levels measured June 2021, except for MB13, measured in August 2021.

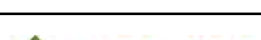


Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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	Standing Water Levels		 Mining Lease Boundary	 Groundwater Monitoring Bore (with SWL)
			 Property Boundary	 Standing Water Level Contour
			 Watercourse	
			 Access Track	
Sheet No. RTPL_ARD_MGT003_MAP_0007_B	Drawn By: Chris Schlebusch	 Elevation Contour		
	Requested by: Richard Davis			
	Date: 25/01/2022			

Data sources:
Elevation = SRTM from QDR DEM,
Webservice 2021-07015
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Data sources:
Elevation = SRTM from QDR DEM,
Webservice 2021-07015
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3.5 Hydrogeology

Hydro-stratigraphic units (HSUs) are zones within a hydrogeological system that have similar hydrogeological properties with respect to their influence on groundwater flow. While HSUs are often chosen based on stratigraphy, the type of rock is less important than the properties of the rock that control resistance to groundwater flow and groundwater storage. At the broadest level, HSUs are categorised as aquifers or aquitards; where aquifers consist of stratigraphic units (or sequences of units) that store and transmit useful amounts of groundwater, and aquitards consist of stratigraphic units (or sequences of units) that generally act as barriers to groundwater flow and do not transmit useful amounts of water.

The stratigraphic sequence of rocks within the local area is summarised in **Table 5**. Three HSUs are present. These are the Hodgkinson Formation, Elizabeth Creek Granite and the Quaternary deposits. The Elizabeth Creek Granite is recorded in bore MB4 and MB12 (at depth).

The Hodgkinson Formation can be considered as an aquitard, with low hydraulic conductivity, transmissivity and (likely) storativity values. The Elizabeth Creek Granite is inferred to also behave as an aquitard, based on typical behaviour of granite plutons. The Quaternary deposits likely form a poor to moderate aquifer of variable hydraulic properties, depending upon coarseness of clastic materials and degree of sorting, as well as the degree of anthropogenic reworking. The HSUs are summarised in **Table 7**.

Table 7 Hydro stratigraphic Unit Details

HSU	Description	Aquifer / Aquitard
Quaternary Deposits	Reworked clay, gravel, silt and sand. Variable hydraulic properties according to composition. Likely to form a perched aquifer above the underlying Hodgkinson Formation. Reworking by earlier mining operations will likely limit aquifer potential.	Poor Aquifer.
Hodgkinson Formation	Deformed marine siliclastic rocks, dominated by deep water turbidite sequences, including greywackes. Largely composed of metamorphosed shale and quartzites in Dalcouth area with a strongly developed cleavage. Hydraulic properties determined by degree of secondary porosity (fractures, fissures and cleavage partings). Groundwater movement is dependent on interconnection of fracture sets and there is evidence that this is poor, with pockets of groundwater being hydraulically isolated.	Aquitard
Elizabeth Creek Granite	Pink and pale grey leucocratic, biotite, adamellite granite. Essentially undeformed intrusive volcanics, with hydraulic properties likely determined by degree of secondary porosity (fractures, joints). Groundwater movement is inferred to be poor in this formation.	Aquitard

3.5.1 Hydrogeological Properties

Slug test work was undertaken on selected bores in 2018. This data was used to derive estimates of hydraulic conductivity (K) of the screened intervals. These results are summarised in **Table 8**.

Table 8 Slug Test Analysis Results

Hydro Stratigraphic Unit	Monitoring Bore	Hydraulic conductivity (m/day)
Alluvials	MB9	20
Hodkinson Formation	MB5	0.4
	MB6	0.006
	MB7	1.2
	MB8	0.06
	MB10	0.05
	MB11	0.009

There was no test work conducted in the Elizabeth Creek Granite.

The Quaternary deposits consist of reworked clay, gravel, silt and sand, and overlie the Hodgkinson Formation in the valley bottom at the Project. Groundwater is present in these deposits and is likely to be predominantly recharged during stream flows. Aquifer testing indicates the sediments are highly permeable.

Aquifer testing indicates the Hodgkinson Formation has low hydraulic conductivity **Table 8** and correspondingly is expected to have low storage values and low primary (effective) porosity, due to both its greywacke and turbidite origins and the metamorphism that it has undergone. Hydraulic conductivity of the rocks comprising this formation will be dominated by secondary porosity fractures and fissures where these occur and remain open. Groundwater movement through the Hodgkinson Formation will depend largely on the interconnection of fracture sets and there is evidence that this is poor, with pockets of groundwater being hydraulically isolated, based on observations during reverse circulation drilling carried out by MGT in the project area where water levels in adjacent bores are very different.

Additional testwork was undertaken by Golder in mid 2021 in the vicinity of the proposed tailings dam, including packer testing of shallow weathered Hodgkinson Formation (Geotechnical Investigation and Groundwater Monitoring Bore Installation, Mt Veteran Tin Mine, 27 August, 2021, Golder). The Hydraulic testing consisted of constant head and falling head tests, with testwork conducted in the open section of at least 1m of Hodgkinson Formation at the base of a 5 to 9m deep HQ diamond drill hole.

The constant-head test data measured in the temporary shallow bores was analysed using the following equation developed by the United States Bureau of Reclamation (Reynolds, 2013):

$$KUSBR = \frac{Q_s}{C_u aH}, \text{ where } C_u = 2\pi \left(\frac{L}{a} \right) \left[\frac{2 - (L/H)}{\sinh^{-1}(L/a) - (L/H)} \right]$$

Where:

KUSBR – Saturated hydraulic conductivity (m/s)

Q_s – Steady state flow out from the test section (m³/s)
 C_u – Quasi-empirical “conductivity coefficient” (-)
 a – effective radius of the water discharge zone (m)
 H – Steady state head from base of the hole (m)
 L – Length of test interval (m)

Data obtained from each FHT was analysed using the KGS model and Barker Black method for a single-well test in an unconfined aquifer. The test data was analysed using AQTESOLV Version 4.50.

A summary of the CHT and FHT results is included in **Table 9** below.

Table 9 Constant Head Test and Falling Head Test Results

Bore ID	Test interval (m below ground level)	Tested Formation	Test Method	Analysis Method	Estimated K (m/s)
GB01	7.4 to 8.4	Arenite	Falling Head Test	KGS Model	3.7×10^{-9}
				Barker Black	3.1×10^{-9}
GB02	7.7 to 8.70	Arenite	Constant Head Test	Ahrens & Barlow	1.5×10^{-8}
			Falling Head Test	KGS Model	1.5×10^{-8}
				Barker Black	1.2×10^{-8}
GB03	5.50 to 6.50	Arenite	Constant Head Test	Ahrens & Barlow	1.1×10^{-8}
			Falling Head Test	KGS Model	3.1×10^{-8}
				Barker Black	2.6×10^{-8}
GB04	6.15 to 7.15	Arenite	Constant Head Test	Ahrens & Barlow	3.0×10^{-8}
			Falling Head Test	KGS Model	8.5×10^{-8}
				Barker Black	8.5×10^{-8}

The results of this testwork indicate very low hydraulic conductivity in the shallow Hodgkinson Formation.

Recharge to the Hodgkinson Formation will be primarily via diffuse infiltration of rainfall and also from leakage from the Quaternary deposits that overlie it where they are present in local valleys. The low overall hydraulic conductivity of the unit likely restricts recharge rates and most recharge probably occurs in areas where the fracture and fissure systems are developed, outcrop or sub-crop, and remain open and extend to depth. The maximum recharge potential will occur where fracture and fissure sets are open and are exposed to flowing watercourses (e.g. Males Creek) during the wet season.

A summary of the anticipated ranges in hydraulic properties for the project area is included in **Table 10**.

Table 10 Expected Range in Hydraulic Property Values

Hydro Stratigraphic Unit	General Description	K (m/s) [1]	S_y (-/-) [2] [3]	n_e (-/-) [2] [4]
Quaternary sediments	Sand, silt and gravel (poorly sorted, assume bulk hydraulic properties related to fine-medium sand)	2.3×10^{-4}	8×10^0 to 2.5×10^1	3×10^{-1} to 5×10^{-1}
Hodkinson Formation	Greywacke, sandstone, siltstone, shale and conglomerate (assume bulk hydraulic properties related to shale and sandstone)	5.8×10^{-8} to 1.1×10^{-5}	5×10^{-1} to 1.5×10^1	5×10^{-3} to 1×10^{-1}

Notes:

1. Hydraulic conductivity
2. Source: Domenico and Schwartz (1990), and Driscoll (1986)
3. Specific yield
4. Effective porosity

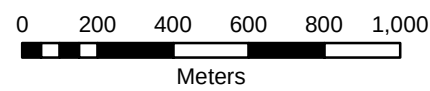
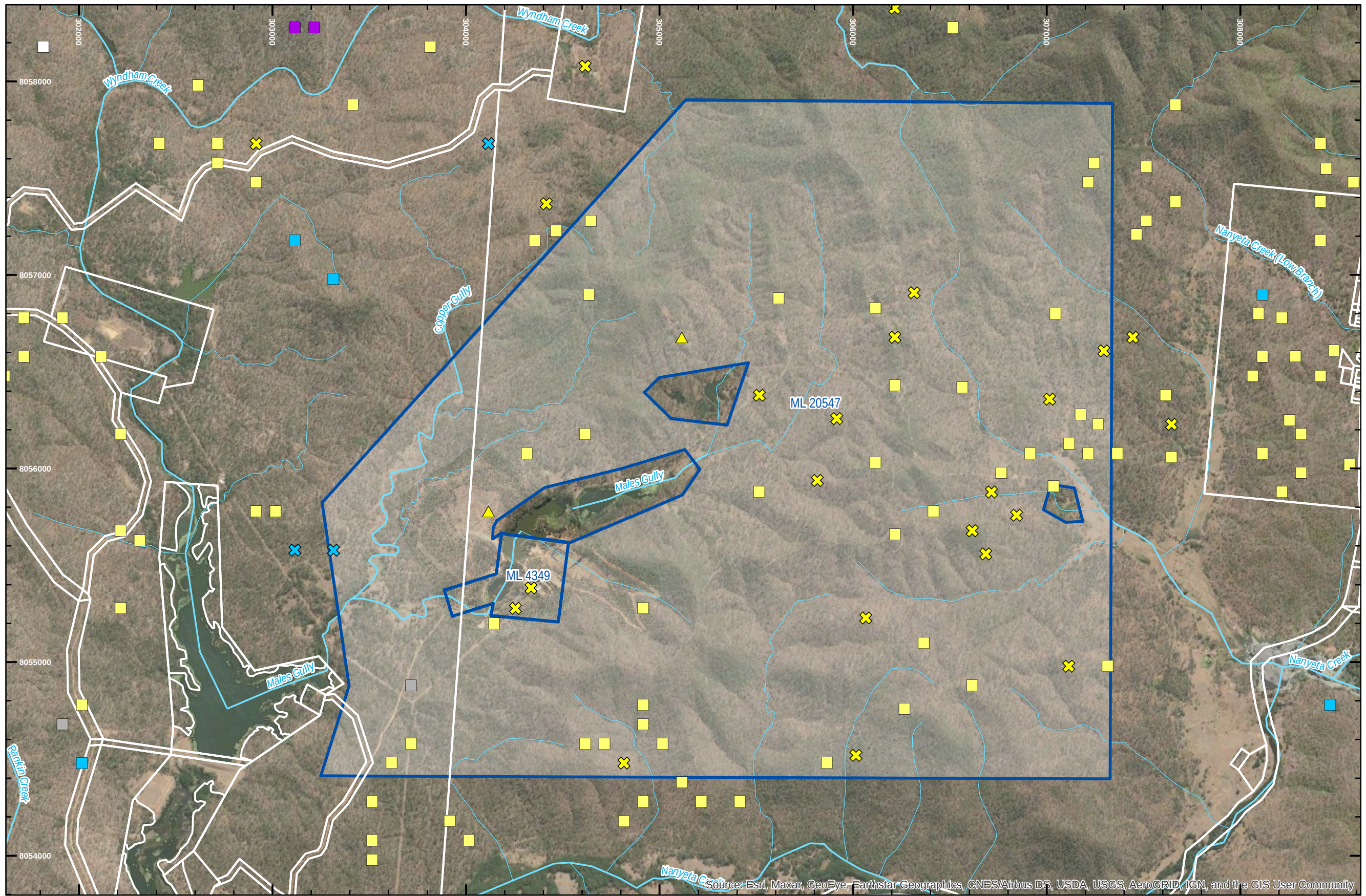
It is reported that historical groundwater level data indicates little variation over time, with a slight increase in water level following wet seasons. Groundwater level head data has been plotted on **Figure 9** and from this map the following can be inferred;

1. The overall hydraulic gradient in the Hodkinson Formation is from north east to south west in the local project area.
2. Groundwater pressure level in MB9 in the alluvial gravels is above the pressure level in the Hodkinson Formation.
3. Groundwater level in MB9 is approximately equal to the water level in the adjacent pond inferring a direct connection.
4. Standing water levels in the ponds in Males Gully are above the pressure level in the Hodkinson Formation.
5. If there was a hydraulic connection between the Alluvial Gravels and the Hodkinson Formation, then the Hodkinson Formation would be receiving recharge from the pond water/alluvial gravels.
6. Pressure levels in the Hodkinson Formation are below the local surface elevation, such that no groundwater dependent ecosystems reliant on the Hodkinson Formation are likely to be present in the local project area.

3.5.2 Background Mineralisation and Mineral Occurrences

The project region is well endowed with mineral occurrences (**Figure 10**). Soil sampling across the project area has highlighted that the soils contain elevated levels of tin, copper, arsenic, manganese etc., as outlined in **Figure 11**. The results of soil sampling are a good proxy for indicating bulk chemistry of the bedrock (hence why soil geochemistry is a mineral exploration technique).

From both the extensive distribution of mineral occurrences, and elevated metals levels in soil chemistry, it is clear that the background rock geochemistry is elevated in metals.



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Figure 10 - Mineral Occurrences

Drawn By: Chris Schlebusch

Requested by: Richard Davis

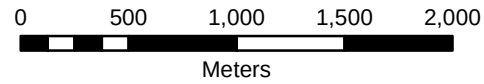
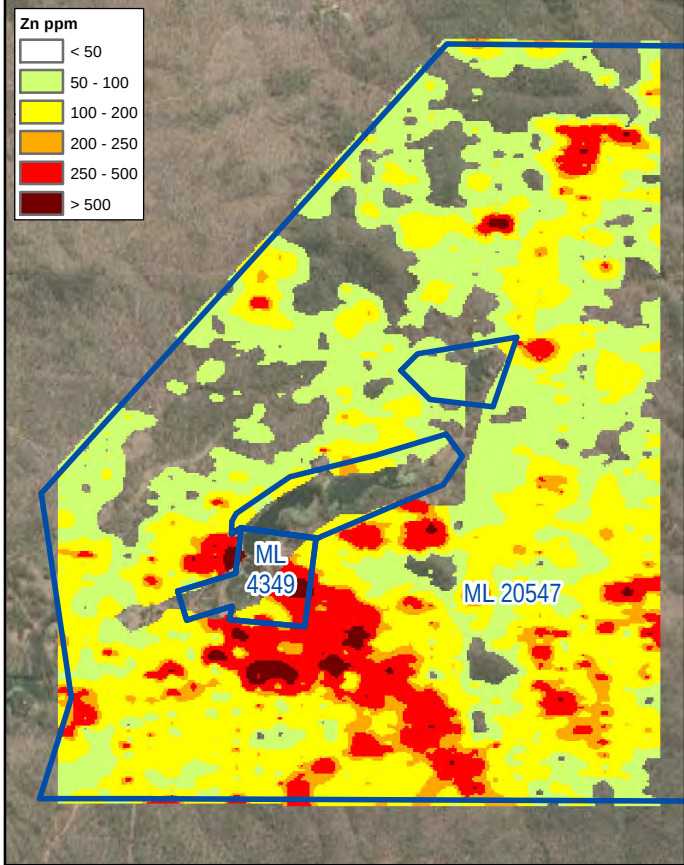
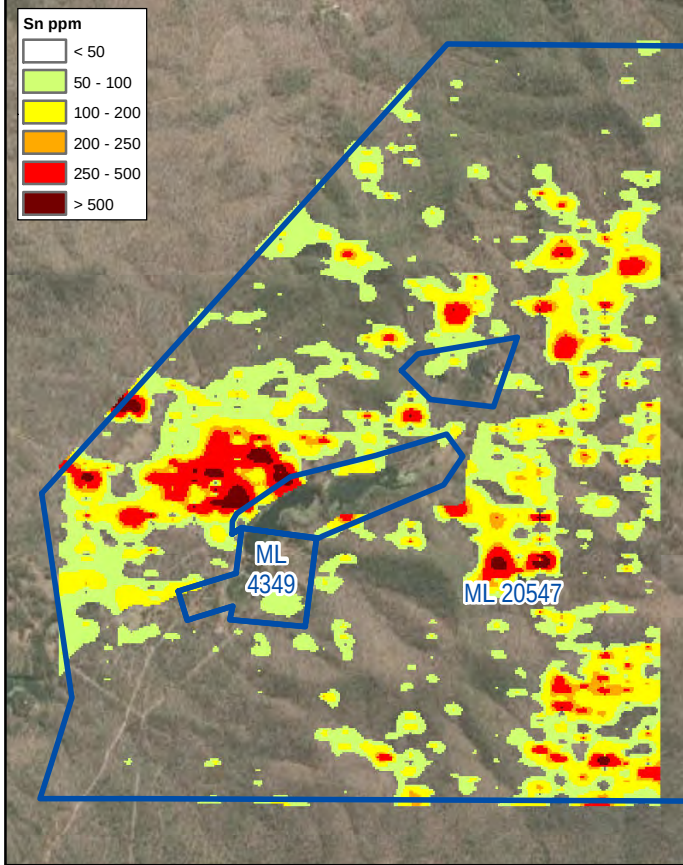
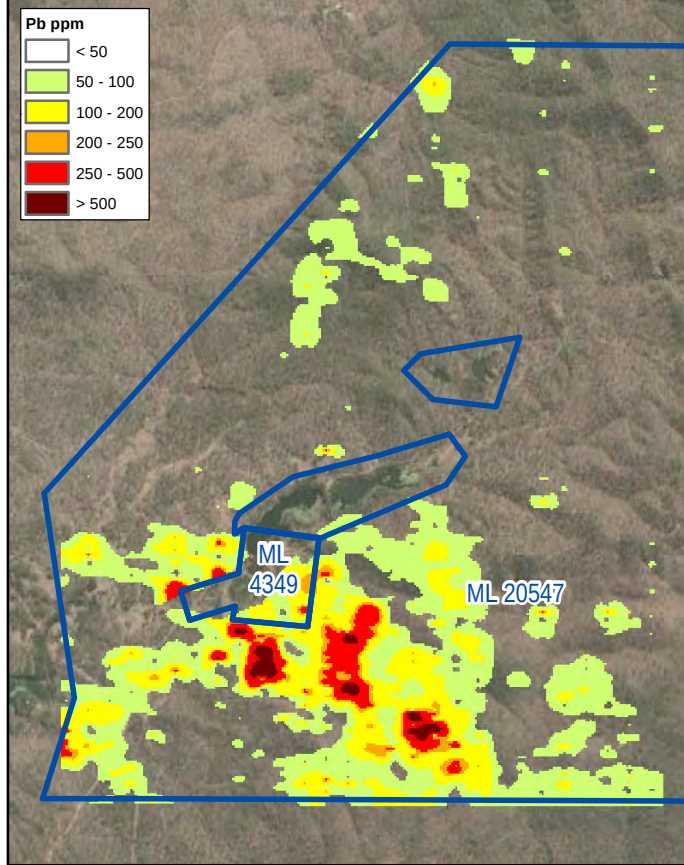
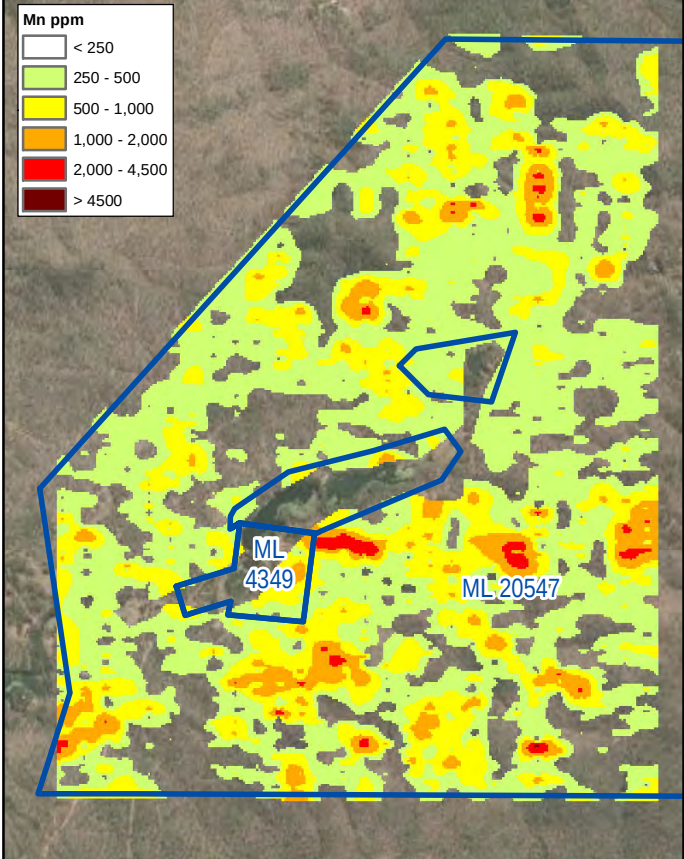
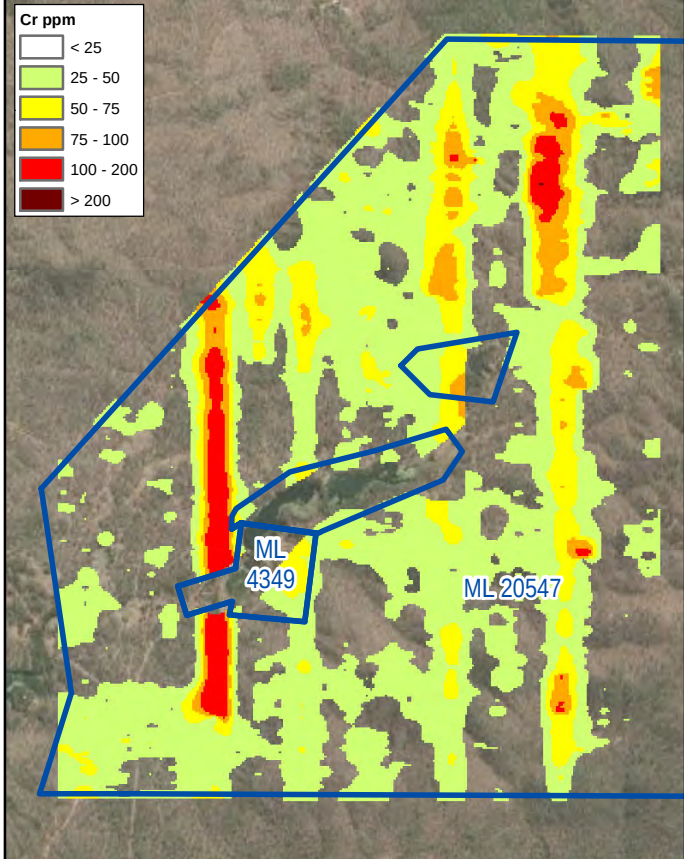
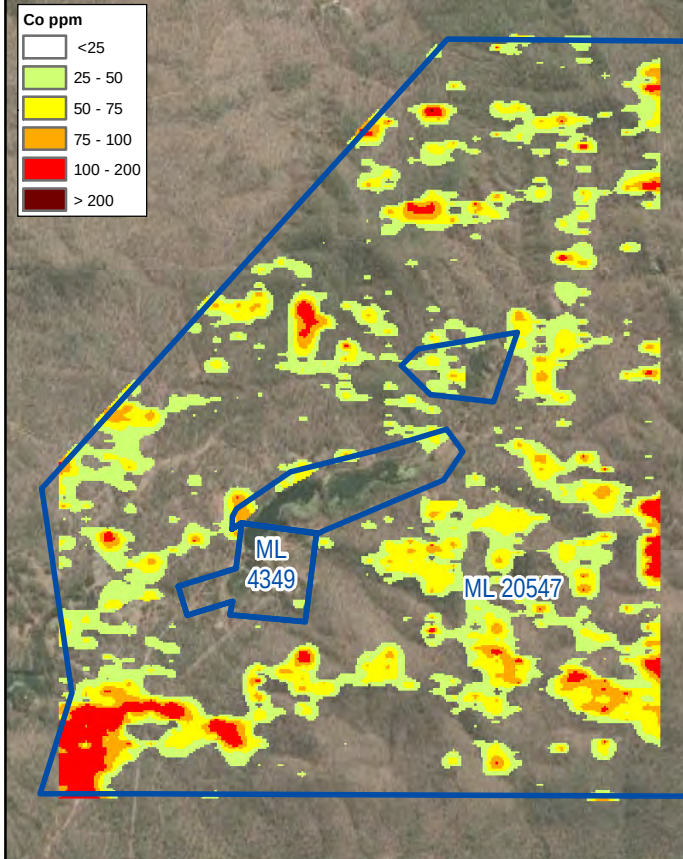
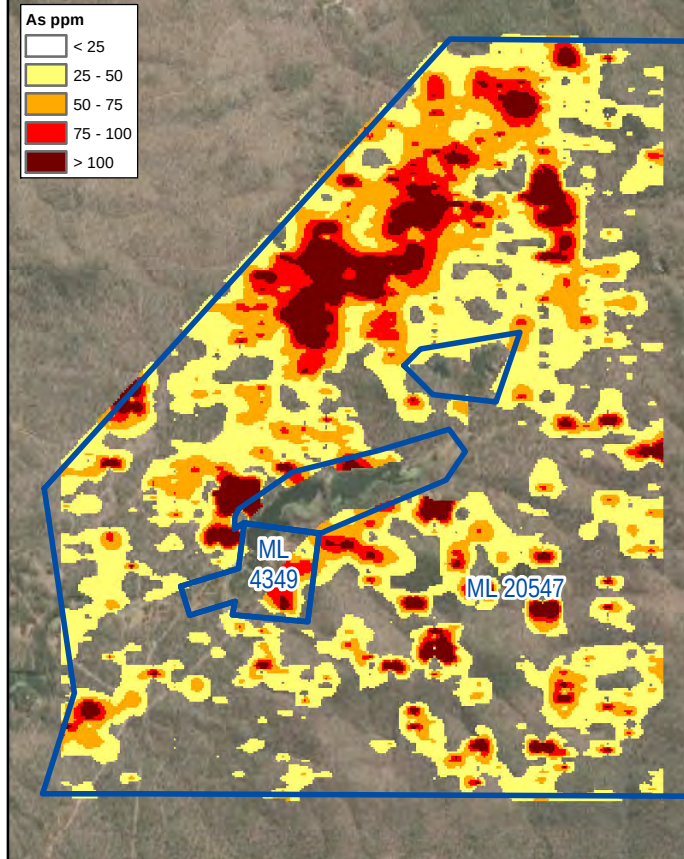
Date: 9/09/2021

- Mining Lease Boundary
- Property Boundary
- Watercourse

- TIN, Operating Mine
- TIN, Abandoned Mine
- TIN, Mineral Occurrence
- COPPER, Mineral Occurrence
- FLUORITE, Abandoned Mine
- LEAD, Abandoned Mine
- TUNGSTEN, Abandoned Mine
- COPPER, Abandoned Mine

Sheet No.
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Data sources:
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**Figure 11 -
Soil Survey
Geochemistry
Summary Maps**

Mining Lease Boundary

Sheet No. RTPL_ARD_MGT001_MAP_0013_A	Drawn By: Chris Schlebusch
	Requested by: Richard Davis
	Date: 17/09/2021

Data sources:
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Service Layer Credits:
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

3.5.3 Potential for Historical Groundwater Quality Impacts

This section explores the potential for the historical and current site activities to impact on groundwater quality. The Herberton Region has been subject to tin (and to a lesser extent copper and lead) exploration and mining activity since 1898. Historical disturbance has included the use of mobile plant and dredging to extract tin from surficial soils, sands and gravels in the gullies and adjacent hill slopes, together with shallow costean, pit and adits to access hard rock tin deposits. Surface infrastructure from historical mining includes clean water dams, sand/gravel spoil deposits and a tailings dam constructed in Males Gully. There has been no mining activity in the current mining lease area since the mid 1980's.

Recent exploration and mining activity includes exploration drilling (percussion and diamond drilling) and shallow costeans (up to approximately 3m below surface).

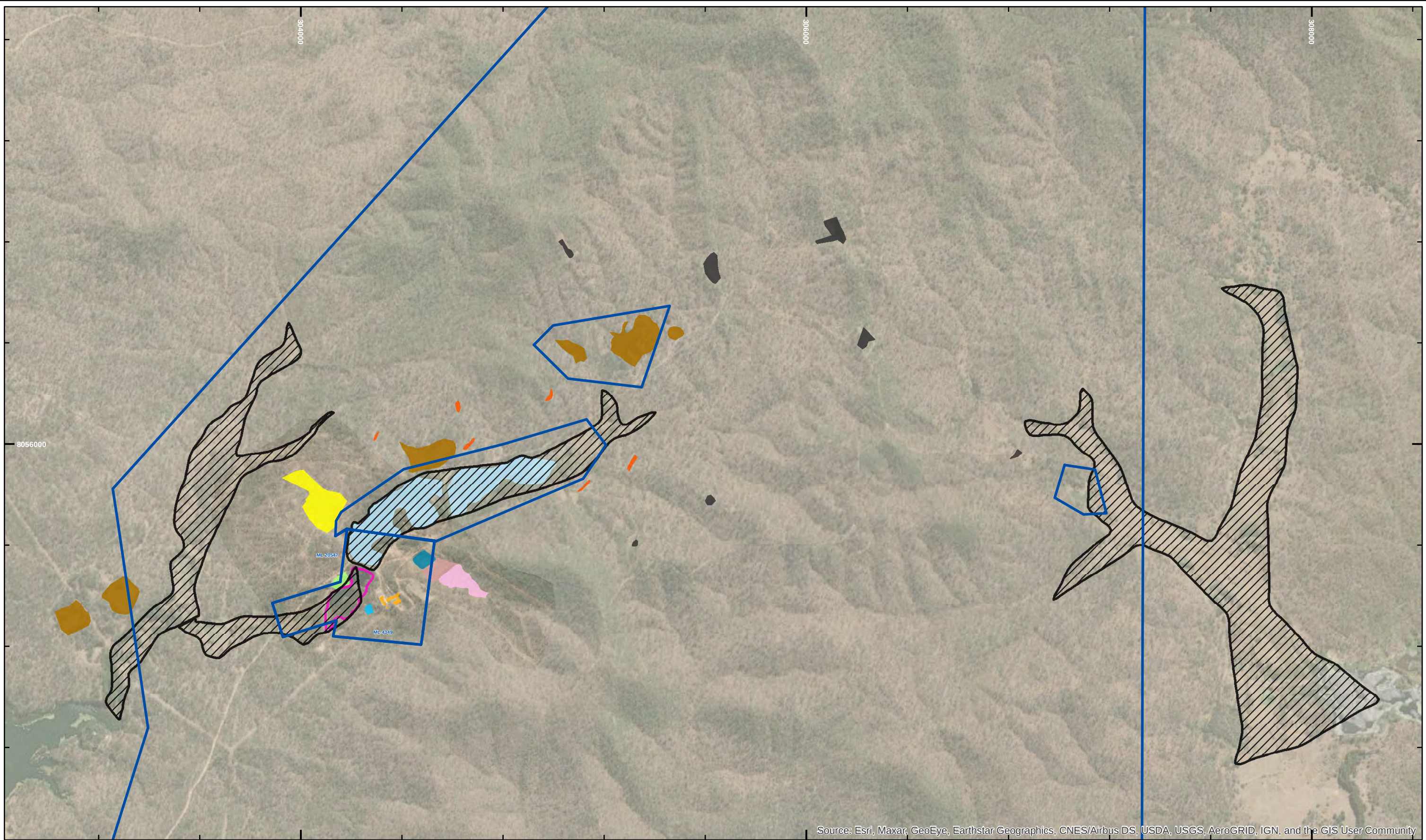
The approximate locations of historical and recent mining and exploration is noted on **Figure 12**.

The potential for impact of these activities on the Hodgkinson Formation aquifer, and the extent of impact is outlined in **Table 11** below.

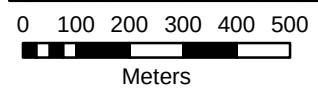
Table 11 Activities with Potential to Impact on Hodgkinson Formation Groundwater Quality

Activity	Activity or Infrastructure	Potential Impact on Ground Water Quality
Historic	Surficial alluvial / colluvial mining	Nil, due to excavation depth well above Hodgkinson Formation aquifer.
	Clean Water Dams	Hydraulic connection between surface water and near surface (alluvial) aquifer likely. Connection between alluvial aquifer and Hodgkinson Formation likely to be poor due to significant difference in hydraulic conductivity. Poor connection is supported by different water (head) pressure levels recorded in bores.
	Historic Tailings Dam	Hydraulic connection between surface water and near surface (alluvial) aquifer possible. Connection between alluvial aquifer and Hodgkinson Formation likely to be poor due to significant difference in hydraulic conductivity. Poor connection is supported by different pressure levels recorded in bores. Thus, there is a low probability that the historic tailings dam impacts on Hodgkinson Formation Groundwater quality. The only bore located down groundwater gradient of this dam is MB1.
	Shallow Pits	Shallow pits may hold water after rain events. This rainwater may recharge the Hodgkinson Formation aquifer, locally below any shallow pit. Assessment of pit water quality from Viking Pit (in the eastern part of the Mining Lease) has indicated no contaminants of concern above EA surface water limits. Therefore, an impact on groundwater quality is not expected.

Activity	Activity or Infrastructure	Potential Impact on Ground Water Quality
	Gravel, sand spoil deposit	Spoil heaps of re-distributed gravel and sand mined out of gully regions is not expected to hold water after rainfall recharge due to the high porosity of such deposits. Therefore, the impact on groundwater quality is not anticipated.
Recent (MGT)	Exploration Drilling	Exploration drilling (percussion and limited diamond drilling) is not anticipated to have any impact on groundwater quality. Drill holes have been plugged and/or backfilled on completion.
	Costeans	Exploration costeans are limited to approximately 3m below surface, and so are too shallow to impact on groundwater quality.
	Office/Processing Plant/Workshop/Process Pond/Camp	There is no anticipated impact on groundwater quality from this infrastructure for the following reasons; • No chemicals used in historical processing (gravity processing used). • Limited quantities of fuels, lubricants retained on site in bunded locations. • Process ponds are HDPE lined. • Sewage treated via septic tank system. • Rubbish is removed and taken to Mt Garnet transfer station.



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



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Figure 12 - Historic and Recent Mining Activities

Mining Lease Boundary

Historic Activities

- Costean
- Gravel, sand spoil deposit
- Shallow Pit
- Surficial Mining

Recent MGT Activities

- Process Plant
- Office and Camp
- Clear Water Dam
- Plant Pond - Wet
- Process Water Pond - Dry
- Existing TSF
- New TSF
- New TSF Wall
- Costean

Sheet No. RTPL_ARD_MGT001_MAP_0011_A	Drawn By: Chris Schlebusch
	Requested by: Richard Davis
	Date: 8/09/2021

Data sources:
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3.5.4 Registered Bores

The only Registered Bores on the Mining Lease are the monitoring bores installed by MGT Minerals. The nearest Registered Bore (#148103) that is in the project vicinity is located 2.6 km to the west of the Processing Plant (**Figure 13**). However, this bore is mis-plotted and is actually monitoring bore MB1. These bore reports are included in **Appendix 2**. Beyond this, the next closest bore is located 8km south of the site.

The key message from the lack of registered bores in the region is that the regional groundwater in the Hodgkinson Formation is not valuable for domestic or stock use, due to the combination of limited flow and/or quality characteristics.

3.5.5 Waste Management

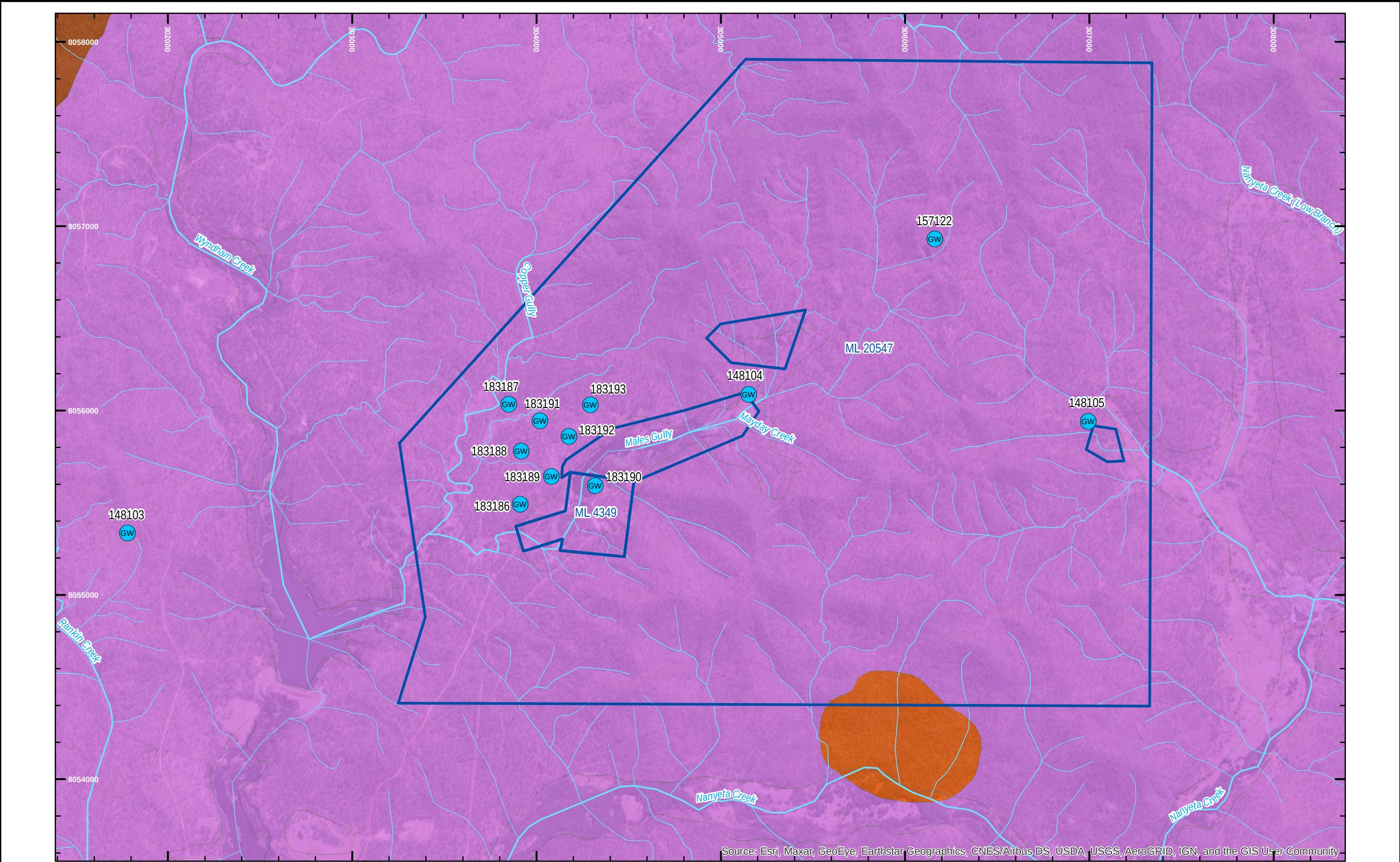
Wastes that are likely to be produced during mining and processing have been tabulated in **Table 12** below. This site does not release wastes to surface or groundwaters. The only wastes which are disposed of on site are waste rock and tailings, within the areas approved by the Environmental Authority. Note that this Waste Rock Dump area and new TSF do not contain any waste at present, as the mine has not yet commenced production.

Table 12 Waste Source Storage and Disposal

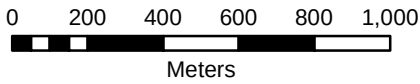
Waste	Source	Storage or Disposal area	Comment
Waste Rock	Open Pit	Waste Rock Dump	Mining not yet commenced, so open pit and waste rock dump not yet constructed. Areas as per Environmental Authority.
Tailings	Mineral Processing	Tailings Dam	Mining not yet commenced, so tailings dam contains no tailings. Areas as per Environmental Authority.
Process water	Mineral Processing	Process water is recirculated in the process plant circuit and HDPE lined ponds.	Processing used gravity and electromagnetic methods. No processing chemicals are used.
Lubricating oils	Engine maintenance	Stored in waste oil drums, on bunded storage pallets at the	Waste from current care and maintenance

Waste	Source	Storage or Disposal area	Comment
		Process Plant area, before removal to Mt Garnet Transfer Station.	activities, as well as during future mining.
Domestic (kitchen) waste	Camp, crib rooms	Stored in covered bins, at the Process Plant area before removal to Mt Garnet Transfer Station.	Waste from current care and maintenance activities, as well as during future mining.
Industrial waste (scrap metals, timber, plastic, tyres, batteries)	Plant maintenance	Stored at the at the Process Plant area. Remove appropriate items for recycling Non-recycling materials aggregated then disposed of at Mt Garnet transfer station.	Waste from current care and maintenance activities, as well as during future mining.

The location of waste storage areas is marked on **Figure 14**.



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

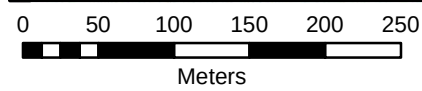


MGT MINERALS PTY LTD
Mount Veteran Overview



Note bore #148103 is mis-plotted and is located approx 1.6km further east on ML20547

	Figure 13 - Registered Groundwater Bores in Project Vicinity		 Mining Lease Boundary	 Devon Microgranite
	Drawn By: Chris Schlebusch		 Property Boundary	 Excelsior Granite
	Requested by: Richard Davis		 Watercourse	 Hodgkinson Formation/am
	Date: 7/09/2021		 Registered Groundwater Bore	
Sheet No. RTPL_ARD_MGT003_MAP_0010_A		Data sources: ©Queensland Department of Resources		



MGT MINERALS PTY LTD
Mount Veteran Overview



Figure 14 - Waste Storage Areas

-  Mining Lease Boundary
-  Waste Storage Area

Sheet No.
RTPL_ARD_MGT002_MAP_0015_A

Drawn By: Chris Schlebusch
Requested by: Richard Davis
Date: 7/09/2021

Data sources:
©Queensland Department of Resources

3.5.6 Hydrochemistry

Assessment of the relationship between groundwater bores and hydro stratigraphic units is commonly by the use of ionic chemistry of the groundwater. There are various methods available, but a Piper Plot or Durov Plot are useful in this assessment. The plot of ionic chemistry from June 2021 sampling (MB1-12 inclusive) and September 2021 (MB13) has been prepared and is reproduced in **Figure 15** and **Figure 16**.

An assessment of these plots indicates;

- All bores cluster within close proximity in the ionic diagrams.
- All waters are bicarbonate rich and vary from Na dominant to Ca dominant.
- MB 4 and MB6 plot with slightly elevated Na compared with the other bores.
- MB9 has similar ionic chemistry, but lower EC when compared with the other bores.
- No evolution of groundwater chemistry across the project area is discernible, perhaps implying that the groundwater from bore to bore is not well connected, but instead reflects the bulk chemistry of the host formation.

On the basis of the ionic chemistry results, it would be reasonable to conclude that the groundwater in all the monitoring bores are from the same hydrostratigraphic unit (i.e. Hodgkinson Formation).

Based on knowledge of the geology and the relative groundwater pressure head levels, it is interpreted that MB9 intersects groundwater in the Alluvials hydrostratigraphic unit.

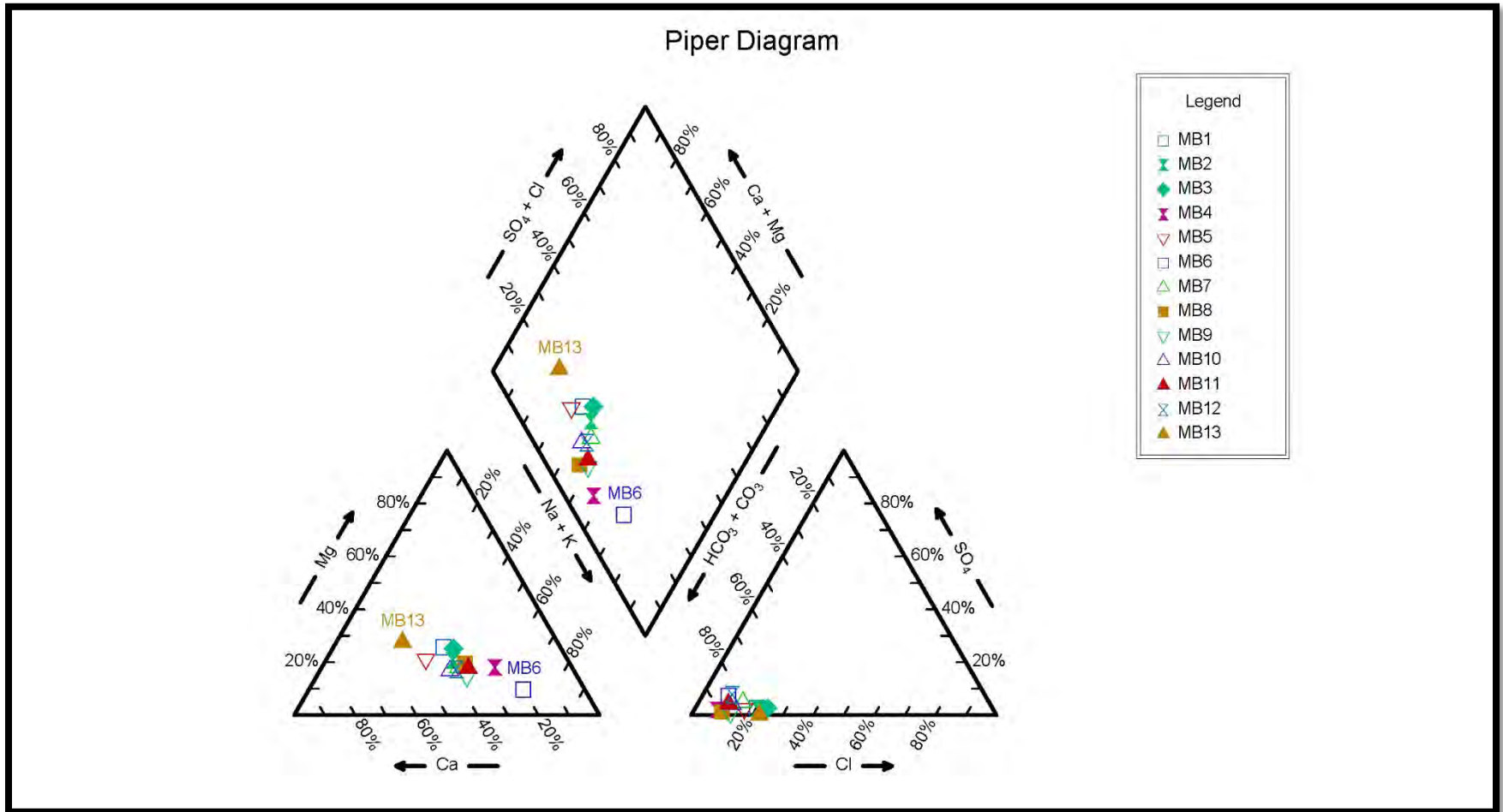


Figure 15 Piper Plot Bores MB1 to 13

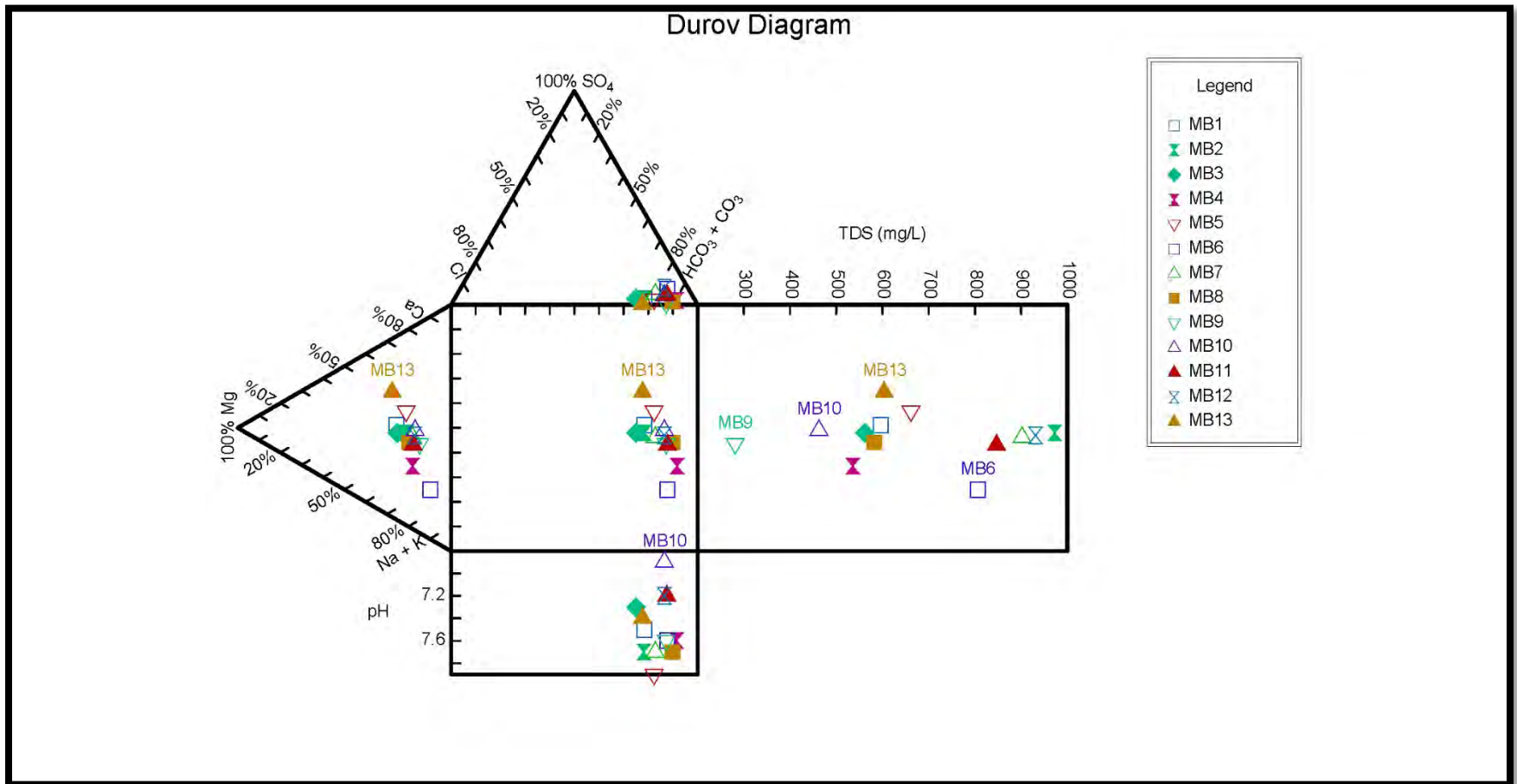


Figure 16 Durov Diagram Bores MB1 to 13

3.6 Conceptual Hydrogeological Model

Drawing together all of the above elements has enabled the preparation of a conceptual Hydrogeological Model for the project area.

Groundwater recharge is anticipated to occur mainly during the wet season as infiltration in outcropping areas, and during stream flow events. Evapotranspiration from the soil horizon and unsaturated zone will take place all year, with this rate exceeding the rainfall rate for most months of an average year. Rainfall runoff results in ephemeral flow in streams, although the ponded water bodes in Males Creek are maintained year-round.

It is concluded that there are two main hydrostratigraphic units present in the project area, the Hodgkinson Formation and Alluvial deposits.

Groundwater flow in the Hodgkinson Formation is predominantly from the higher north-eastern areas to the lower south western area of the project. Groundwater movement will be slow, relying on secondary porosity, and thus poor connectivity across the site. Groundwater levels in the Hodgkinson Formation are anticipated to be lower than the overlying Alluvial Aquifer. If there is a connection between these two hydrostratigraphic units, then the Alluvial Aquifer may add a component of recharge to the Hodgkinson Formation.

Groundwater levels in the Alluvial aquifer are anticipated to reflect water level in adjacent ponds. Groundwater levels in the Alluvial aquifer will generally follow the local ground level contours (i.e. flow downhill) although this may be locally disrupted where gravel and sand thickness is affected by past (historical) alluvial mining activities.

Groundwater may be hosted in the Alluvial deposits coincident with creeks, in areas away from the ponded areas. This groundwater would be in response to recharge of Alluvial sands and gravels during times of ephemeral creek flow. It is anticipated that there is poor connection in this aquifer along drainage lines. This is because observations in creek lines of exposed basement rock formations is relatively common.

Flow (or recharge) between the Alluvial aquifer and underlying Hodgkinson Formation is expected to be minimal due to the significantly lower hydraulic conductivity present in the Hodgkinson Formation.

While there has been historical mining activities noted in the district, no activities by the current mining lease holders is anticipated to have had a material impact on the groundwater quality or levels on site.

The Hydrostratigraphic Units are summarised in **Table 13** and illustrated in **Figure 17**.

Table 13 Hydrostratigraphic Unit Summary

Hydrostratigraphic Unit	Age	Description	Recharge Mechanisms	Discharge Mechanisms	Hydraulic Conductivity	Aquifer classification
Alluvial/Alluvium	Quaternary	Alluvium, colluvium, sand, silt and gravel	• direct rainfall • stream flow	limited discharge into underlying formations, evaporation	2×10^{-4} m/s (a)	poor Aquifer
Hodkinson Formation	Devonian to Late Silurian	Thin bedded metamorphosed rock including meta-greywacke, meta-sandstone, meta-siltstone, meta-shale and meta-conglomerate.	• direct rainfall • stream flow, where formation is exposed in base of streams	no discharge to surface (i.e. GDE), groundwater flows down groundwater gradient generally to west	8×10^{-7} m/s (a) 8.5×10^{-8} to 3.1×10^{-9} m/s (b)	Aquitard

Note (a) from MGT Minerals, EA Amendment Application Supporting Report, 2018, (b) from unpublished report Geotechnical Investigation and Groundwater Monitoring Bore Installation, Golder, August 2021

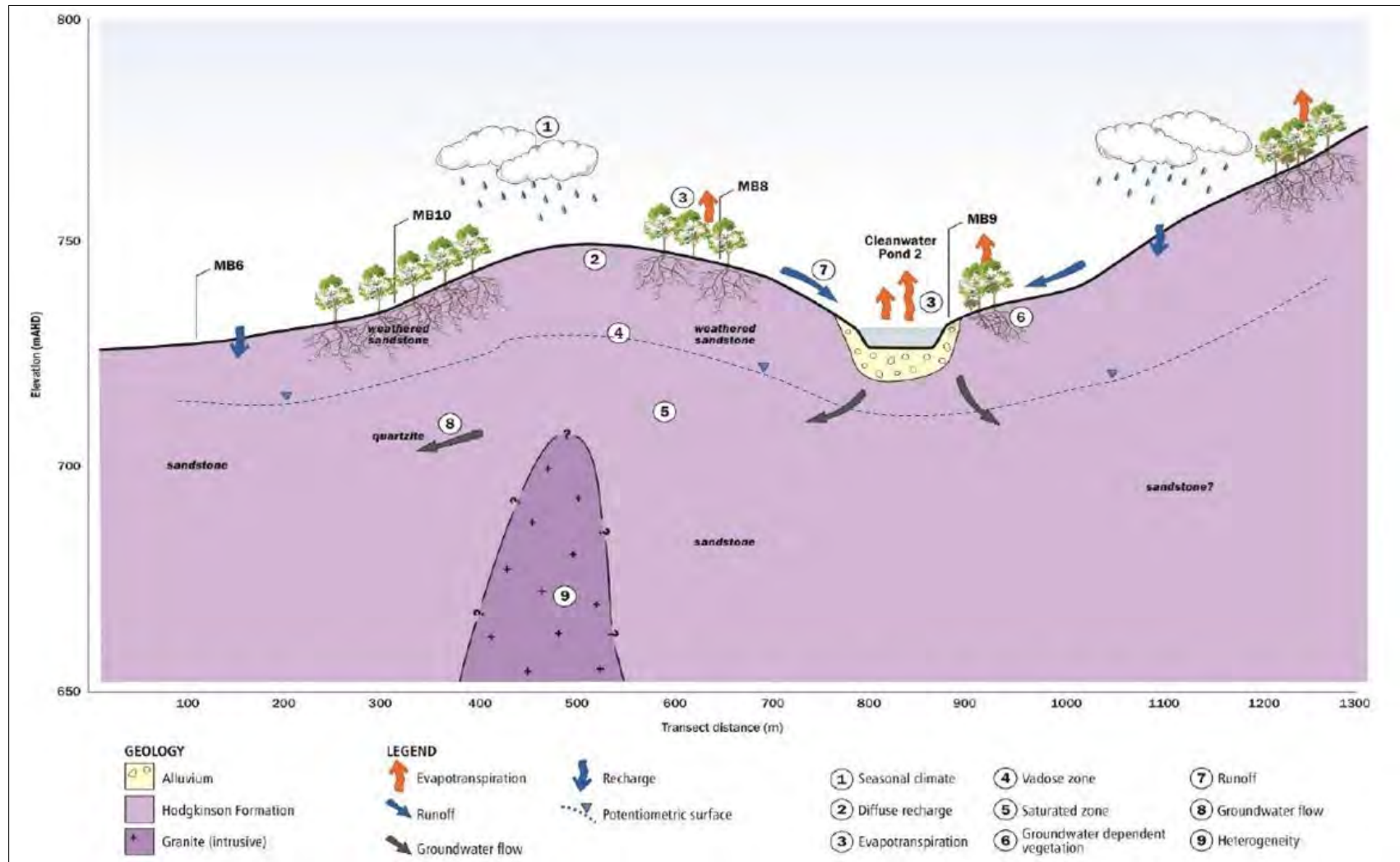


Figure 17 Conceptual Groundwater Model

4. Assessment of Groundwater Quality Monitoring Data

4.1 Groundwater Results Dataset

The DES guideline (DES 2021) acknowledges that there is little guidance from Australian sources on the minimum number of samples to assess groundwater quality. Guidance from the US Interstate Technology and Regulatory Council identified that most guidelines on sample size for groundwater tests recommended eight to ten background measurements when constructing limits (ITRC 2013).

It is considered that discussion on time periods and number of samples for assessing surface water quality outlined in the ANZWQG for surface water are not especially relevant to assessing groundwater quality, as the method of water flow and interaction with the environment is fundamentally different.

The groundwater results dataset available for this project includes samples taken over an extended period, across a wide area of the mining lease. There is a concentration of monitoring bores adjacent to the Dalcouth tin resource. The dataset is summarised in below in **Table 14**.

Table 14 Bore Sample Period and Sampling Events

Bore	Hydrostratigraphic Unit	completion date	sampling period	total number of samples	number of samples last 12 months
MB1	Hodkinson Fmn	2009	2013- 2021	39	8
MB2	Hodkinson Fmn	2009	2018-2021	12	7
MB3	Hodkinson Fmn	2009	2018-2021	11	6
MB4	Hodkinson Fmn	2013	2013-2021	37	8
MB5	Hodkinson Fmn	2018	2018-2021	13	8
MB6	Hodkinson Fmn	2018	2020-2021	9	6
MB7	Hodkinson Fmn	2018	2018-2021	12	7
MB8	Hodkinson Fmn	2018	2018-2021	13	8
MB9	Alluvials	2018	2020-2021	12	8
MB10	Hodkinson Fmn	2018	2018-2021	12	8
MB11	Hodkinson Fmn	2018	2018-2021	12	8
MB12	Hodkinson Fmn	2018	2018-2021	13	8
MB13	Hodkinson Fmn	2021	2021-2021	3	3

The majority of groundwater bores have intersected the Hodkinson Formation hydrostatic unit. This assessment will determine if it is reasonable to group these results together for the purpose of calculating site specific trigger values.

Review of the laboratory results reports for sampling after has indicated that field quality control samples have been undertaken on a regular basis, in addition to laboratory QA/QC assessment, and no QA/QC problems are apparent.

Assessment of the potential for impact of historical or current mining activities on the Hodgkinson Formation hydrostratigraphic unit in section 3.5.3 has concluded that no historical or current site activities are considered to have adverse impacts on groundwater quality or quantity in the Hodgkinson Formation. It is noted that monitoring bore MB1 is down groundwater gradient from the old TSF. No impact is noted in the groundwater chemistry of this bore, and thus the results from MB1 have been included when undertaking statistical analysis.

It is concluded that the groundwater database is sufficiently robust for use in the following assessment.

4.2 Summary Statistics

The summary statistics for each bore and each element has been undertaken and the results tables are included in **Appendix 3**.

4.3 Ionic Composition and Assessment

Assessment of the ionic composition of the groundwater has been completed. The plot of ionic chemistry from June 2021 sampling has been prepared and is reproduced in **Figure 15** and **Figure 16**.

An assessment of these plots indicates;

- All bores cluster within close proximity in the ionic diagrams;
- All waters are bicarbonate rich and vary from Na dominant to Ca dominant;
- MB 4 and MB6 plot with slightly elevated Na compared with the other bores;
- MB9 has similar ionic chemistry, but lower EC when compared with the other bores; and
- No evolution of groundwater chemistry across the project area is discernible, perhaps implying that the groundwater from bore to bore is not well connected, but instead reflects the bulk chemistry of the host formation.

On the basis of the ionic chemistry results, it would be reasonable to conclude that the groundwater in all the monitoring bores are from the same hydrostratigraphic unit (i.e. Hodgkinson Formation).

Based on knowledge of the geology and the relative groundwater pressure head levels, it is interpreted that MB9 intersects groundwater in the upper alluvials hydrostratigraphic unit.

4.4 Sample Dataset

An assessment was undertaken to determine if the full dataset should be used for the statistical analysis. If the full dataset was to be used, then the extended results record for bores MB1 and MB4 would result in unbalanced statistics, as combined, these bores would contribute nearly 50% of the results to the dataset (refer [Figure 18](#)). Thus it was decided that further statistical assessment would be limited to the dataset post July 2020, so that each bore contributed more or less equally to the dataset used for calculating statistics.

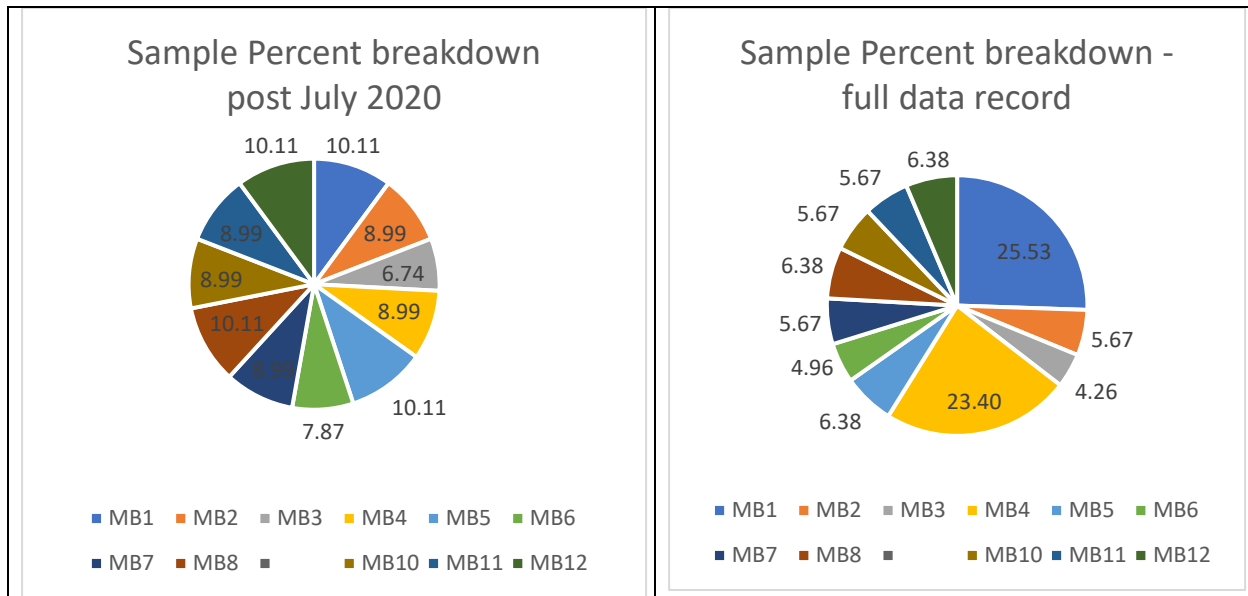


Figure 18 Sample Weighting Assessment

4.5 Exploratory Data Analysis

Time series plots have been prepared for each bore, and each element. These results are included in [Appendix 4](#).

Review of the time series graphs has not indicated any long-term trends that may be indicative of contamination by site activities. There are some step jumps in the graphed data, which are believed to relate to older data points (pre- April 2018) being recorded in the database as a true number, rather than “less than” the limit of reporting. This has created artificial “jumps” in the graphed data. In addition, some minor spikes in results are noted (for example MB2, mercury, July 2021) where a result above the limit of reporting is detected amongst a larger group of data all at the limit of reporting.

A spike in some results in July 2021 was subject to investigation, with the laboratory re-issuing amended results, which were more consistent with the data record and hence these results have been retained in the database except for zinc in bores MB7 and MB11. The high zinc values in MB7 and MB11 have been excluded from the dataset for the purpose of calculating statistics.

Based on discussion earlier in this report, it was identified that bore MB9 was representative of the Alluvial Aquifer unit. The statistics for MB9 will be calculated separately from the statistics on the bores drilled into the Hodgkinson Formation.

Some elements have greater than 50% of results at below the limit of reporting, this includes copper, chromium, and mercury. These elements will not be explored further and the existing EA guideline values will be accepted for these elements. Elements with greater than 50% of results above the limit of reporting and more than eight sample results will be taken forward into the assessment of site-specific limits in the section below.

4.6 Determination of Site-Specific Groundwater Guidelines

4.6.1 Preliminary Comments

The DES 2021 Guideline provides guidance on classification of groundwater bores as suitable to be considered “reference” sites. Using the criteria from table 4.4.1 of the Queensland Water Quality Guidelines (DES 2013), the project groundwater bores have been assessed in **Table 15**.

Table 15 Comparison of Groundwater Bores with Criteria for Reference Sites

Item	Reference Site Criteria (1)	How the Groundwater Bores Meet the Criteria
1	No intensive agriculture within 20km upstream. Intensive agriculture is that which involves irrigation, widespread soil disturbance, use of agrochemicals and pine plantations. Dry-land grazing does not fall into this category.	Project region used for cattle grazing. Criteria has been met for reference site.
2	No major extractive industry (current or historical) within 20km upstream. This includes mines, quarries and sand/gravel extraction.	Region has historically been mined for tin, with the majority of extraction being of alluvial gravels in creek lines and colluvial soil/gravel in drainage lines. Section 3.5 and 3.6 of this report has defined the conceptual hydrogeology of the project area and demonstrated that there is unlikely to be any influence of this historic mining on the Hodgkinson Formation aquifer properties. Reference site criteria met for Hodgkinson Formation bores MB1 -8, 10- 13. Bore MB9 is completed in alluvial gravels. These gravels are likely to have been disturbed by historical mining. Reference site criteria not met for bore MB9 (for the Alluvial aquifer).
3	No major urban area (>5000 population) within 20km upstream. If the urban area is small and the river large this criterion can be relaxed.	Closest population centre is Mount Garnet, some 20km to the south. The population of Mount Garnet is less than 500 people. Reference site criteria has been met.
4	No significant point source wastewater discharge within 20km upstream.	No known significant wastewater discharge points known within 20km of the project site.

Item	Reference Site Criteria (1)	How the Groundwater Bores Meet the Criteria
	Exceptions can again be made for small discharges into large rivers.	Reference site criteria has been met.
5	Seasonal flow regime not greatly altered. This may be by abstraction or regulation	The only known registered bores on the ML are the monitoring bores. There is no groundwater abstraction on the Mining Lease (site is in care and maintenance). The next nearest registered bore is located 2.5km west of the processing plant, and there is no surface infrastructure apparent on air photos, so it is assumed there is no abstraction from this bore. Reference site criteria has been met.

Note (1) Criteria based on “freshwater” criteria from Table 4.4.1 from DES 2013

On the basis of the assessment in **Table 15**, the bores MB1 to 8, MB10 to 13 meet the criteria to be considered reference bores for the Hodgkinson Formation Aquifer.

Bore MB9 is within the Alluvial aquifer, which has been disturbed by historical mining activities. Based on the extent of historical mining, all alluvial deposits in the mining lease, and in fact the region, would be considered “disturbed”. Notwithstanding this, the water quality data is considered valid for understanding the values in this disturbed aquifer, and setting site specific water quality limits for the purpose of monitoring potential future impacts on this aquifer from activities on the mining lease.

While bores MB1 to 8, 10 to 13 intersect the Hodgkinson Formation hydrostatic unit, there is substantial difference in the concentrations for various parameters. A substantial amount of time was spent trying to determine appropriate groupings based on the elemental and ionic chemistry. This assessment included seeking advice from the Department of Environment and Science. For the purpose of calculating site specific groundwater guidelines for the Hodgkinson Formation aquifer, the results from these bores have been assessed and the following water quality objective groupings have been developed due to water quality similarities:

1. MB1;
2. MB2;
3. MB3 and MB8;
4. MB4 and MB5;
5. MB6 and MB10;
6. MB7 and MB11; and
7. MB12 and MB13.

For the purpose of calculating site specific groundwater guidelines for the Alluvial aquifer, the results from bore MB9 over the last 12 months (12 samples) have been used. This is considered reasonable on the basis that the Alluvial aquifer in the entire region has been disturbed by past mining activities, and so the

site specific trigger values calculated from this data will enable the detection of potential impacts from future mining activities.

4.6.2 Hodkinson Formation Aquifer

Following assessment of the Hodkinson Formation aquifer results in the database (MB1 -8, 10- 13), the following outcomes for site specific guidelines for the Hodkinson Formation Aquifer have been summarised in **Table 16** and **Table 22**. Where results are less than the limit of reporting, these have not been used to calculate percentiles.

Table 16 MB1 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	N/A	997	N/A	EA water quality objective to be retained.
Sulfate	mg/L	N/A	8.94	12	9.72	Site specific value is less than EA limit. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.
Arsenic	mg/L	N/A	N/A	0.013	N/A	EA water quality objective to be retained.
Cadmium	mg/L	0.00054	0.0005	0.00086	0.00082	Site specific 95 th percentile value is lower than EA Limit B. Site specific 80 th percentile value is lower than EA Limit A.
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	2.6	2.6	3.08	2.64	Site specific 95 th percentile value is lower than EA Limit B. Limit A retained as it is the site-

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
						specific 80 th percentile value.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	N/A	0.037	N/A	EA water quality objective to be retained.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 17 MB2 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	1380	997	1400	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Sulfate	mg/L	N/A	12	12	13.45	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
Arsenic	mg/L	N/A	N/A	0.013	N/A	EA water quality objective to be retained.
Cadmium	mg/L	N/A	0.0002	0.0002	0.00036	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	N/A	0.001	0.002	Site specific 95 th percentile value is higher than EA Limit B.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	N/A	3.7	0.55	4.145	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	0.19	0.037	0.2	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 18 MB3 and MB8 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	810	997	828.5	Site specific 95 th percentile value is lower than EA Limit B. Limit A added.
Sulfate	mg/L	N/A	7.4	12	8.025	Site specific 95 th percentile value is lower than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.
Arsenic	mg/L	N/A	0.013	0.013	0.0167	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Cadmium	mg/L	N/A	N/A	0.0002	N/A	EA water quality objective to be retained.
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	0.003	0.001	0.00625	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	N/A	3.34	0.55	3.685	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	0.364	0.037	0.4525	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 19 MB4 and MB5 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	N/A	997	N/A	EA water quality objective to be retained.
Sulfate	mg/L	N/A	5.82	12	6.61	Site specific 95 th percentile value is lower than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.
Arsenic	mg/L	0.0432	0.0406	0.0948	0.1051	Site specific 95 th percentile value is higher than EA Limit B. Site specific 80 th percentile value is lower than EA limit A.
Cadmium	mg/L	0.0003	0.0003	0.0004	0.0004	Site specific 95 th percentile value is equal to EA Limit B. Site specific

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
						80 th percentile value is equal to EA limit A.
Chromium	mg/L	0.001	N/A	0.00165	0.001	Site specific 95 th percentile value is lower than EA Limit B. Limit A removed.
Cobalt	mg/L	N/A	0.001	0.001	0.002	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	2.6	2.7	3.29	3.1	Site specific 95 th percentile value is lower than EA Limit B. Site specific 80 th percentile value is higher than EA limit A.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	0.456	0.412	0.513	0.491	Site specific 95 th percentile value is lower than EA Limit B. Site specific 80 th percentile value is lower than EA limit A.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 20 MB6 and MB10 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	1400	997	1600	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Sulfate	mg/L	N/A	45	12	72	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	0.064	0.055	0.245	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Arsenic	mg/L	N/A	0.065	0.013	0.084	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Cadmium	mg/L	N/A	N/A	0.0002	N/A	EA water quality objective to be retained.
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	0.006	0.001	0.008	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	N/A	2.7	0.55	2.9	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	1.1	0.037	1.7	Site specific 95 th percentile value is higher

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
						than EA Limit B. Limit A added.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 21 MB7 and MB11 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	N/A	997	1200	Site specific 95 th percentile value is higher than EA Limit B.
Sulfate	mg/L	N/A	23	12	25.85	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.
Arsenic	mg/L	N/A	0.0224	0.013	0.0355	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Cadmium	mg/L	N/A	0.0002	0.0002	0.00044	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	N/A	3.54	0.55	4.04	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	0.24	0.037	0.44	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	0.054	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

Table 22 MB12 and MB13 Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
EC	µS/cm	N/A	N/A	997	1200	Site specific 95 th percentile value is higher than EA Limit B.
Sulfate	mg/L	N/A	37.6	12	38.25	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Aluminium	mg/L	N/A	N/A	0.055	N/A	EA water quality objective to be retained.
Arsenic	mg/L	N/A	0.017	0.013	0.022	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Cadmium	mg/L	N/A	0.0002	0.0002	0.00035	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Chromium	mg/L	N/A	N/A	0.001	N/A	EA water quality objective to be retained.
Cobalt	mg/L	N/A	N/A	0.001	0.002	Site specific 95 th percentile value is higher than EA Limit B.
Copper	mg/L	N/A	N/A	0.02	N/A	EA water quality objective to be retained.
Fluoride	mg/L	N/A	4.2	0.55	4.675	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	N/A	EA water quality objective to be retained.
Manganese	mg/L	N/A	1.0	0.037	1.1	Site specific 95 th percentile value is higher than EA Limit B. Limit A added.
Mercury	mg/L	N/A	N/A	0.0006	N/A	EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	N/A	EA water quality objective to be retained.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
Silver	mg/L	N/A	N/A	0.00005	N/A	EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	N/A	EA water quality objective to be retained.

note; all metals dissolved.

The historical results from the database, current EA water quality objective and proposed new site specific guideline are graphed and presented in **Appendix 5**.

4.6.3 Alluvial Aquifer

Following assessment of the MB9 results in the database, the following outcomes for site specific guidelines for the Alluvial Aquifer have been summarised in **Table 23**.

Table 23 Alluvial Aquifer (MB9) Water Quality Objectives Assessment

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
pH	pH units	N/A	N/A	6.9-7.9	N/A	EA water quality objective to be retained.
EC	µS/cm	N/A	444	997	511.5	site specific value is less than EA limit. Limit A added.
Sulfate	mg/L	N/A	1.52	12	3.77	site specific value is less than EA limit. Limit A added.
Aluminium	mg/L	N/A	0.06	0.055	0.075	site specific value is higher than EA limit. Limit A added.
Arsenic	mg/L	N/A	N/A	0.013	N/A	EA water quality objective to be retained.

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
Cadmium	mg/L	N/A	N/A	0.0002	na	too many results less than limit of reporting, EA water quality objective to be retained.
Chromium	mg/L	N/A	N/A	0.001	na	too many results less than limit of reporting, EA water quality objective to be retained.
Cobalt	mg/L	N/A	N/A	0.001	na	too many results less than limit of reporting, EA water quality objective to be retained.
Copper	mg/L	N/A	N/A	0.02	na	too many results less than limit of reporting, EA water quality objective to be retained.
Fluoride	mg/L	N/A	0.40	0.55	0.445	site specific value less than but similar to EA water quality objective. Limit A added.
Lead	mg/L	N/A	N/A	0.0034	na	too many results less than limit of reporting, EA water quality objective to be retained.
Manganese	mg/L	N/A	0.248	0.037	0.33	site specific value much higher than EA limit. Limit A added.
Mercury	mg/L	N/A	N/A	0.0006	na	too many results less than limit of reporting, EA water quality objective to be retained.
Nickel	mg/L	N/A	N/A	0.011	na	too many results less than limit of reporting, EA water

Indicator	Unit	EA Water Quality Objective (Limit A)	Site Specific Guideline (80 th percentile, Limit A)	EA Water Quality Objective (Limit B)	Site Specific Guideline (95 th percentile, Limit B)	Comment
						quality objective to be retained.
Selenium	mg/L	N/A	N/A	0.011	na	too many results less than limit of reporting, EA water quality objective to be retained.
Silver	mg/L	N/A	N/A	0.00005	na	too many results less than limit of reporting, EA water quality objective to be retained.
Zinc	mg/L	N/A	N/A	0.054	na	too many results less than limit of reporting, EA water quality objective to be retained.

note; all metals dissolved.

5. Proposed Site Specific Groundwater Quality Monitoring Trigger and Limits

Based on the assessment presented in this report, it is proposed to adopt new site specific 80th percentile (Limit A) and 95th percentile (Limit B) water quality guideline values. Consistent with the compliance approach recommended in DES 2021, it is proposed that these “limit A” guideline values be adopted on the basis that the groundwater measured must not exceed this limit on any 5 consecutive sampling occasions. It is proposed that “limit B” guideline values be adopted on the basis that the groundwater measured must not exceed this limit on any three consecutive sampling occasions. **Table 24** below summarise the proposed new groundwater quality “Limit A” and “Limit B” values, for the groundwater monitoring bores. Where statistical analysis did not support a change to the existing EA limit, the existing limit value has been adopted.

Table 24 Proposed Groundwater Quality Objectives

Monitoring Bores Water Quality Objectives ¹																	
Quality Characteristic	Unit	MB1		MB2		MB3 and MB8		MB4 and MB5		MB6 and MB10		MB7 and MB11		MB12 and MB13		MB9	
		Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B	Limit A	Limit B
pH	pH units	6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²		6.9 - 7.9 ²	
EC	µS/cm	-	997 ²	1380 ⁴	1400 ⁵	810 ⁴	828.5 ⁵	-	997 ²	1400 ⁴	1600 ⁵	-	1200 ⁵	-	1200 ⁵	444 ⁴	511.5 ⁵
Sulfate	mg/L	8.94 ⁴	9.72 ⁵	12 ²	13.45 ⁵	7.4 ⁴	8.025 ⁵	5.82 ⁴	6.61 ⁵	45 ⁴	72 ⁵	23 ⁴	25.8 ⁵	37.0 ⁴	38.25 ⁵	1.52 ⁴	3.77 ⁵
Aluminium	mg/L	-	0.055 ³	-	0.055 ³	-	0.055 ³	-	0.055 ³	0.064 ³	0.245 ⁵	-	0.055 ³	-	0.055 ³	0.06 ⁴	0.075 ⁵
Arsenic	mg/L	-	0.013 ³	-	0.013 ³	0.013 ³	0.0167 ⁵	0.0406 ⁴	0.1051 ⁵	0.065 ⁴	0.084 ⁵	0.0224 ⁴	0.0355 ⁵	0.017 ⁴	0.022 ⁵	-	0.013 ³
Cadmium	mg/L	0.0005 ⁴	0.00082 ⁵	0.0002 ³	0.00036 ⁵	-	0.0002 ³	0.0003 ⁴	0.0004 ⁵	-	0.0002 ³	0.0002 ³	0.00044 ⁵	0.0002 ³	0.00035 ⁵	-	0.0002 ³
Chromium	mg/L	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³	-	0.001 ³
Cobalt	mg/L	-	0.001 ³	-	0.002 ⁵	0.003 ³	0.00625 ⁵	0.001 ³	0.002 ⁵	0.006 ³	0.008 ⁵	-	0.001 ³	-	0.002 ⁵	-	0.001 ³
Copper	mg/L	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²	-	0.02 ²
Fluoride	mg/L	2.60 ⁴	2.64 ⁵	3.70 ⁴	4.145 ⁵	3.34 ⁴	3.685 ⁵	2.70 ⁴	3.10 ⁵	2.70 ⁴	2.9 ⁵	3.54 ⁴	4.04 ⁵	4.2 ⁴	4.675 ⁵	0.40 ⁴	0.45 ⁵
Lead	mg/L	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³	-	0.0034 ³
Manganese	mg/L	-	0.037 ³	0.19 ⁴	0.20 ⁵	0.364 ⁴	0.4525 ⁵	0.412 ⁴	0.491 ⁵	1.1 ⁴	1.7 ⁵	0.240 ⁴	0.440 ⁵	1.0 ⁴	1.10 ⁵	0.248 ⁴	0.33 ⁵
Mercury (inorganic)	mg/L	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³	-	0.0006 ³
Nickel	mg/L	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³
Selenium	mg/L	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³	-	0.011 ³
Silver	mg/L	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³	-	0.00005 ³
Zinc	mg/L	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³	-	0.054 ³
Other major ions	mg/L	For interpretive purpose															

¹ All metals and metalloids must be measured as 'dissolved' (from analysis of a field filtered sample).

² 80th percentile (moderate depth) - Table 4.3 Water quality objectives to protect aquatic ecosystem EVs for Groundwater Chemistry Group (refer to Plan WQ1083) – Sodic – 10 Granitic uplands and slopes, Environmental Protection (Water) Policy 2009 Herbert River Basin Environmental Values and Water Quality Objectives.

³ ANZECC (2000) trigger levels for 95% aquatic ecosystem protection for slightly to moderately disturbed ecosystems.

⁴ 80th percentile bore data

⁵ 95th percentile bore data

6. References

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EA AMENDMENT APPLICATION SUPPORTING REPORT
MGT Minerals Pty Ltd

Appendix 1 Monitoring Bore Log and Construction Details

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MB 1

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148103	Sub-Artesian Facility	Existing	06/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-47	Basin1160
Parish	1228 - COOLGARRA		Longitude	145-07-56	Sub-area
Original Name			GIS Latitude	-17.5797222	Lot220
			GIS Longitude	145.1322222	PlanCP903610
			Easting	301780	
Driller Name	GREEN, LESLIE NORMAN		Northing	8055335	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (3727)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148103
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	06/07/2009	1	0.00	22.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	06/07/2009	2	16.00	22.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	06/07/2009	3	6.00	6.50	Gravel Pack	5.000	GR - Gravel Size	130	
A	06/07/2009	4	6.00	6.50	Bentonite Seal			130	

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From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	06/07/2009	5	0.00	6.00	Grout			130

Strata Logs 2 records for RN 148103

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	17.00	LIMINITE YELLOW *
2	17.00	22.00	FRACTURED SANDSTONE

Stratigraphies 1 records for RN 148103

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	22.00	RINGROSE FORMATION

Aquifers 1 records for RN 148103

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	17.00	22.00	SEDI - Sedimentary	06/07/2009	-0.30	N		0.78	Y	PS	RINGROSE FORMATION

Pump Tests Part 1 0 records for RN 148103

Pump Tests Part 2 0 records for RN 148103

Bore Conditions 0 records for RN 148103

Elevations 0 records for RN 148103

Water Analysis Part 1 0 records for RN 148103

Water Analysis Part 2 0 records for RN 148103

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From Year:

Water Levels

1 records for RN 148103

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	06/07/2009		-0.30	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

Wire Line Logs

0 records for RN 148103

Field Measurements

0 records for RN 148103

Special Water Analysis

0 records for RN 148103

From Year:

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MB 2

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148104	Sub-Artesian Facility	Existing	06/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-24	Basin1160
Parish	1228 - COOLGARRA		Longitude	145-09-51	Sub-area
Original Name			GIS Latitude	-17.573237	Lot230
			GIS Longitude	145.164048	PlanAP4557
			Easting	305152	
Driller Name	GREEN, LESLIE NORMAN		Northing	8056086	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (4351)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148104
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	06/07/2009	1	0.00	22.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	06/07/2009	2	16.00	22.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	06/07/2009	3	6.50	22.00	Gravel Pack	5.000	GR - Gravel Size	130	
A	06/07/2009	4	6.00	6.50	Bentonite Seal			130	

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	06/07/2009	5	0.00	6.00	Grout			130

Strata Logs 2 records for RN 148104

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	5.00	LIMINITE
2	5.00	22.00	FRACTURED SANDSTONE *

Stratigraphies 0 records for RN 148104

Aquifers 1 records for RN 148104

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	5.00	22.00	SDST - Sandstone	06/07/2009	-2.00	N		1.84	Y	FR	RINGROSE FORMATION

Pump Tests Part 1 0 records for RN 148104

Pump Tests Part 2 0 records for RN 148104

Bore Conditions 0 records for RN 148104

Elevations 0 records for RN 148104

Water Analysis Part 1 0 records for RN 148104

Water Analysis Part 2 0 records for RN 148104

Water Levels 1 records for RN 148104

Pipe	Date	Time	Measure	Meas	Point	Remark	Meas	Type	Coll	Coll	Method	Project	Quality
------	------	------	---------	------	-------	--------	------	------	------	------	--------	---------	---------

From Year:

		(m)					Auth					
A	06/07/2009	-2.00	N	Natural Surface	NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality	

Wire Line Logs0 records for RN 148104

Field Measurements0 records for RN 148104

Special Water Analysis0 records for RN 148104

From Year:

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MB 3

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148105	Sub-Artesian Facility	Existing	07/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-29	Basin 1160
Parish	1228 - COOLGARRA		Longitude	145-10-53	Sub-area
Original Name			GIS Latitude	-17.5747222	Lot 230
			GIS Longitude	145.1813889	Plan AP4557
			Easting	306994	
Driller Name	GREEN, LESLIE NORMAN		Northing	8055939	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (4351)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148105
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	07/07/2009	1	0.00	31.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	07/07/2009	2	25.00	31.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	07/07/2009	3	6.50	31.00	Gravel Pack	5.000	GR - Gravel Size	130	
A	07/07/2009	4	6.00	6.50	Bentonite Seal			130	

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Bore Report

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From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	07/07/2009	5	0.00	6.00	Grout			130

Strata Logs 3 records for RN 148105

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	13.00	LIMINITE
2	13.00	27.00	MED SEDIMENT *
3	27.00	31.00	GRANITE

Stratigraphies 0 records for RN 148105

Aquifers 0 records for RN 148105

Pump Tests Part 1 0 records for RN 148105

Pump Tests Part 2 0 records for RN 148105

Bore Conditions 0 records for RN 148105

Elevations 0 records for RN 148105

Water Analysis Part 1 0 records for RN 148105

Water Analysis Part 2 0 records for RN 148105

Water Levels 1 records for RN 148105

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	07/07/2009		-29.00	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

From Year:

Wire Line Logs	0 records for RN 148105
Field Measurements	0 records for RN 148105
Special Water Analysis	0 records for RN 148105

From Year:

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MB 4

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
157122	Sub-Artesian Facility	Existing	03/07/2013	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG 1018645		Latitude	17-33-56	Basin 1160
Parish	1228 - COOLGARRA		Longitude	145-10-25	Sub-area
Original Name			GIS Latitude	-17.56569137	Lot 230
			GIS Longitude	145.1736311	Plan AP4557
			Easting	306161	
			Northing	8056931	Map Scale
Driller Name	GREEN, LESLIE NORMAN		Zone	55	Map Series
Drill Company	DRILL NORTH		Accuracy	GPS	Map No
Const Method	ROTARY MUD		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	10/07/2013	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 7 records for RN 157122

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/07/2013	1	0.00	52.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	03/07/2013	2	40.00	52.00	Perforated or Slotted Casing	5.000	AP - Aperture Size	60
A	03/07/2013	3	39.00	52.00	Gravel Pack	7.000	GR - Gravel Size	100
A	03/07/2013	4	37.00	39.00	Bentonite Seal			100
A	03/07/2013	5	7.00	37.00	Cuttings or other fill between casing and hole wall			100

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/07/2013	6	6.00	7.00	Bentonite Seal			100
A	03/07/2013	7	0.00	6.00	Grout			100

Strata Logs 5 records for RN 157122

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	3.00	GRANITES RED
2	3.00	10.00	GRANITES KHAKI
3	10.00	23.00	GRANITES RED GREY
4	23.00	50.00	GRANITES GREY *
5	50.00	52.00	GRANITES GREY

Stratigraphies 0 records for RN 157122

Aquifers 1 records for RN 157122

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	23.00	50.00	GNTG - Acid Intrusive, Granite	03/07/2013	-22.00	N			Y	XX	ELIZABETH CREEK GRANITE

Pump Tests Part 1 0 records for RN 157122

Pump Tests Part 2 0 records for RN 157122

Bore Conditions 0 records for RN 157122

Elevations 0 records for RN 157122

Water Analysis Part 1 0 records for RN 157122

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From Year:

Water Analysis Part 2

0 records for RN 157122

Water Levels

1 records for RN 157122

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	03/07/2013		-22.00	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

Wire Line Logs

0 records for RN 157122

Field Measurements

0 records for RN 157122

Special Water Analysis

0 records for RN 157122

From Year:

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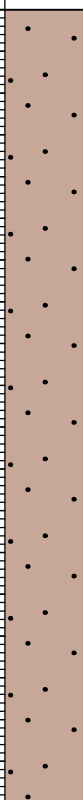
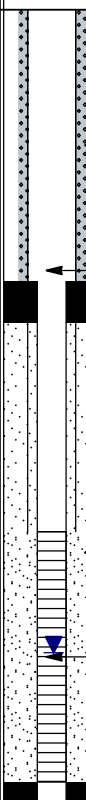
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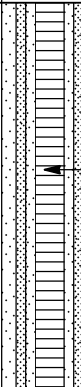
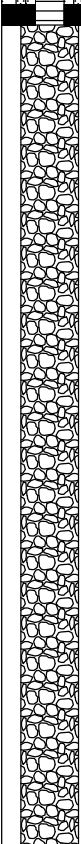
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				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB5							
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200		Total Depth (m bgl):48							
				Project Name: Mt Veteran EA		Well Permit Number:							
				Location: Dalcouth Tin Mine		Surface Elevation (m AHD):729							
				Client: MGT		Static Water Level							
				Drilled By: AED		Date: 20/6/18 Depth (mbRP): 18.1							
				Drilling Method: Air Hammer		Projection: MGA 94 Zn 55							
				Bore Diameter: 200 mm		Easting: 303911 Northing: 8055490							
				Date Started: 12-Jun-18		Date Completed: 12-Jun-18							
DRILLING INFO.				GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY		WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
		0		Hodgkinson Formation Tan, dark brown, grey & dark grey, fine to medium sandstone, siltstone, mudstone and shale									
		1											
		2											
		3											
		4											
		5											
		6											
		7											
		8											
		9											
		10											
		11											
		12											
		13											
		14											
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		27											
		28											
		29											
						LOGGED BY: R Finch		DATE: 12-Jun-18					
						CHECKED BY Gary Bownds		DATE: 25 August 2018					

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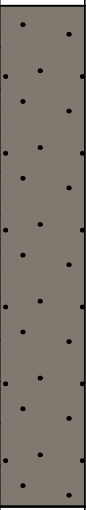
				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB6									
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200			Total Depth (m bgl): 19								
				Project Name: Mt Veteran EA			Well Permit Number:								
				Location: Dalcouth Tin Mine			Surface Elevation (m AHD): 727								
				Client: MGT			Static Water Level								
				Drilled By: AED			Date: 20/6/18		Depth (mbRP): 15.4						
				Drilling Method: Air Hammer			Projection: MGA 94 Zn 55								
				Bore Diameter: 200 mm			Easting: 303850		Northing: 8056032						
				Date Started: 18-Jun-18			Date Completed: 18-Jun-18								
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
		0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19		Hodgkinson Formation Extremely weathered											Dry - no water strike.

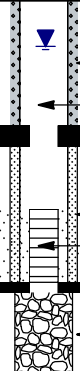
				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: MB7					
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200 Project Name: Mt Veteran EA Location: Dalcouth Tin Mine Client: MGT Drilled By: AED Drilling Method: Air Hammer Bore Diameter: 200 mm Date Started: 14-Jun-18				Total Depth (m bgl): 60 Well Permit Number: Surface Elevation (m AHD): 726 Static Water Level Date: 20/6/18 Depth (mbRP): 15.9 Projection: MGA 94 Zn 55 Easting: 303916 Northing: 8055778 Date Completed: 14-Jun-18					
				DRILLING INFO.		GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.					
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS	
		30		Dark grey silicified siltstone. Hodgkinson Formation (continued)							100mm PN9 Slotted PVC Bore Casing	Water sample is turbid, grey in colour	
		31				0.45	793	8					
		32											
		33											
		34											
		35											
		36											
		37				0.79	703	8					Water sample is turbid, grey in colour
		38											
		39											
		40		Hodgkinson Formation Dark grey fine to medium silicified sandstone.							Bentonite		
		41											
		42											
		43				0.79	704	7.8					Water sample is turbid, grey in colour
		44											
		45											
		46											
		47											
		48											
		49				0.79	650	7.8				Gravel backfill	Water sample is turbid, grey in colour
		50											
		51											
		52											
		53											
		54											
		55			0.79	713	7.8					Water sample is turbid, grey in colour	
		56											
		57											
		58											
		59										Water sample is turbid, grey	
LOGGED BY: R Finch DATE: 14-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018													

[illegible]

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB8												
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200				Total Depth (m bgl): 72										
				Project Name: Mt Veteran EA				Well Permit Number:										
				Location: Dalcouth Tin Mine				Surface Elevation (m AHD): 740										
				Client: MGT				Static Water Level										
				Drilled By: AED				Date: 20/6/18 Depth (mbRP): 28.3										
				Drilling Method: Air Hammer				Projection: MGA 94 Zn 55										
				Bore Diameter: 200 mm				Easting: 304080 Northing: 8055641										
				Date Started: 13-Jun-18				Date Completed: 13-Jun-18										
DRILLING INFO.			GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.											
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS			
		0		Hodgkinson Formation Tan, light brown and brown weathered sandstone.														
		1																
		2																
		3																
		4																
		5																
		6																
		7																
		8																
		9																
		10																
		11		SANDSTONE Dark grey to tan fine to medium sandstone.														
		12																
		13																
		14																
		15																
		16																
		17																
		18																
		19																
		20																
		21																
		22																
		23																
		24																
		25																
		26																
		27																
		28																
		29																
LOGGED BY: R Finch DATE: 13-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018																		

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: MB8									
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200 Project Name: Mt Veteran EA Location: Dalcouth Tin Mine Client: MGT Drilled By: AED Drilling Method: Air Hammer Bore Diameter: 200 mm Date Started: 13-Jun-18				Total Depth (m bgl): 72 Well Permit Number: Surface Elevation (m AHD): 740 Static Water Level Date: 20/6/18 Depth (mbRP): 28.3 Projection: MGA 94 Zn 55 Easting: 304080 Northing: 8055641 Date Completed: 13-Jun-18									
				DRILLING INFO.		GEOLOGICAL DESCRIPTION		FIELD RECORDS / CONSTRUCTION INFO.									
				METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY		WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
						30		SANDSTONE <i>(continued)</i>									
		31		RHYOLITE Dark grey to tan, silicified.													
		32															
		33															
		34		silicified SANDSTONE Dark grey, fine to medium grained. Siltstone and mudstone also present.													
		35															
		36				36						100mm PN9 Slotted PVC Bore Casing					
		37					0.79	483	8.2					Moist samples			
		38												Water strike Water sample is turbid, light brown in colour			
		39															
		40															
		41															
		42															
		43					0.79	504	8.1				Bentonite				
		44															
		45															
		46															
		47															
		48															
		49					0.79										
		50															
		51															
		52															
		53															
		54															
		55					0.7	510	7.9					Water sample is turbid, grey in colour			
		56															
		57															
		58															
		59															
LOGGED BY: R Finch DATE: 13-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018																	

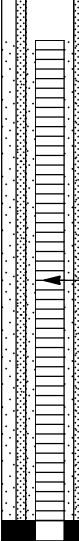
				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: MB8							
 CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200 Project Name: Mt Veteran EA Location: Dalcouth Tin Mine Client: MGT Drilled By: AED Drilling Method: Air Hammer Bore Diameter: 200 mm Date Started: 13-Jun-18				Total Depth (m bgl): 72 Well Permit Number: Surface Elevation (m AHD): 740 Static Water Level Date: 20/6/18 Depth (mbRP): 28.3 Projection: MGA 94 Zn 55 Easting: 304080 Northing: 8055641 Date Completed: 13-Jun-18							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
		60 61 62 63 64 65 66 67 68 69 70 71 72		silicified SANDSTONE (continued)					0.79	504	7.8				Water sample is turbid, grey in colour
									0.7	475	8.0				Water sample is turbid, grey in colour
									0.7	533	8				Water sample is turbid, grey in colour
LOGGED BY: R Finch DATE: 13-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018															

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB9															
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200			Total Depth (m bgl):9														
				Project Name: Mt Veteran EA			Well Permit Number:														
				Location: Dalcouth Tin Mine			Surface Elevation (m AHD):731														
				Client: MGT			Static Water Level														
				Drilled By: AED			Date: 20/6/18 Depth (mbRP): 1.1														
				Drilling Method: Air Hammer			Projection: MGA 94 Zn 55														
				Bore Diameter: 200 mm			Easting: 304319 Northing: 8055592														
				Date Started: 19-Jun-18			Date Completed: 19-Jun-18														
DRILLING INFO.				GEOLOGICAL DESCRIPTION			FIELD RECORDS / CONSTRUCTION INFO.														
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY			WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS							
		0		clayey silty SAND Red brown. Some gravels present.			3						Grout 100mm PN9 Blank PVC Bore Casing Bentonite	Moist samples Water strike							
		1																			
		2		silty sandy GRAVEL																Gravel 100mm PN9 Slotted PVC Bore Casing Bentonite Aquifer materials - hole collapsed	Too much water to check for airlift yield. Hole collapses and blows out.
		3																			
		4																			
		5																			
		6																			
		7																			
		8																			
		9																			
LOGGED BY: R Finch DATE: 19-Jun-18																					
CHECKED BY Gary Bownds DATE: 25 August 2018																					

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB10								
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200			Total Depth (m bgl): 55							
				Project Name: Mt Veteran EA			Well Permit Number:							
				Location: Dalcouth Tin Mine			Surface Elevation (m AHD): 733							
				Client: MGT			Static Water Level							
				Drilled By: AED			Date: 20/6/18		Depth (mbRP): 22.1					
				Drilling Method: Air Hammer			Projection: MGA 94 Zn 55							
				Bore Diameter: 200 mm			Easting: 304019		Northing: 8055944					
				Date Started: 17-Jun-18			Date Completed: 17-Jun-18							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.						
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY	WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS		
		30		QUARTZITE (continued)										
		31					0.14	233	8.3				Water sample is turbid, grey in colour	
		32												
		33												
		34												
		35												
		36												
		37					0.14	348	8.1				Water sample is turbid, grey in colour	
		38												
		39												
		40												
		41												
		42												
		43					0.14	248	8				Water sample is turbid, grey in colour	
		44												
		45												
		46												
		47												
		48												
		49				0.22	510	7.9				Water sample is turbid, grey in colour		
		50												
		51												
		52												
		53												
		54												
		55				0.32	595	7.9				Water sample is turbid, grey in colour		

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: MB11							
 CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200 Project Name: Mt Veteran EA Location: Dalcouth Tin Mine Client: MGT Drilled By: AED Drilling Method: Air Hammer Bore Diameter: 200 mm Date Started: 16-Jun-18				Total Depth (m bgl): 88 Well Permit Number: Surface Elevation (m AHD): 756 Static Water Level Date: 20/6/18 Depth (mbRP): 32.7 Projection: MGA 94 Zn 55 Easting: 304176 Northing: 8055858 Date Completed: 16-Jun-18							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
		60		SILTSTONE <i>(continued)</i>											
		61													
		62													
		63													
		64													
		65													
		66													
		67													
		68													
		69													
		70													
		71													
		72													
		73													
		74													
		75													
		76													
		77													
		78													
		79													
		80		QUARTZITE Dark grey, quartz veining and sulphide mineralisation present.											
		81													
		82													
		83													
		84													
		85													
		86													
		87													
		88													
LOGGED BY: DATE: 16-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018															

				COMPOSITE WELL LOG		BOREHOLE / WELL NUMBER: MB12												
CDM Smith CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200			Total Depth (m bgl):43											
				Project Name: Mt Veteran EA			Well Permit Number:											
				Location: Dalcouth Tin Mine			Surface Elevation (m AHD):749											
				Client: MGT			Static Water Level											
				Drilled By: AED			Date: 20/6/18 Depth (mbRP): 22.7											
				Drilling Method: Air Hammer			Projection: MGA 94 Zn 55											
				Bore Diameter: 200 mm			Easting: 304292 Northing: 8056030											
				Date Started: 17-Jun-18			Date Completed: 17-Jun-18											
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.										
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS			
		0		QUARTZITE Light brown, reddish brown and grey in colour.														
		1																
		2																
		3																
		4																
		5																
		6																
		7																
		8																
		9																
		10																
		11																
		12																
		13																
		14																
		15																
		16																
		17																
		18																
		19																
		20																
		21																
		22																
		23																
		24																
		25																
		26																
		27																
		28																
		29																
								LOGGED BY: DATE: 17-Jun-18										
								CHECKED BY Gary Bownds DATE: 25 August 2018										

				COMPOSITE WELL LOG				BOREHOLE / WELL NUMBER: MB12							
 CDM Smith Australia Pty Ltd Suite 2, Level 1B, 682 Murray Street, West Perth, WA, 6005				Project Number: 1000200				Total Depth (m bgl): 43							
				Project Name: Mt Veteran EA				Well Permit Number:							
				Location: Dalcouth Tin Mine				Surface Elevation (m AHD): 749							
				Client: MGT				Static Water Level							
				Drilled By: AED				Date: 20/6/18 Depth (mbRP): 22.7							
				Drilling Method: Air Hammer				Projection: MGA 94 Zn 55							
				Bore Diameter: 200 mm				Easting: 304292 Northing: 8056030							
				Date Started: 17-Jun-18				Date Completed: 17-Jun-18							
DRILLING INFO.				GEOLOGICAL DESCRIPTION				FIELD RECORDS / CONSTRUCTION INFO.							
METHOD	BIT LOG (inches)	DEPTH (m)	GRAPHIC LOG	LITHOLOGY				WATER CUT (m bgl)	AIRLIFT YIELD (L/sec)	EC (uS/cm)	pH (pH Units)	TEMP (degrees C)	WELL CONSTRUCTION	WELL DESCRIPTION	FIELD OBSERVATIONS
		30		QUARTZITE <i>(continued)</i>				33						100mm PN9 Slotted PVC Bore Casing	Water sample is turbid, brown in colour
		31													
		32													
		33													
		34													
		35		MICROGRANITE				1.24	698	8.1		Bentonite		Water sample is turbid, brown in colour	
		36		Dark grey.											
		37													
		38													
		39													
		40													
		41													
		42													
		43													
LOGGED BY: DATE: 17-Jun-18 CHECKED BY Gary Bownds DATE: 25 August 2018															



GOLDER
MEMBER OF WSP

REPORT OF BOREHOLE: MB13

SHEET: 1 OF 1

DRILL RIG: Comacchio - 405

CONTRACTOR: Saxon

LOGGED: LM DATE: 5/8/21

CHECKED: DATE:

CLIENT: MGT Minerals Limited

PROJECT: Mt Veteran

LOCATION: Mt Garnet

JOB NO: 21465876

COORDS: 305110.4 m 8055798.6 m

SURFACE RL: 751.79 m DATUM:

INCLINATION: -90°

HOLE DEPTH: 35.00 m

Drilling				Sampling		Field Material Description				
METHOD	PENETRATION RESISTANCE	WATER	DEPTH (metres)	DEPTH RL	SAMPLE OR FIELD TEST	RECOVERED GRAPHIC LOG	GROUP SYMBOL	SOIL/ROCK MATERIAL DESCRIPTION	MOISTURE CONDITION CONSISTENCY DENSITY	STRUCTURE AND ADDITIONAL OBSERVATIONS
ADT	L		0	751.79				Sandy CLAY medium plasticity, orange brown and red brown, fine to medium grained sand	w < PL	RESIDUAL SOIL
				1.00				ARENITE brown and off white, fine to medium grained, appears moderate weathered, appears low to medium strength		ROCK (Hodgkinson Formation)
				750.79						
			5	5.00				appears medium strength		
				746.79						
			10							
			15							
			20							larger chip fragments recovered, inferred fracture zone between 17.0 to 20.0 m bgl
			25							
			30							
			35	716.79				END OF BOREHOLE @ 35.00 m TARGET DEPTH GROUNDWATER ENCOUNTERED @ 24.00 m DEPTH STANDPIPE INSTALLED		
			40							

This report of borehole must be read in conjunction with accompanying notes and abbreviations. It has been prepared for geotechnical purposes only, without attempt to assess possible contamination. Any references to potential contamination are for information only and do not necessarily indicate the presence or absence of soil or groundwater contamination.

GAP gINT FN. F01a
RL3

EA AMENDMENT APPLICATION SUPPORTING REPORT
MGT Minerals Pty Ltd

Appendix 2 Registered Bore Records

Report Date: 18/06/2021 12:12

Queensland Government
Groundwater Information
Bore Report

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148103	Sub-Artesian Facility	Existing	06/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-47	Basin 1160
Parish	1228 - COOLGARRA		Longitude	145-07-56	Sub-area
Original Name			GIS Latitude	-17.5797222	Lot 220
			GIS Longitude	145.1322222	Plan CP903610
			Easting	301780	
Driller Name	GREEN, LESLIE NORMAN		Northing	8055335	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (3727)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148103
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	06/07/2009	1	0.00	22.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	06/07/2009	2	16.00	22.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	06/07/2009	3	6.00	6.50	Gravel Pack	5.000	GR - Gravel Size	130	
A	06/07/2009	4	6.00	6.50	Bentonite Seal			130	

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From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	06/07/2009	5	0.00	6.00	Grout			130

Strata Logs 2 records for RN 148103

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	17.00	LIMINITE YELLOW *
2	17.00	22.00	FRACTURED SANDSTONE

Stratigraphies 1 records for RN 148103

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	22.00	RINGROSE FORMATION

Aquifers 1 records for RN 148103

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	17.00	22.00	SEDI - Sedimentary	06/07/2009	-0.30	N		0.78	Y	PS	RINGROSE FORMATION

Pump Tests Part 1 0 records for RN 148103

Pump Tests Part 2 0 records for RN 148103

Bore Conditions 0 records for RN 148103

Elevations 0 records for RN 148103

Water Analysis Part 1 0 records for RN 148103

Water Analysis Part 2 0 records for RN 148103

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Water Levels

1 records for RN 148103

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	06/07/2009		-0.30	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

Wire Line Logs

0 records for RN 148103

Field Measurements

0 records for RN 148103

Special Water Analysis

0 records for RN 148103

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148104	Sub-Artesian Facility	Existing	06/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-24	Basin 1160
Parish	1228 - COOLGARRA		Longitude	145-09-51	Sub-area
Original Name			GIS Latitude	-17.573237	Lot 230
			GIS Longitude	145.164048	Plan AP4557
			Easting	305152	
Driller Name	GREEN, LESLIE NORMAN		Northing	8056086	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (4351)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148104
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	06/07/2009	1	0.00	22.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	06/07/2009	2	16.00	22.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	06/07/2009	3	6.50	22.00	Gravel Pack	5.000	GR - Gravel Size	130	
A	06/07/2009	4	6.00	6.50	Bentonite Seal			130	

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	06/07/2009	5	0.00	6.00	Grout			130

Strata Logs 2 records for RN 148104

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	5.00	LIMINITE
2	5.00	22.00	FRACTURED SANDSTONE *

Stratigraphies 0 records for RN 148104

Aquifers 1 records for RN 148104

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	5.00	22.00	SDST - Sandstone	06/07/2009	-2.00	N		1.84	Y	FR	RINGROSE FORMATION

Pump Tests Part 1 0 records for RN 148104

Pump Tests Part 2 0 records for RN 148104

Bore Conditions 0 records for RN 148104

Elevations 0 records for RN 148104

Water Analysis Part 1 0 records for RN 148104

Water Analysis Part 2 0 records for RN 148104

Water Levels 1 records for RN 148104

Pipe	Date	Time	Measure	Meas	Point	Remark	Meas	Type	Coll	Coll	Method	Project	Quality
------	------	------	---------	------	-------	--------	------	------	------	------	--------	---------	---------

From Year:

		(m)					Auth					
A	06/07/2009	-2.00	N	Natural Surface	NR	Not Recorded	NR	NR	Not Recorded	130	Data is of unknown quality	

Wire Line Logs 0 records for RN 148104

Field Measurements 0 records for RN 148104

Special Water Analysis 0 records for RN 148104

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
148105	Sub-Artesian Facility	Existing	07/07/2009	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description			Latitude	17-34-29	Basin1160
Parish	1228 - COOLGARRA		Longitude	145-10-53	Sub-area
Original Name			GIS Latitude	-17.5747222	Lot230
			GIS Longitude	145.1813889	PlanAP4557
			Easting	306994	
Driller Name	GREEN, LESLIE NORMAN		Northing	8055939	Map Scale
Drill Company	DRILL NORTH PTY LTD		Zone	55	Map Series
Const Method	ROTARY AIR		Accuracy	GPS	Map No
Bore Line			GPS Accuracy	30	Map Name
D/O File No	MAR/515/000 (4351)	Polygon	Checked	Yes	Prog Section
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	09/07/2009	Data Owner			
Roles	Water Supply				

Casing									5 records for RN 148105
Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)	
A	07/07/2009	1	0.00	31.00	Polyvinyl Chloride	3.100	WT - Wall Thickness	60	
A	07/07/2009	2	25.00	31.00	Perforated or Slotted Casing	1.500	AP - Aperture Size	60	
A	07/07/2009	3	6.50	31.00	Gravel Pack	5.000	GR - Gravel Size	130	
A	07/07/2009	4	6.00	6.50	Bentonite Seal			130	

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	07/07/2009	5	0.00	6.00	Grout			130

Strata Logs 3 records for RN 148105

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	13.00	LIMINITE
2	13.00	27.00	MED SEDIMENT *
3	27.00	31.00	GRANITE

Stratigraphies 0 records for RN 148105

Aquifers 0 records for RN 148105

Pump Tests Part 1 0 records for RN 148105

Pump Tests Part 2 0 records for RN 148105

Bore Conditions 0 records for RN 148105

Elevations 0 records for RN 148105

Water Analysis Part 1 0 records for RN 148105

Water Analysis Part 2 0 records for RN 148105

Water Levels 1 records for RN 148105

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	07/07/2009		-29.00	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

From Year:

Wire Line Logs	0 records for RN 148105
Field Measurements	0 records for RN 148105
Special Water Analysis	0 records for RN 148105

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
157122	Sub-Artesian Facility	Existing	03/07/2013	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG 1018645		Latitude	17-33-56	Basin 1160
Parish	1228 - COOLGARRA		Longitude	145-10-25	Sub-area
Original Name			GIS Latitude	-17.56569137	Lot 230
			GIS Longitude	145.1736311	Plan AP4557
			Easting	306161	
			Northing	8056931	Map Scale
Driller Name	GREEN, LESLIE NORMAN		Zone	55	Map Series
Drill Company	DRILL NORTH		Accuracy	GPS	Map No
Const Method	ROTARY MUD		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	10/07/2013	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 7 records for RN 157122

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/07/2013	1	0.00	52.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	03/07/2013	2	40.00	52.00	Perforated or Slotted Casing	5.000	AP - Aperture Size	60
A	03/07/2013	3	39.00	52.00	Gravel Pack	7.000	GR - Gravel Size	100
A	03/07/2013	4	37.00	39.00	Bentonite Seal			100
A	03/07/2013	5	7.00	37.00	Cuttings or other fill between casing and hole wall			100

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	03/07/2013	6	6.00	7.00	Bentonite Seal			100
A	03/07/2013	7	0.00	6.00	Grout			100

Strata Logs

5 records for RN 157122

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	3.00	GRANITES RED
2	3.00	10.00	GRANITES KHAKI
3	10.00	23.00	GRANITES RED GREY
4	23.00	50.00	GRANITES GREY *
5	50.00	52.00	GRANITES GREY

Stratigraphies

0 records for RN 157122

Aquifers

1 records for RN 157122

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	23.00	50.00	GNTG - Acid Intrusive, Granite	03/07/2013	-22.00	N			Y	XX	ELIZABETH CREEK GRANITE

Pump Tests Part 1

0 records for RN 157122

Pump Tests Part 2

0 records for RN 157122

Bore Conditions

0 records for RN 157122

Elevations

0 records for RN 157122

Water Analysis Part 1

0 records for RN 157122

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Water Analysis Part 2

0 records for RN 157122

Water Levels

1 records for RN 157122

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	03/07/2013		-22.00	N	Natural Surface		NR	Not Recorded	NR	NR	Not Recorded		130 Data is of unknown quality

Wire Line Logs

0 records for RN 157122

Field Measurements

0 records for RN 157122

Special Water Analysis

0 records for RN 157122

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183186	Sub-Artesian Facility	Existing	13/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035286		Latitude	17-34-43	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-08	Sub-area
Original Name			GIS Latitude	-17.57851306	Lot 220
			GIS Longitude	145.15230722	Plan CP903610
			Easting	303911	
			Northing	8055490	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 6 records for RN 183186

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	13/06/2018	1	0.00	48.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	13/06/2018	2	36.00	48.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	13/06/2018	3	14.50	48.00	Gravel Pack			200
X	13/06/2018	4	13.50	14.50	Bentonite Seal			200
X	13/06/2018	5	6.50	13.50	Gravel Pack			200

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Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	13/06/2018	6	0.00	6.50	Grout			200

Strata Logs 3 records for RN 183186

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	CLAY, GRAVELLY, SILTY
2	1.00	35.00	SANDSTONE/SILTSTONE, HIGHLY WEATHERED, LIGHT BROWN
3	35.00	48.00	BASALT, FRESH, HARD, DARK GREY *

Stratigraphies 0 records for RN 183186

Aquifers 1 records for RN 183186

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	35.00	48.00	XXXX - Unknown	13/06/2018	-18.20	N		0.80	N	XX	HODGKINSON FORMATION

Pump Tests Part 1 0 records for RN 183186

Pump Tests Part 2 0 records for RN 183186

Bore Conditions 0 records for RN 183186

Elevations 0 records for RN 183186

Water Analysis Part 1 0 records for RN 183186

Water Analysis Part 2 0 records for RN 183186

Water Levels 1 records for RN 183186

From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	13/06/2018		-18.20	R	Reference Point		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

Wire Line Logs	0 records for RN 183186
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Field Measurements	0 records for RN 183186
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Special Water Analysis	0 records for RN 183186
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From Year:

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Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183187	Sub-Artesian Facility	Existing	15/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035287		Latitude	17-34-25	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-06	Sub-area
Original Name			GIS Latitude	-17.5736111	Lot 220
			GIS Longitude	145.1517824	Plan CP903610
			Easting	303850	
			Northing	8056032	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTAY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183187

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	15/06/2018	1	0.00	18.50	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	15/06/2018	2	12.50	18.50	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	15/06/2018	3	7.50	19.00	Gravel Pack			200
X	15/06/2018	4	6.50	7.50	Bentonite Seal			200
X	15/06/2018	5	0.00	6.50	Grout			200

From Year:

Strata Logs

1 records for RN 183187

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	19.00	SANDSTONE WITH CLAY, HIGHLY WEATHERED BROWN/GREY *

Stratigraphies

0 records for RN 183187

Aquifers

1 records for RN 183187

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	0.00		XXXX - Unknown	15/06/2018	-16.00	N		0.00	N	XX	HODGKINSON FORMATION

Pump Tests Part 1

0 records for RN 183187

Pump Tests Part 2

0 records for RN 183187

Bore Conditions

0 records for RN 183187

Elevations

0 records for RN 183187

Water Analysis Part 1

0 records for RN 183187

Water Analysis Part 2

0 records for RN 183187

Water Levels

1 records for RN 183187

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	15/06/2018		-16.00	R	Reference Point		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

Wire Line Logs

0 records for RN 183187

Field Measurements

0 records for RN 183187

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Special Water Analysis	0 records for RN 183187
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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183188	Sub-Artesian Facility	Existing	17/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035288		Latitude	17-34-33	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-09	Sub-area
Original Name			GIS Latitude	-17.57591162	Lot 220
			GIS Longitude	145.15238075	Plan CP903610
			Easting	303916	
			Northing	8055778	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183188

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	17/06/2018	1	0.00	40.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	17/06/2018	2	2.80	40.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	17/06/2018	3	8.00	60.00	Gravel Pack			200
X	17/06/2018	4	7.00	8.00	Bentonite Seal			200
X	17/06/2018	5	0.00	7.00	Grout			200

From Year:

Strata Logs

4 records for RN 183188

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	3.00	CLAY, GRAVELLY, SILTY, RED-BROWN
2	3.00	14.00	SILTSTONE, HIGHLY WEATHERED, LIGHT BROWN
3	14.00	30.00	SANDSTONE, WEATHERED, GREY-LIGHT BROWN
4	30.00	60.00	BASALT, FRESH, DARK GREY *

Stratigraphies

0 records for RN 183188

Aquifers

1 records for RN 183188

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	30.00	60.00	XXXX - Unknown	17/06/2018	-16.00	N		0.80	N	XX	CHILLAGOE FORMATION

Pump Tests Part 1

0 records for RN 183188

Pump Tests Part 2

0 records for RN 183188

Bore Conditions

0 records for RN 183188

Elevations

0 records for RN 183188

Water Analysis Part 1

0 records for RN 183188

Water Analysis Part 2

0 records for RN 183188

Water Levels

1 records for RN 183188

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	17/06/2018		-16.00	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

From Year:

Wire Line Logs	0 records for RN 183188
Field Measurements	0 records for RN 183188
Special Water Analysis	0 records for RN 183188

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183189	Sub-Artesian Facility	Existing	18/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035289		Latitude	17-34-38	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-14	Sub-area
Original Name			GIS Latitude	-17.57716374	Lot 230
			GIS Longitude	145.1539129	Plan AP4557
			Easting	304080	
			Northing	8055641	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183189

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	19/06/2018	1	0.00	42.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	19/06/2018	2	30.00	42.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	19/06/2018	3	8.00	71.00	Gravel Pack			200
X	19/06/2018	4	7.00	8.00	Bentonite Seal			200
X	19/06/2018	5	0.00	7.00	Grout			200

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Strata Logs 3 records for RN 183189

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	CLAY, GRAVELLY, SILTY
2	1.00	36.00	SILTSTONE/SANDSTONE, HIGHLY WEATHERED, LIGHT BROWN/GREY
3	36.00	71.00	BASALT, FRESH, HARD, DARK GREY *

Stratigraphies 0 records for RN 183189

Aquifers 1 records for RN 183189

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	0.00		XXXX - Unknown	19/06/2018	-28.50	N		0.80	N	XX	HODGKINSON FORMATION

Pump Tests Part 1 0 records for RN 183189

Pump Tests Part 2 0 records for RN 183189

Bore Conditions 0 records for RN 183189

Elevations 0 records for RN 183189

Water Analysis Part 1 0 records for RN 183189

Water Analysis Part 2 0 records for RN 183189

Water Levels 1 records for RN 183189

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	19/06/2018		-28.50	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

From Year:

Wire Line Logs	0 records for RN 183189
Field Measurements	0 records for RN 183189
Special Water Analysis	0 records for RN 183189

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183190	Sub-Artesian Facility	Existing	20/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035290		Latitude	17-34-39	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-22	Sub-area
Original Name			GIS Latitude	-17.57762743	Lot 230
			GIS Longitude	145.15615958	Plan AP4557
			Easting	304319	
			Northing	8055592	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183190

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	20/06/2018	1	0.00	7.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	20/06/2018	2	5.00	7.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	20/06/2018	3	4.00	7.00	Gravel Pack			200
X	20/06/2018	4	3.00	4.00	Bentonite Seal			200
X	20/06/2018	5	0.00	3.00	Grout			200

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Strata Logs 2 records for RN 183190

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	4.00	SAND, CLAYEY/SILTY WITH GRAVEL RED/BROWN
2	4.00	7.00	GRAVEL, SANDY, ROUNDED ALLUVIAL GRAVELS, RED/BROWN, LOOSE *

Stratigraphies 0 records for RN 183190

Aquifers 1 records for RN 183190

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	4.00	7.00	XXXX - Unknown	20/06/2018	-1.10	N			N	XX	HERBERT RIVER ALLUVIUM

Pump Tests Part 1 0 records for RN 183190

Pump Tests Part 2 0 records for RN 183190

Bore Conditions 0 records for RN 183190

Elevations 0 records for RN 183190

Water Analysis Part 1 0 records for RN 183190

Water Analysis Part 2 0 records for RN 183190

Water Levels 1 records for RN 183190

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	20/06/2018		-1.10	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

Wire Line Logs 0 records for RN 183190

From Year:

Field Measurements	0 records for RN 183190
Special Water Analysis	0 records for RN 183190

From Year:

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Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183191	Sub-Artesian Facility	Existing	21/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035291		Latitude	17-34-28	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-12	Sub-area
Original Name			GIS Latitude	-17.57442098	Lot 220
			GIS Longitude	145.15336613	Plan CP903610
			Easting	304019	
			Northing	8055944	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	23/06/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183191

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	21/06/2018	1	0.00	47.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	114
A	21/06/2018	2	23.00	47.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	114
X	21/06/2018	3	7.50	55.00	Gravel Pack			200
X	21/06/2018	4	6.50	7.50	Bentonite Seal			200
X	21/06/2018	5	0.00	6.50	Grout			200

From Year:

Strata Logs

5 records for RN 183191

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SANDSTONE, RESIDUAL SOIL
2	1.00	20.00	SANDSTONE, HIGHLY WATHERED, RED/BROWN
3	20.00	27.00	BASALT, FRESH, DARK GREY
4	27.00	48.00	FRACTURED LENS * 27M
5	48.00	55.00	FRACTURED LENS

Stratigraphies

0 records for RN 183191

Aquifers

1 records for RN 183191

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	0.00		XXXX - Unknown	21/06/2018	-22.10	N		0.30	N	XX	

Pump Tests Part 1

0 records for RN 183191

Pump Tests Part 2

0 records for RN 183191

Bore Conditions

0 records for RN 183191

Elevations

0 records for RN 183191

Water Analysis Part 1

0 records for RN 183191

Water Analysis Part 2

0 records for RN 183191

Water Levels

1 records for RN 183191

Pipe	Date	Time	Measure (m)	Meas Point	Remark	Meas Type	Coll Auth	Coll	Method	Project	Quality
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From Year:

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	21/06/2018		-22.10	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

Wire Line Logs 0 records for RN 183191

Field Measurements 1 records for RN 183191

Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	20/06/2018		595	7.9						AI	Air Lifting	GB	Groundwater - from Bore

Special Water Analysis 0 records for RN 183191

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183192	Sub-Artesian Facility	Existing	22/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035292		Latitude	17-34-31	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-17	Sub-area
Original Name			GIS Latitude	-17.57521174	Lot 230
			GIS Longitude	145.15483702	Plan AP4557
			Easting	304176	
			Northing	8055858	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 6 records for RN 183192

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	22/06/2018	1	0.00	48.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	112
A	22/06/2018	2	36.00	48.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	112
X	22/06/2018	3	48.00	88.00	Cuttings or other fill between casing and hole wall			200
X	22/06/2018	4	7.00	48.00	Gravel Pack			200
X	22/06/2018	5	6.00	7.00	Bentonite Seal			200

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From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	22/06/2018	6	0.00	6.00	Grout			200

Strata Logs

6 records for RN 183192

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	CLAY, GRAVELLY, SILTY
2	1.00	19.00	SILTSTONE, HIGHLY WEATHERED, LIGHT BROWN
3	19.00	44.00	SANDSTONE, WEATHERED, LIGHT BROWN/GREY
4	44.00	88.00	BASALT, FRESH, HARD, DARK GREY
5			NO WATER STRIKE
6			NO AIR LIFT YIELD

Stratigraphies

0 records for RN 183192

Aquifers

1 records for RN 183192

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	0.00		XXXX - Unknown	22/06/2018	-33.70	N		0.00	N	XX	

Pump Tests Part 1

0 records for RN 183192

Pump Tests Part 2

0 records for RN 183192

Bore Conditions

0 records for RN 183192

Elevations

0 records for RN 183192

Water Analysis Part 1

0 records for RN 183192

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Water Analysis Part 2

0 records for RN 183192

Water Levels

1 records for RN 183192

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	22/06/2018		-33.70	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

Wire Line Logs

0 records for RN 183192

Field Measurements

0 records for RN 183192

Special Water Analysis

0 records for RN 183192

From Year:

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From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
183193	Sub-Artesian Facility	Existing	24/06/2018	Mareeba	6820 - TABLELANDS REGIONAL COUNCIL
Details			Location		
Description	DRILL LOG # 2035293		Latitude	17-34-25	Basin 1160
Parish	6000 - NO LONGER USED		Longitude	145-09-21	Sub-area
Original Name			GIS Latitude	-17.57366803	Lot 230
			GIS Longitude	145.15594537	Plan AP4557
			Easting	304292	
			Northing	8056030	Map Scale
Driller Name	KROGH, PETER		Zone	55	Map Series
Drill Company	KROGHIES DRILLING		Accuracy	GPS	Map No
Const Method	ROTARY AIR		GPS Accuracy	30	Map Name
Bore Line			Checked	Yes	Prog Section
D/O File No	RN DRAWER	Polygon			
R/O File No		Equipment			
H/O File No		RN of Bore Replaced			
Log Received Date	01/08/2018	Data Owner			
Roles	Sub-Artesian Monitoring				

Casing 5 records for RN 183193

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	24/06/2018	1	0.00	43.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	114
A	24/06/2018	2	31.00	43.00	Perforated or Slotted Casing	2.000	AP - Aperture Size	114
A	24/06/2018	3	7.50	43.00	Gravel Pack			200
A	24/06/2018	4	6.50	7.50	Bentonite Seal			200
A	24/06/2018	5	0.00	6.50	Grout			200

From Year:

Strata Logs

4 records for RN 183193

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SANDSTONE, RESIDUAL SOIL, RED/BROWN
2	1.00	33.00	SANDSTONE, HIGHLY WEATHERED, LIGHT BROWN/GREY
3	33.00	36.00	GRAVELLY, FRACTURED LENS * 33M
4	36.00	43.00	BASALT, FRESH, HARD, DARK GREY

Stratigraphies

0 records for RN 183193

Aquifers

1 records for RN 183193

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	0.00		XXXX - Unknown	24/06/2018	-24.00	N		1.20	N	XX	

Pump Tests Part 1

0 records for RN 183193

Pump Tests Part 2

0 records for RN 183193

Bore Conditions

0 records for RN 183193

Elevations

0 records for RN 183193

Water Analysis Part 1

0 records for RN 183193

Water Analysis Part 2

0 records for RN 183193

Water Levels

1 records for RN 183193

Pipe	Date	Time	Measure (m)	Meas	Point	Remark	Meas	Type	Coll Auth	Coll	Method	Project	Quality
A	24/06/2018		-24.00	N	Natural Surface		ACT	Actual	XX	MA	Manual/Hand		130 Data is of unknown quality

From Year:

Wire Line Logs	0 records for RN 183193
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Field Measurements	1 records for RN 183193
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Pipe	Date	Depth (m)	Conduct (uS/cm)	pH	Temp (C)	NO3 (mg/L)	DO2 (mg/L)	Eh (mV)	Alkalinity (mV)	Samp	Method	Samp	Source
A	24/06/2018		698	8.1						AI	Air Lifting	GB	Groundwater - from Bore

Special Water Analysis	0 records for RN 183193
------------------------	-------------------------

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EA AMENDMENT APPLICATION SUPPORTING REPORT
MGT Minerals Pty Ltd

Appendix 3 Summary Statistics Results Tables

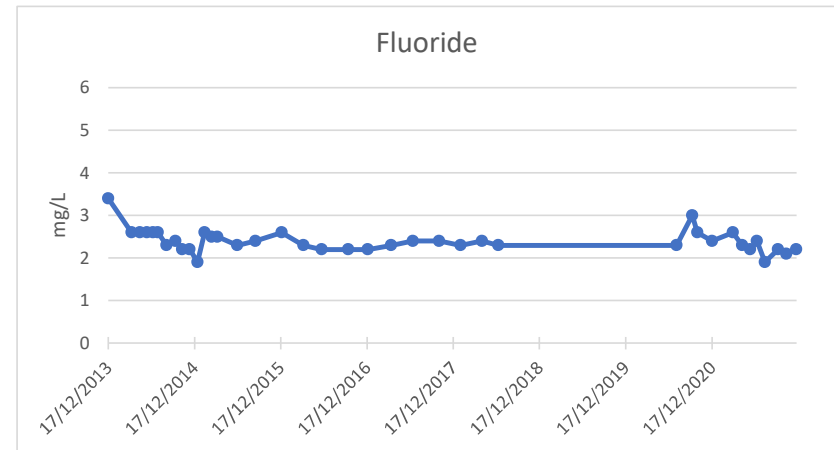
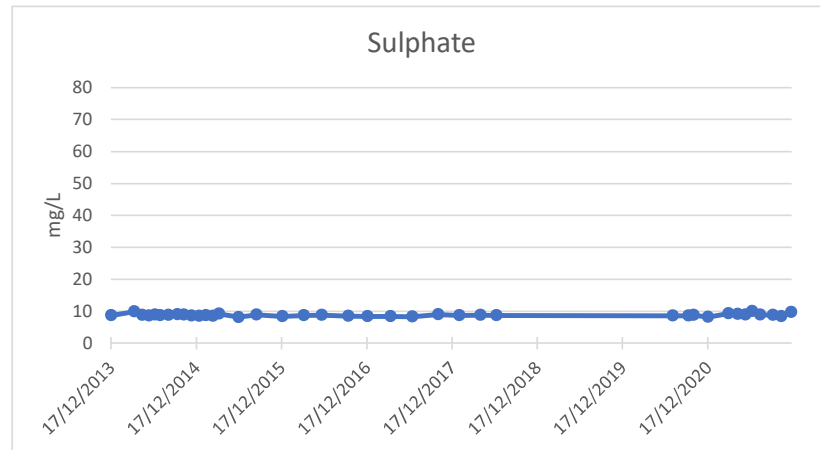
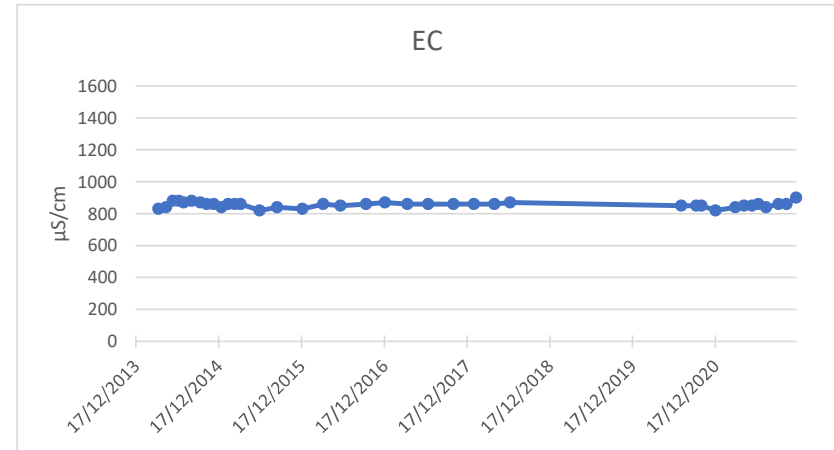
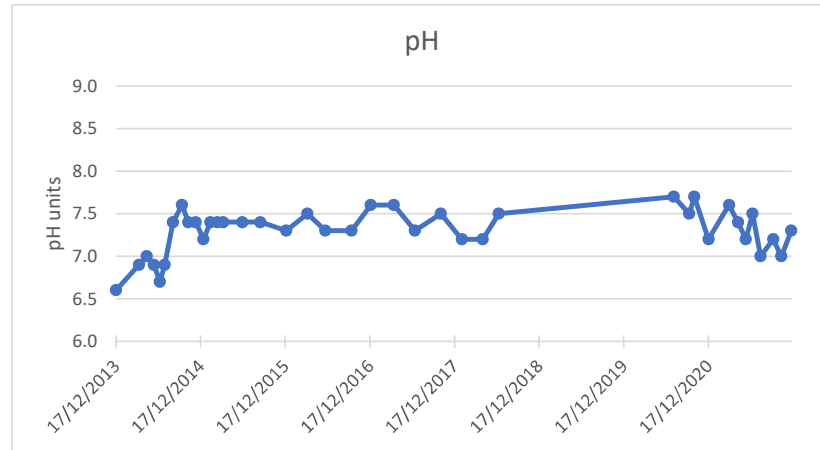
	Monitoring Bores												
	MB1	MB2	MB3	MB4	MB5	MB6	MB7	MB8	MB9	MB10	MB11	MB12	MB13
pH													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	6.6	7	6.9	6.8	7.3	7	7.1	7.2	6.9	6.8	7.1	7.1	7
5th percentile	6.88	7.055	6.98	7	7.3	7	7.155	7.2	6.955	6.855	7.155	7.16	7.02
20th percentile	7.12	7.3	7.1	7.22	7.4	7.18	7.3	7.3	7.2	7.02	7.32	7.2	7.08
50th percentile	7.4	7.5	7.3	7.5	7.6	7.3	7.4	7.4	7.4	7.15	7.5	7.3	7.2
80th percentile	7.5	7.7	7.54	7.6	7.86	7.68	7.6	7.6	7.6	7.38	7.6	7.5	7.32
95th percentile	7.61	7.745	7.6	7.7	7.94	7.86	7.745	7.74	7.935	7.635	7.645	7.68	7.38
Maximum	7.7	7.8	7.6	8	8	7.9	7.8	7.8	8.1	7.8	7.7	7.8	7.4
EC (µS/cm)													
Count	38	12	9	36	13	9	12	13	12	12	12	13	3
%< LOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	820	1100	780	660	800	690	1100	750	340	480	1000	1200	850
5th percentile	828.5	1155	784	677.5	824	810	1100	756	345.5	496.5	1000	1200	852
20th percentile	840	1200	790	690	850	996	1120	760	360	602	1020	1200	858
50th percentile	860	1300	800	700	860	1200	1200	770	380	995	1100	1200	870
80th percentile	866	1380	814	720	896	1480	1200	780	444	1380	1100	1200	882
95th percentile	880	1400	844	750	910	1600	1200	806	511.5	1500	1200	1200	888
Maximum	900	1400	860	1200	910	1600	1200	830	550	1500	1200	1200	890
Sulphate (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	8.1	8	5	4.4	3.2	1.8	22	3.4	0.8	2.3	16	33	5.3
5th percentile	8.29	9.045	5.64	4.88	3.32	4.8	22	3.46	0.8	2.3	16.55	33.6	5.34
20th percentile	8.5	11	6.9	5.22	3.52	9.72	23	3.54	1	9.5	17	34.4	5.46
50th percentile	8.7	12	7.4	5.5	3.9	22	23	3.8	1	34.5	18	35	5.7
80th percentile	8.94	12	7.8	5.88	4.5	31.2	24.6	3.86	1.52	65	18.8	37.6	8.28
95th percentile	9.72	13.45	8.58	6.54	7.78	35.4	26	5	3.77	72.9	19.45	38.4	9.57
Maximum	10	14	8.9	10	10	37	26	6.5	5.2	74	20	39	10
Fluoride (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	1.9	2.7	1.5	1.7	2.1	2.1	2.1	2.7	0.3	1.1	2.6	3.2	2
5th percentile	2.08	2.92	1.58	1.88	2.28	2.18	2.375	2.76	0.355	1.155	2.6	3.38	2
20th percentile	2.2	3.12	1.7	2	2.44	2.36	2.7	3.04	0.4	1.22	3.02	3.6	2
50th percentile	2.4	3.45	1.9	2.3	2.5	2.6	2.8	3.3	0.4	2.35	3.5	4	2
80th percentile	2.6	3.7	2.14	2.6	2.86	2.9	2.98	3.56	0.4	2.58	3.68	4.38	2.06
95th percentile	2.64	4.145	2.32	3.14	2.98	4.28	3.37	3.94	0.445	2.745	4.1	4.78	2.09
Maximum	3.4	4.2	2.4	3.5	3.1	5.2	3.7	4.3	0.5	2.8	4.1	5.2	2.1
Aluminium (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	10.26	8.33	22.22	8.11	23.08	0.00	25.00	38.46	8.33	8.33	8.33	15.38	0
Minimum	0.005	0.014	0.014	0.005	0.006	0.013	0.01	0.008	0.007	0.011	0.011	0.009	0.011
5th percentile	0.005	0.014	0.0149	0.005	0.00735	0.0142	0.0116	0.00905	0.014	0.013	0.0125	0.0115	0.0113
20th percentile	0.007	0.016	0.017	0.0056	0.013	0.0184	0.0152	0.0138	0.025	0.02	0.019	0.018	0.0122
50th percentile	0.009	0.018	0.018	0.009	0.018	0.04	0.02	0.019	0.04	0.026	0.03	0.02	0.014
80th percentile	0.0164	0.03	0.0304	0.0164	0.0204	0.18	0.024	0.0226	0.06	0.03	0.03	0.03	0.0152
95th percentile	0.0237	0.03	0.0379	0.02	0.0264	0.3	0.033	0.02755	0.075	0.035	0.0435	0.03	0.0158
Maximum	0.034	0.03	0.04	0.036	0.03	0.34	0.035	0.03	0.08	0.04	0.05	0.03	0.016
Arsenic (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	0.003	0.0027	0.0027	0.005	0.0077	0.0065	0.013	0.0013	0.002	0.029	0.0048	0.01	0.0007
5th percentile	0.003	0.002865	0.00402	0.0108	0.01028	0.0131	0.01355	0.00244	0.00233	0.03175	0.00502	0.01	0.00074
20th percentile	0.004	0.00326	0.0078	0.0162	0.0138	0.0266	0.0152	0.00368	0.00364	0.0368	0.00576	0.0108	0.00086
50th percentile	0.005	0.00455	0.01	0.026	0.019	0.042	0.018	0.005	0.0045	0.045	0.0105	0.014	0.0011
80th percentile	0.005	0.0084	0.0152	0.0456	0.02	0.0572	0.0216	0.0066	0.0078	0.0682	0.0236	0.0182	0.00122
95th percentile	0.007	0.009	0.0206	0.12	0.022	0.074	0.0248	0.0074	0.008	0.0785	0.03835	0.0238	0.00128
Maximum	0.008	0.009	0.023	0.22	0.025	0.084	0.027	0.008	0.008	0.084	0.04	0.031	0.0013
Cadmium (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	5.13	58.33	44.44	18.92	53.85	33.33	50.00	46.15	75.00	58.33	41.67	23.08	66.666667
Minimum	0.00002	0.0001	0.0001	0.00001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
5th percentile	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.00013	0.0001	0.0001	0.0001	0.0001	0.0001
20th percentile	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.00012	0.0001	0.0001
50th percentile	0.0004	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.0001	0.0002	0.0003	0.0002	0.0001
80th percentile	0.0005	0.00024	0.0002	0.0003	0.0002	0.0002	0.0002	0.0002	0.0001	0.0002	0.00038	0.00022	0.0001
95th percentile	0.00082	0.00036	0.0002	0.0004	0.000275	0.000275	0.0002	0.00034	0.0001	0.0002	0.00047	0.000355	0.0001
Maximum	0.017	0.0004	0.0002	0.0004	0.0003	0.0003	0.0002	0.0004	0.0001	0.0002	0.0005	0.0004	0.0001
Chromium (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3

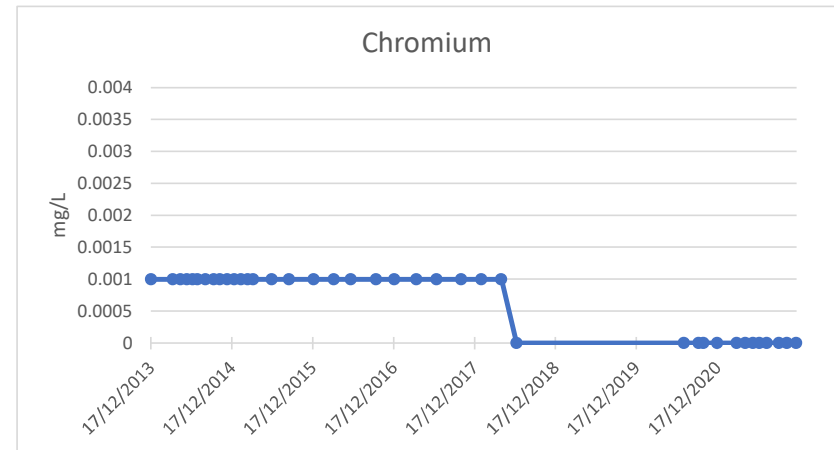
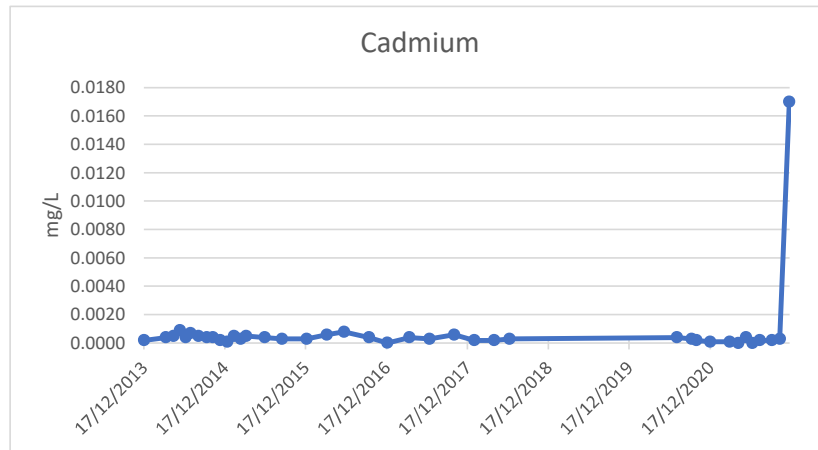
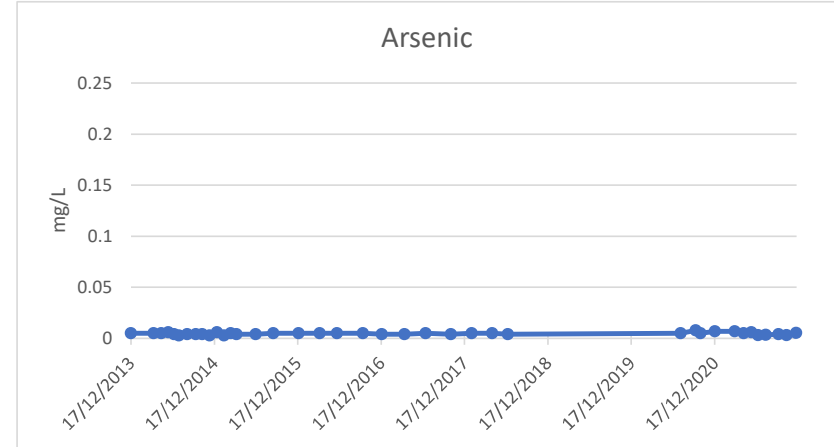
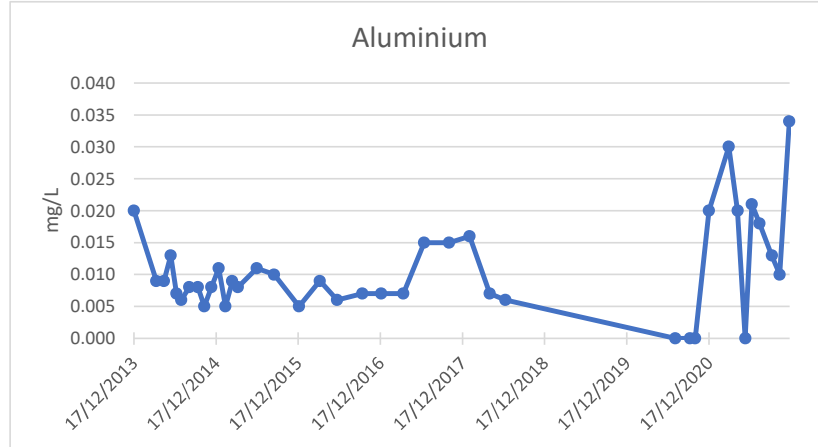
	Monitoring Bores												
	MB1	MB2	MB3	MB4	MB5	MB6	MB7	MB8	MB9	MB10	MB11	MB12	MB13
%< LOR	33.33	91.67	88.89	29.73	84.62	88.89	91.67	100.00	100.00	91.67	91.67	92.31	100
Minimum	0.001	0.0008	0.001	0.0005	0.001	0.0008	0.0038	0	0	0.0009	0.0027	0.0008	0
5th percentile	0.001	0.0008	0.001	0.001	0.001135	0.0008	0.0038	#NUM!	#NUM!	0.0009	0.0027	0.0008	#NUM!
20th percentile	0.001	0.0008	0.001	0.001	0.00154	0.0008	0.0038	#NUM!	#NUM!	0.0009	0.0027	0.0008	#NUM!
50th percentile	0.001	0.0008	0.001	0.001	0.00235	0.0008	0.0038	#NUM!	#NUM!	0.0009	0.0027	0.0008	#NUM!
80th percentile	0.001	0.0008	0.001	0.001	0.00316	0.0008	0.0038	#NUM!	#NUM!	0.0009	0.0027	0.0008	#NUM!
95th percentile	0.001	0.0008	0.001	0.001	0.003565	0.0008	0.0038	#NUM!	#NUM!	0.0009	0.0027	0.0008	#NUM!
Maximum	0.001	0.0008	0.001	0.002	0.0037	0.0008	0.0038	0	0	0.0009	0.0027	0.0008	0
Cobalt (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	33.33	16.67	0.00	5.41	84.62	11.11	25.00	46.15	75.00	33.33	50.00	0.00	0
Minimum	0.001	0.0008	0.002	0.0006	0.001	0.0009	0.0005	0.001	0.0005	0.002	0.001	0.001	0.0008
5th percentile	0.001	0.000845	0.002	0.00077	0.001	0.000935	0.00054	0.001	0.00051	0.00235	0.001	0.00118	0.00082
20th percentile	0.001	0.0009	0.002	0.001	0.001	0.001	0.00066	0.001	0.00054	0.0038	0.001	0.0014	0.00088
50th percentile	0.001	0.001	0.003	0.001	0.001	0.0016	0.001	0.001	0.0006	0.006	0.001	0.002	0.001
80th percentile	0.001	0.002	0.00388	0.001	0.001	0.002	0.001	0.001	0.00084	0.00752	0.001	0.002	0.00118
95th percentile	0.001	0.002	0.00586	0.002	0.001	0.00369	0.001	0.0017	0.00096	0.008	0.001	0.002	0.00127
Maximum	0.001	0.002	0.0071	0.002	0.001	0.0046	0.001	0.002	0.001	0.008	0.001	0.002	0.0013
Copper (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	17.95	50.00	44.44	21.62	61.54	44.44	66.67	61.54	91.67	58.33	66.67	61.54	0
Minimum	0.001	0.001	0.001	0.0009	0.0009	0.0009	0.0006	0.0006	0.0029	0.0009	0.0006	0.0006	0.001
5th percentile	0.001	0.001	0.00108	0.001	0.00092	0.00092	0.000615	0.00062	0.0029	0.00092	0.000765	0.00062	0.00102
20th percentile	0.001	0.001	0.00132	0.001	0.00098	0.00098	0.00066	0.00068	0.0029	0.00098	0.00126	0.00068	0.00108
50th percentile	0.001	0.0011	0.0016	0.001	0.0012	0.0015	0.0007	0.002	0.0029	0.001	0.00175	0.0008	0.0012
80th percentile	0.00182	0.003	0.00304	0.001	0.00242	0.00194	0.00086	0.0028	0.0029	0.00202	0.00236	0.001	0.00276
95th percentile	0.00327	0.003075	0.00316	0.00254	0.00338	0.00266	0.00104	0.0031	0.0029	0.00208	0.00299	0.001	0.00354
Maximum	0.0072	0.0031	0.0032	0.006	0.0037	0.0029	0.0011	0.0032	0.0029	0.0021	0.0032	0.001	0.0038
Lead (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	23.08	58.33	55.56	18.92	38.46	33.33	58.33	53.85	75.00	50.00	50.00	15.38	100
Minimum	0.001	0.001	0.001	0.001	0.001	0.0007	0.001	0.001	0.001	0.002	0.001	0.0007	0
5th percentile	0.001	0.0012	0.001	0.001	0.001	0.000775	0.001	0.001	0.001	0.002	0.001	0.00085	#NUM!
20th percentile	0.001	0.0018	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002	0.001	0.002	#NUM!
50th percentile	0.001	0.002	0.001	0.001	0.002	0.002	0.001	0.0015	0.001	0.002	0.0015	0.0023	#NUM!
80th percentile	0.001	0.002	0.001	0.001	0.002	0.003	0.0012	0.002	0.0016	0.002	0.002	0.004	#NUM!
95th percentile	0.002	0.002	0.001	0.002	0.002	0.00375	0.0018	0.002	0.0019	0.002	0.002	0.0045	#NUM!
Maximum	0.002	0.002	0.001	0.002	0.002	0.004	0.002	0.002	0.002	0.002	0.002	0.005	0
Manganese (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	5.13	8.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
Minimum	0.005	0.043	0.14	0.19	0.32	0.54	0.12	0.2	0.13	0.53	0.083	0.89	0.96
5th percentile	0.0068	0.0815	0.144	0.26	0.344	0.556	0.1475	0.266	0.1355	0.585	0.11985	0.89	0.964
20th percentile	0.009	0.14	0.168	0.314	0.37	0.628	0.172	0.324	0.154	0.642	0.164	0.948	0.976
50th percentile	0.01	0.15	0.24	0.37	0.39	0.75	0.19	0.35	0.205	0.835	0.24	0.99	1
80th percentile	0.012	0.19	0.304	0.416	0.406	0.974	0.198	0.37	0.248	1.52	0.406	1.06	1
95th percentile	0.0174	0.2	0.37	0.504	0.444	1.052	0.209	0.484	0.3295	2.15	0.692	1.1	1
Maximum	0.02	0.21	0.41	0.58	0.48	1.1	0.22	0.52	0.39	2.7	1	1.1	1
Mercury (inorganic) (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	33.33	91.67	88.89	32.43	92.31	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100
Minimum	0.00005	0.00007	0.00005	0.00005	0.00005	0	0	0	0	0	0	0	0
5th percentile	0.00005	0.00007	0.00005	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20th percentile	0.00005	0.00007	0.00005	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
50th percentile	0.00005	0.00007	0.00005	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
80th percentile	0.00005	0.00007	0.00005	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th percentile	0.0000675	0.00007	0.00005	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum	0.00009	0.00007	0.00005	0.00005	0.00005	0	0	0	0	0	0	0	0
Nickel (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	23.08	25.00	0.00	24.32	76.92	0.00	66.67	92.31	91.67	0.00	25.00	61.54	66.666667
Minimum	0.0006	0.0006	0.001	0.001	0.0008	0.001	0.0006	0.001	0.0005	0.001	0.0007	0.0006	0.0008
5th percentile	0.00069	0.00064	0.00124	0.001	0.00082	0.00156	0.00066	0.001	0.0005	0.001055	0.00078	0.00068	0.0008
20th percentile	0.001	0.0007	0.00178	0.001	0.00088	0.0024	0.00084	0.001	0.0005	0.00142	0.00096	0.00092	0.0008
50th percentile	0.001	0.0009	0.002	0.001	0.001	0.003	0.001	0.001	0.0005	0.002	0.001	0.0011	0.0008
80th percentile	0.001	0.001	0.002	0.001	0.001	0.00364	0.00104	0.001	0.0005	0.003	0.00168	0.00124	0.0008
95th percentile	0.001	0.001	0.002	0.001	0.001	0.0046	0.001085	0.001	0.0005	0.00356	0.00192	0.00136	0.0008
Maximum	0.001	0.001	0.002	0.001	0.001	0.005	0.0011	0.001	0.0005	0.004	0.002	0.0014	0.0008
Selenium (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	17.95	41.67	44.44	13.51	46.15	44.44	50.00	46.15	66.67	33.33	41.67	46.15	100
Minimum	0.002	0.003	0.003	0.003	0.003	0.005	0.006	0.002	0.003	0.001	0.004	0.005	0

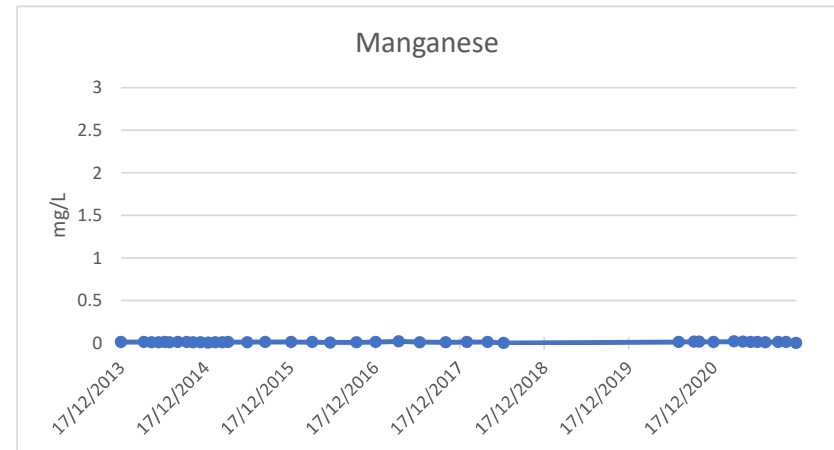
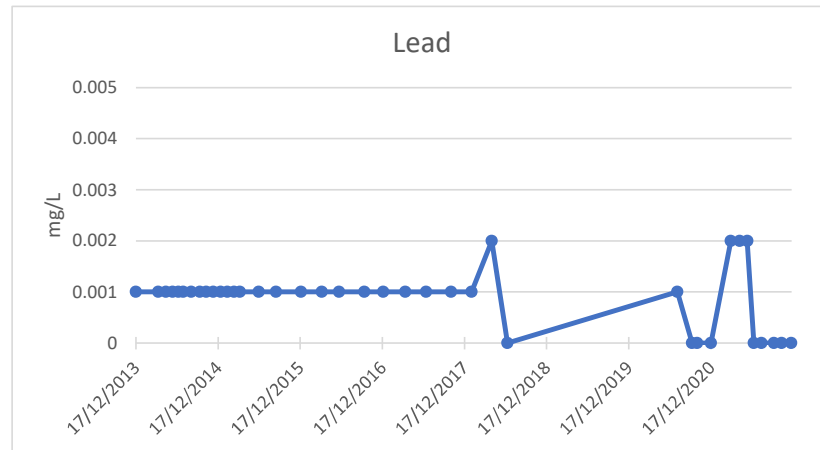
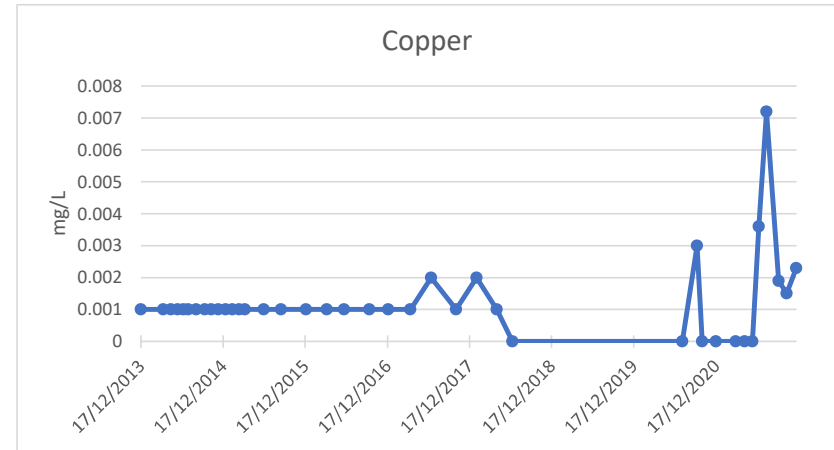
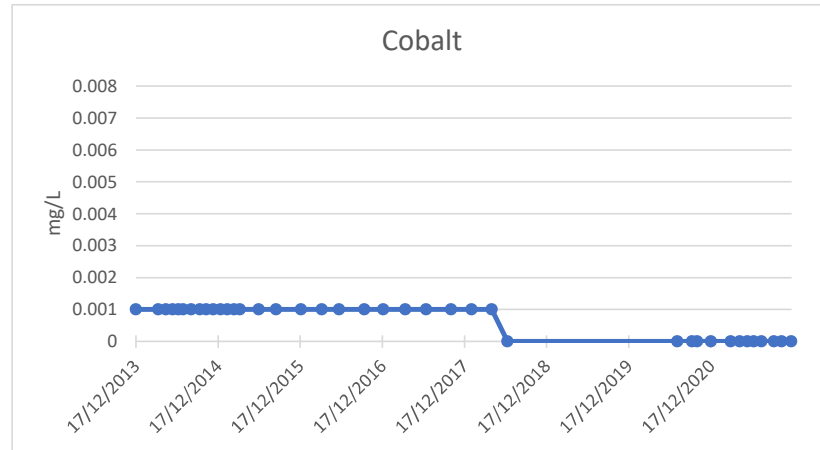
	Monitoring Bores												
	MB1	MB2	MB3	MB4	MB5	MB6	MB7	MB8	MB9	MB10	MB11	MB12	MB13
5th percentile	0.003	0.0036	0.003	0.003	0.0033	0.0052	0.006	0.0023	0.003	0.0017	0.0043	0.005	#NUM!
20th percentile	0.003	0.005	0.003	0.003	0.0042	0.0058	0.006	0.0032	0.003	0.003	0.0052	0.0054	#NUM!
50th percentile	0.003	0.006	0.004	0.003	0.005	0.007	0.0065	0.004	0.003	0.0045	0.006	0.007	#NUM!
80th percentile	0.003	0.0076	0.0052	0.003	0.007	0.008	0.007	0.0064	0.003	0.006	0.0076	0.0088	#NUM!
95th percentile	0.00545	0.0087	0.0058	0.00545	0.007	0.008	0.00925	0.007	0.003	0.00795	0.0087	0.0104	#NUM!
Maximum	0.006	0.009	0.006	0.006	0.007	0.008	0.01	0.007	0.003	0.009	0.009	0.011	0
Silver (mg/L)													
Count	39	12	9	37	12	9	12	13	12	12	12	13	3
%< LOR	30.77	100.00	88.89	32.43	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100
Minimum	0.00005	0	0.00005	0.00005	0	0	0	0	0	0	0	0	0
5th percentile	0.00005	#NUM!	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
20th percentile	0.00005	#NUM!	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
50th percentile	0.00005	#NUM!	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
80th percentile	0.00005	#NUM!	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th percentile	0.000113	#NUM!	0.00005	0.00005	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum	0.16	0	0.00005	0.00005	0	0	0	0	0	0	0	0	0
Zinc (mg/L)													
Count	39	12	9	37	13	9	12	13	12	12	12	13	3
%< LOR	5.13	41.67	0.00	13.51	23.08	0.00	50.00	0.00	41.67	16.67	8.33	15.38	0
Minimum	0.005	0.006	0.008	0.005	0.005	0.007	0.006	0.005	0.005	0.005	0.006	0.005	0.011
5th percentile	0.005	0.0063	0.008	0.005	0.005	0.0086	0.006	0.0062	0.005	0.00545	0.0065	0.005	0.0112
20th percentile	0.005	0.007	0.0086	0.005	0.0058	0.0116	0.006	0.0074	0.005	0.006	0.008	0.005	0.0118
50th percentile	0.006	0.009	0.012	0.005	0.0075	0.02	0.006	0.012	0.005	0.0095	0.009	0.008	0.013
80th percentile	0.01	0.019	0.0194	0.0118	0.0102	0.0382	0.007	0.0196	0.0108	0.0244	0.01	0.012	0.0148
95th percentile	0.0204	0.0368	0.0338	0.02135	0.05335	0.0484	0.12175	0.0526	0.0141	0.02875	0.193	0.015	0.0157
Maximum	0.047	0.044	0.039	0.063	0.088	0.052	0.16	0.097	0.015	0.031	0.37	0.017	0.016

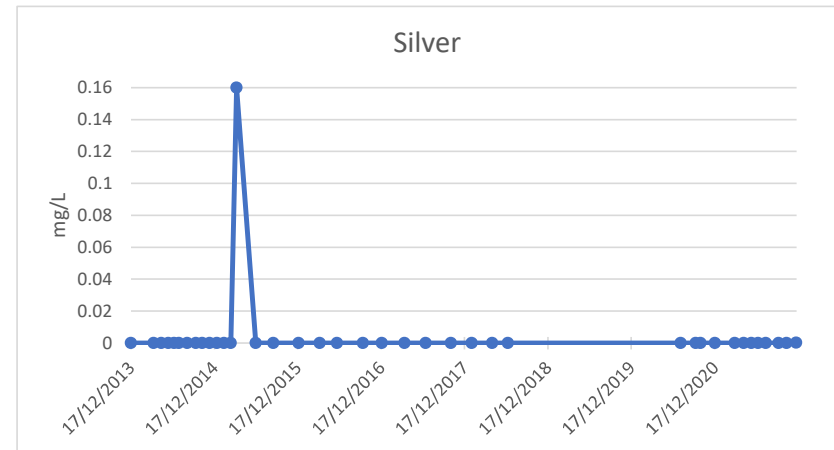
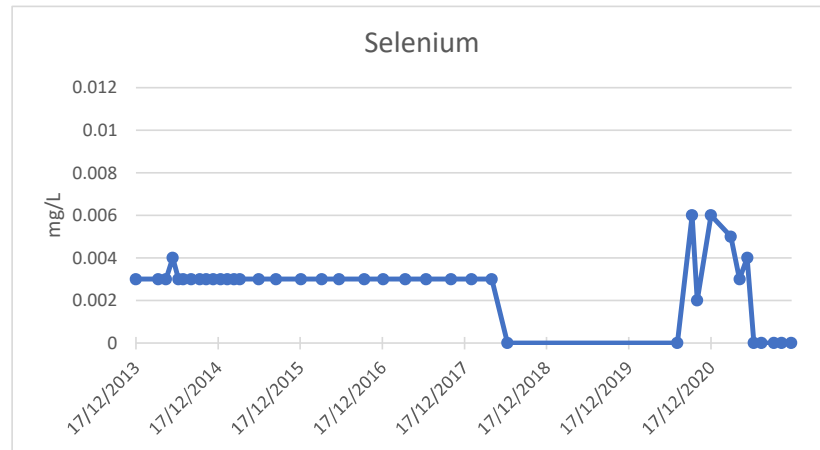
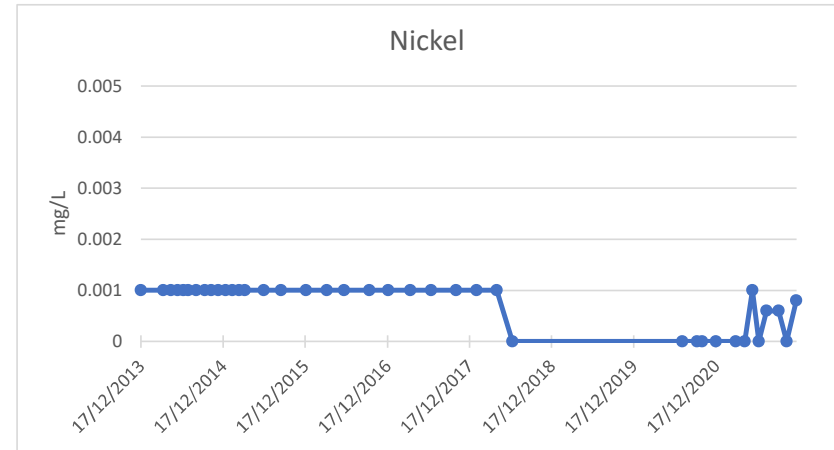
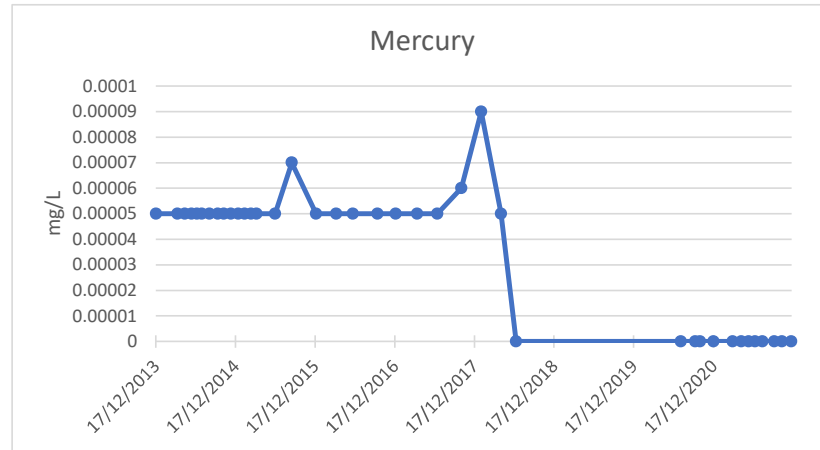
**EA AMENDMENT APPLICATION SUPPORTING REPORT
MGT Minerals Pty Ltd**

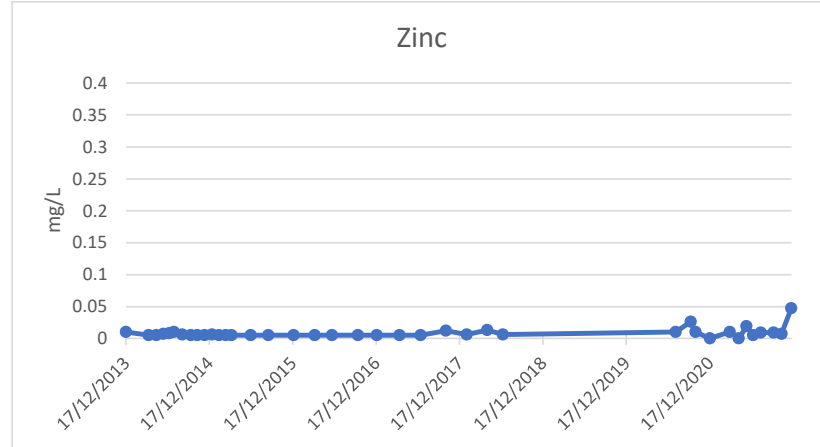
Appendix 4 Groundwater Chemistry Graphs

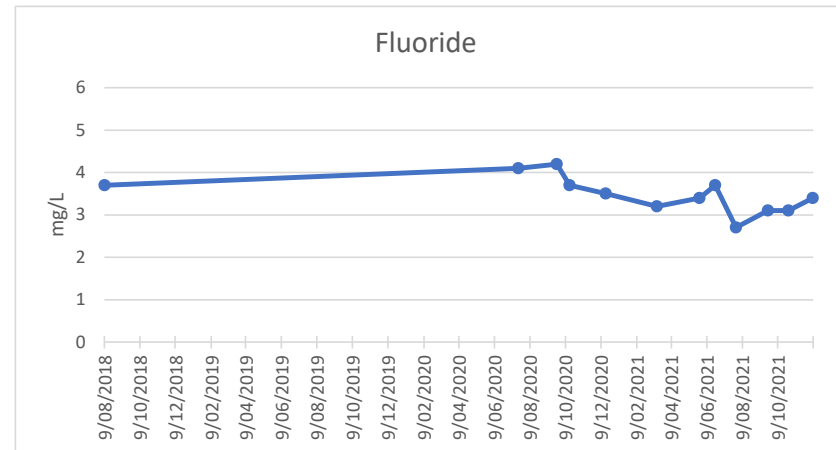
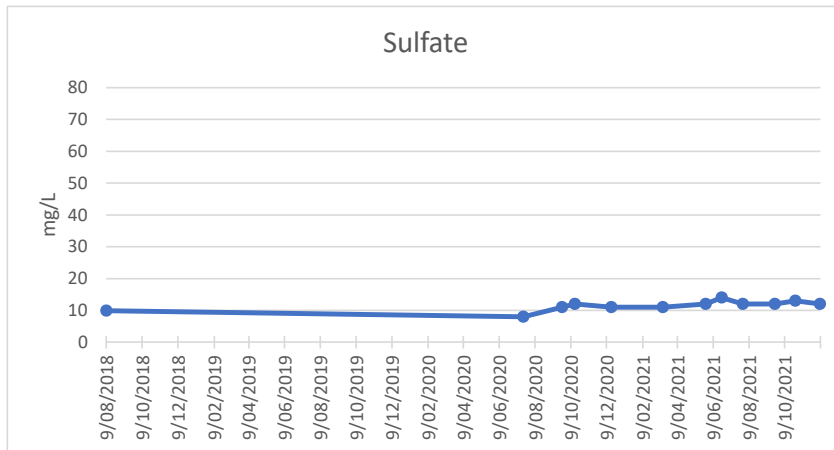
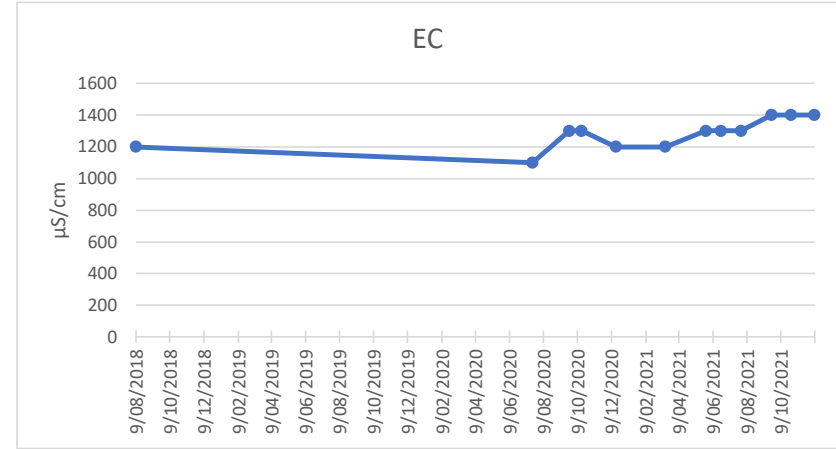
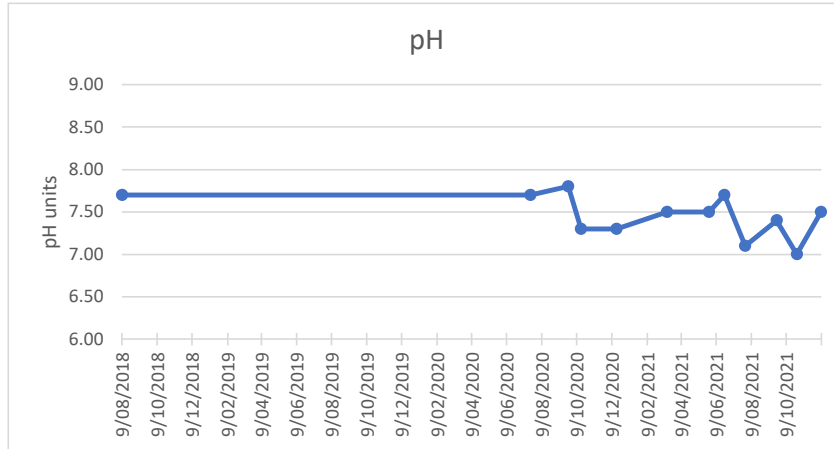


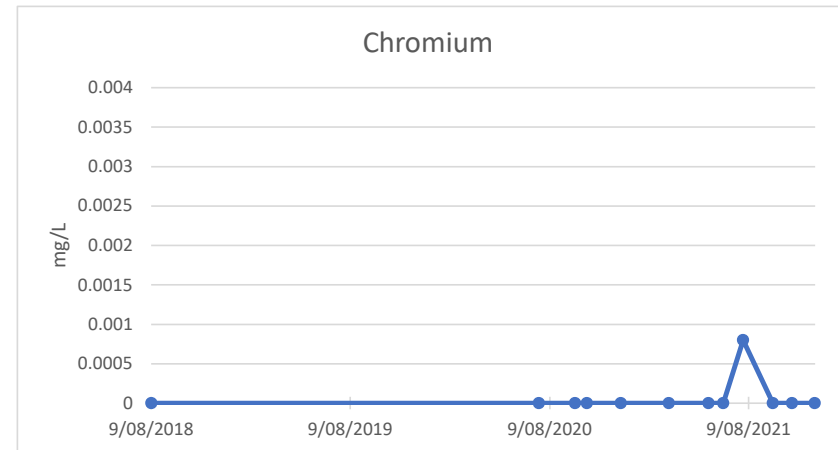
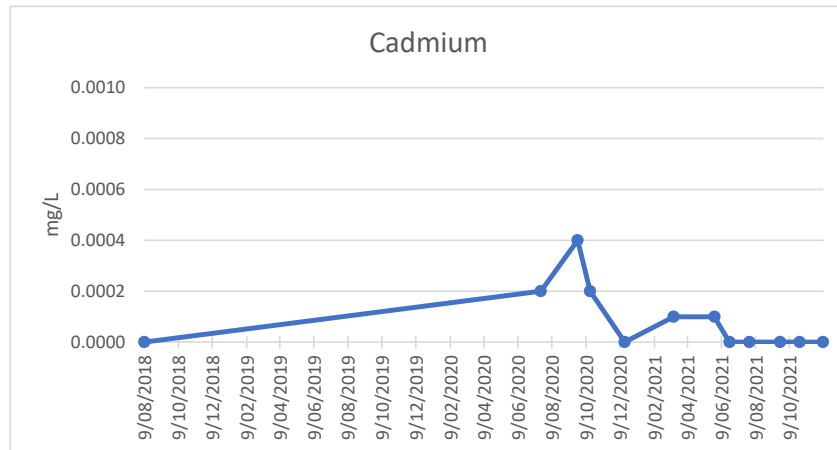
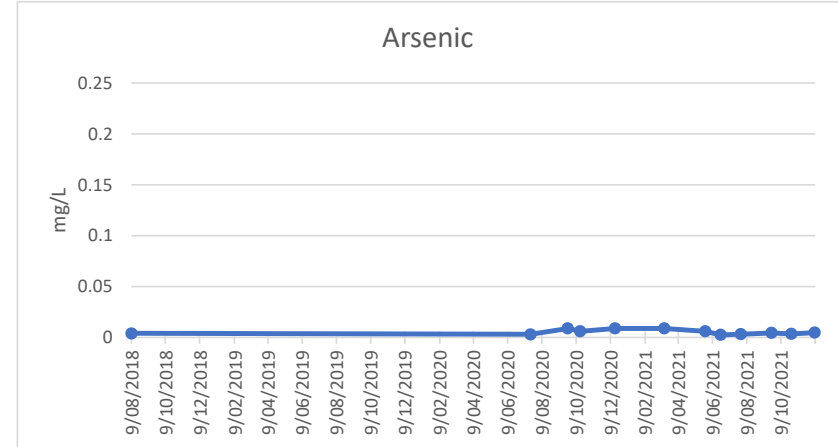
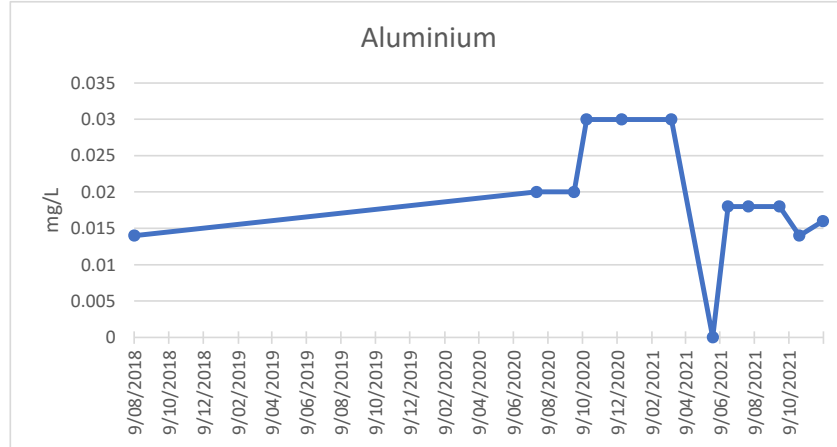


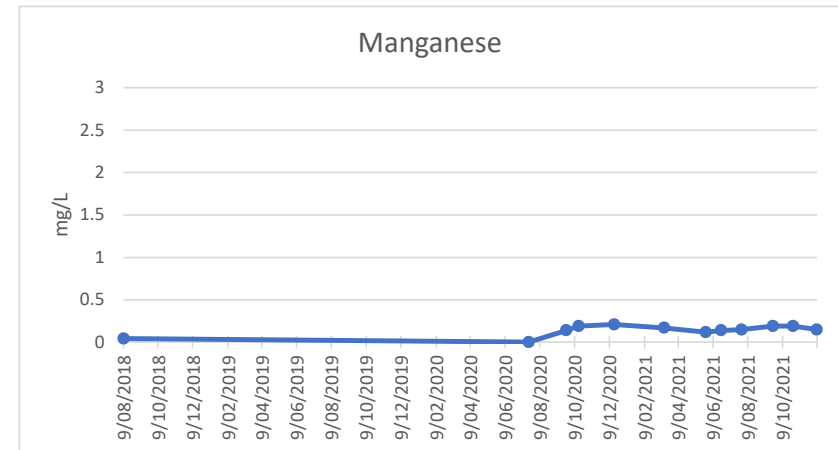
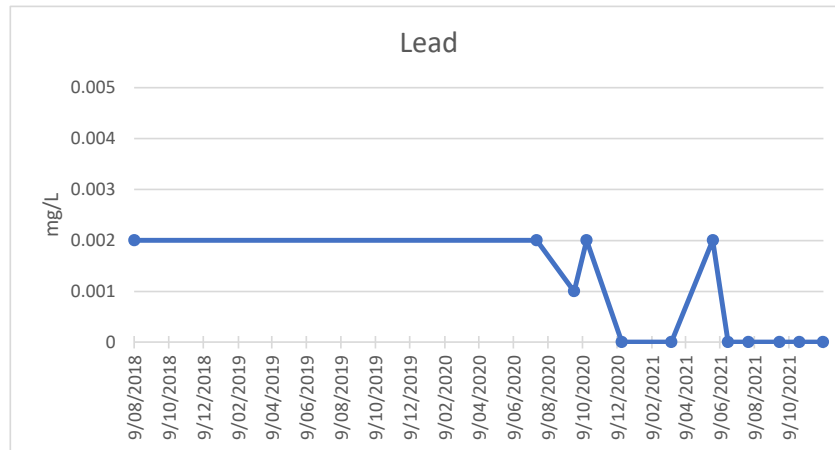
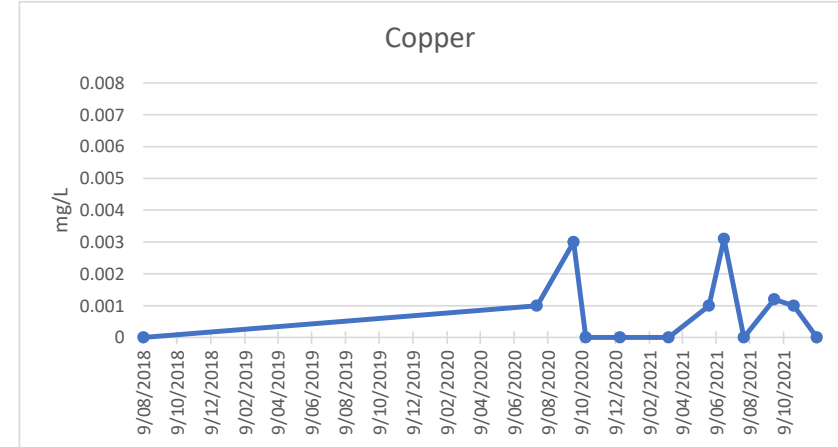
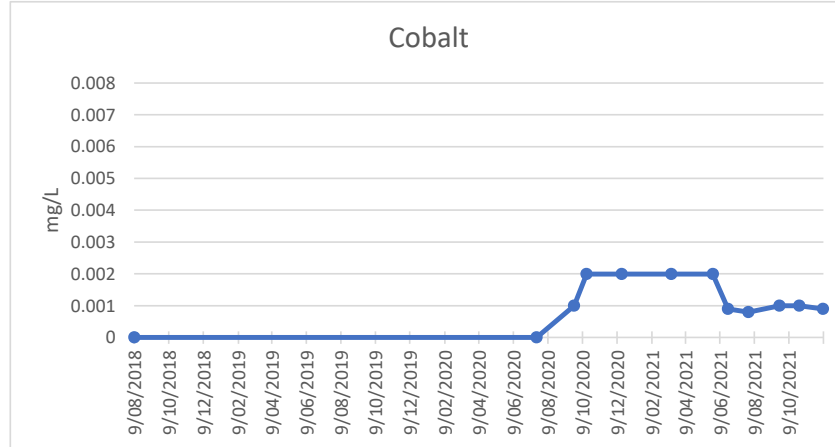


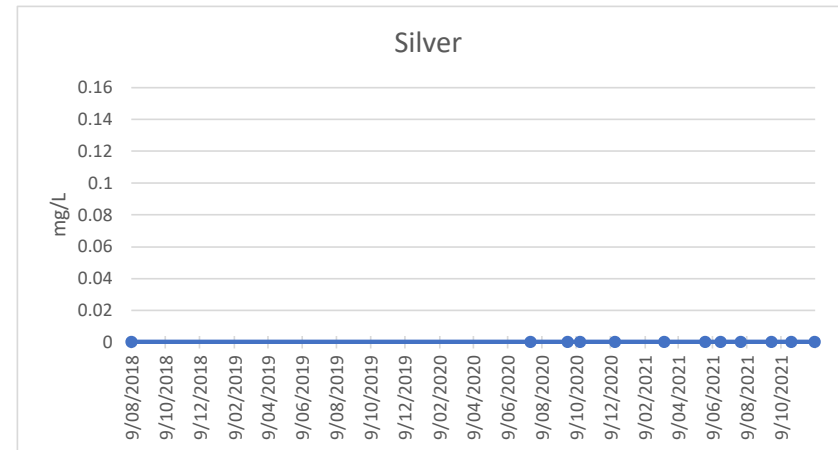
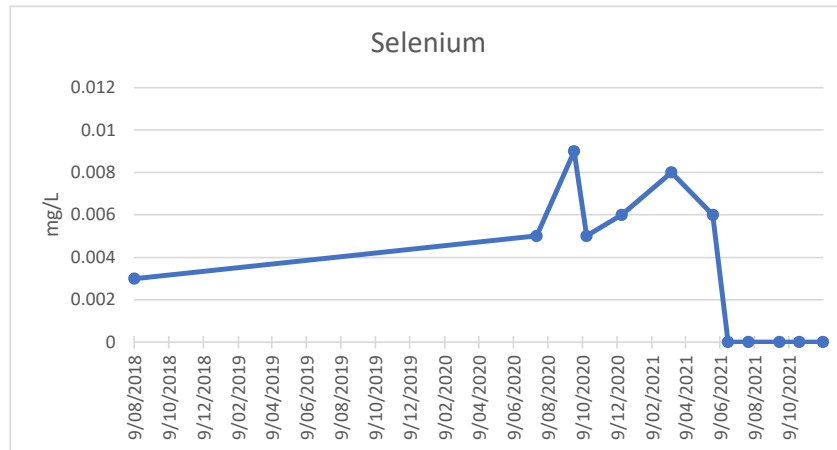
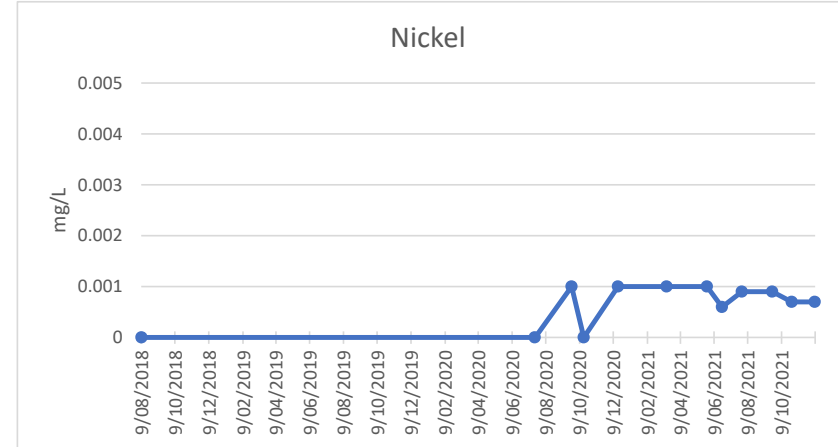
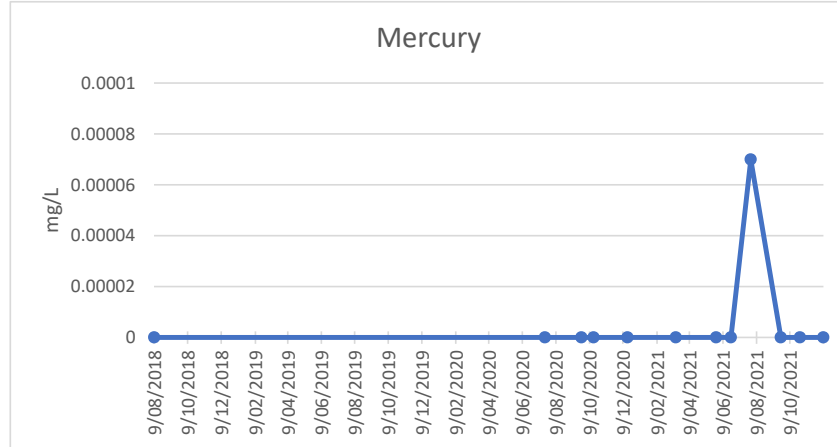


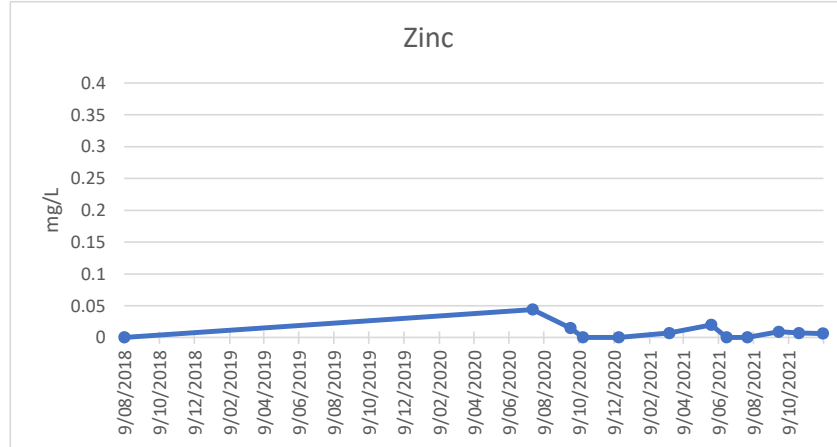


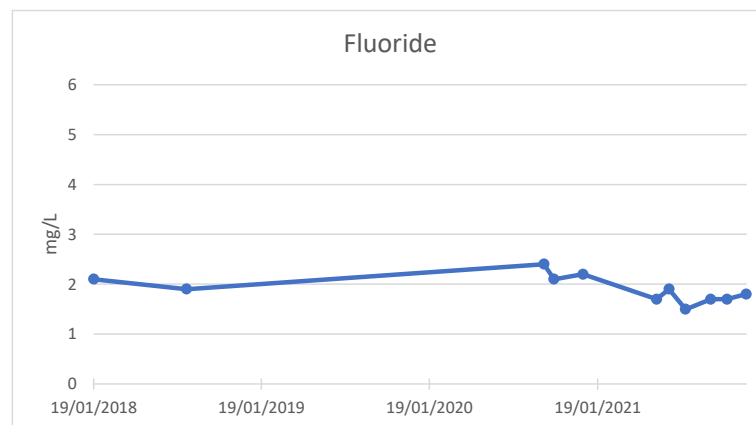
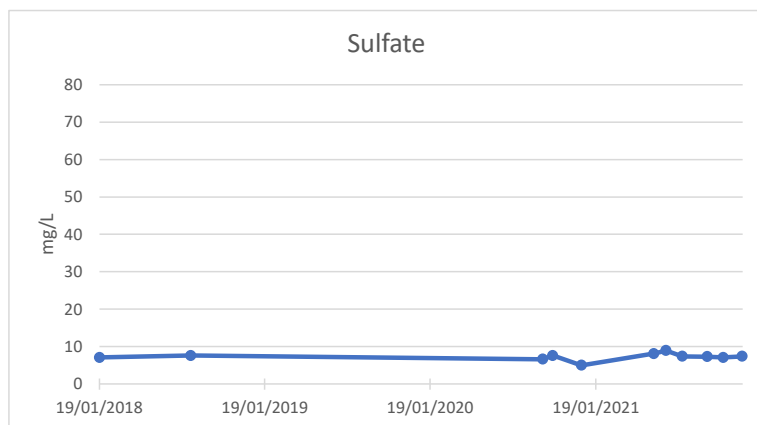
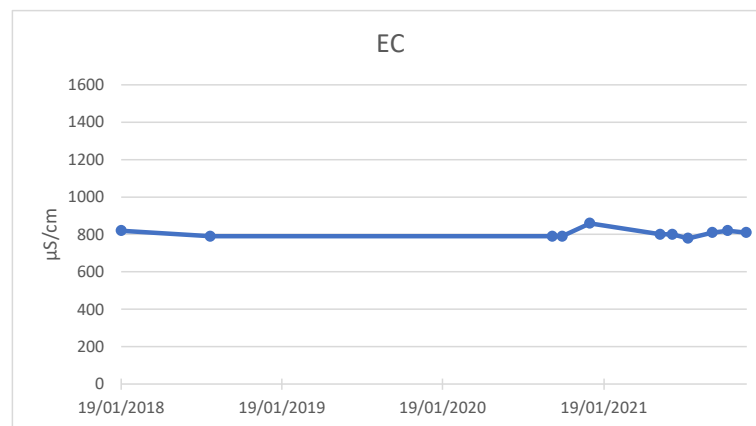
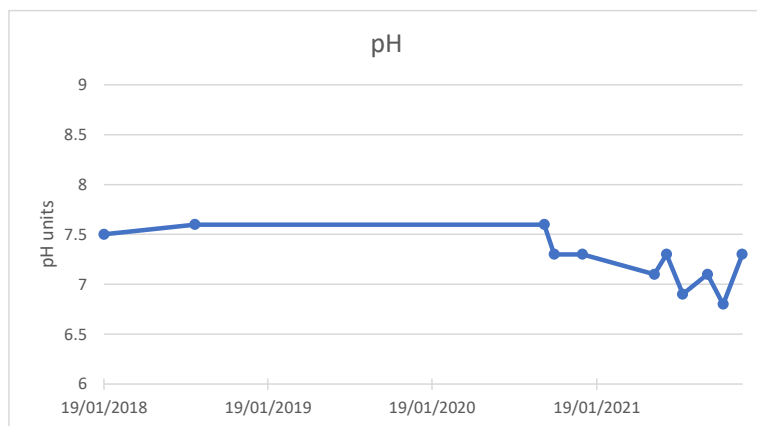


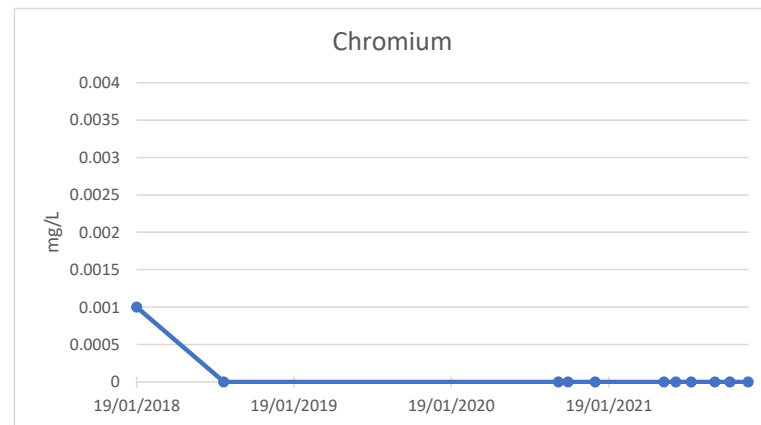
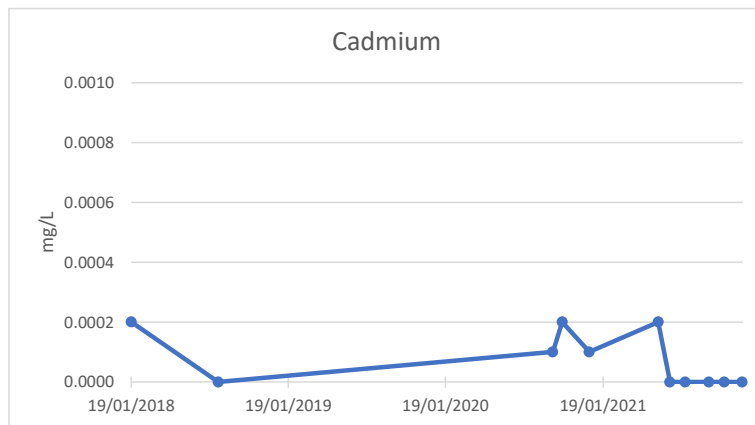
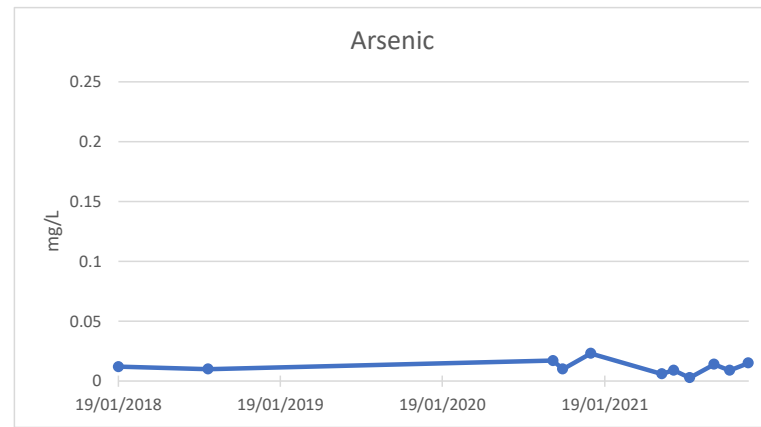
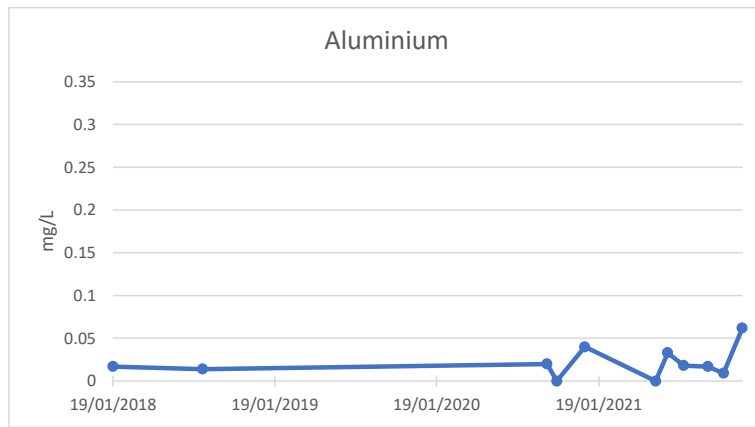


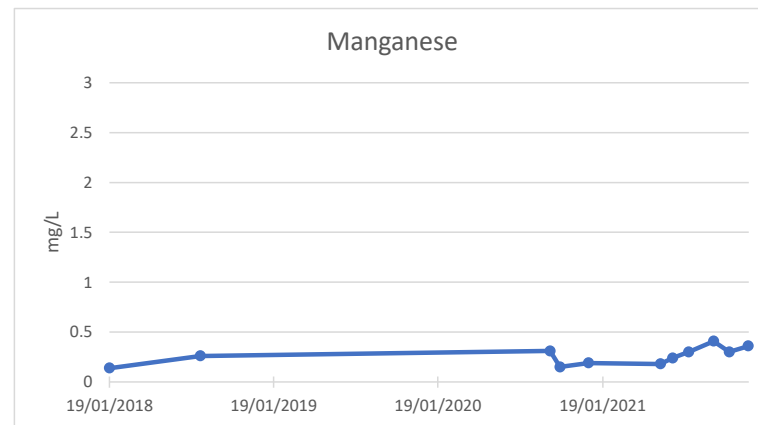
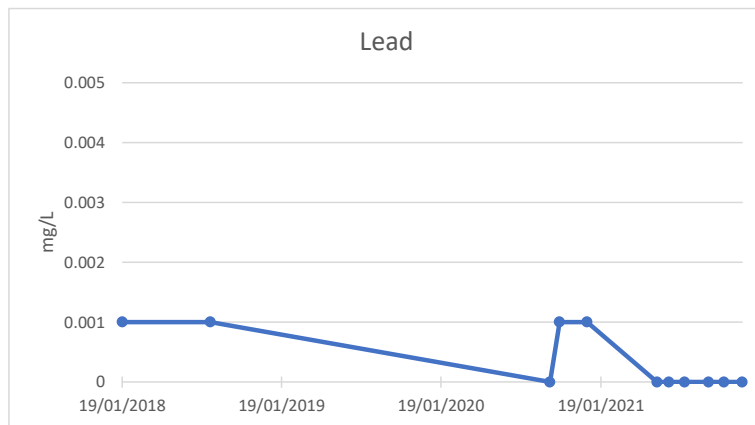
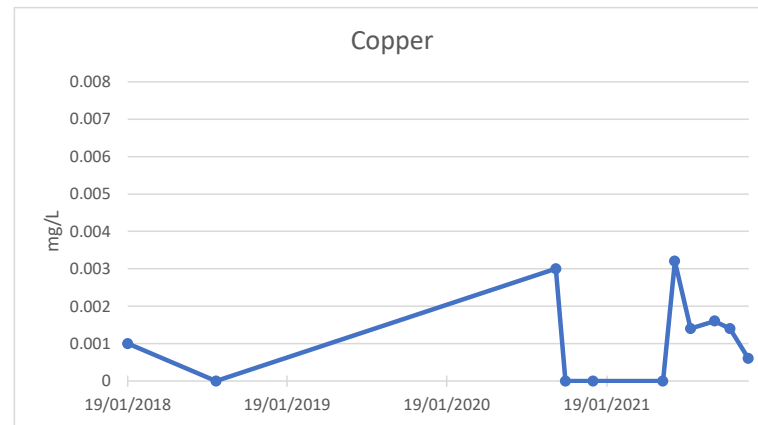
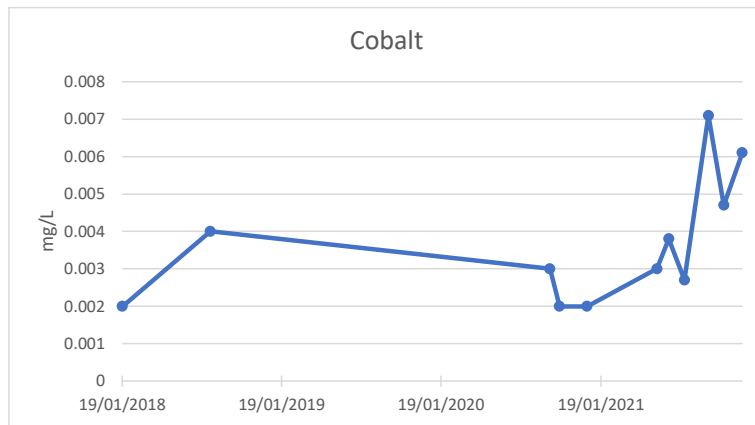


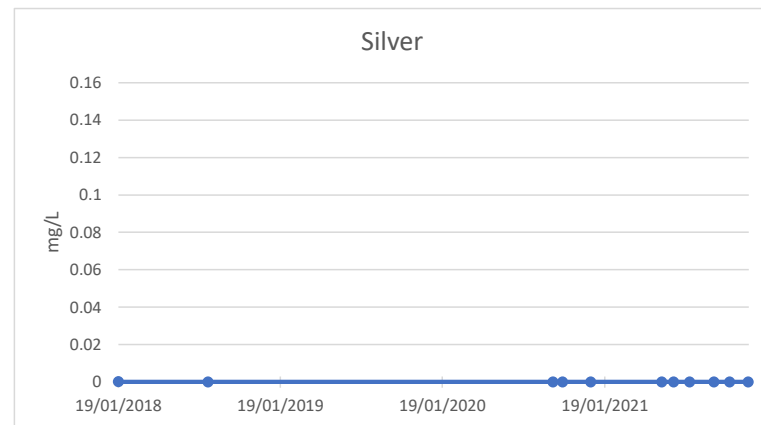
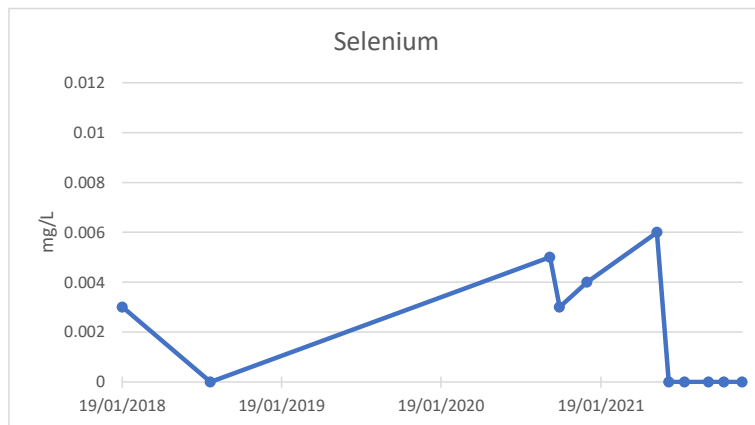
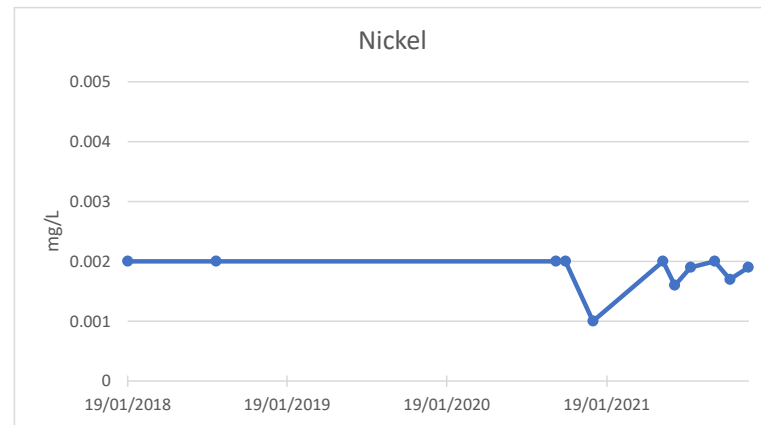
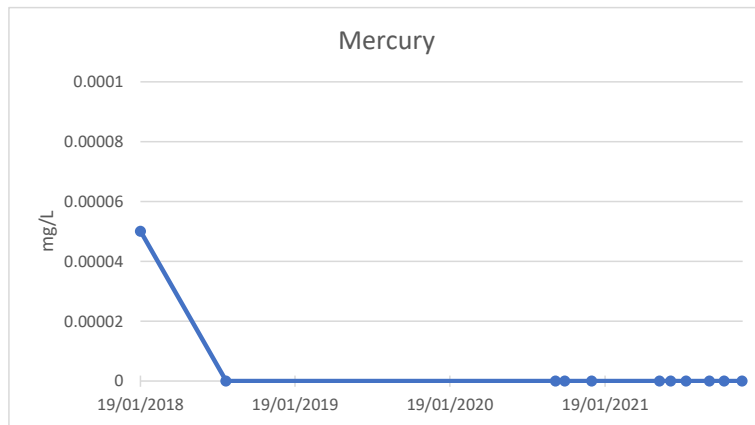


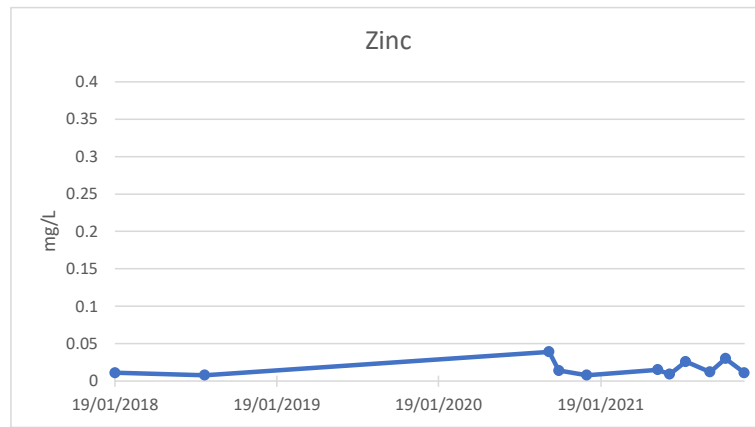


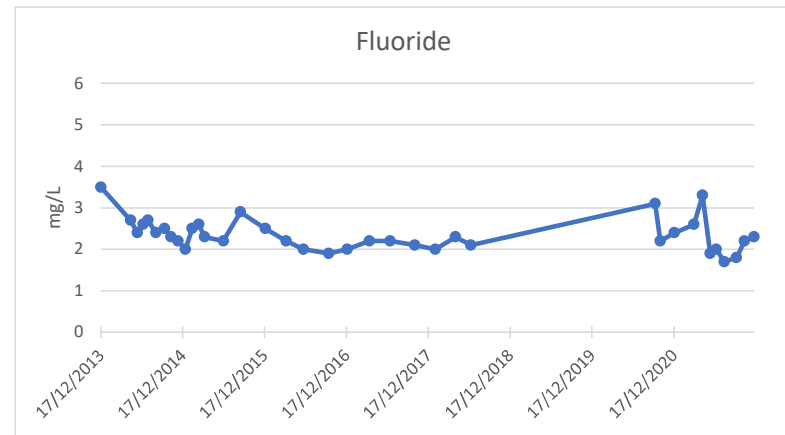
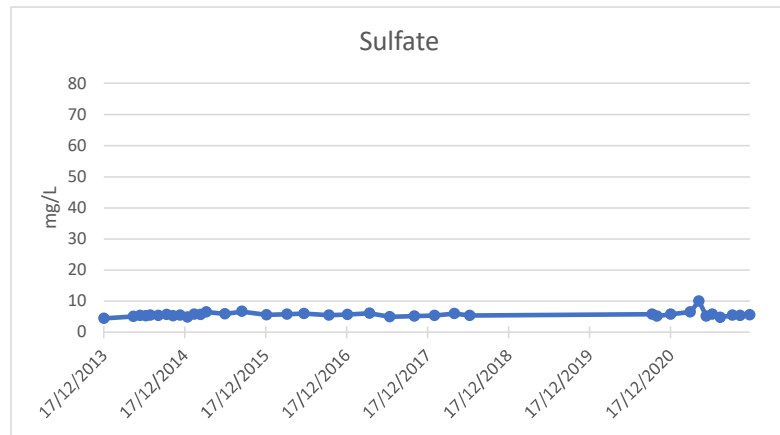
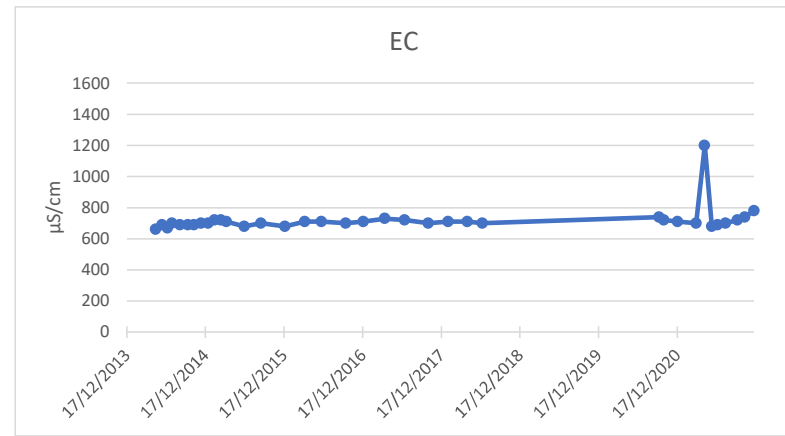
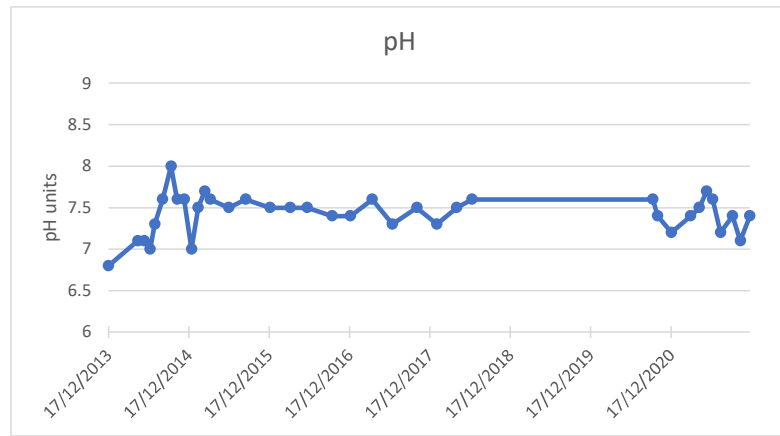


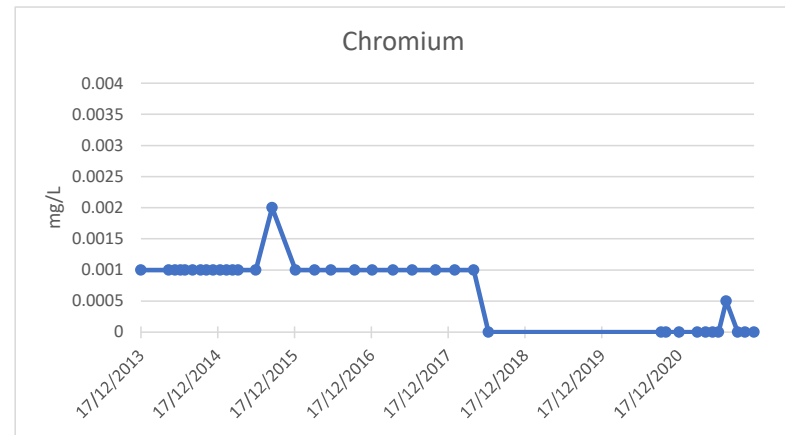
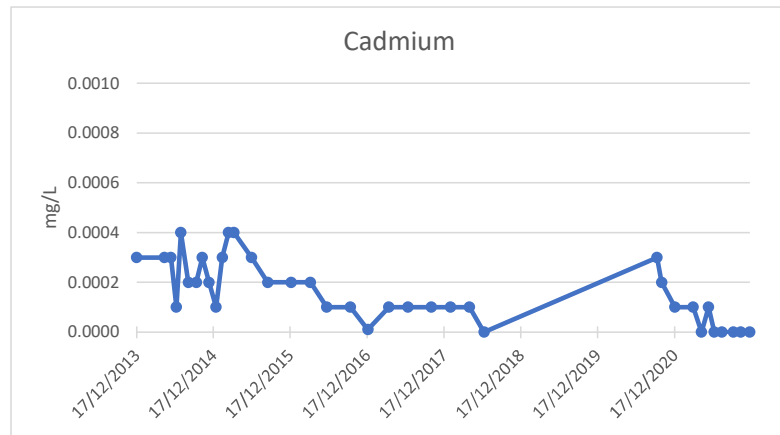
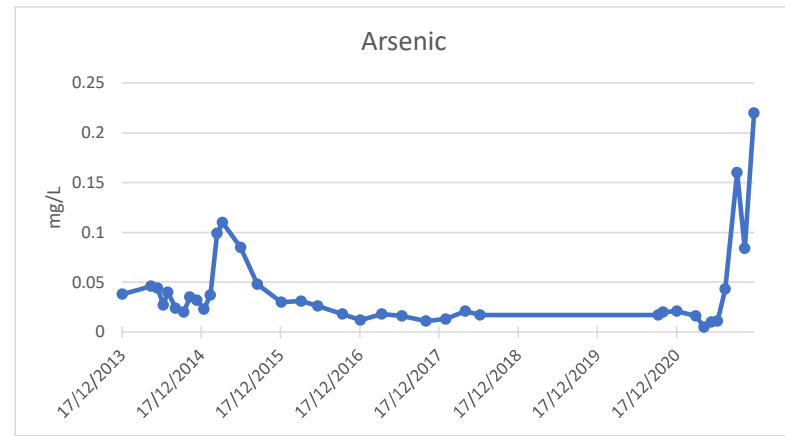
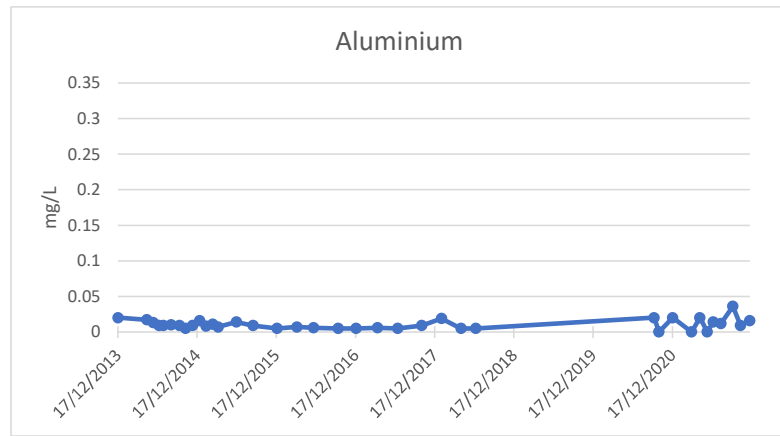


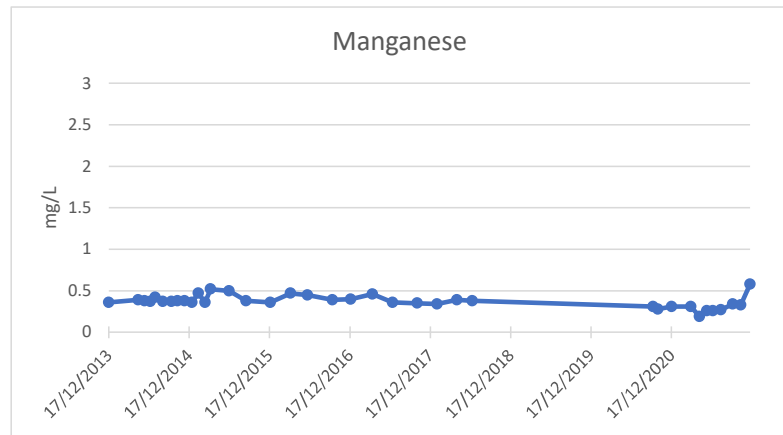
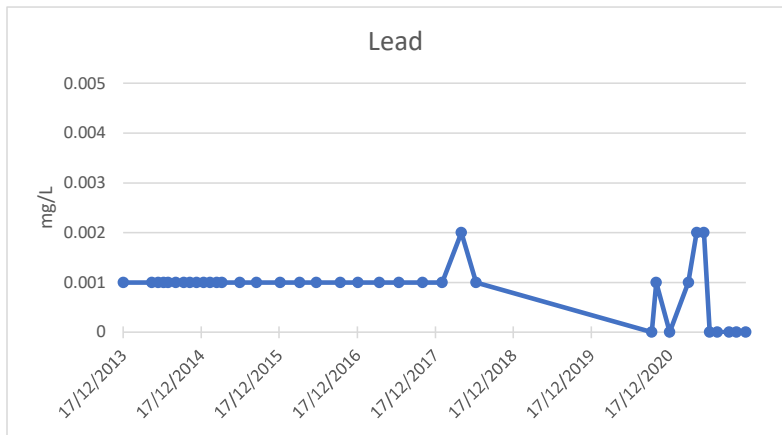
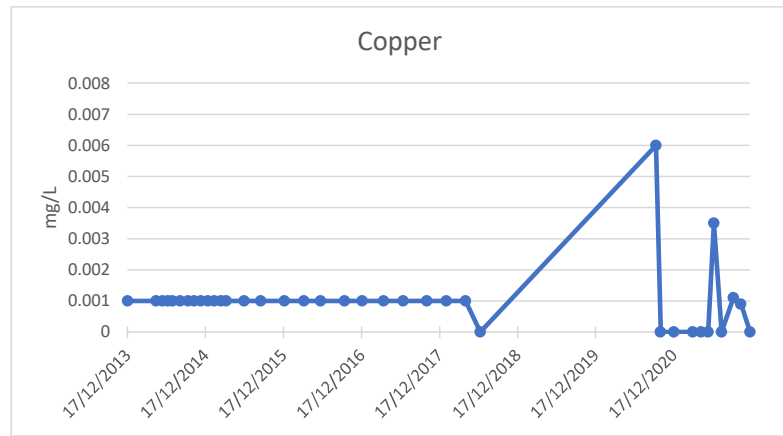
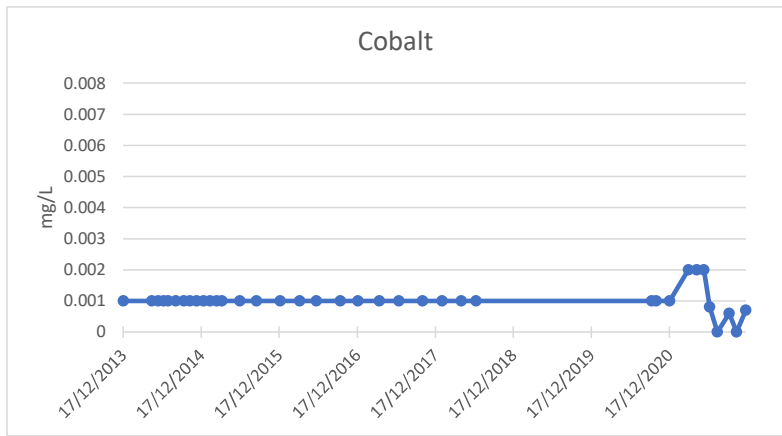


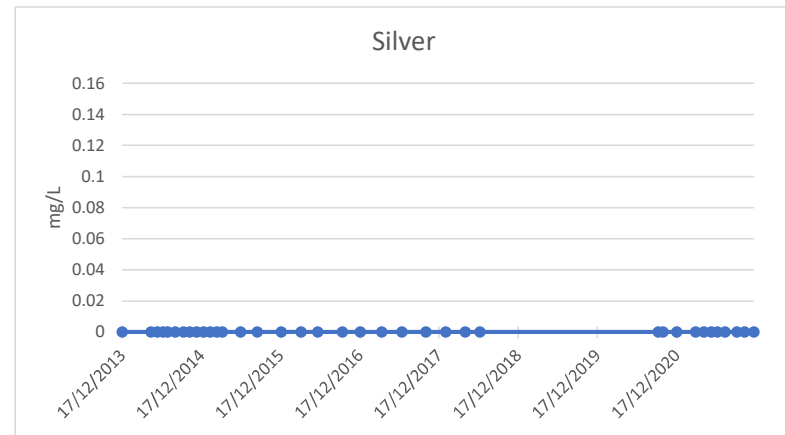
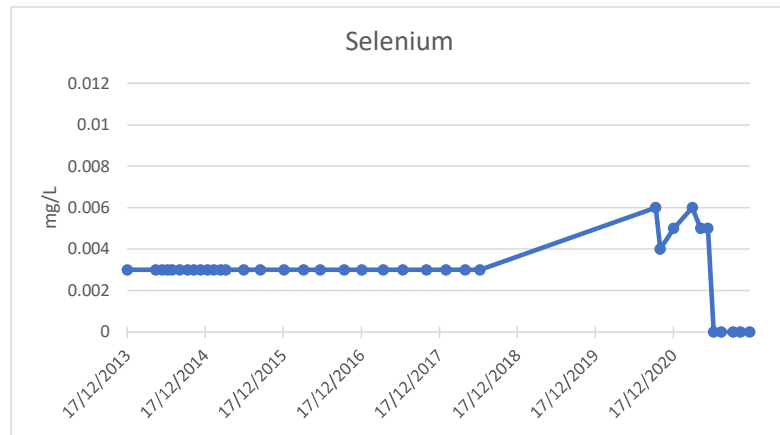
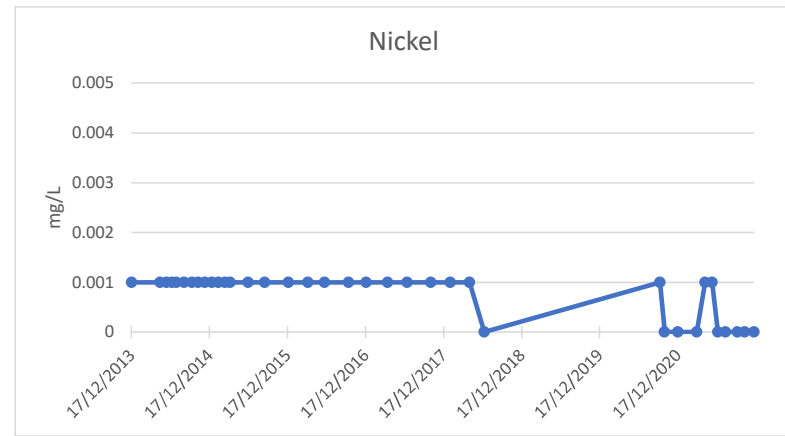
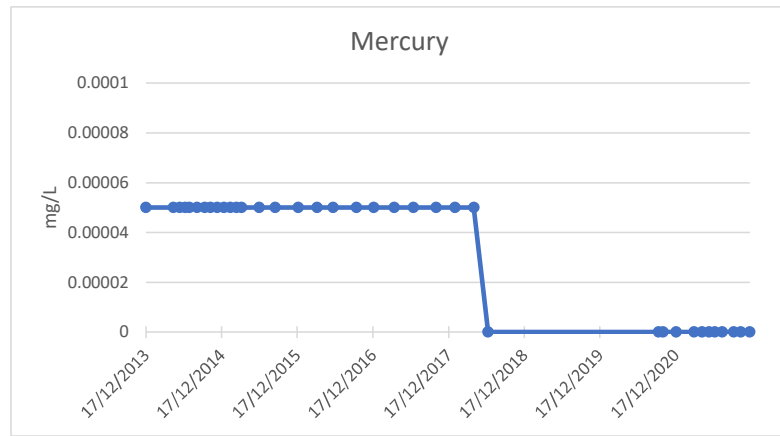


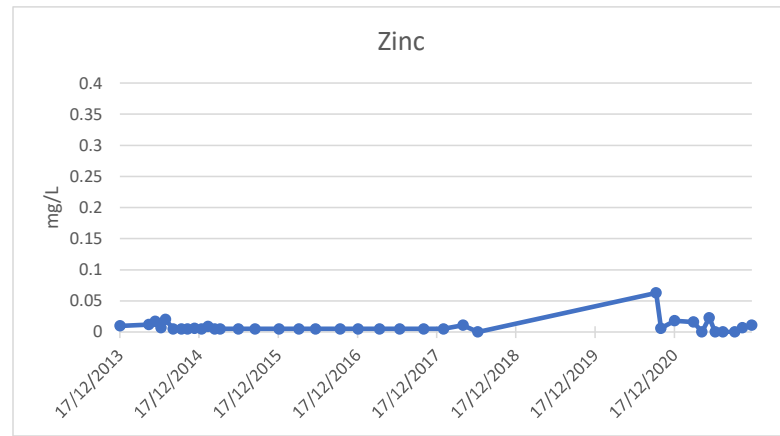


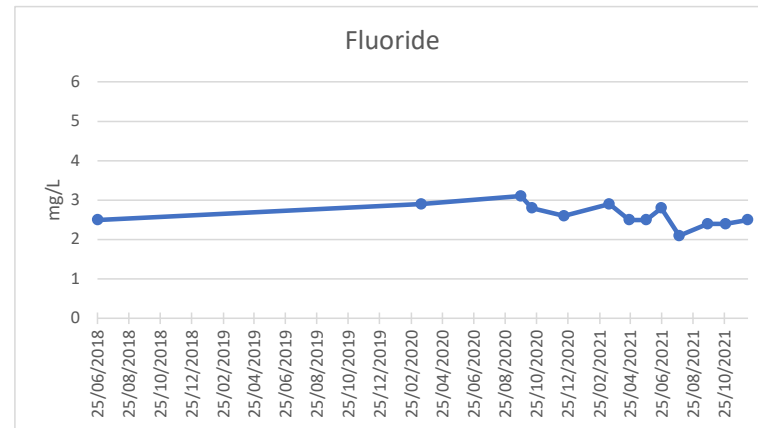
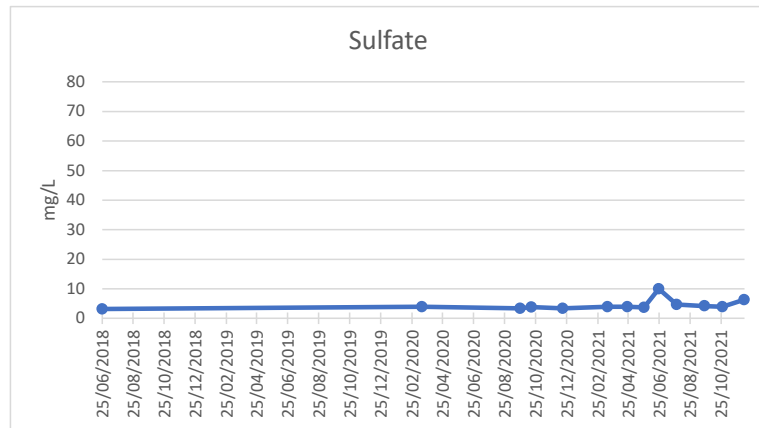
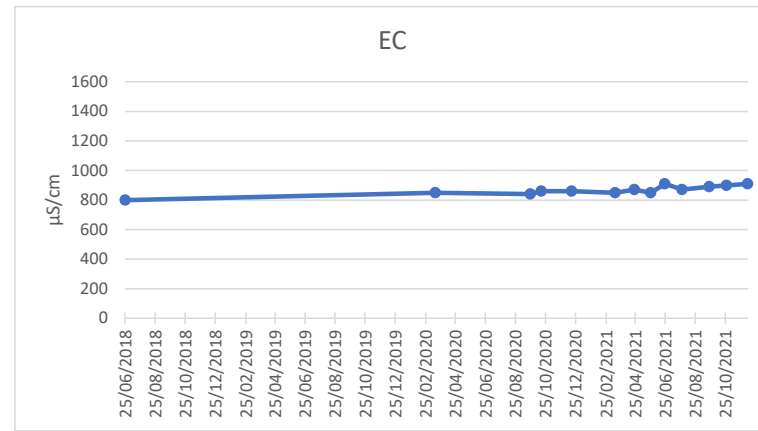
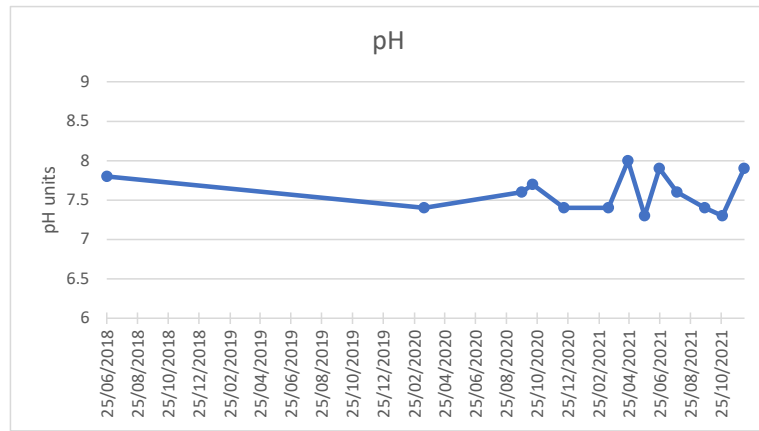


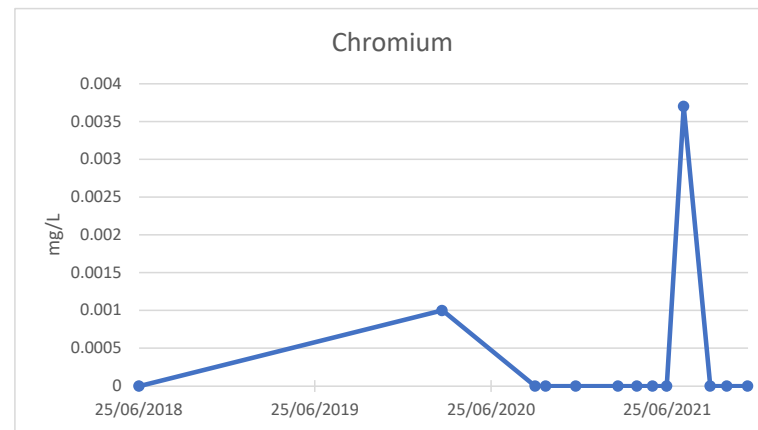
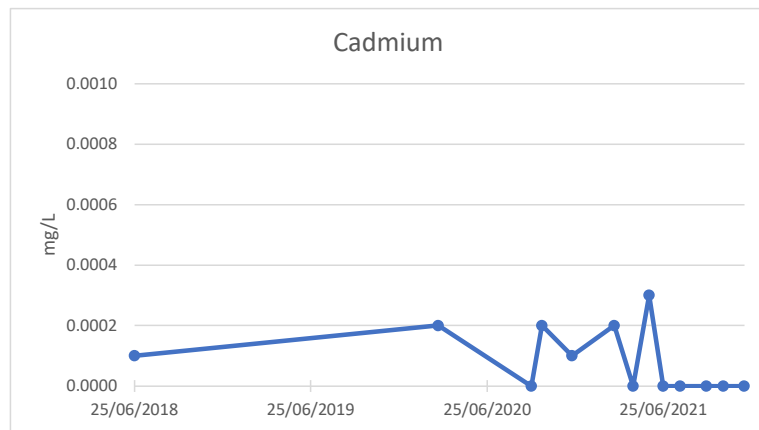
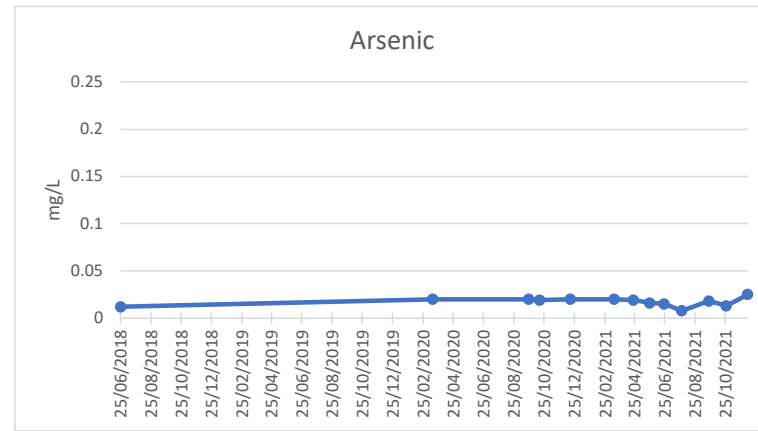
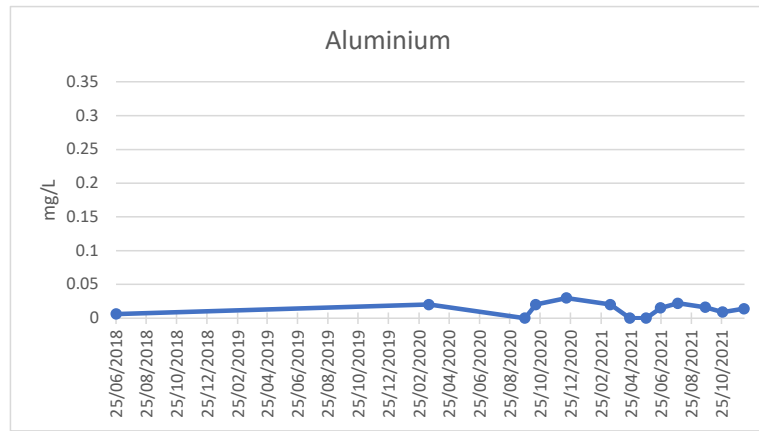


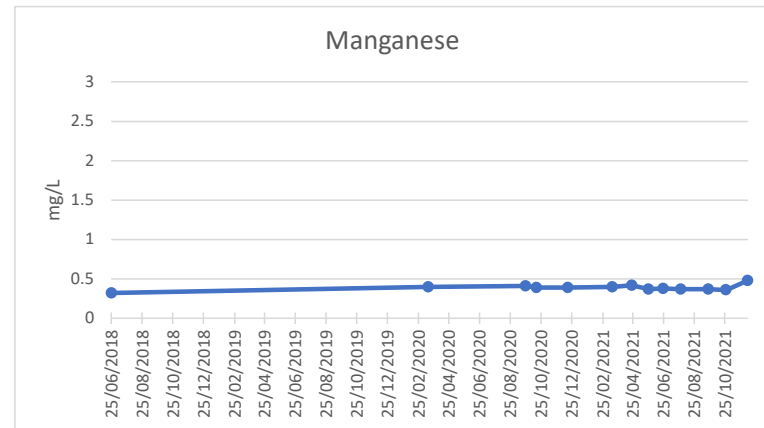
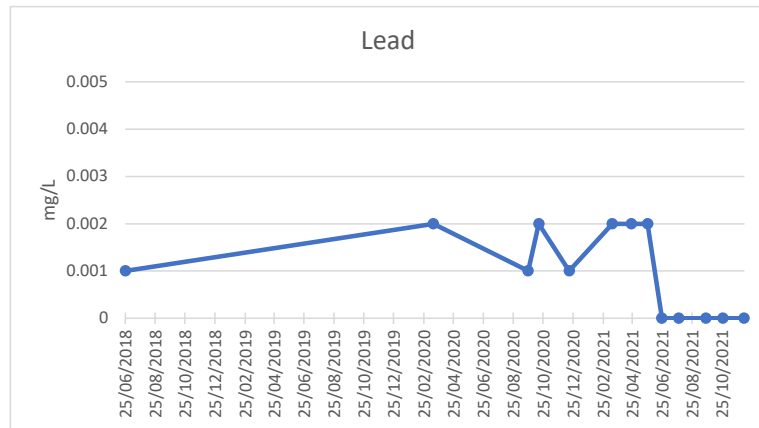
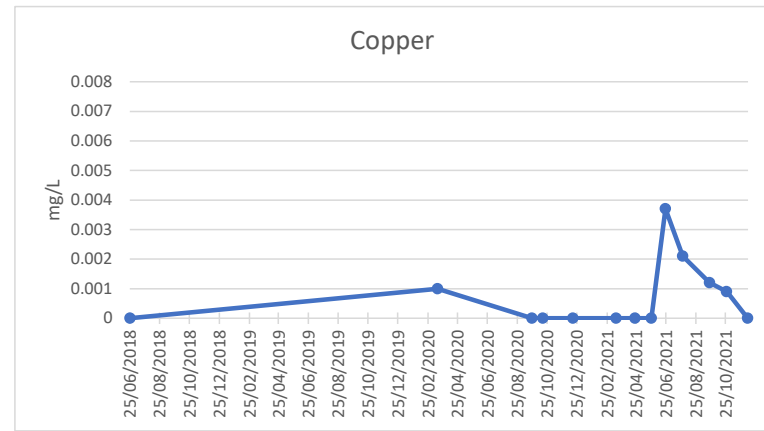
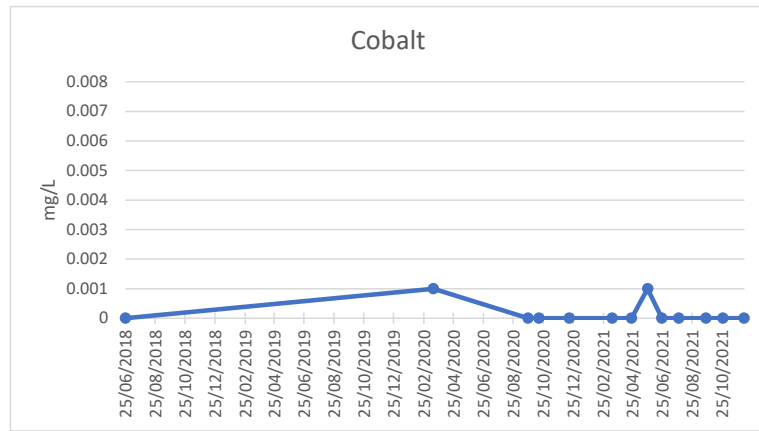


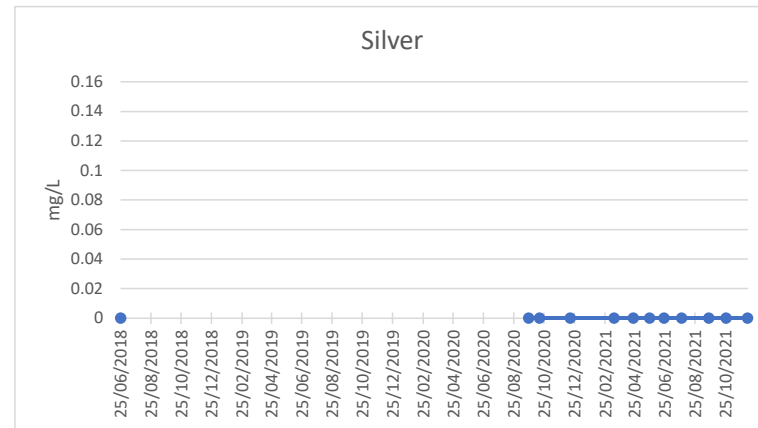
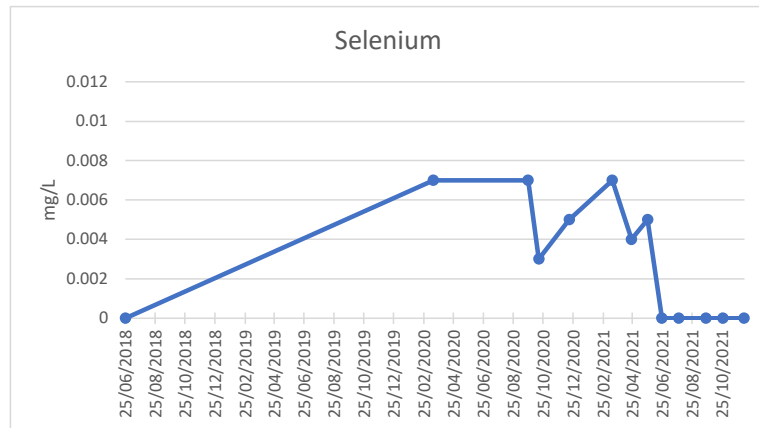
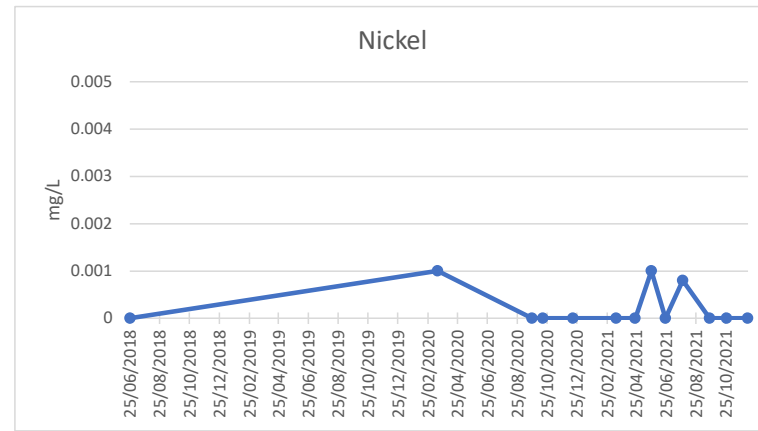
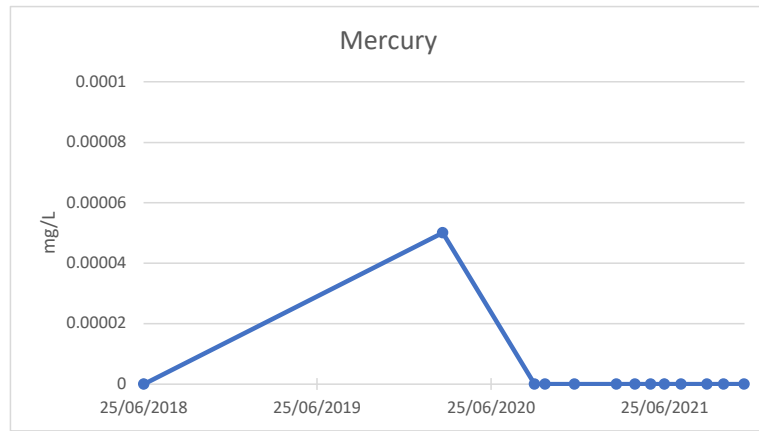


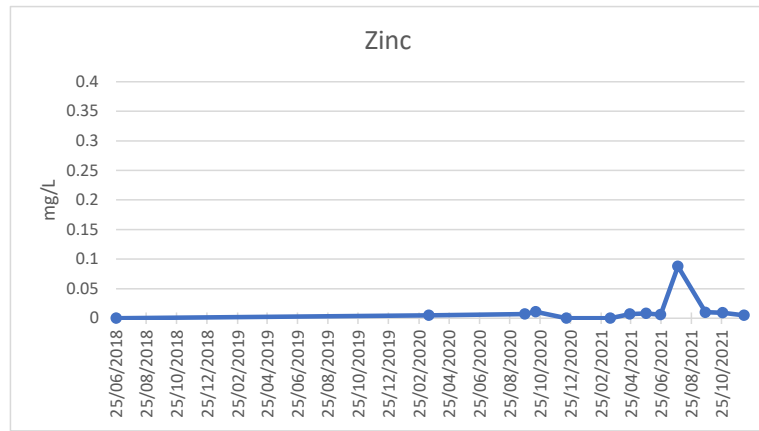


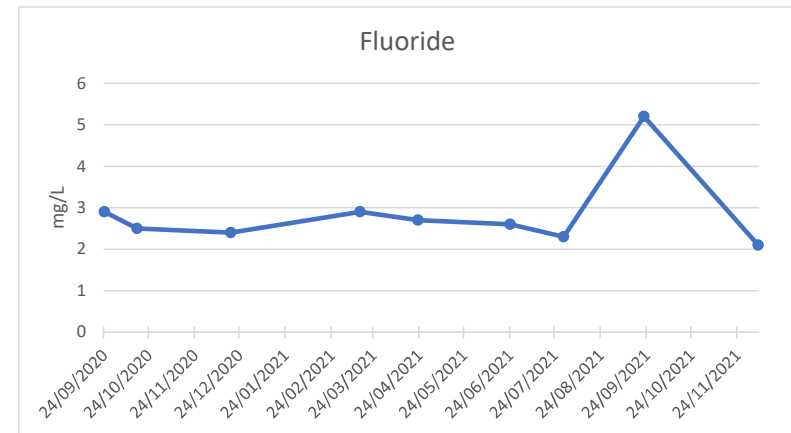
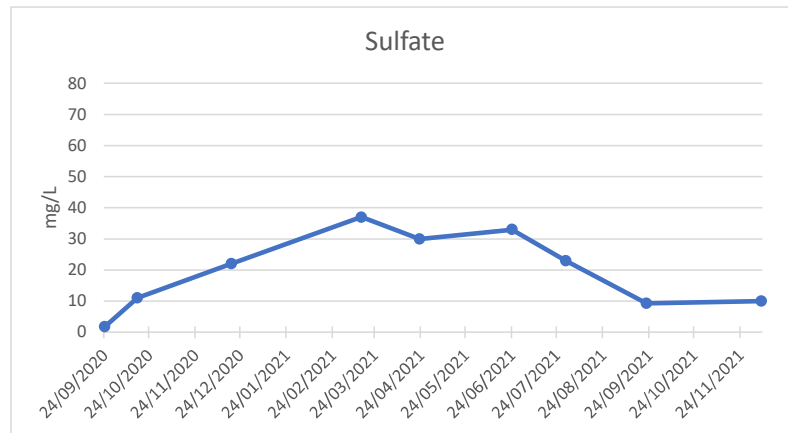
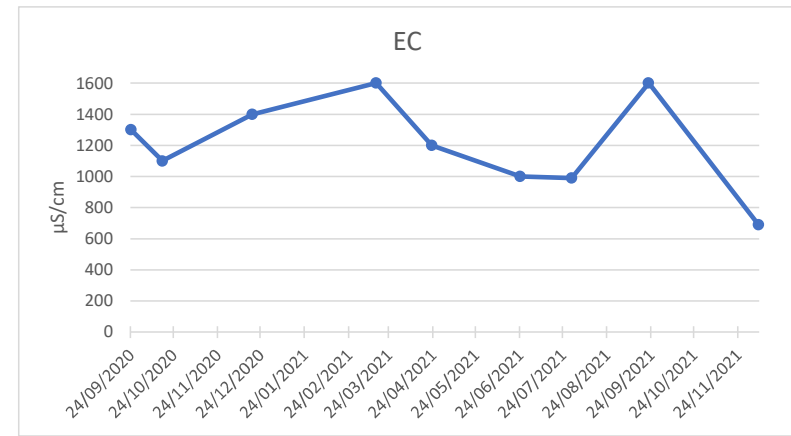
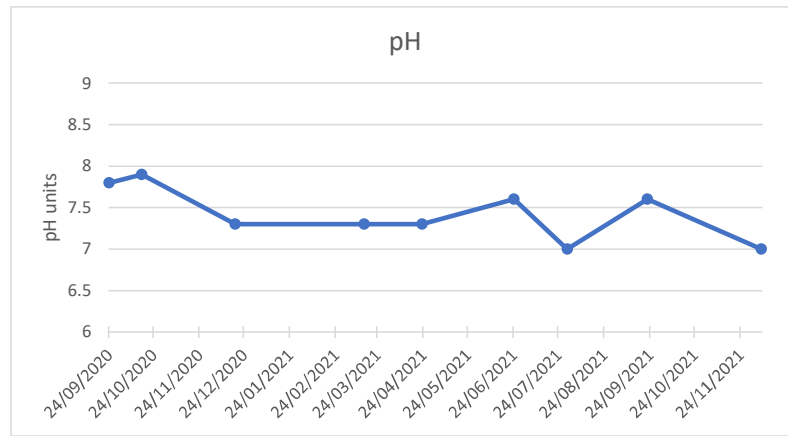


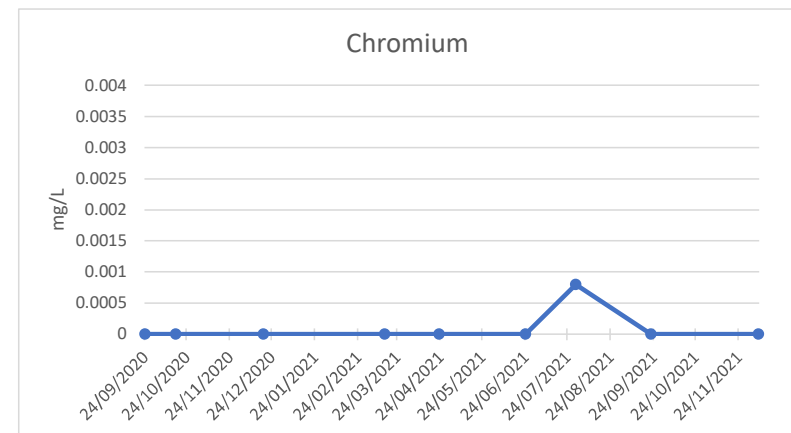
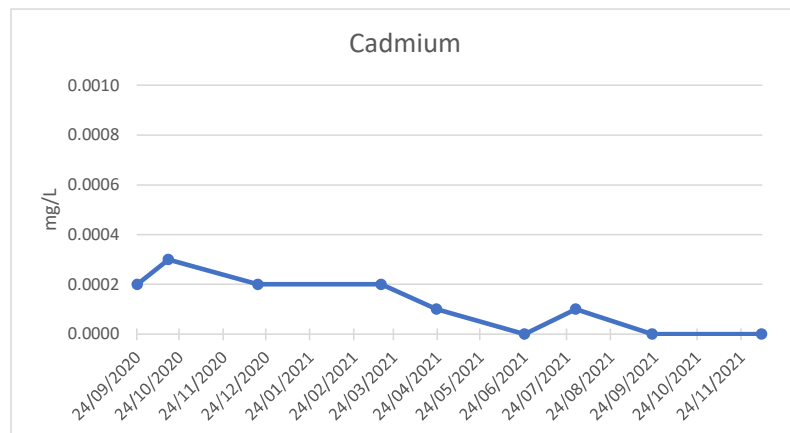
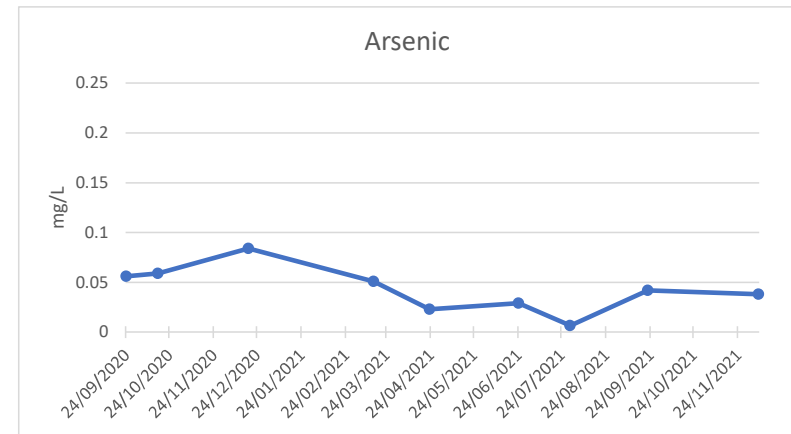
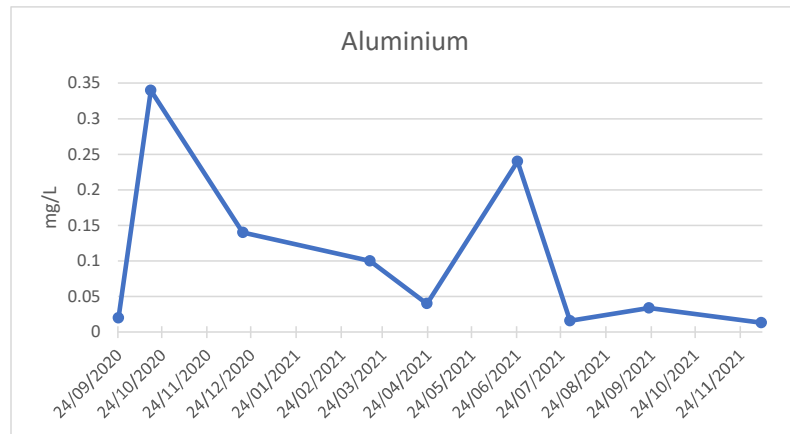


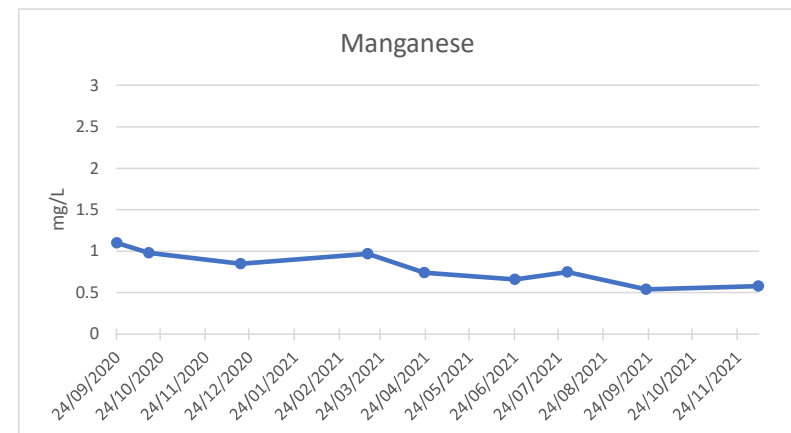
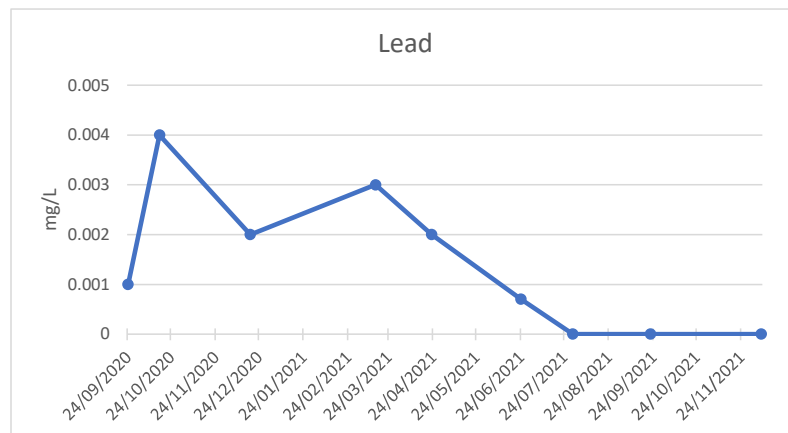
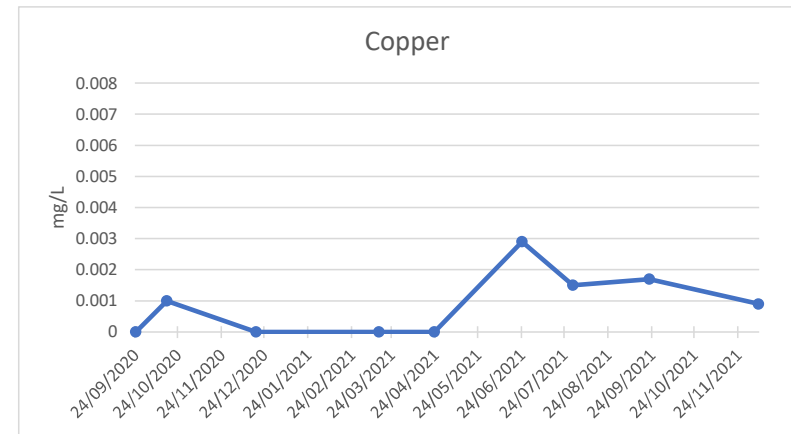
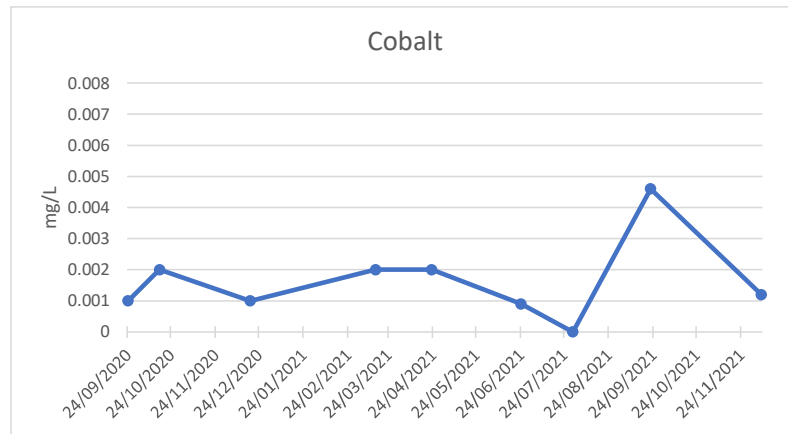


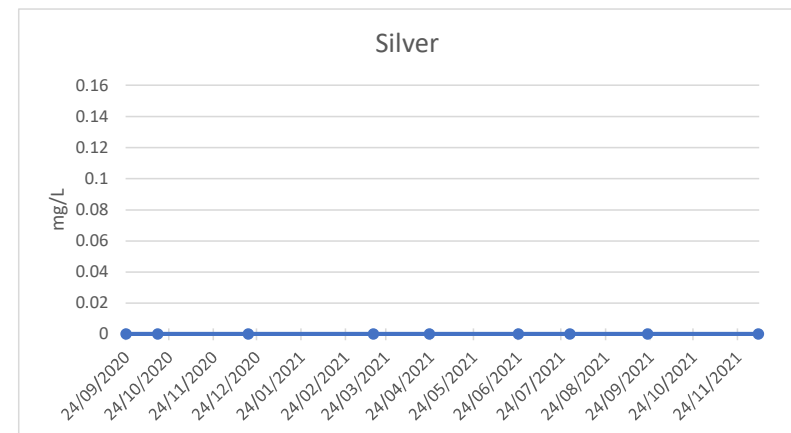
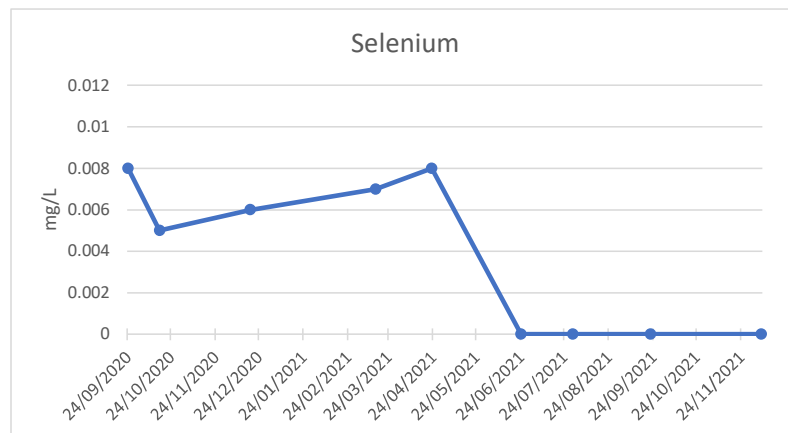
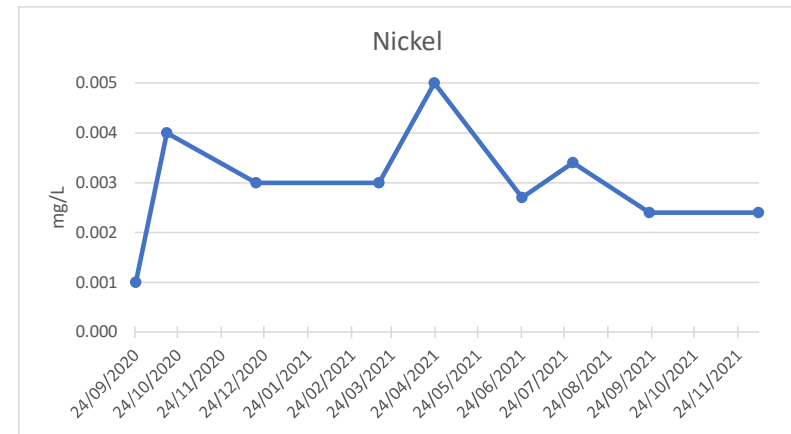
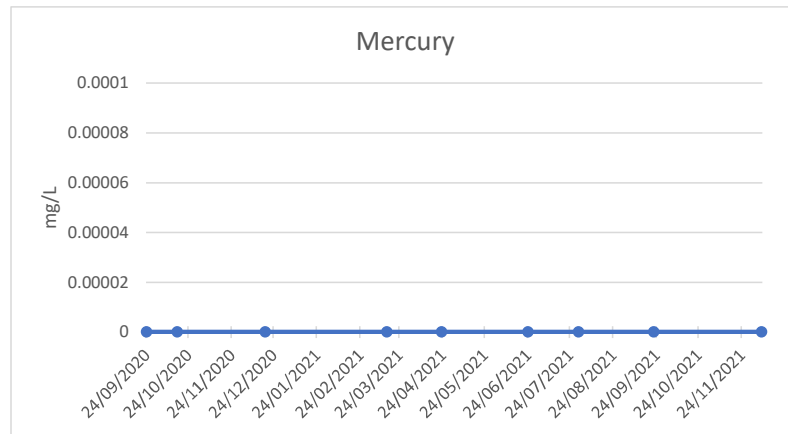


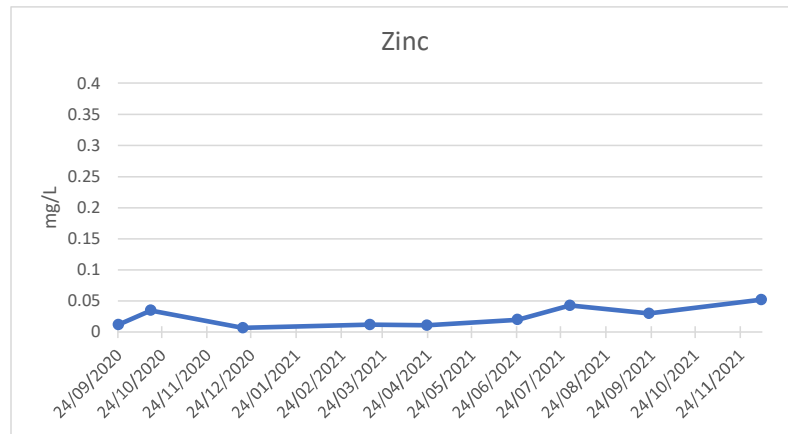


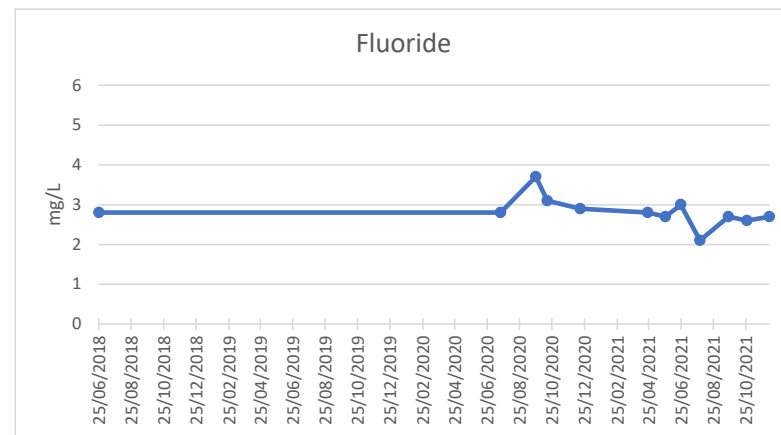
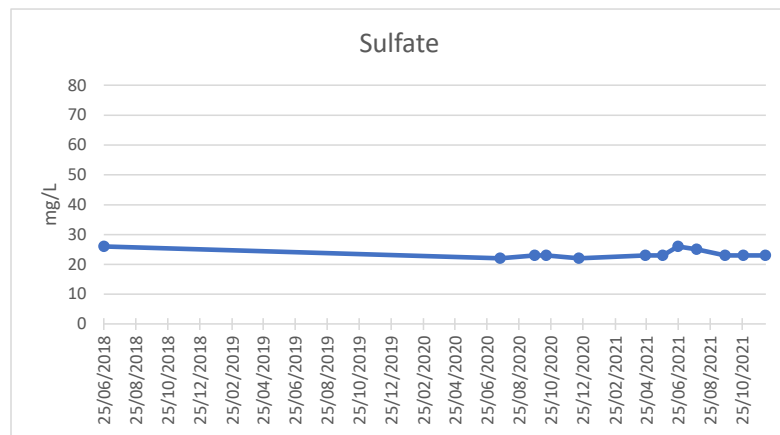
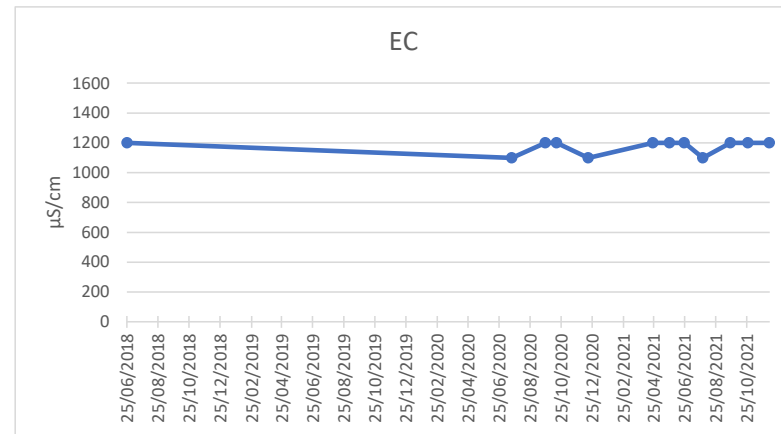
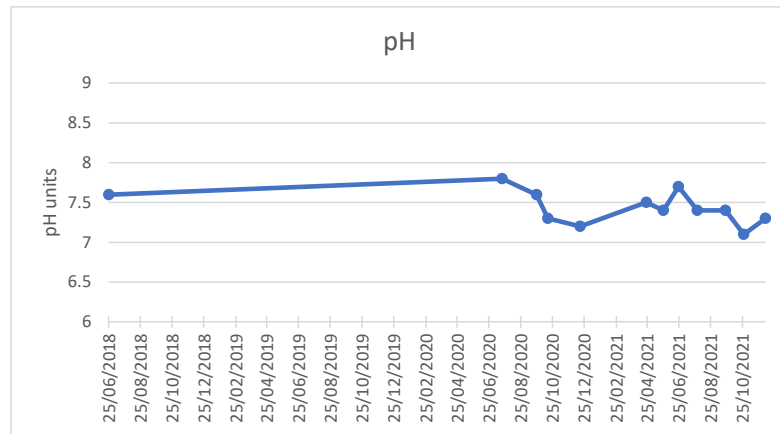


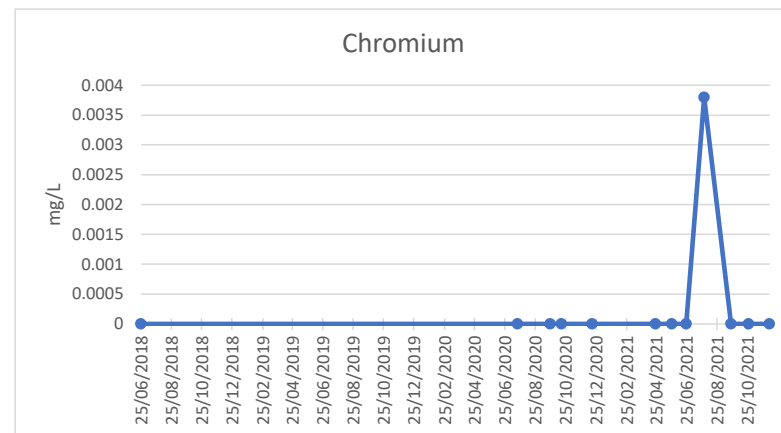
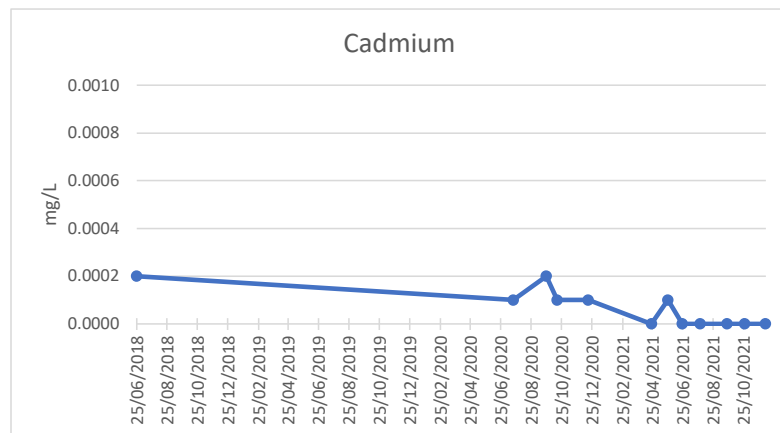
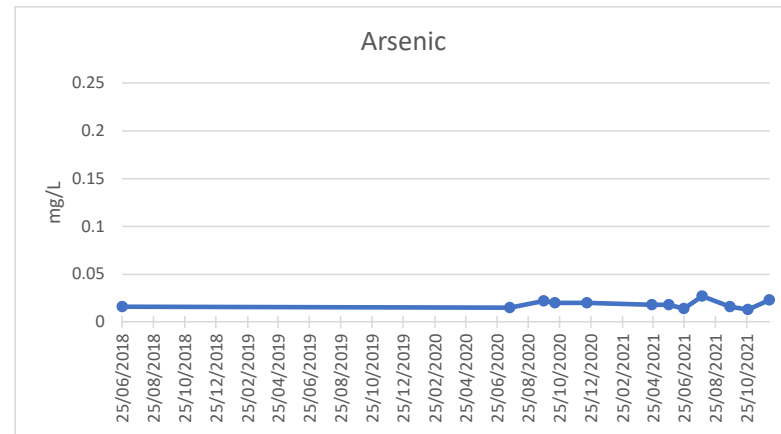
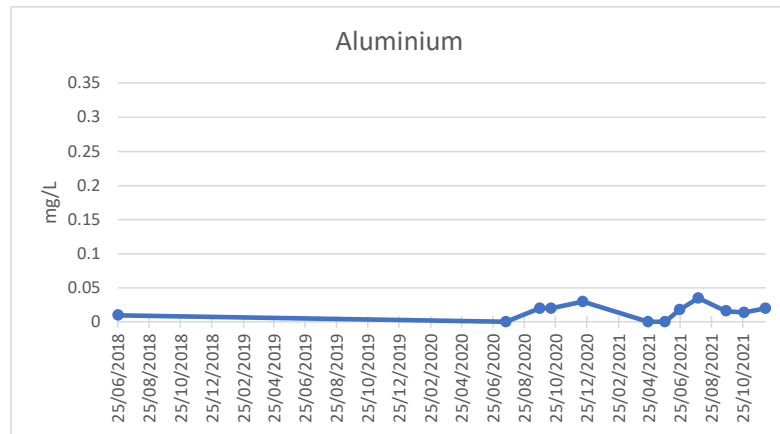


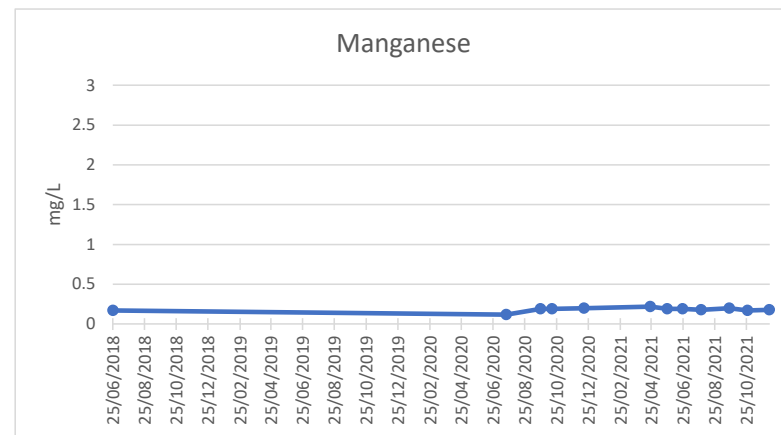
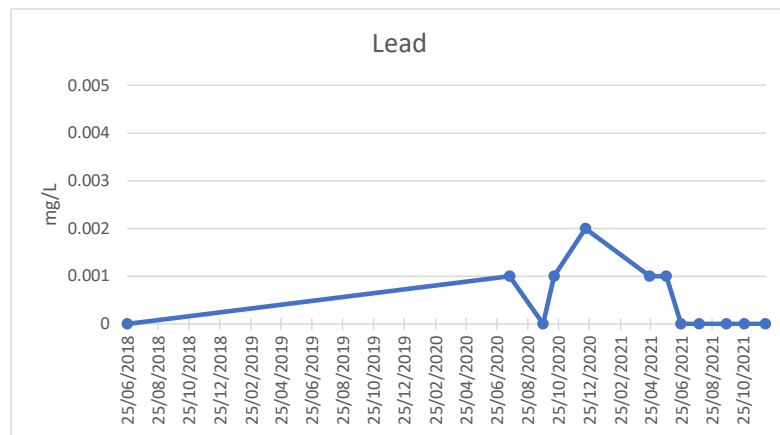
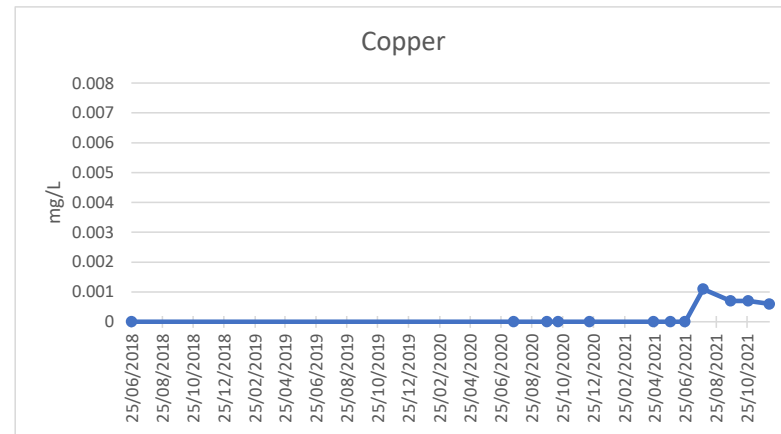
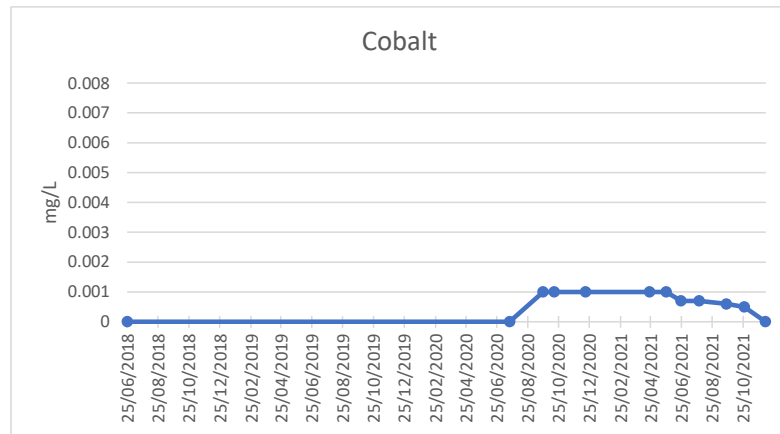


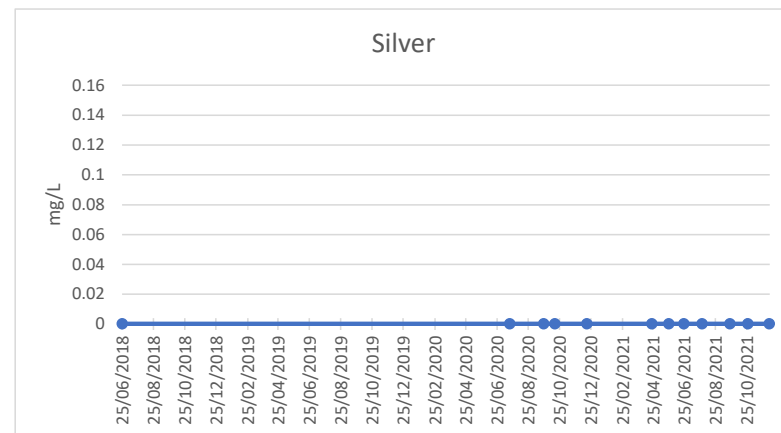
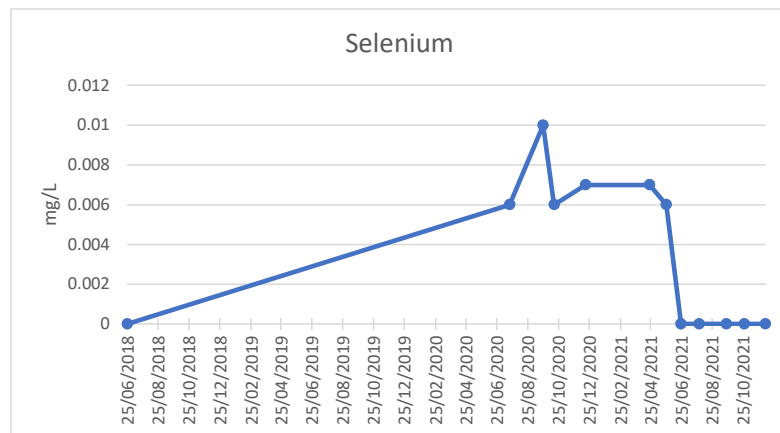
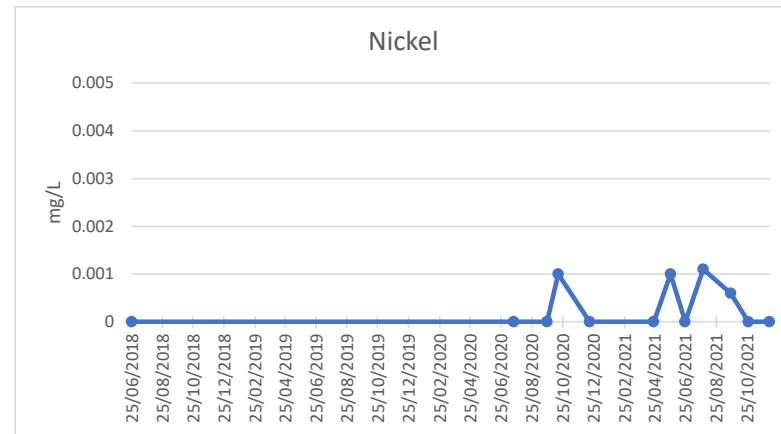
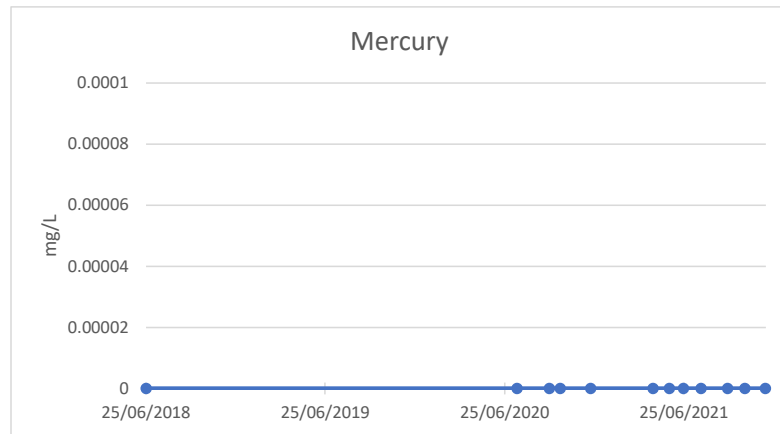


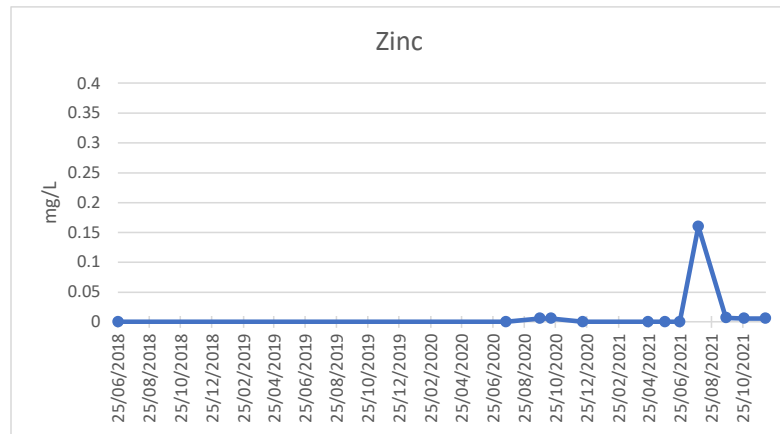


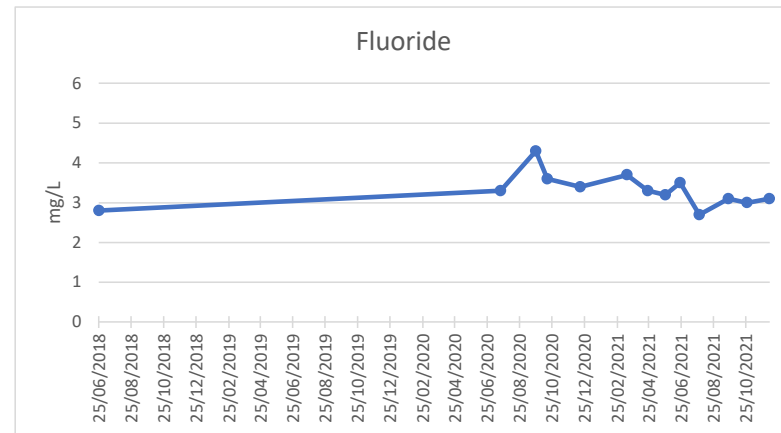
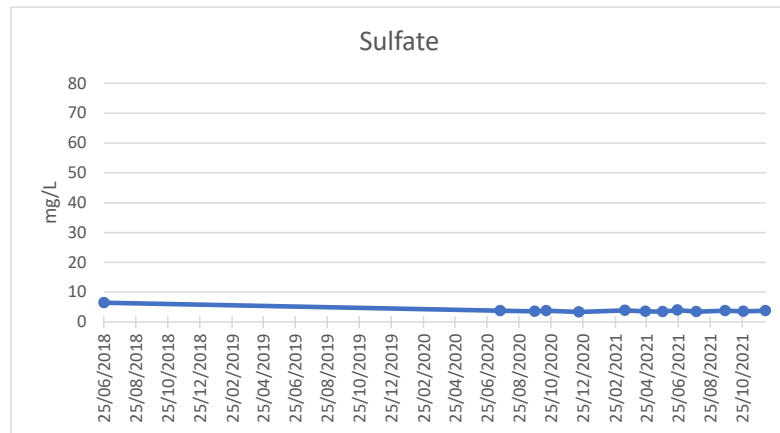
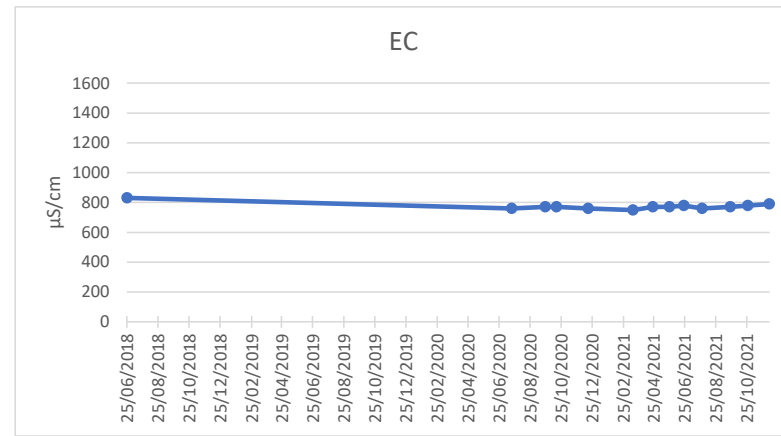
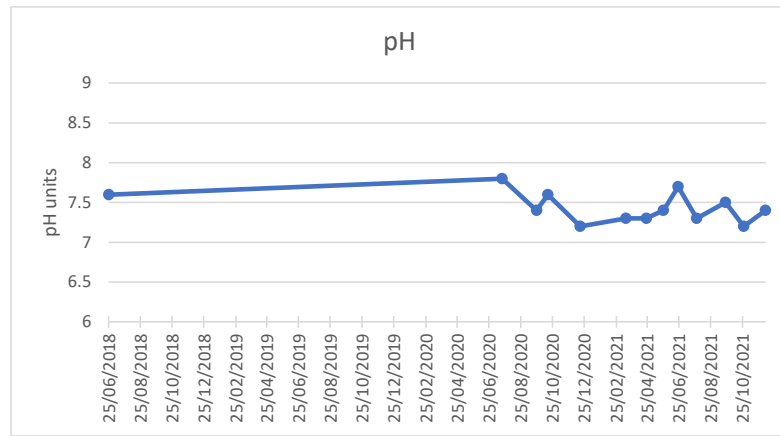


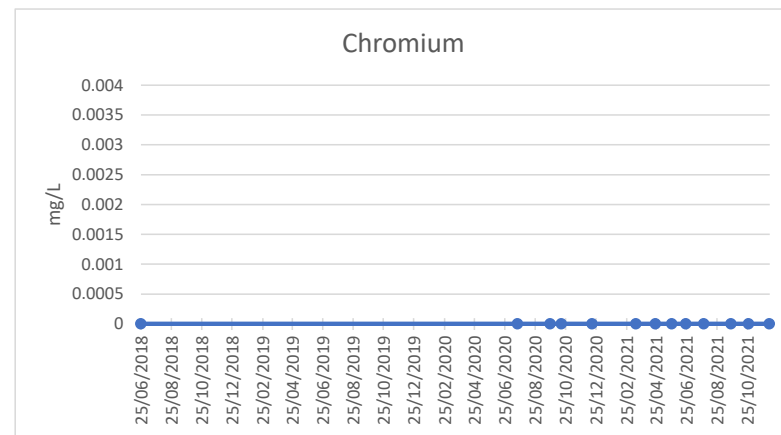
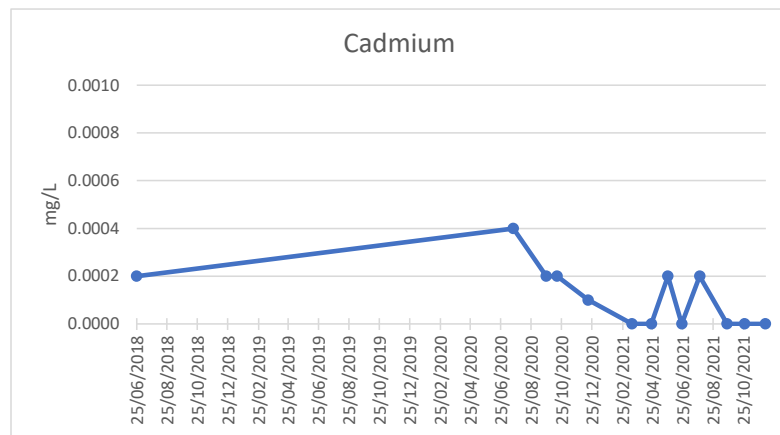
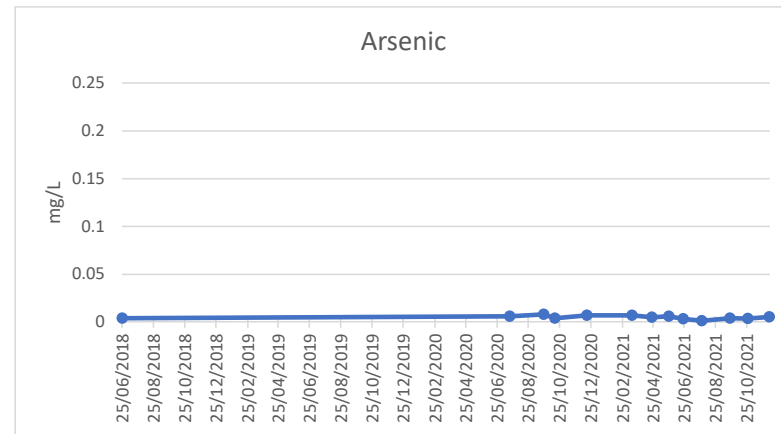
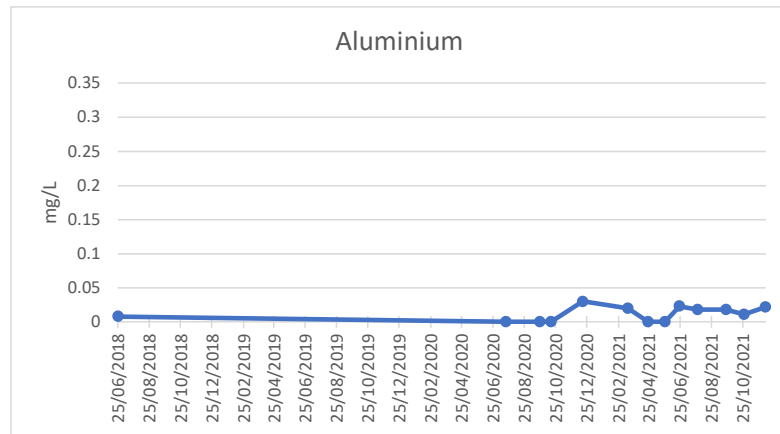


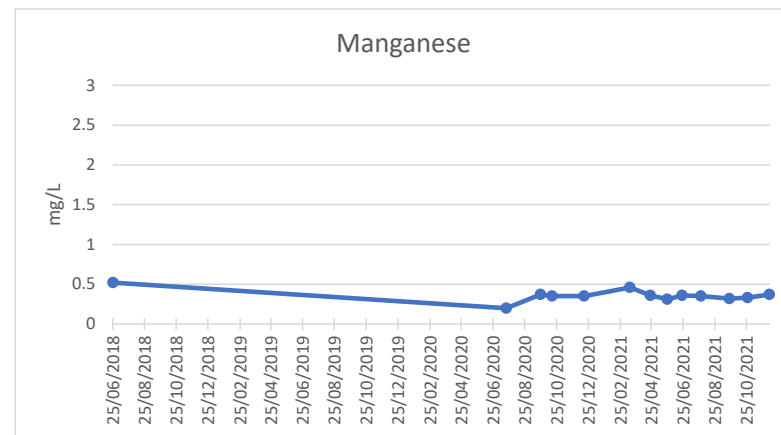
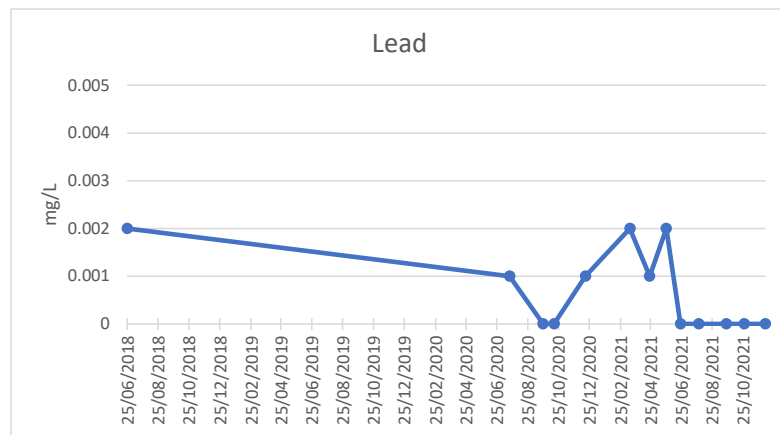
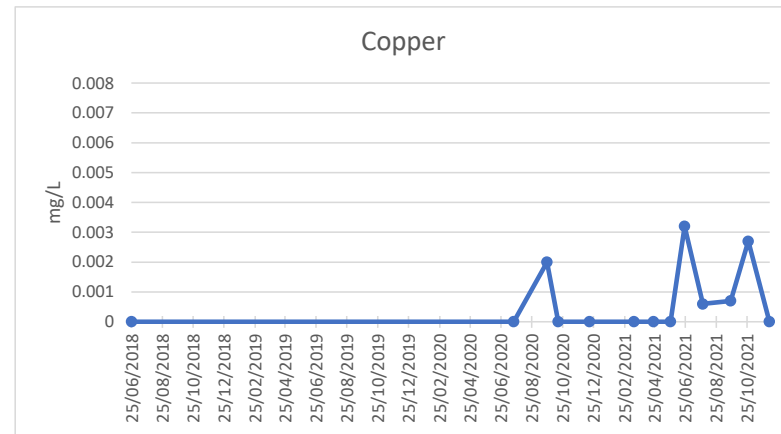
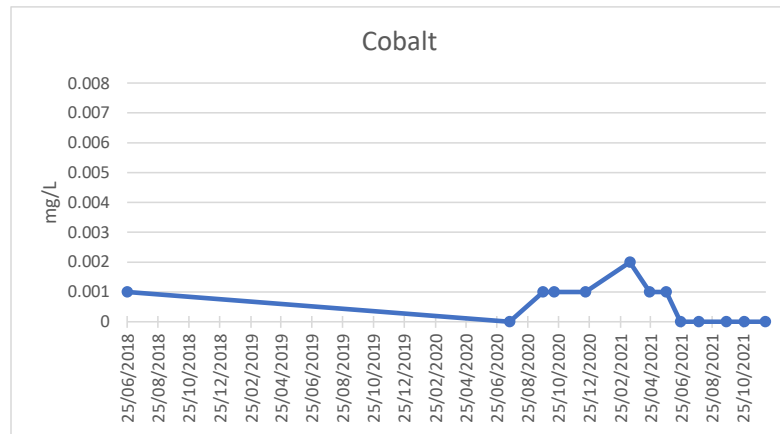


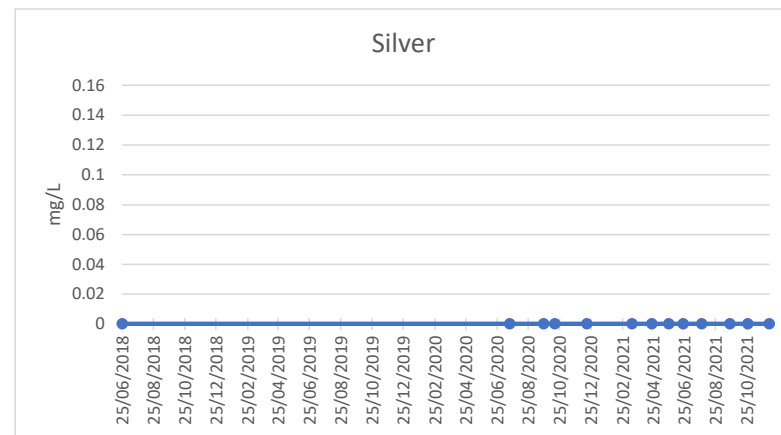
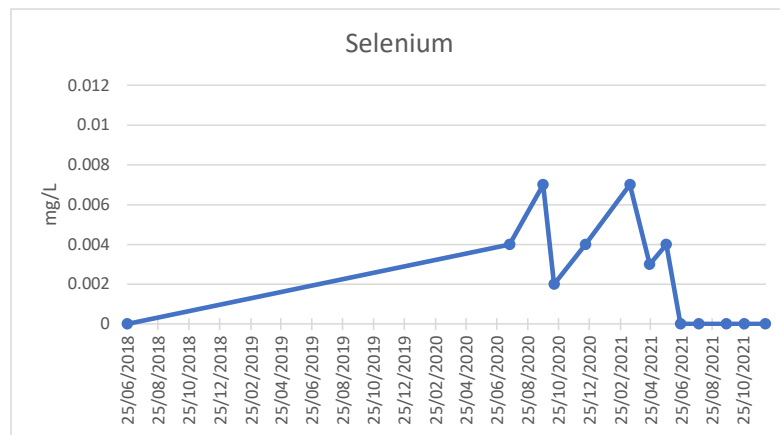
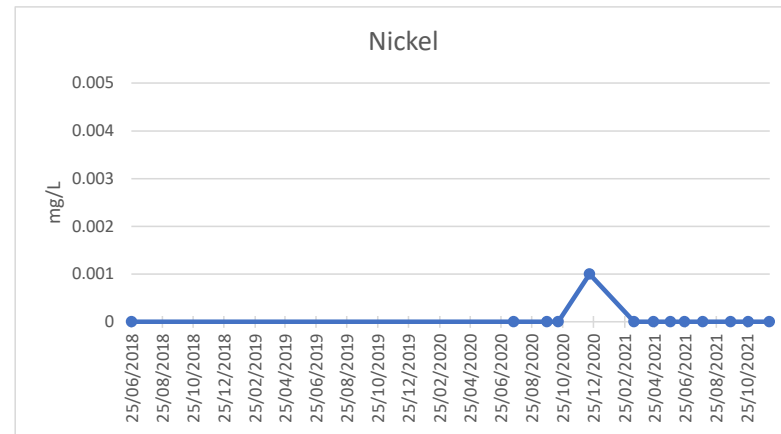
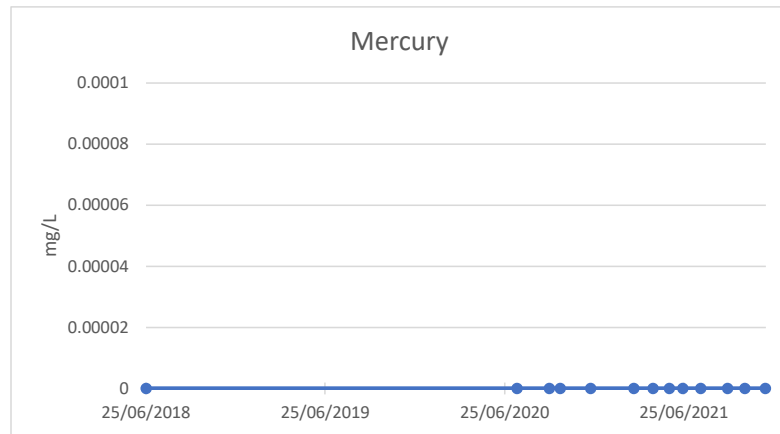


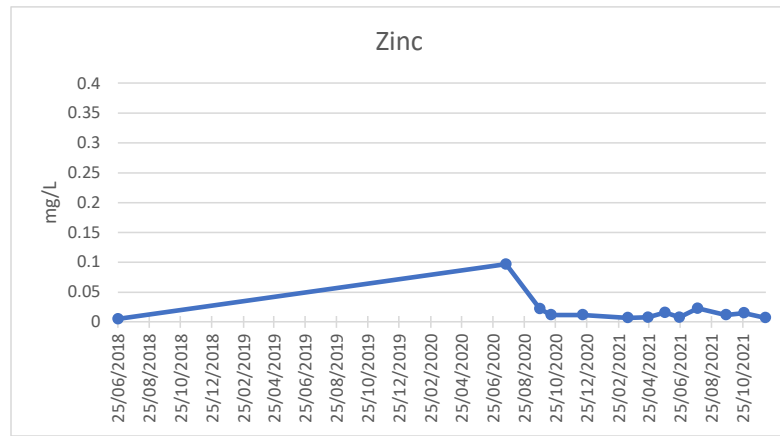


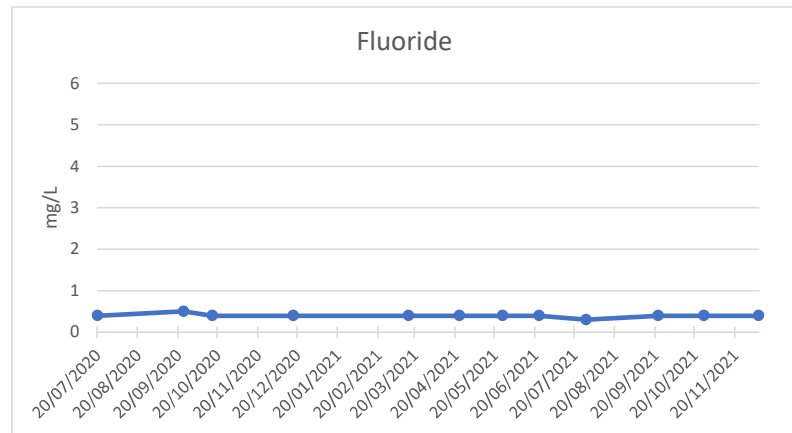
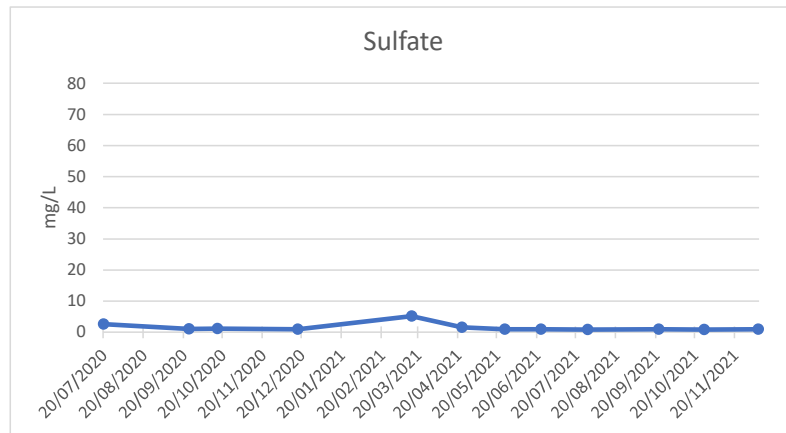
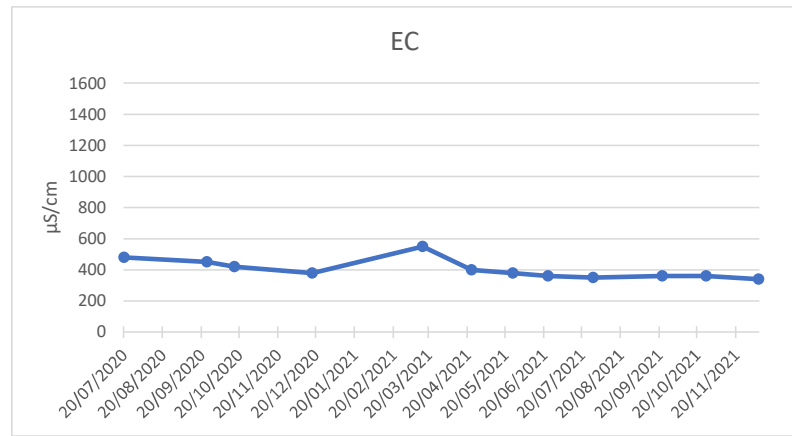
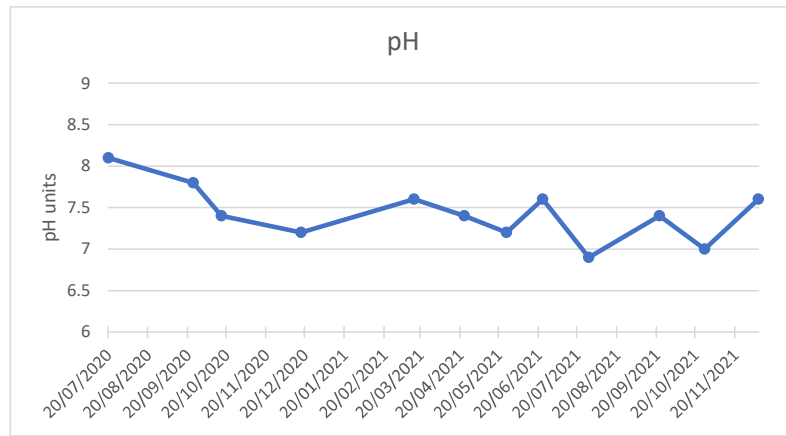


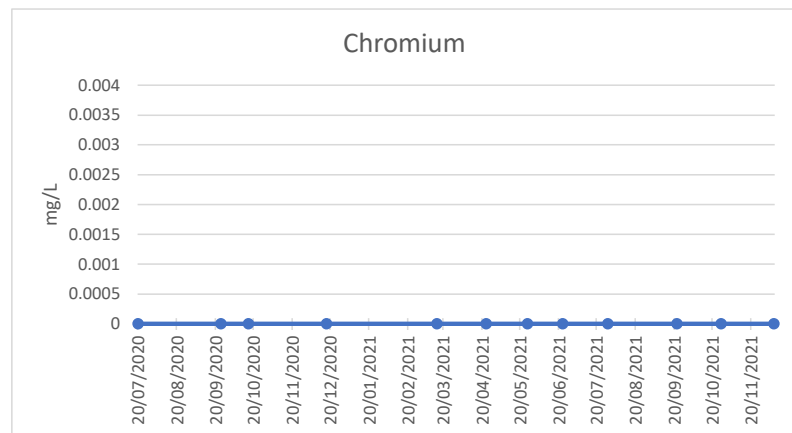
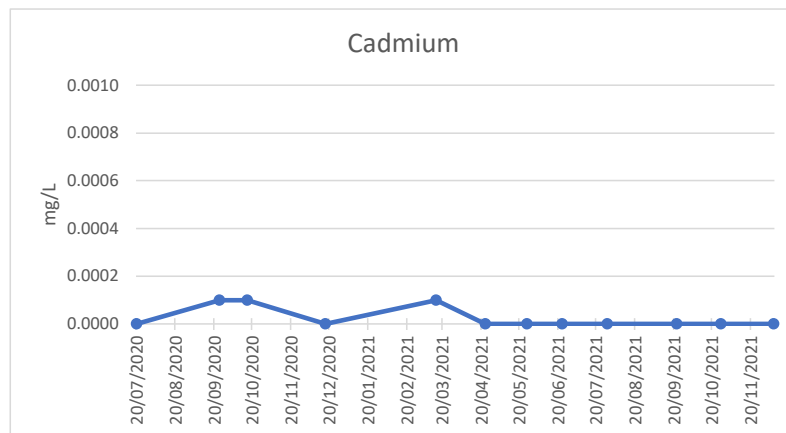
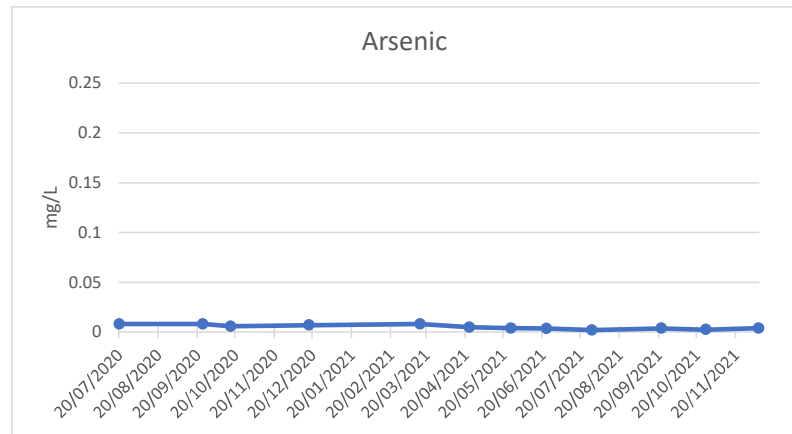
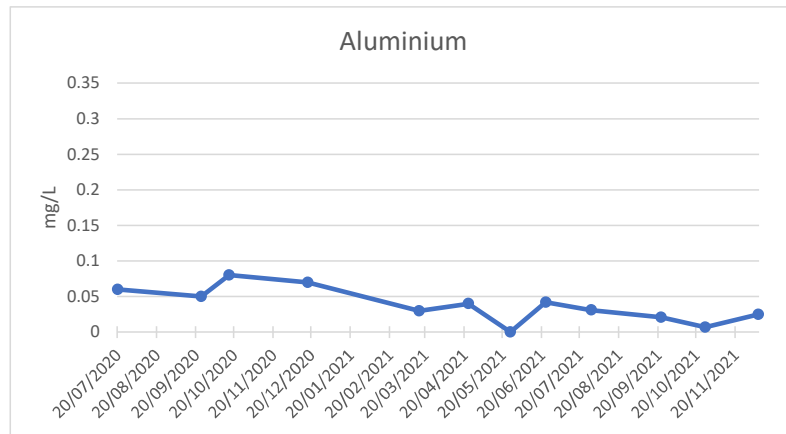


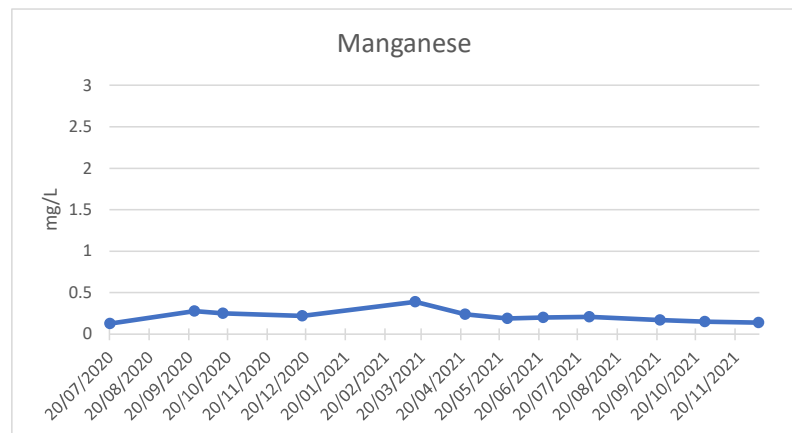
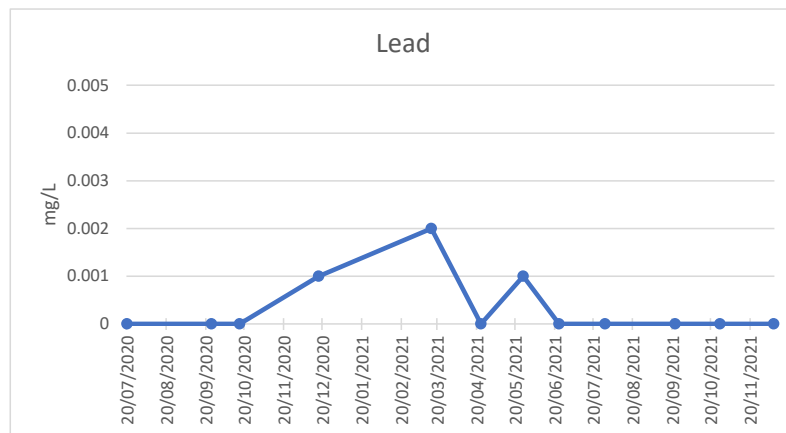
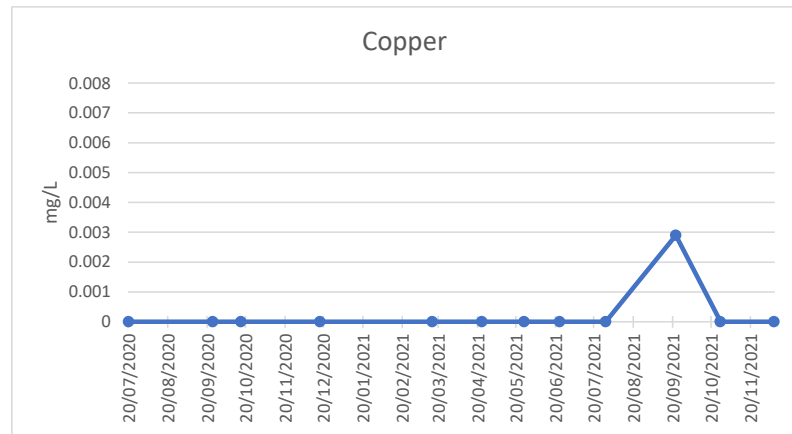
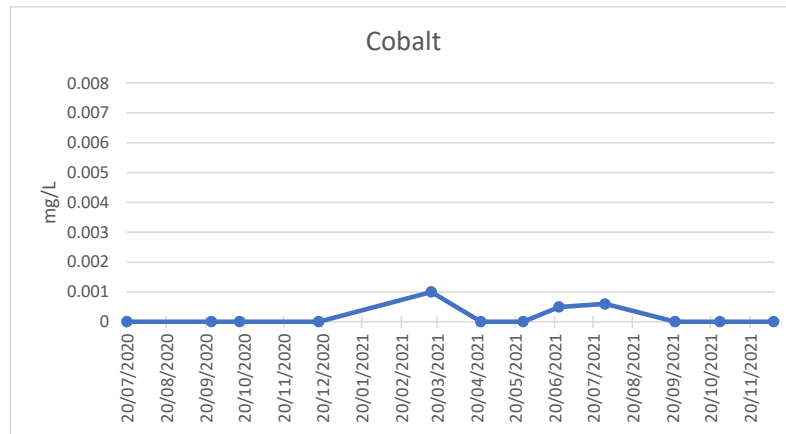


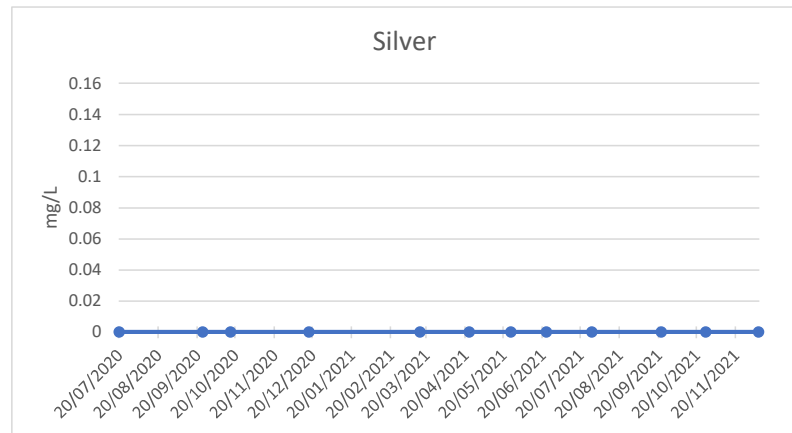
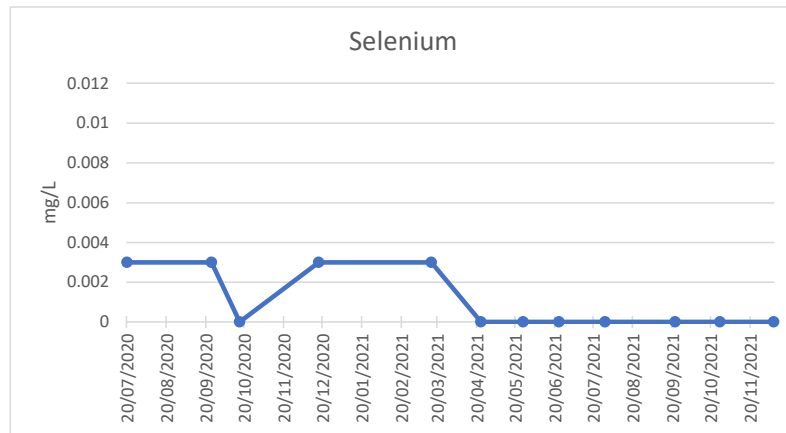
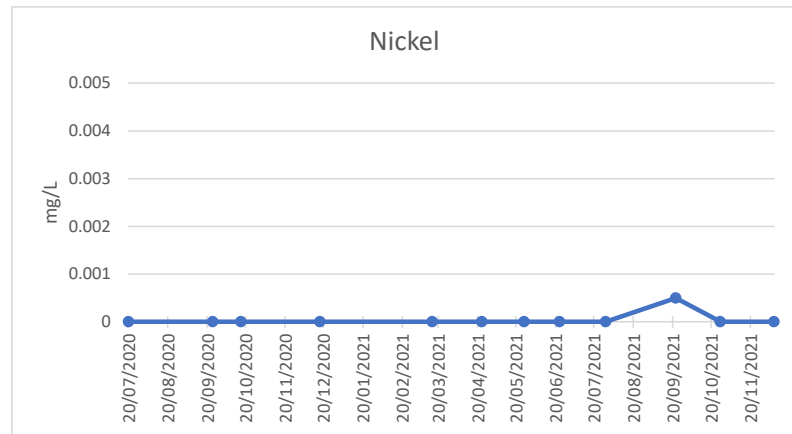
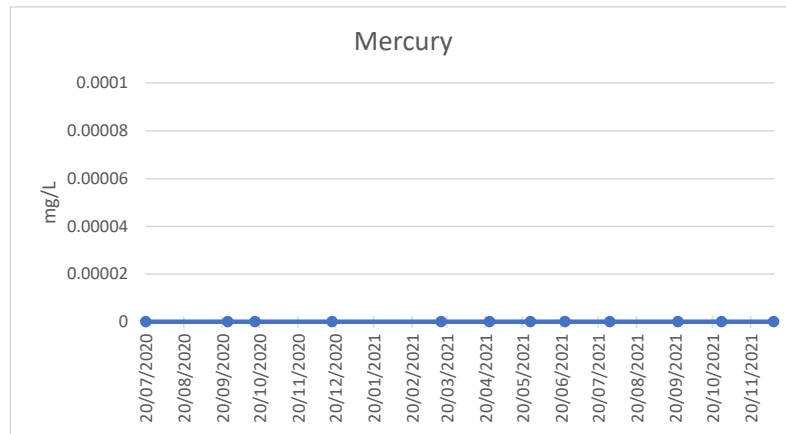


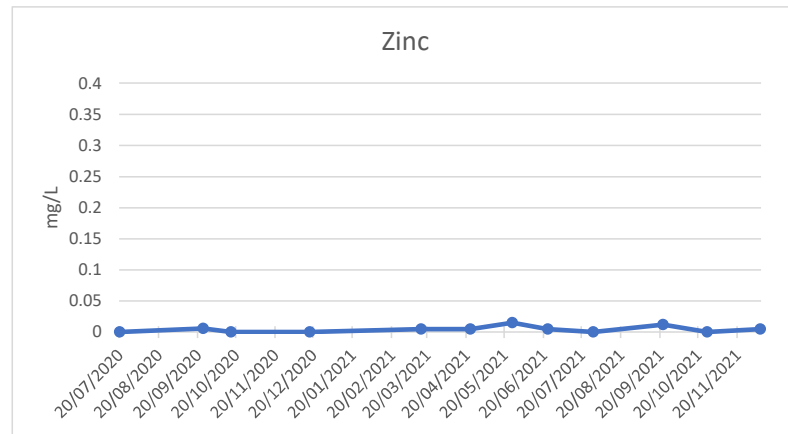


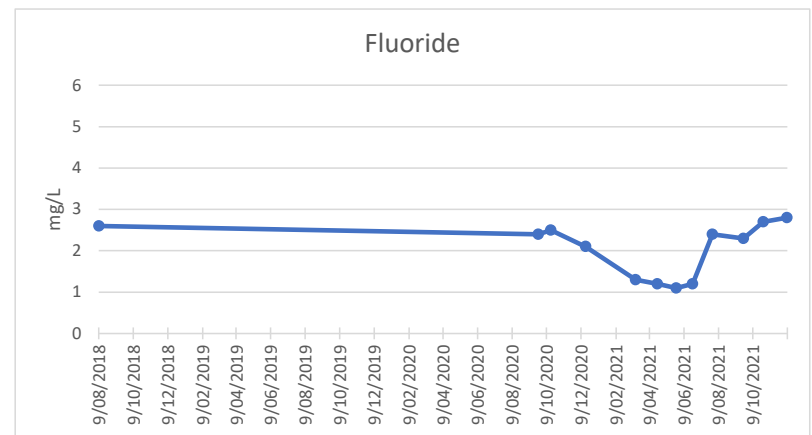
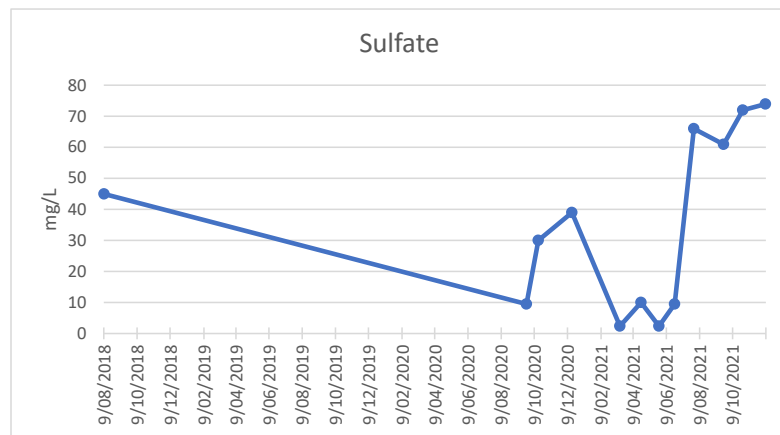
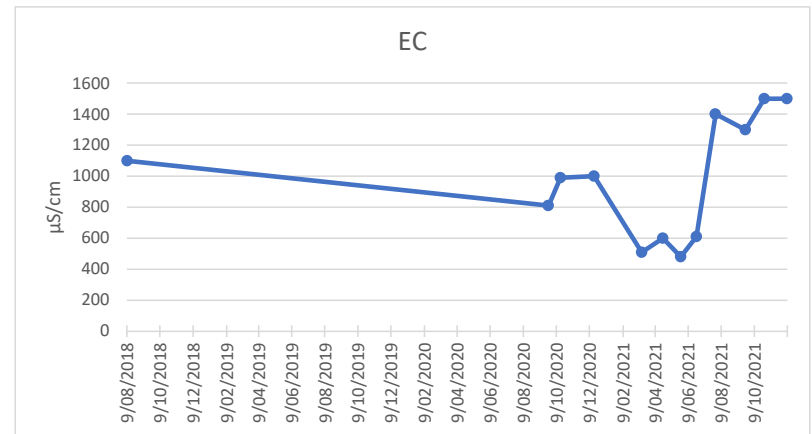
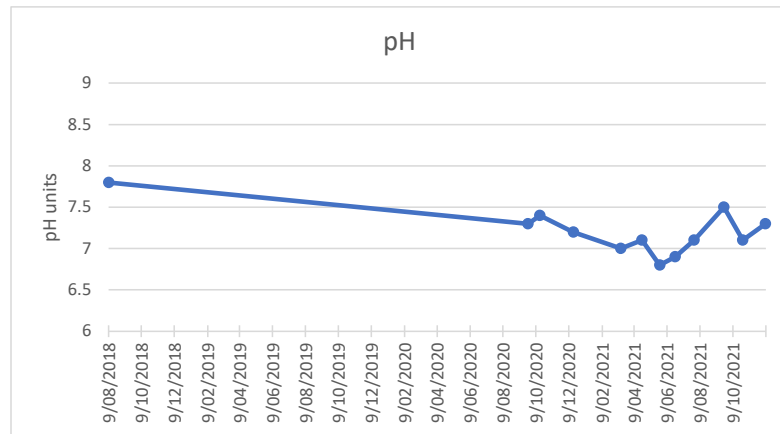


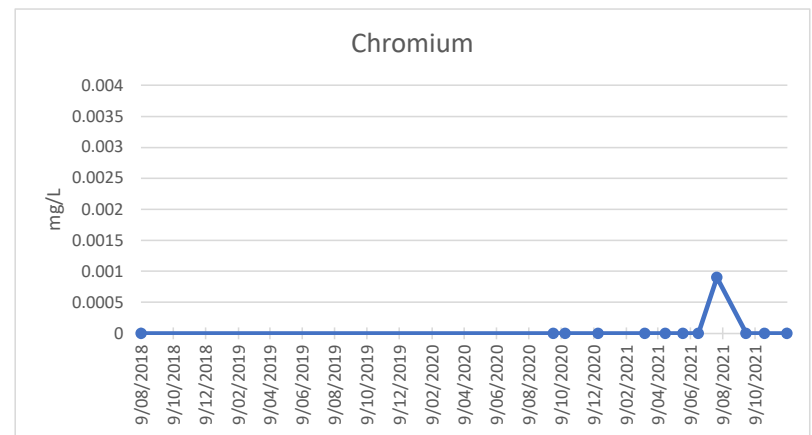
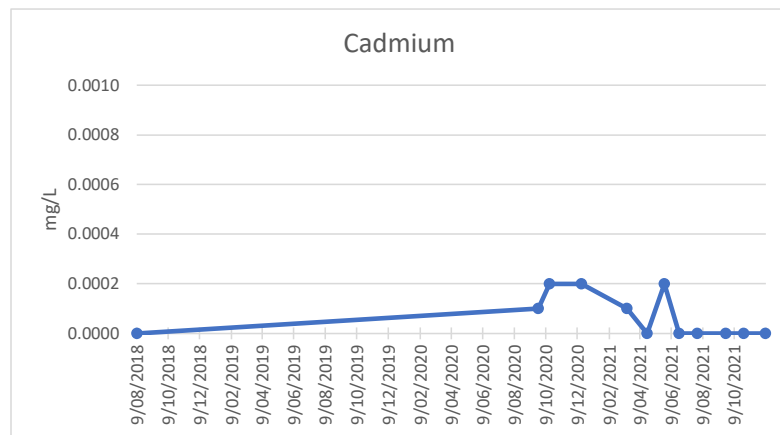
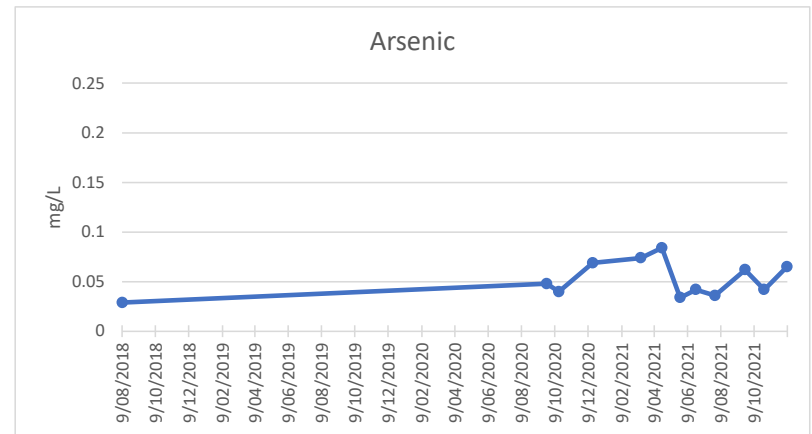
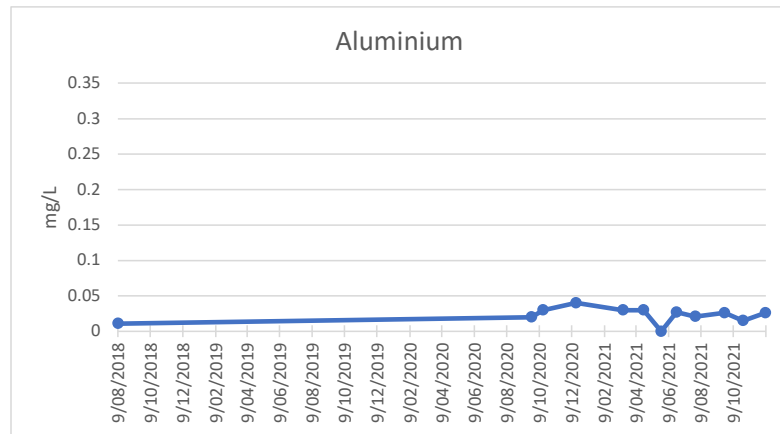


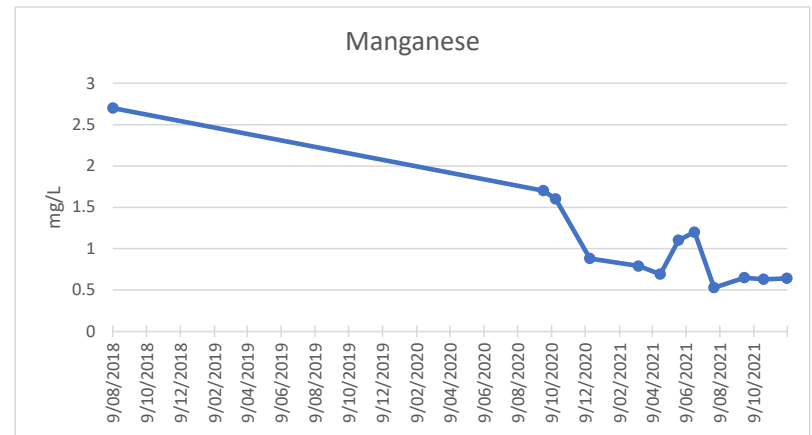
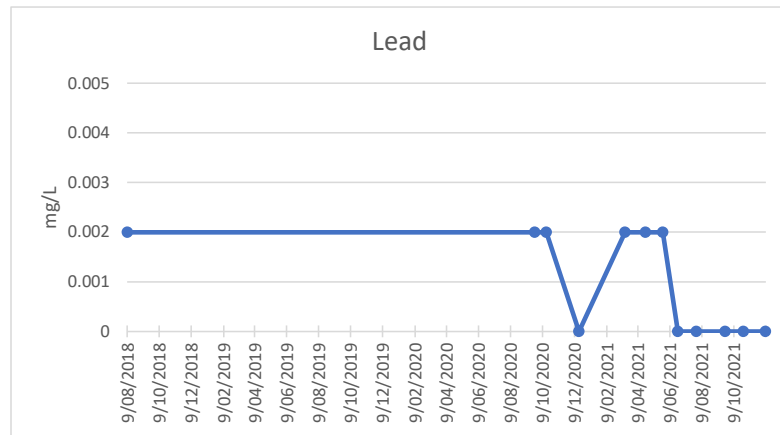
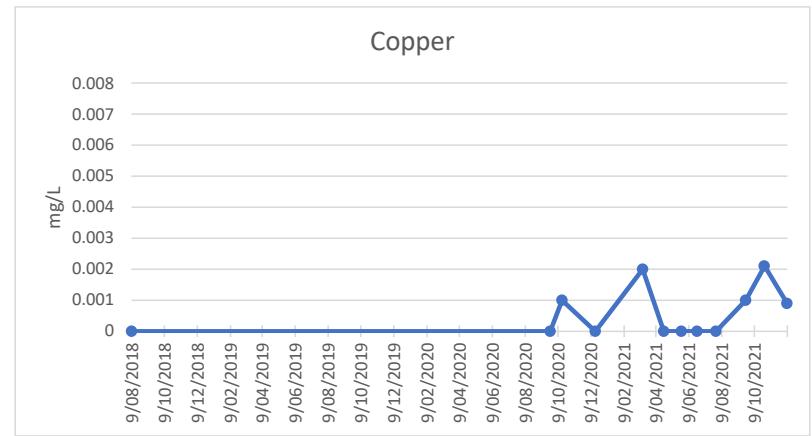
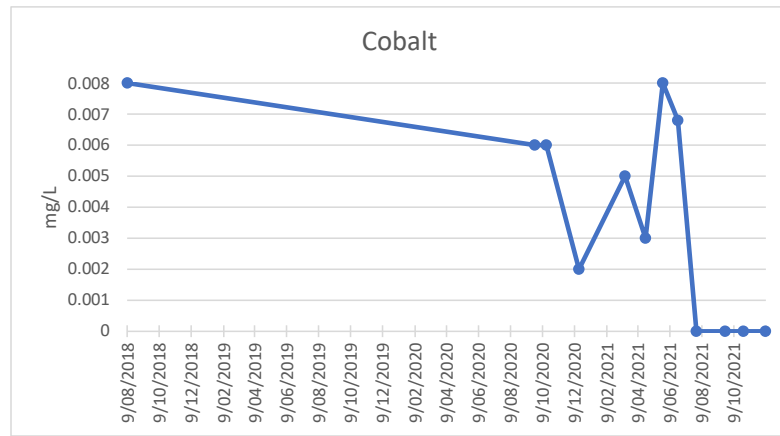


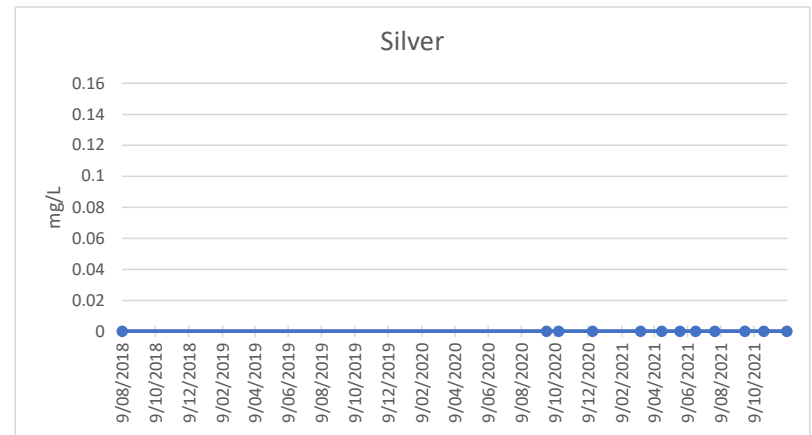
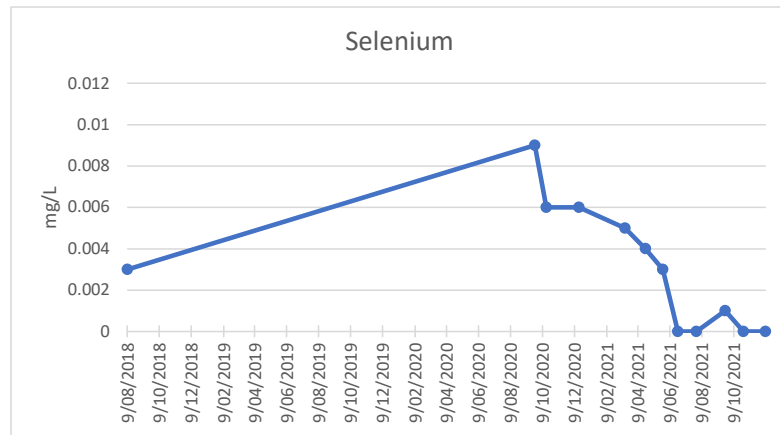
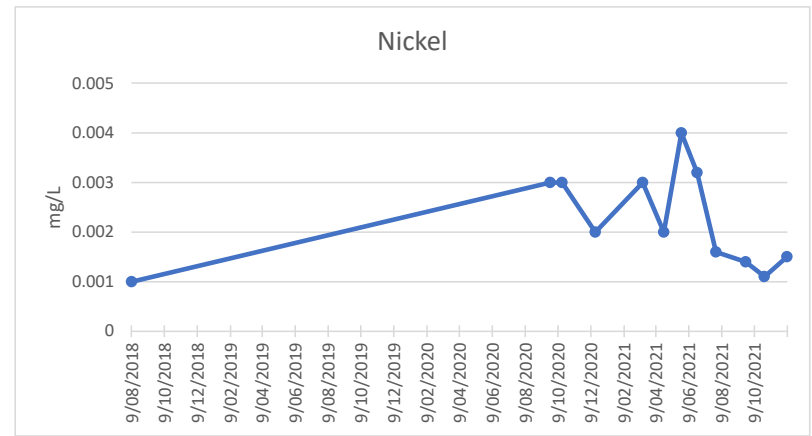
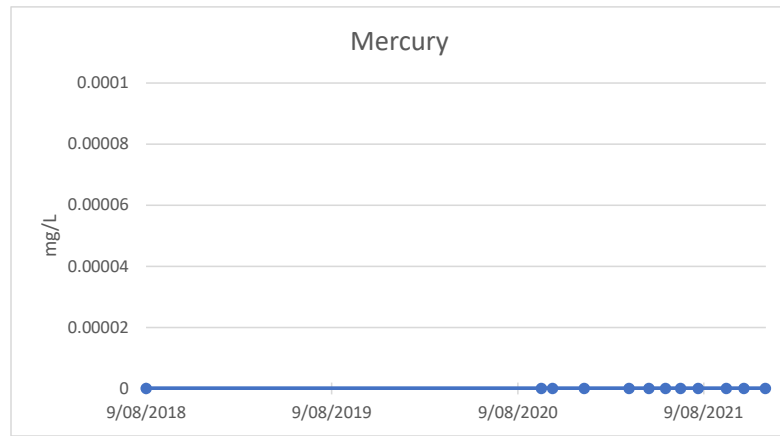


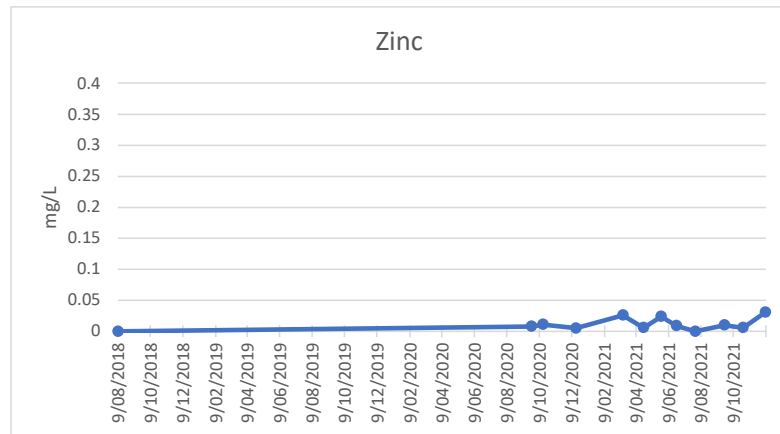


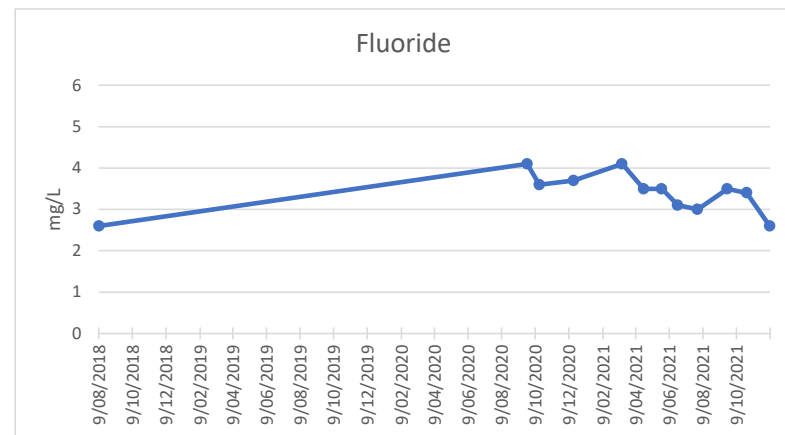
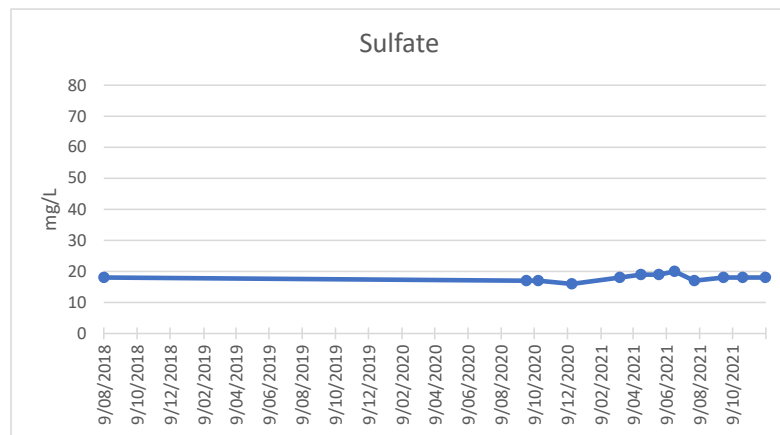
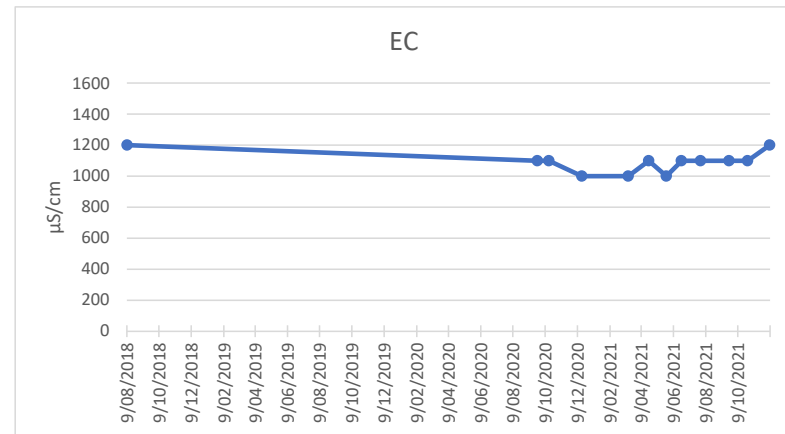
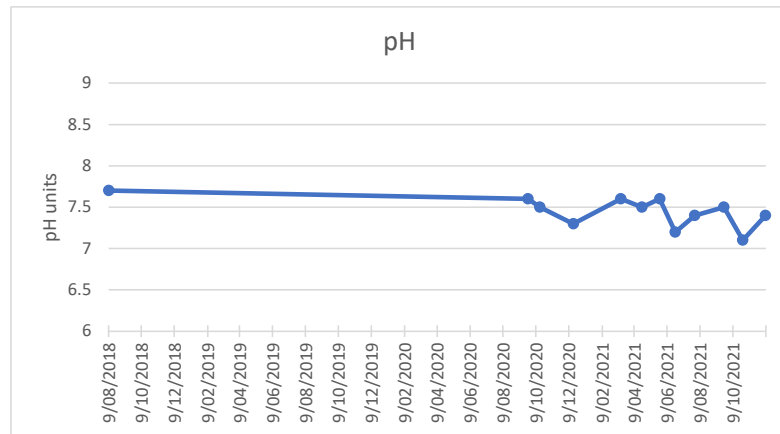


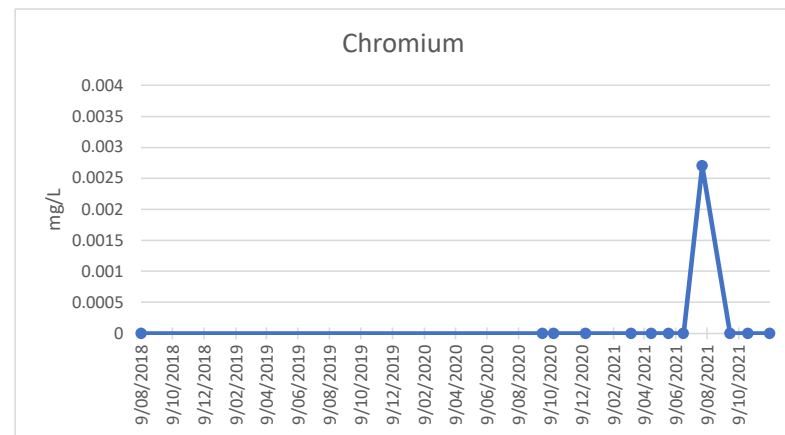
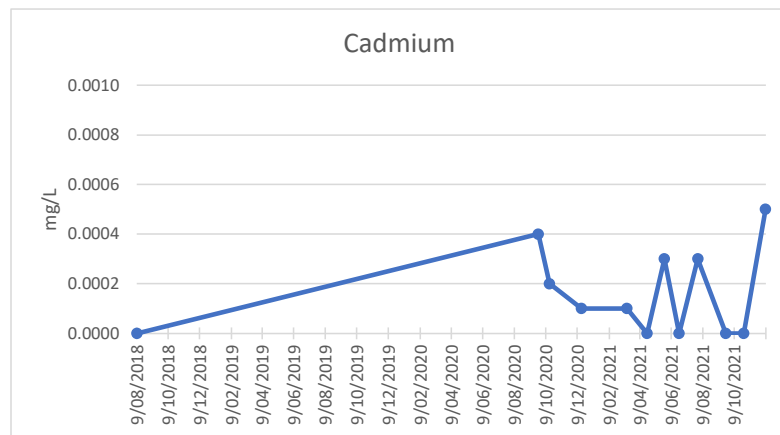
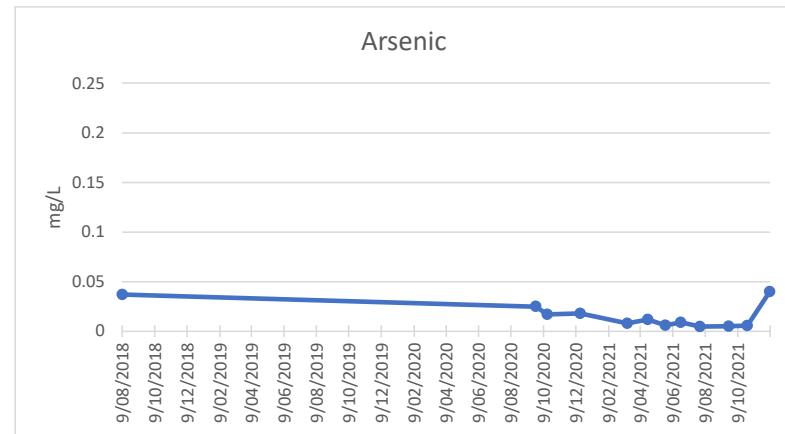
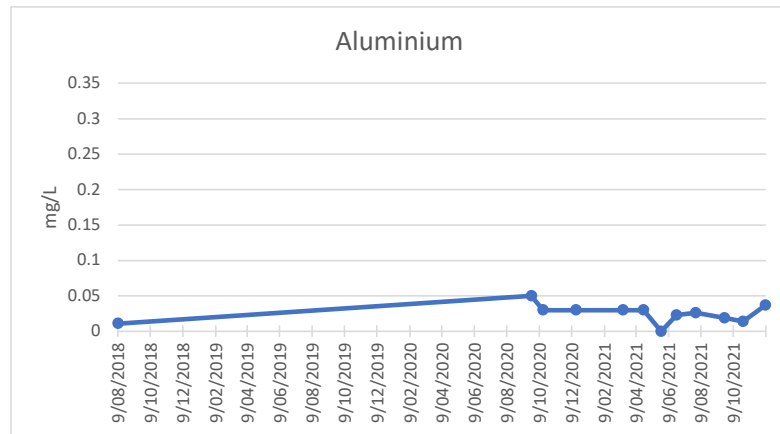


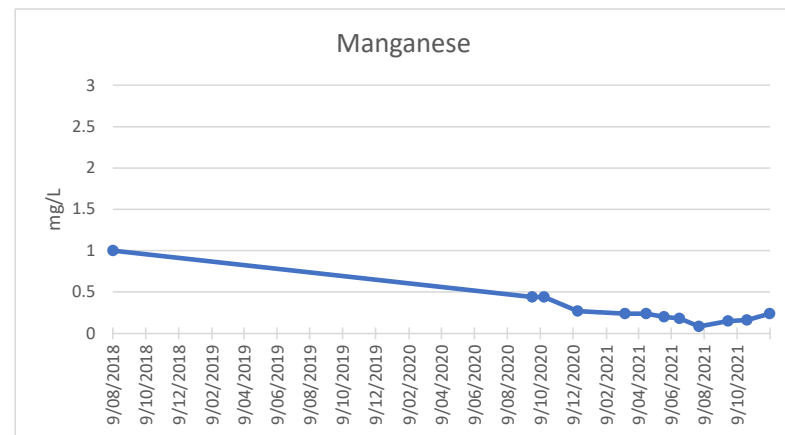
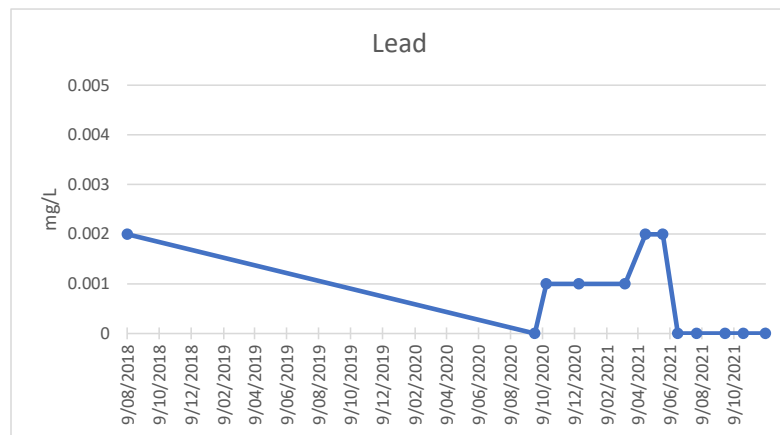
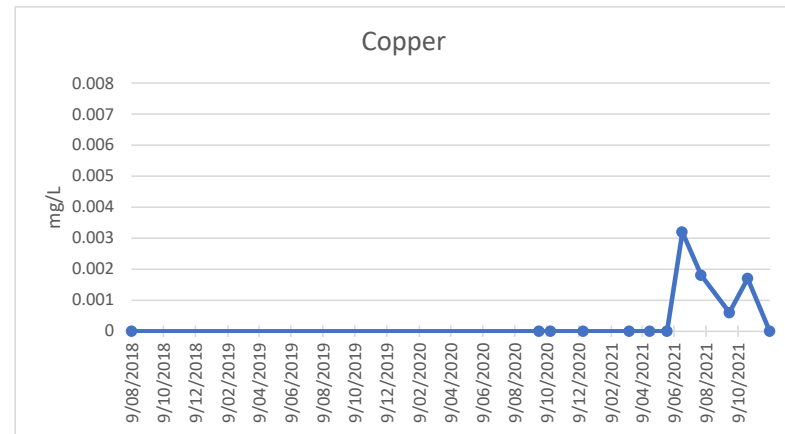
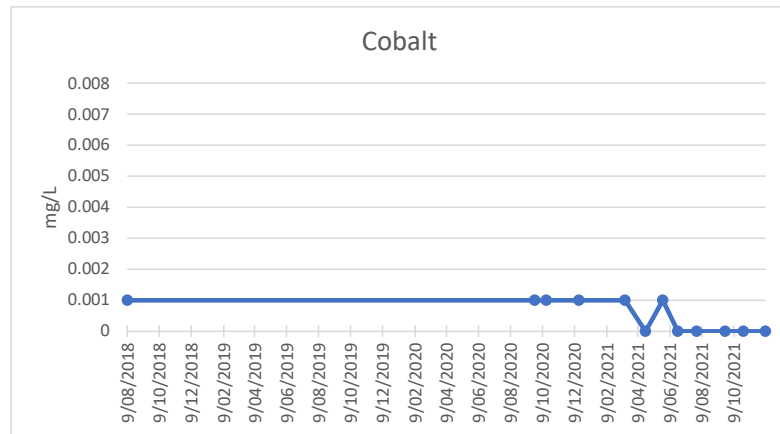


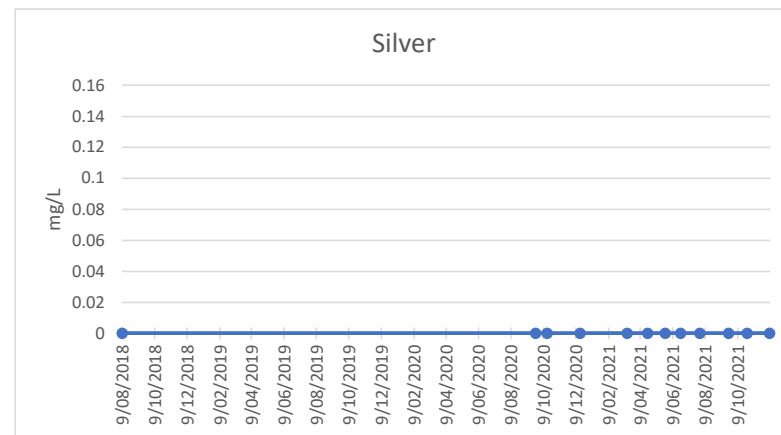
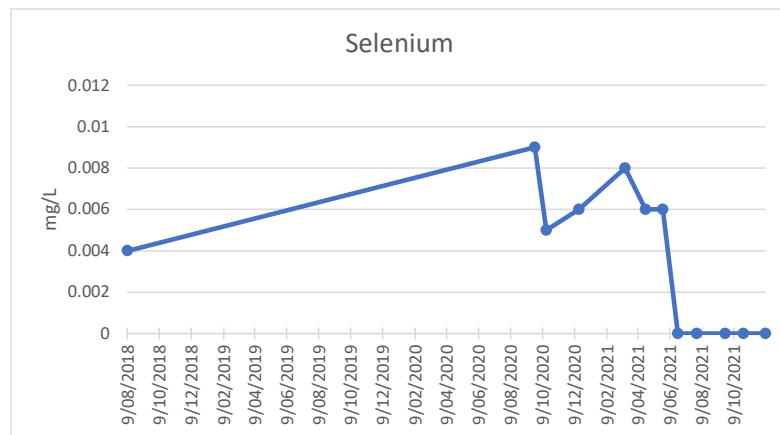
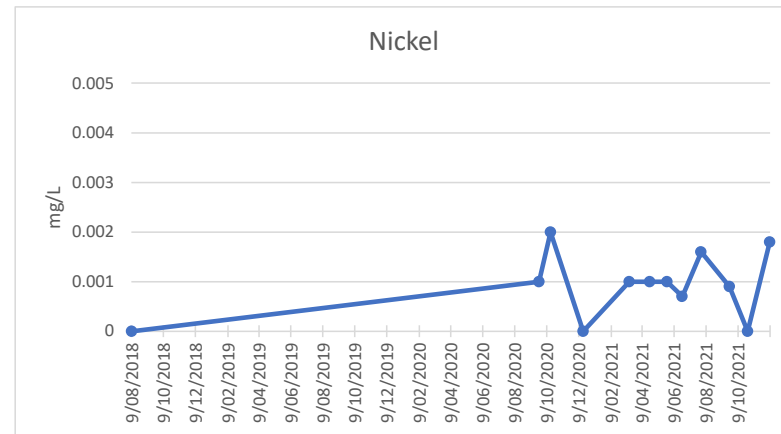
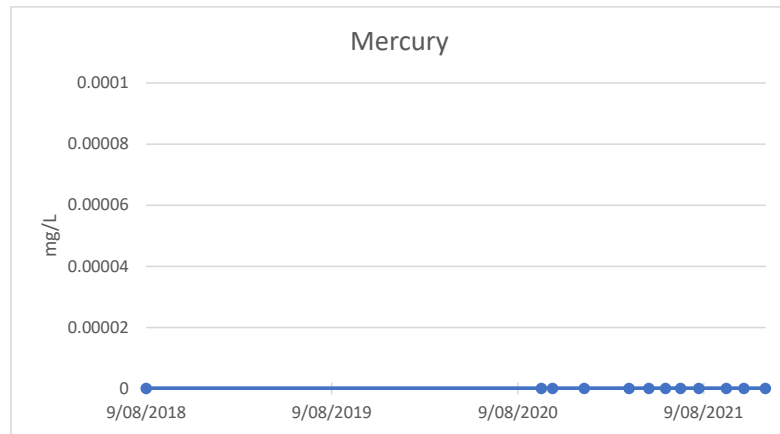


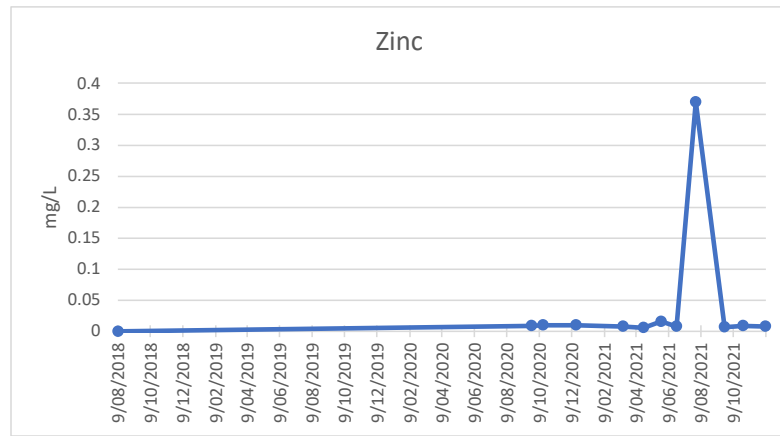


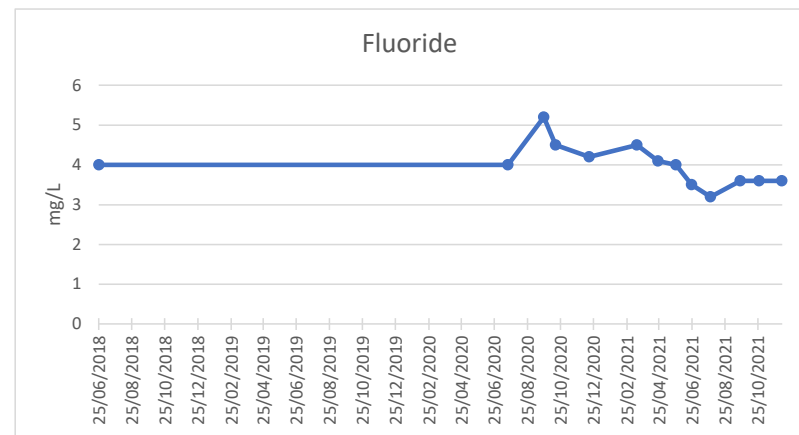
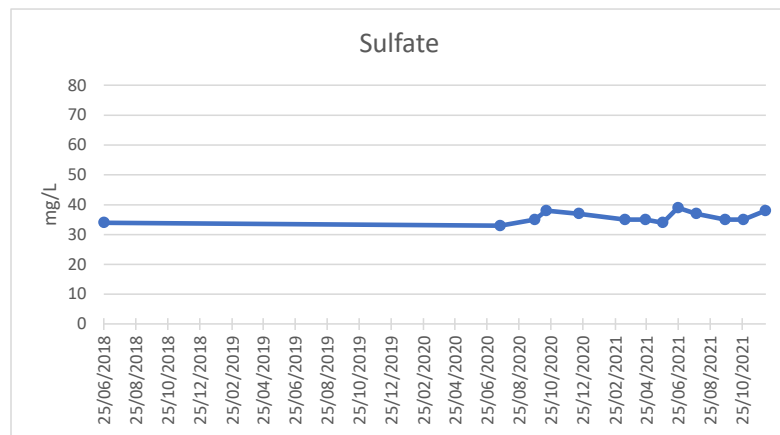
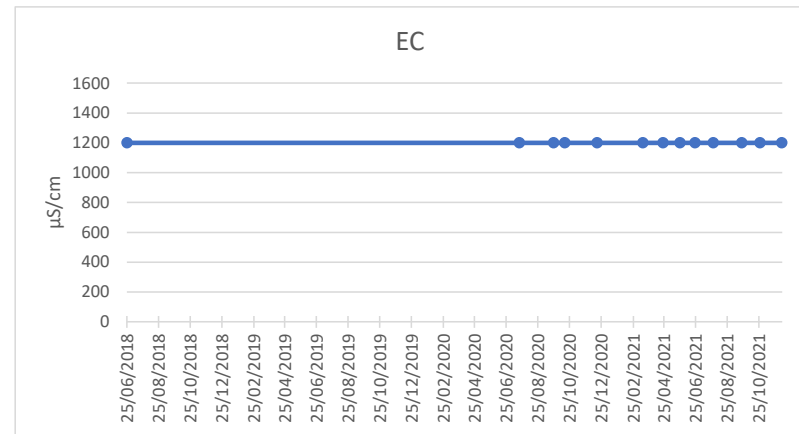
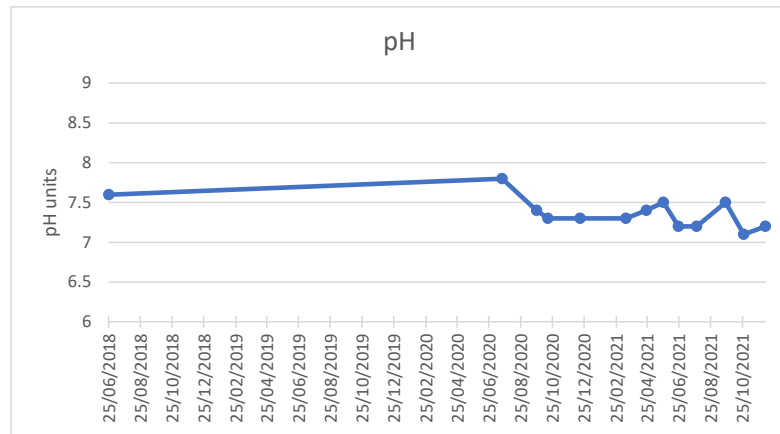


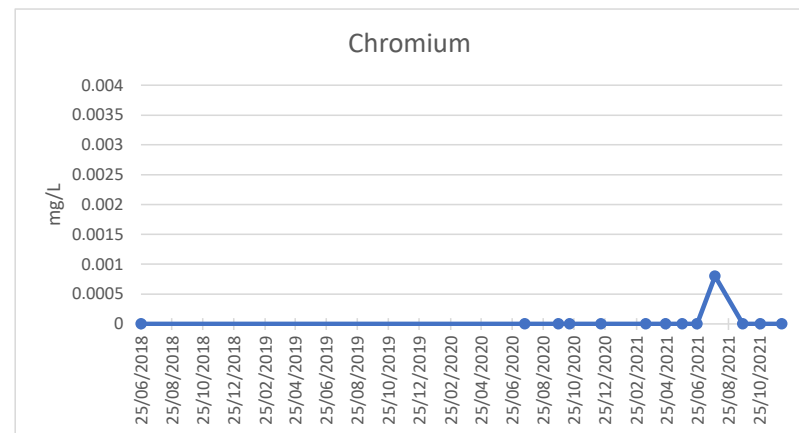
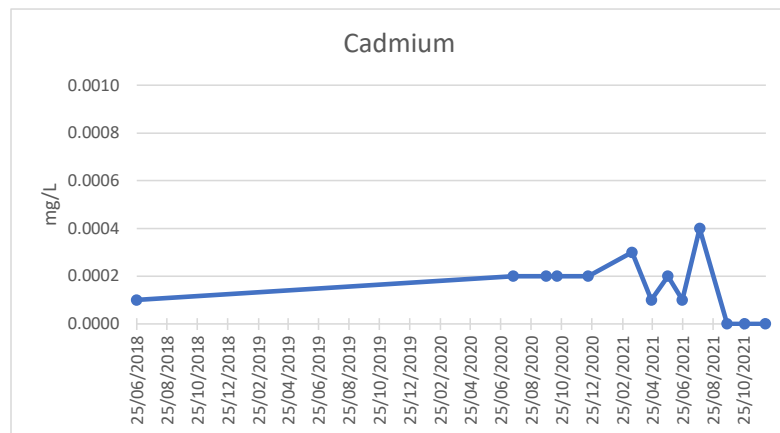
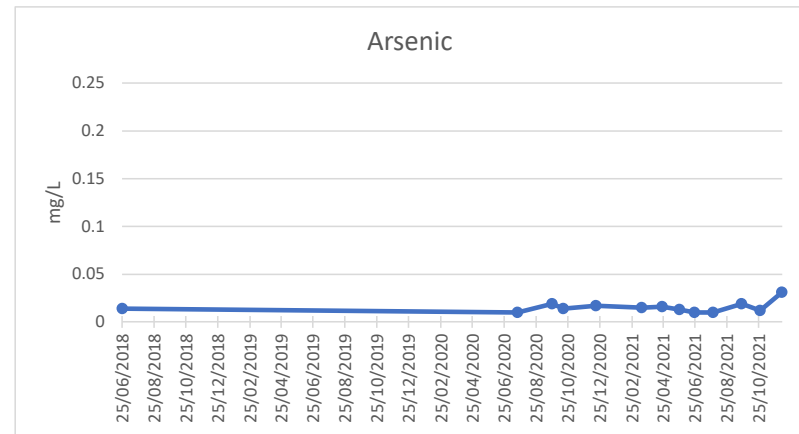
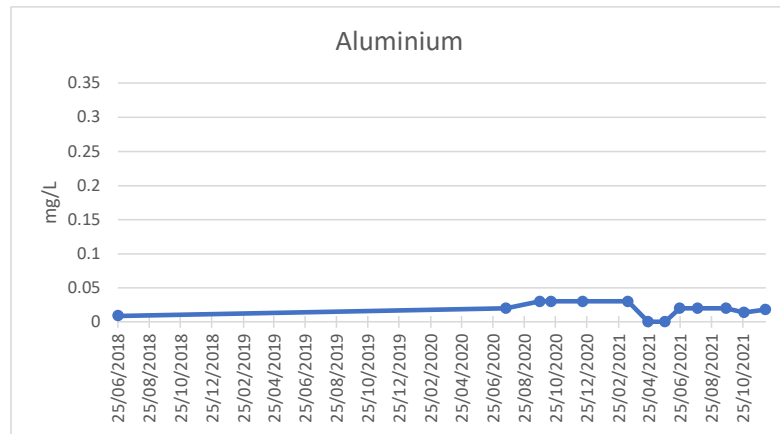


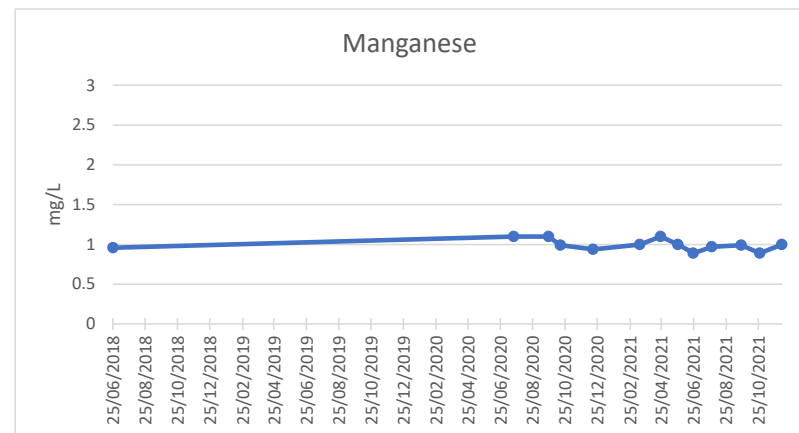
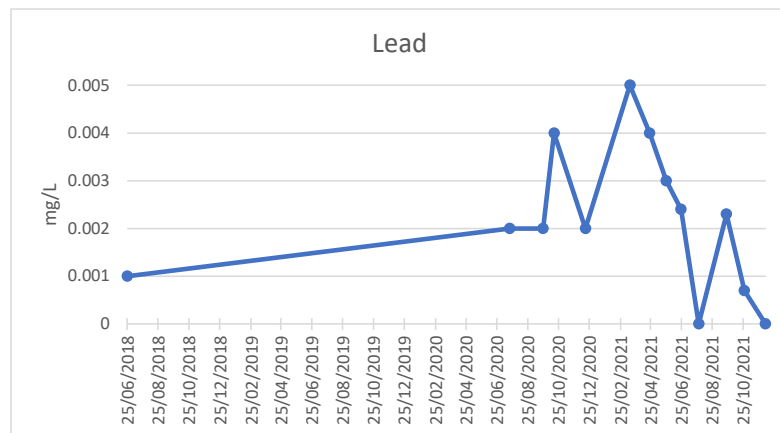
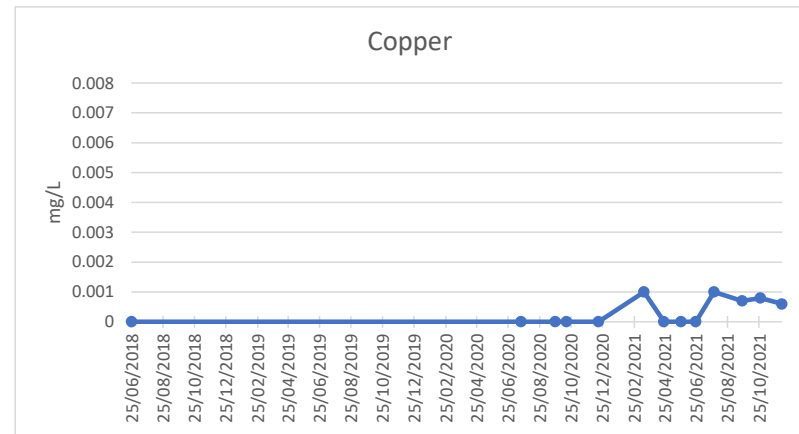
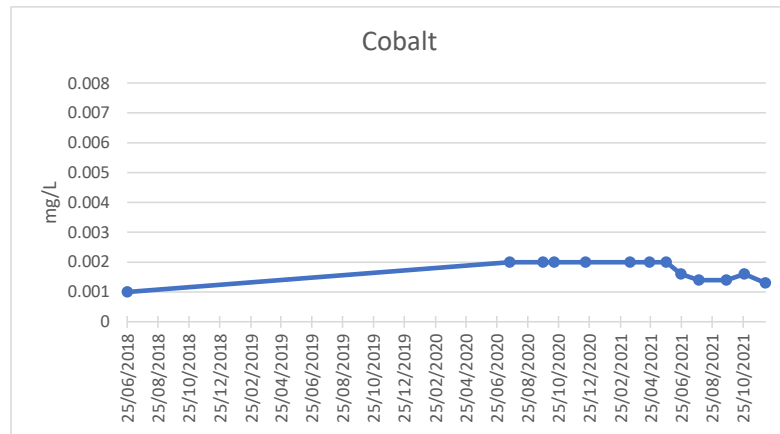


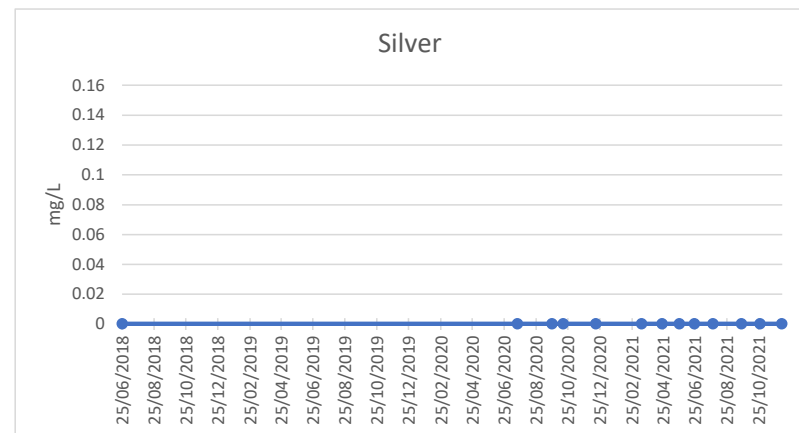
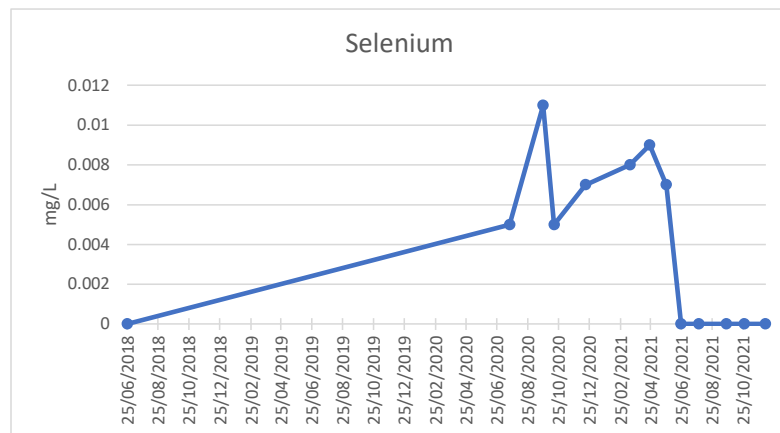
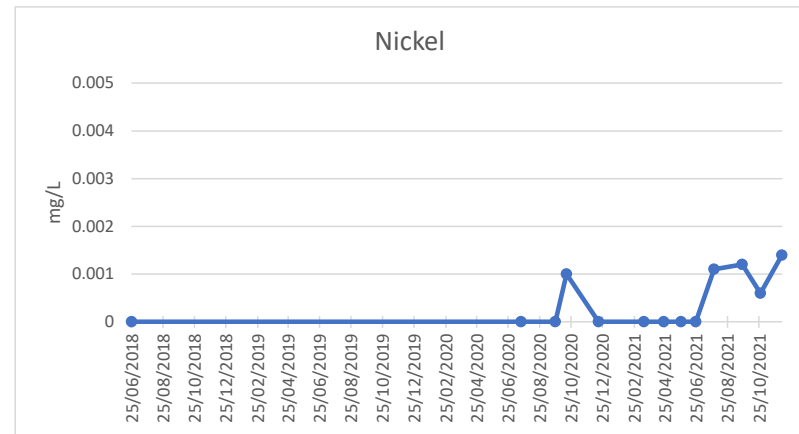
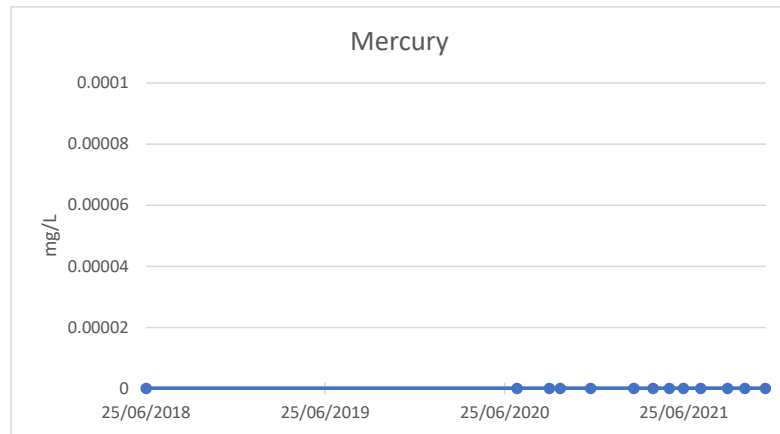


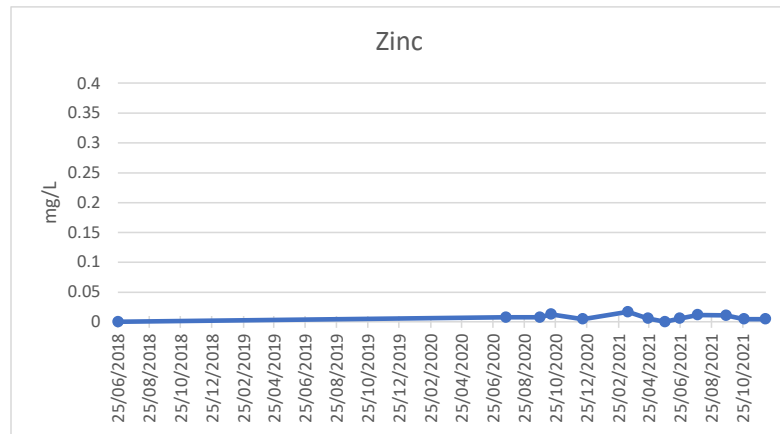


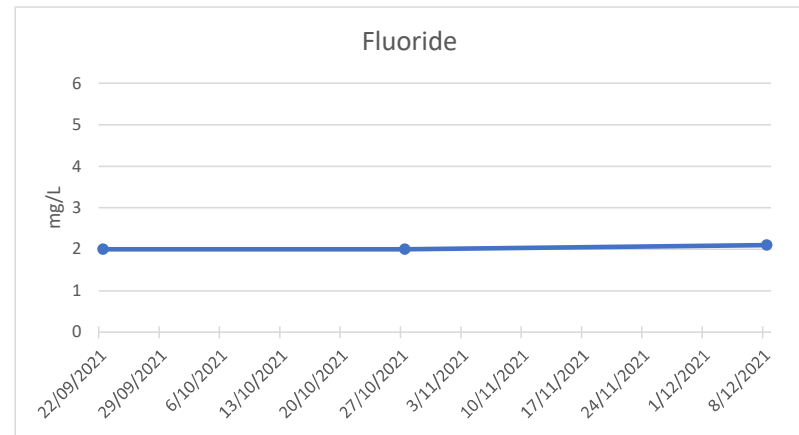
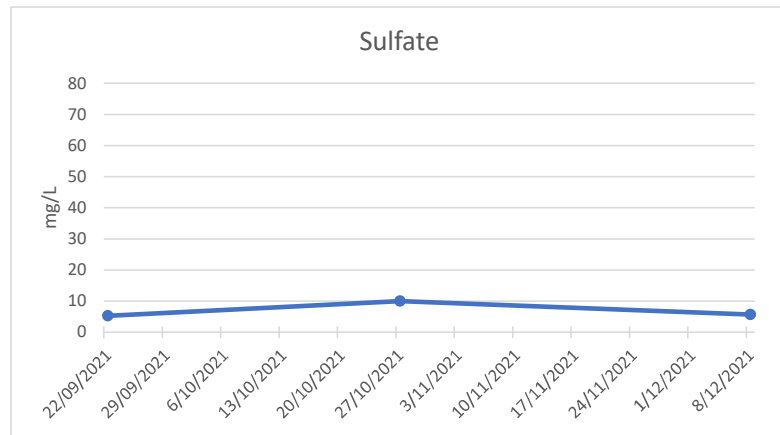
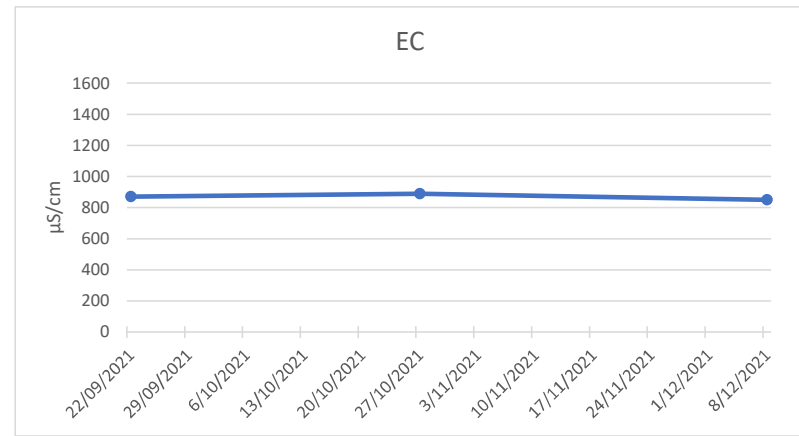
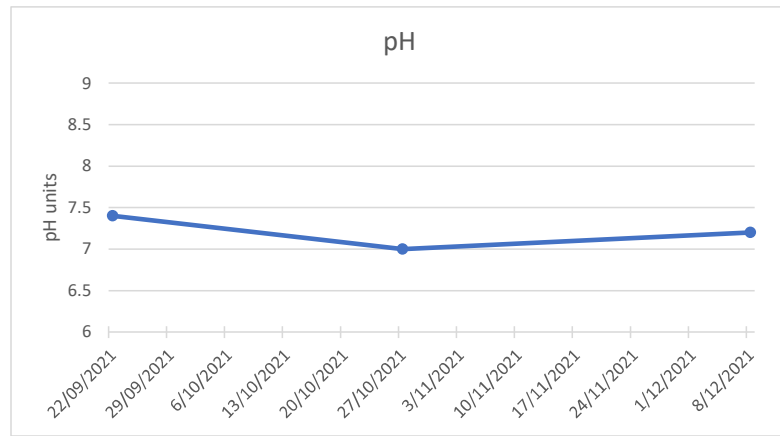


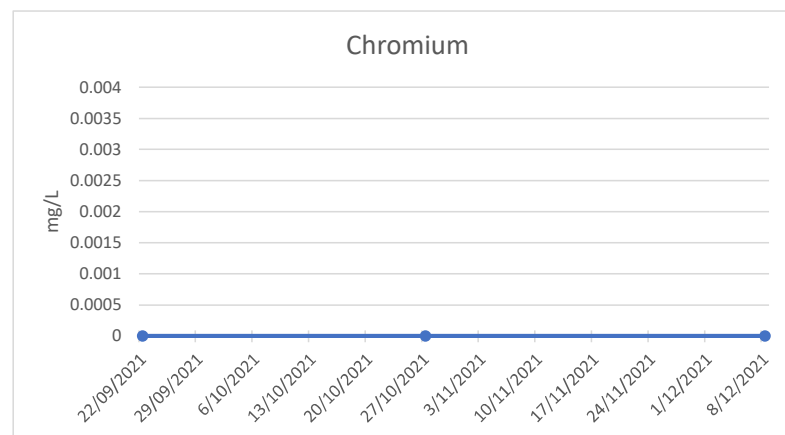
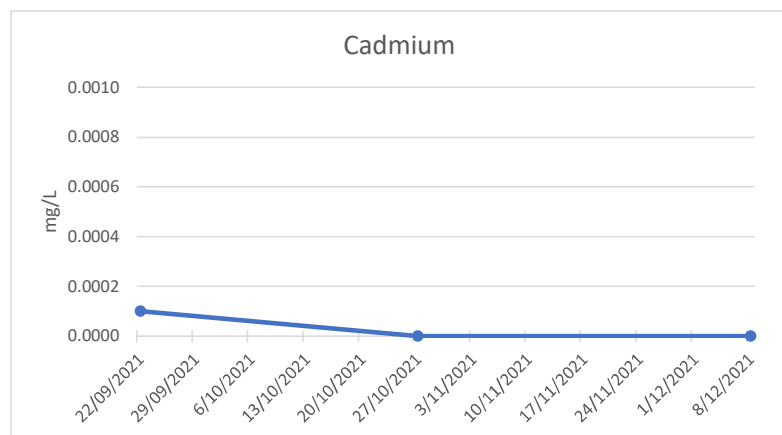
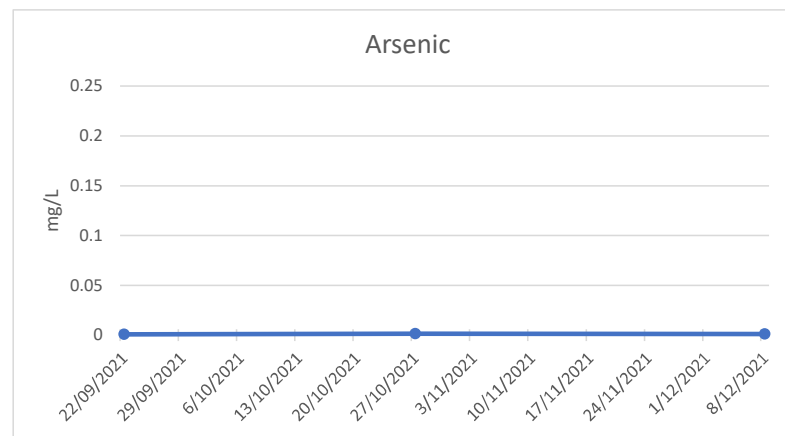
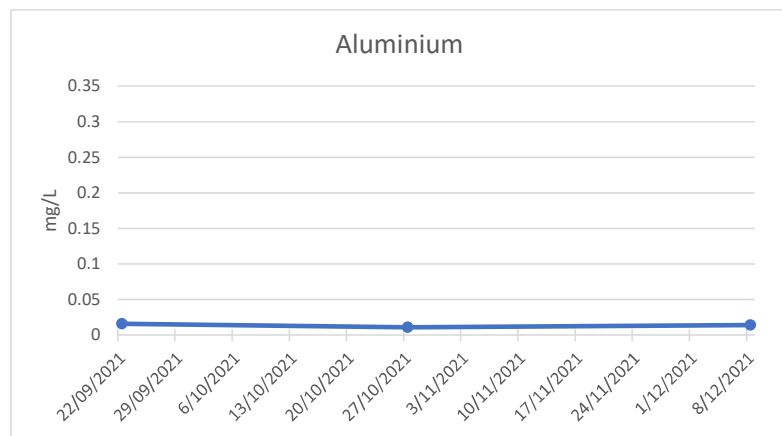


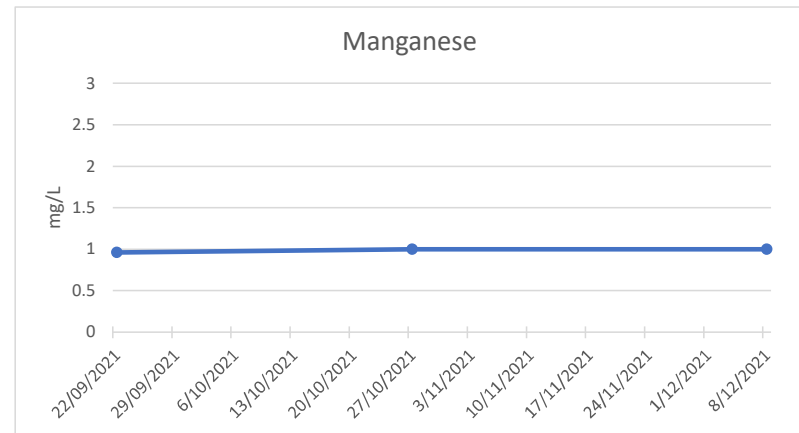
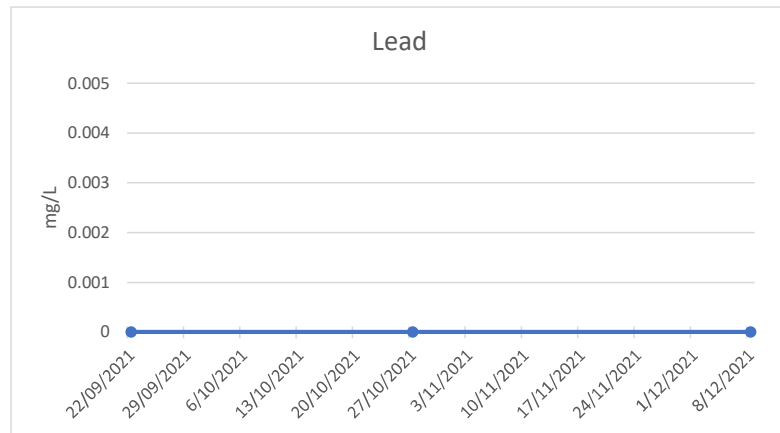
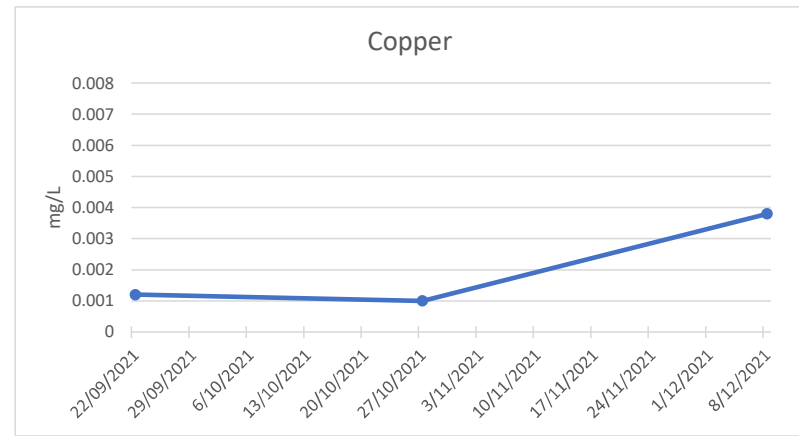
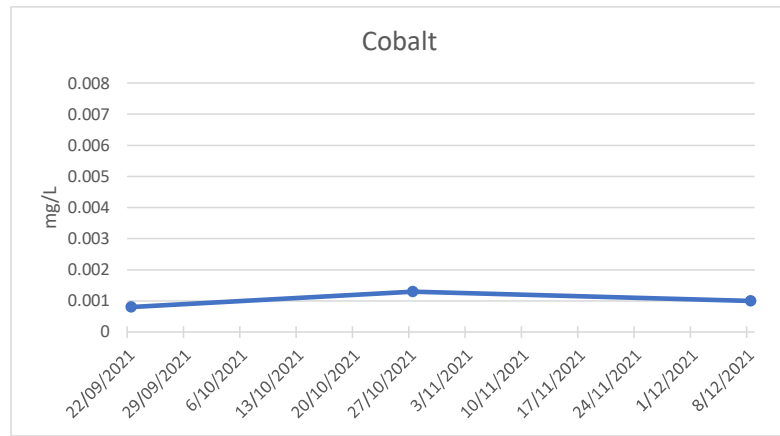


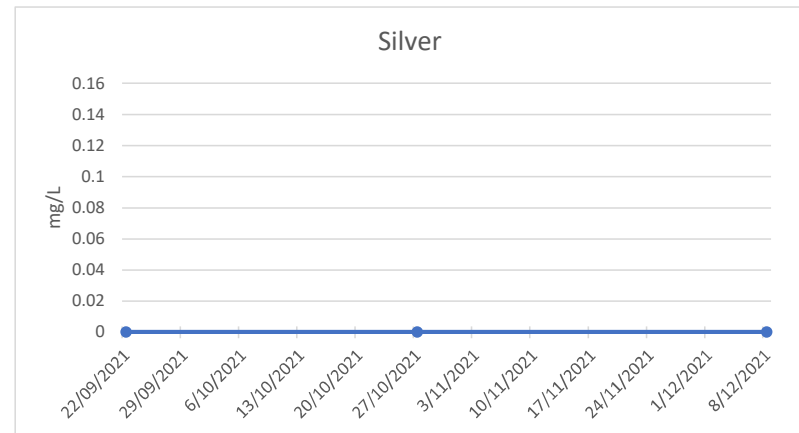
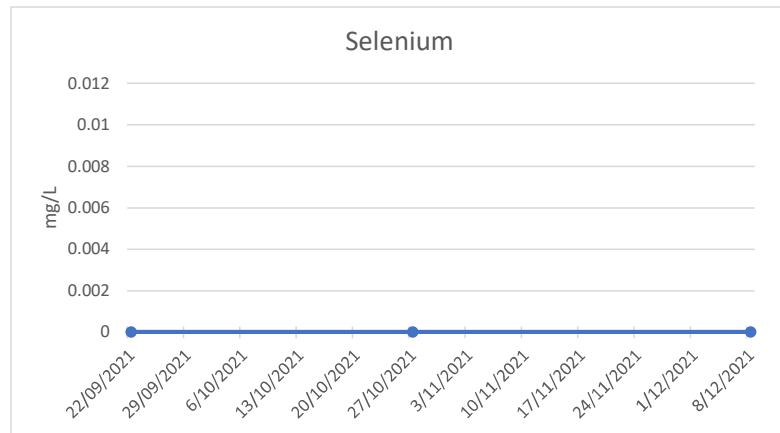
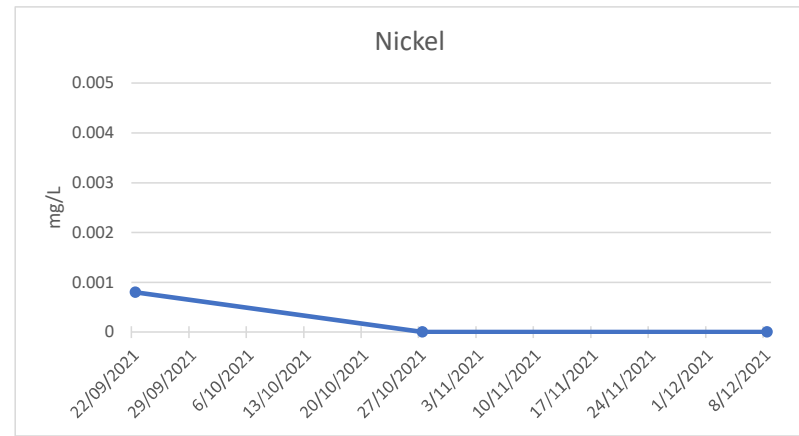
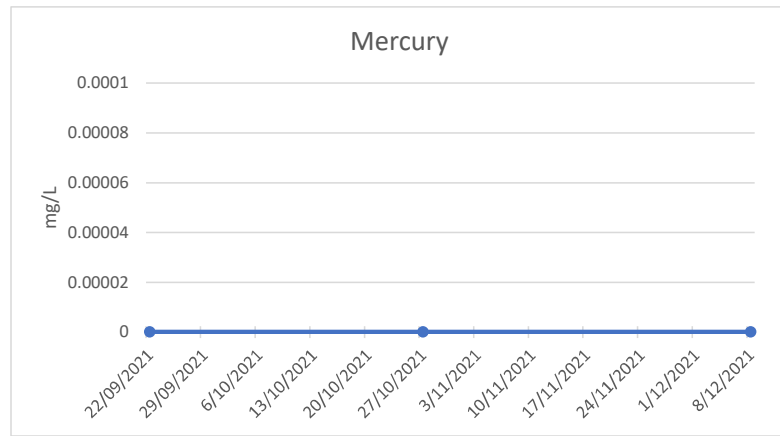


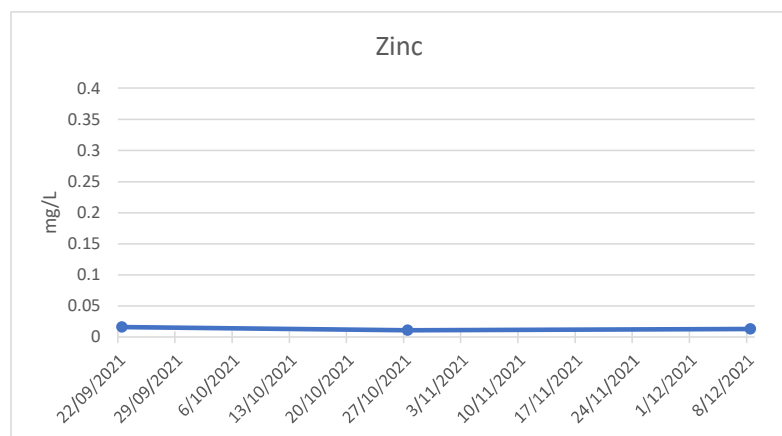








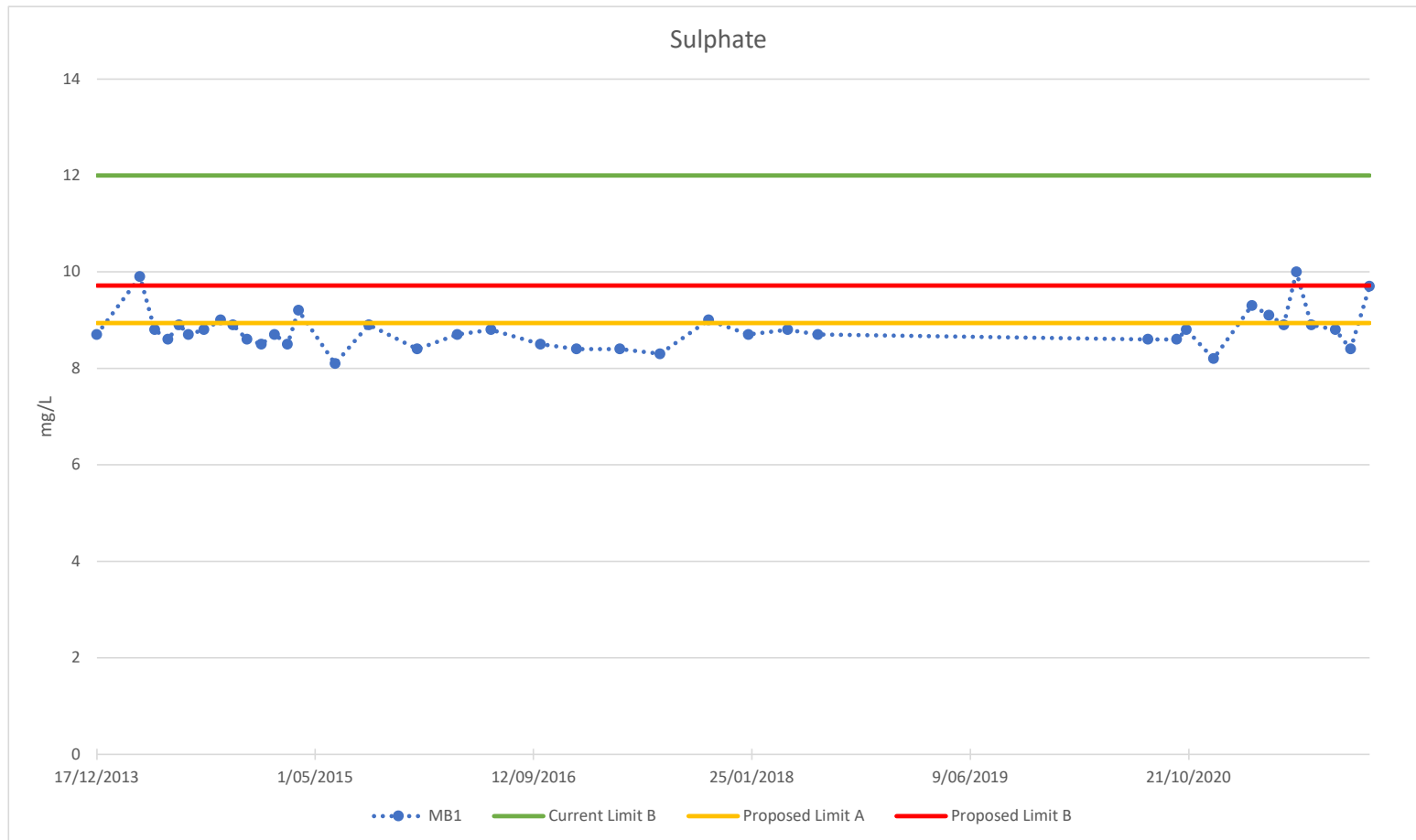




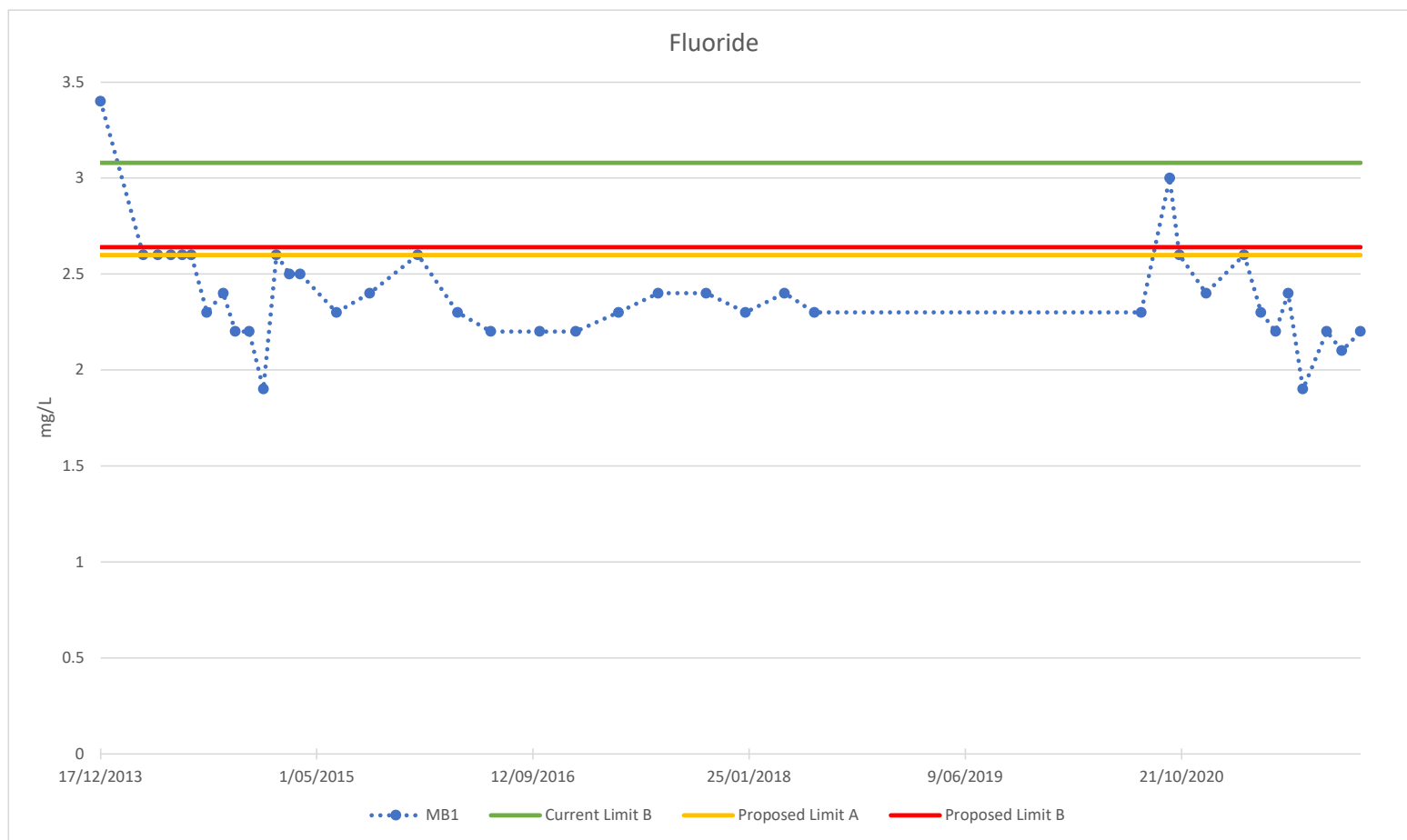
EA AMENDMENT APPLICATION SUPPORTING REPORT
MGT Minerals Pty Ltd

**Appendix 5 Hodgkinson Formation Aquifer – Historical Results and proposed new Site-Specific
Guideline**

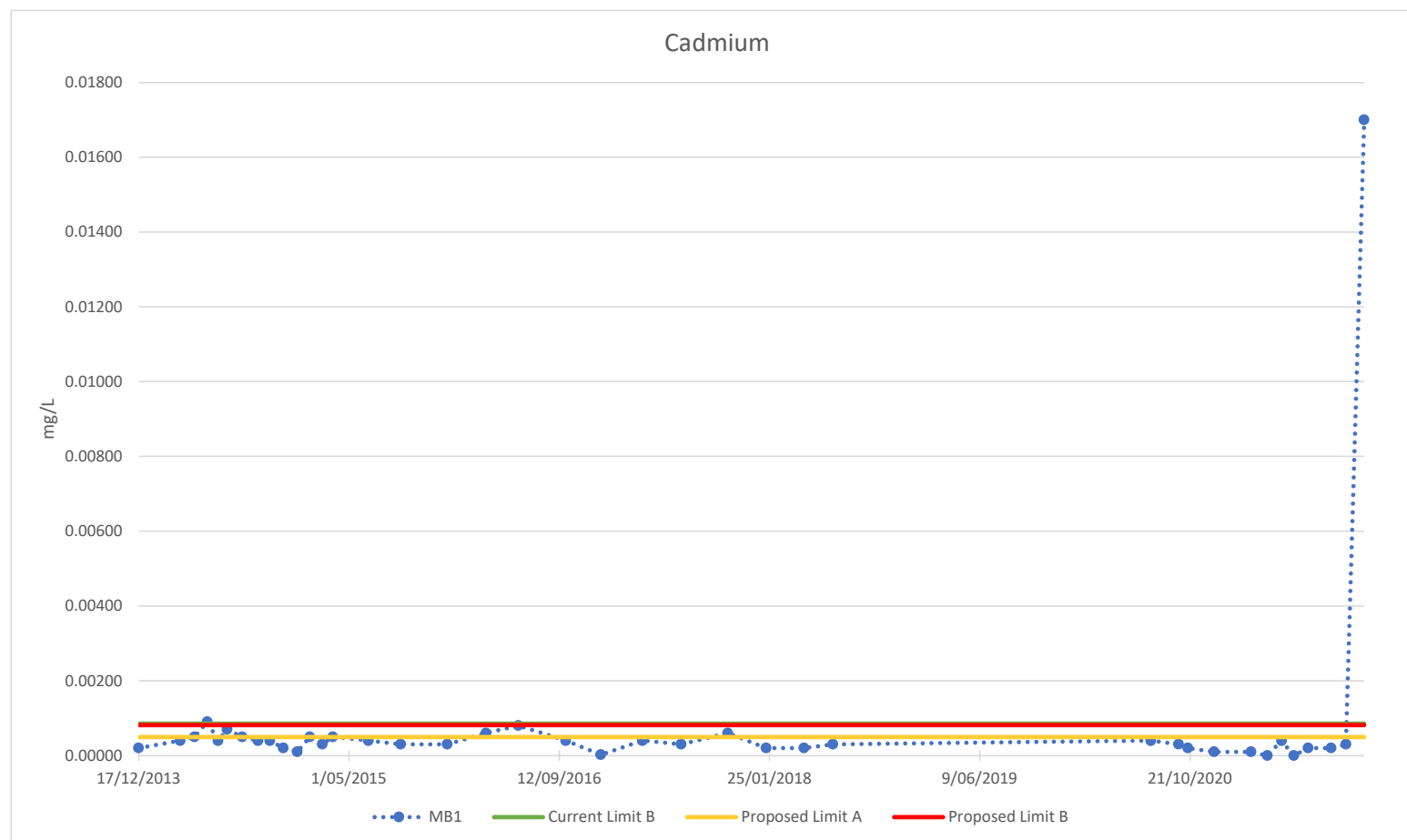
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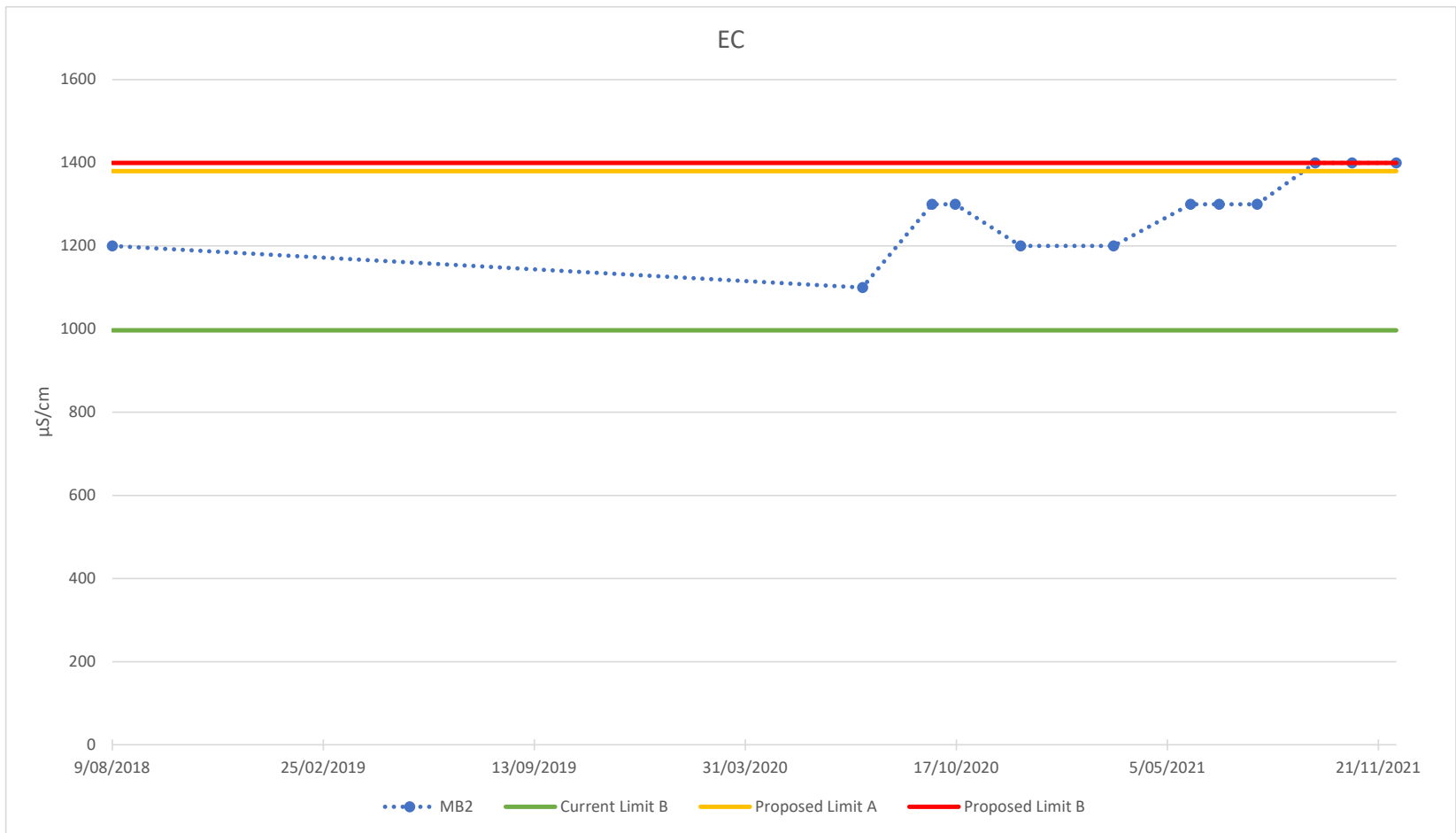
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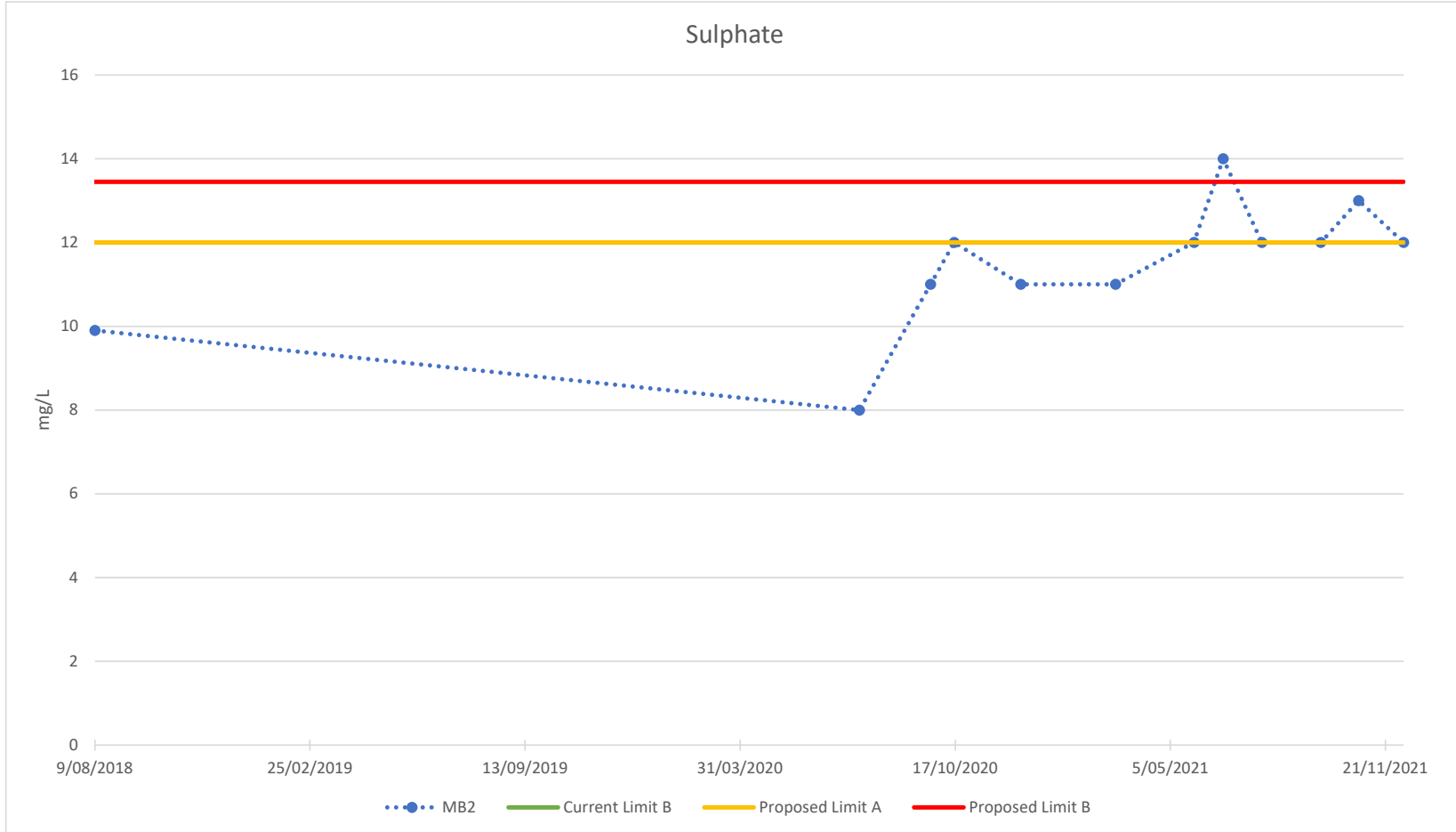
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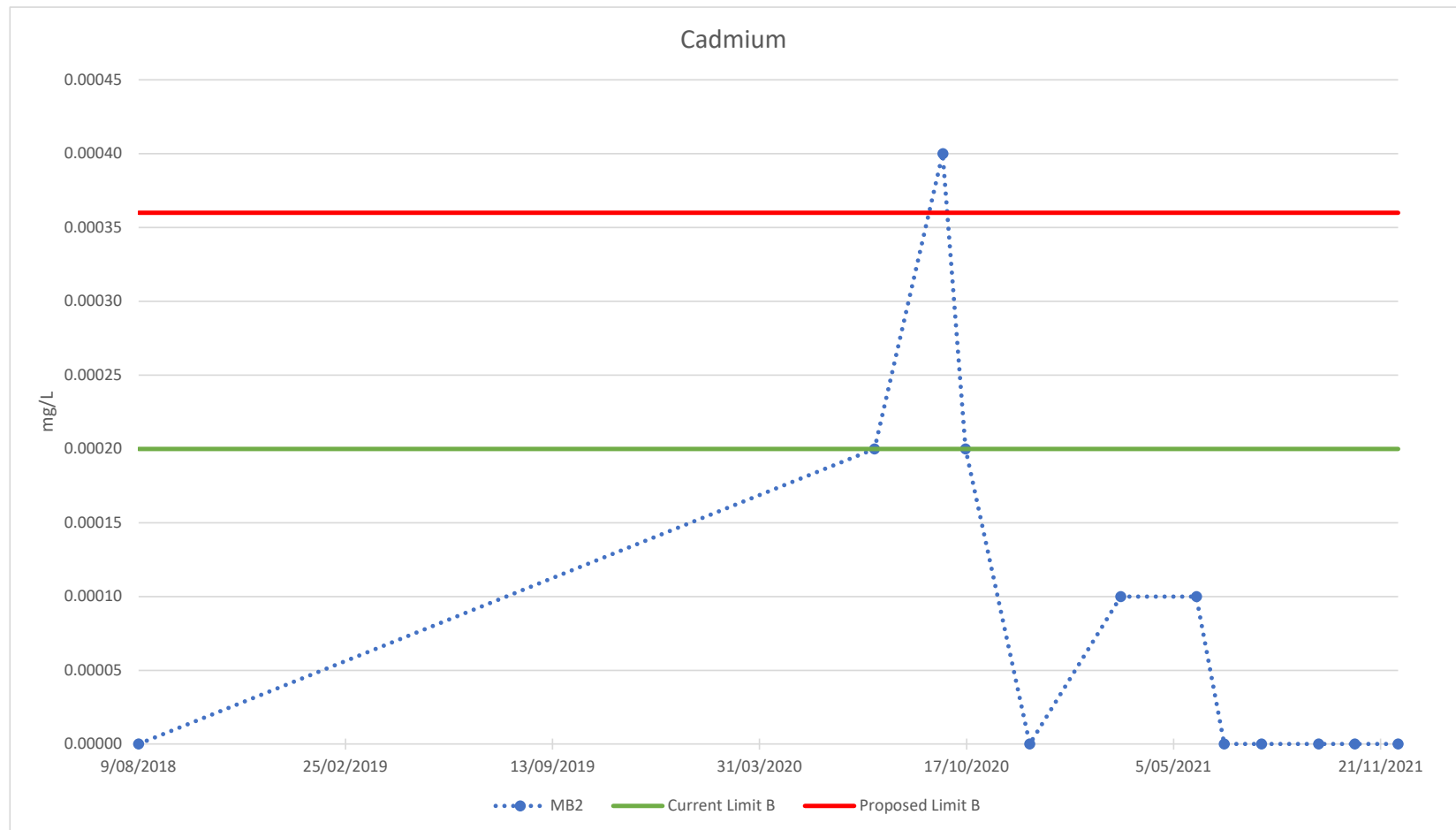
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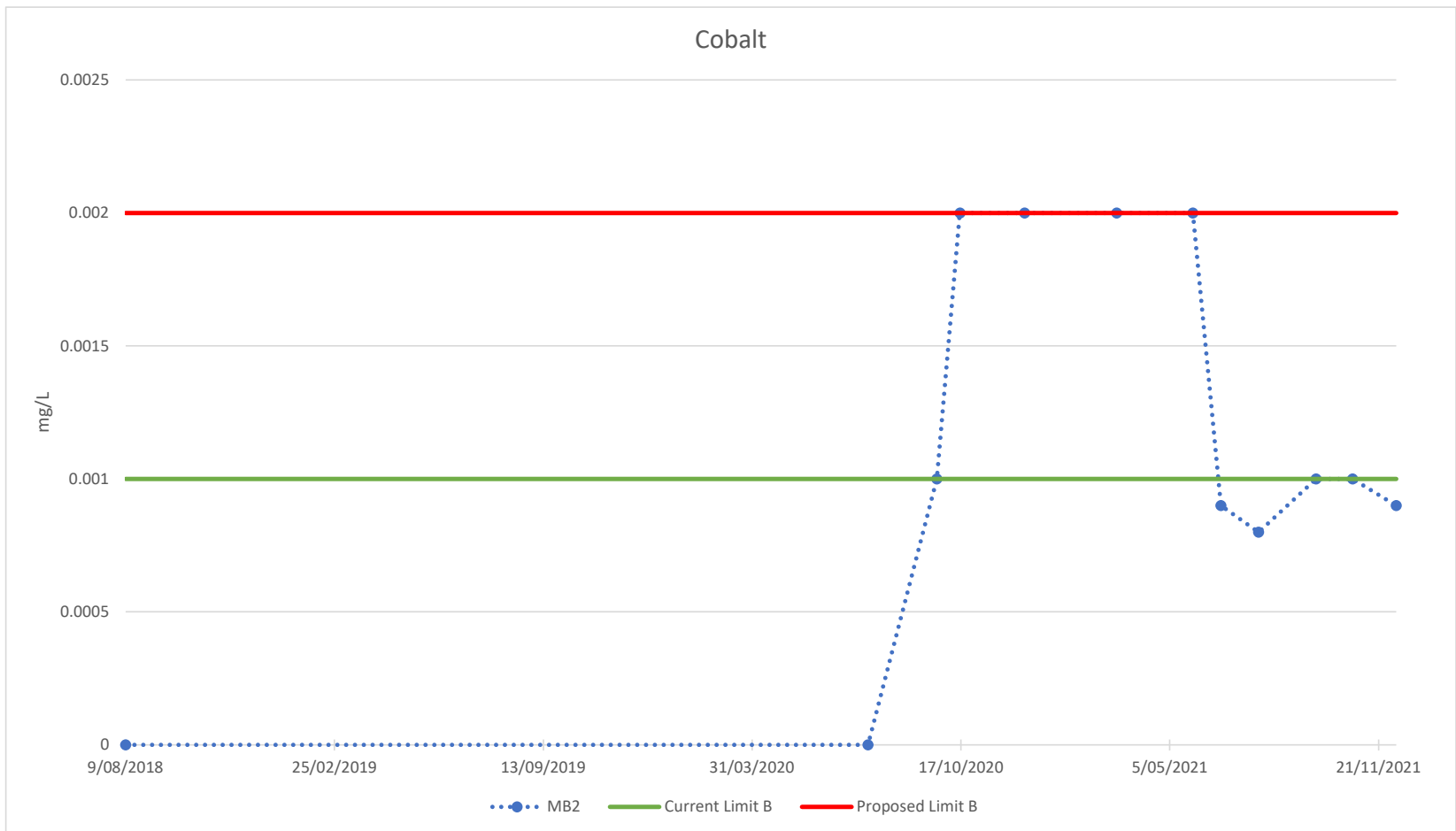
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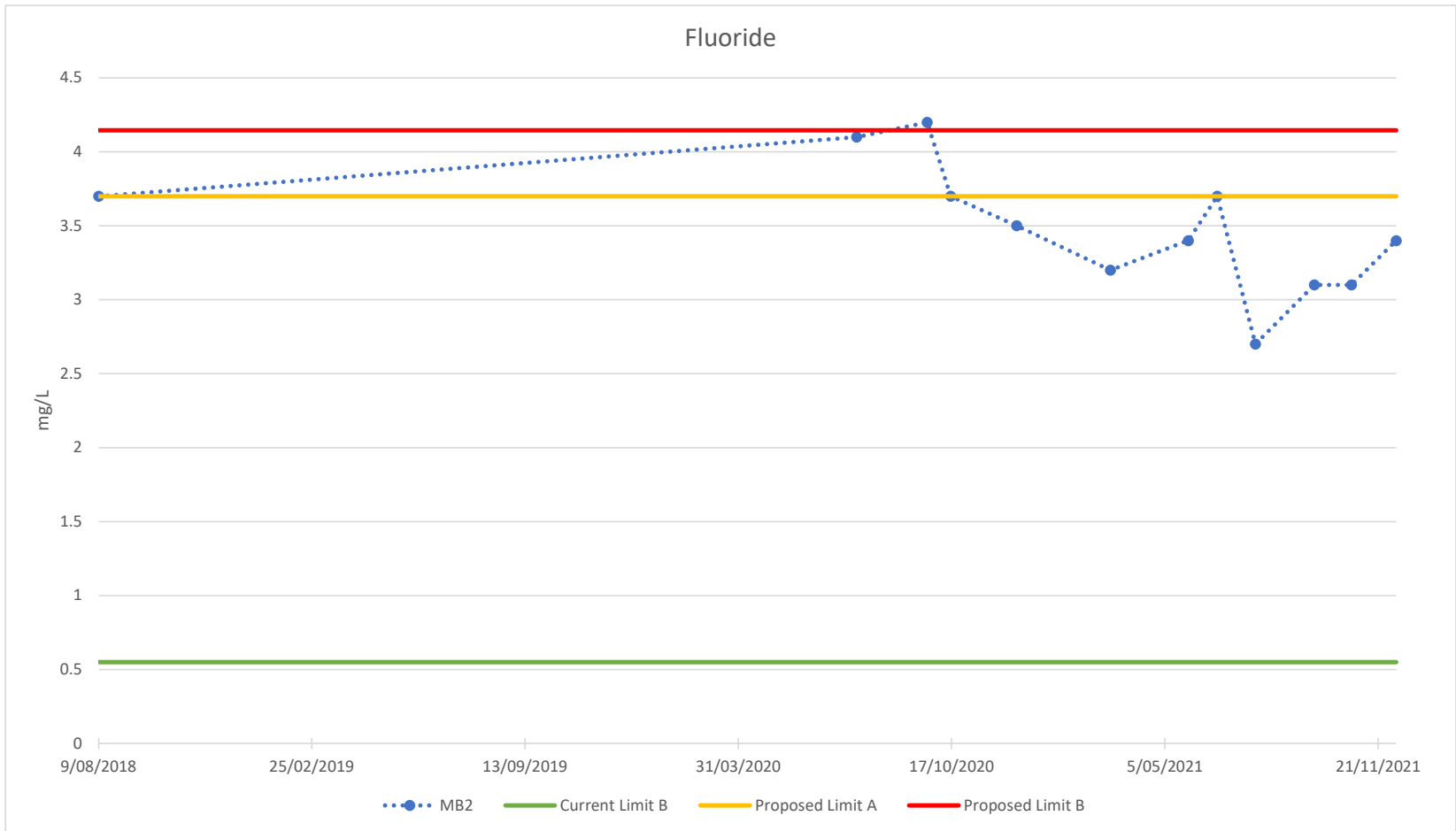


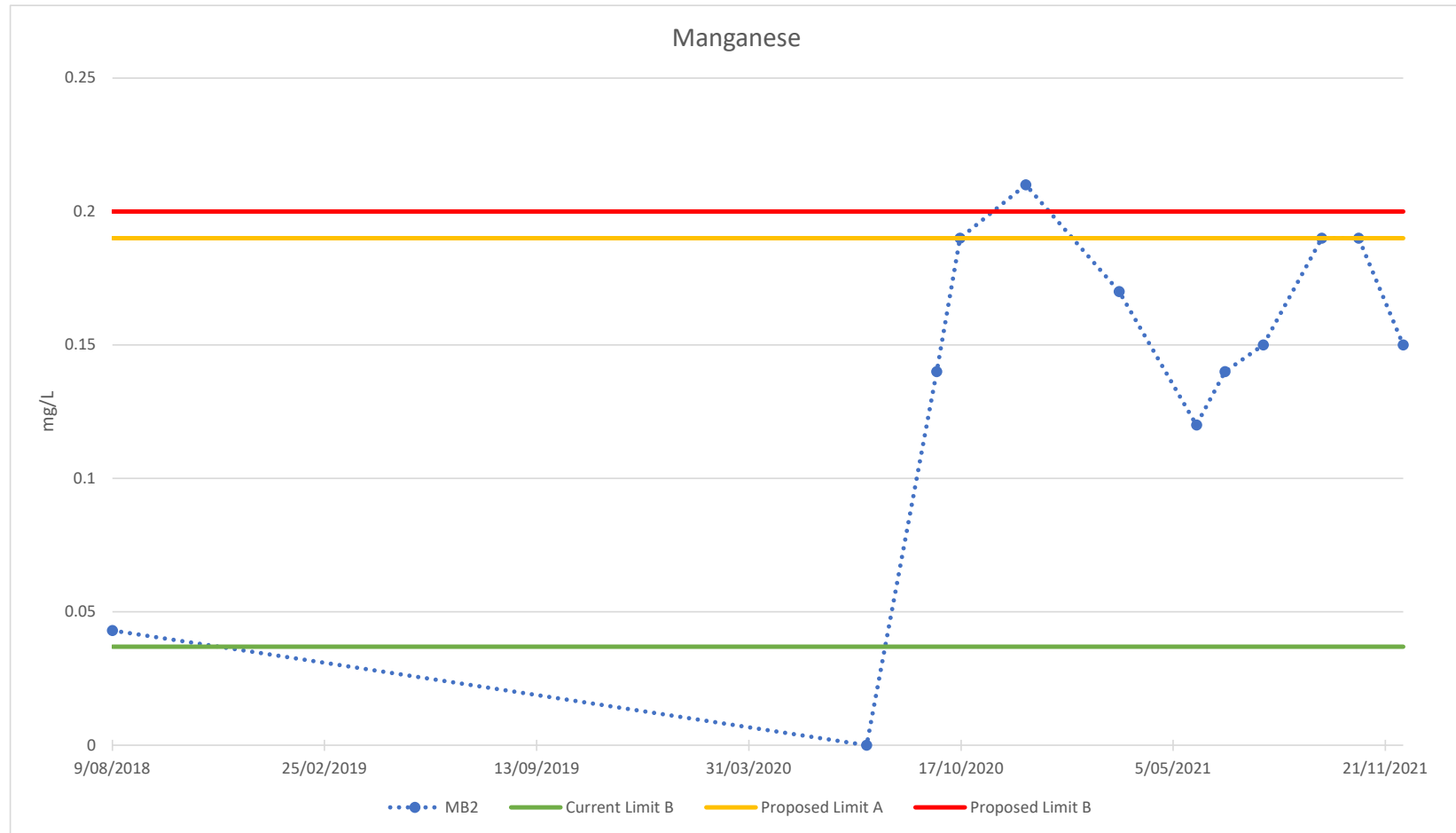
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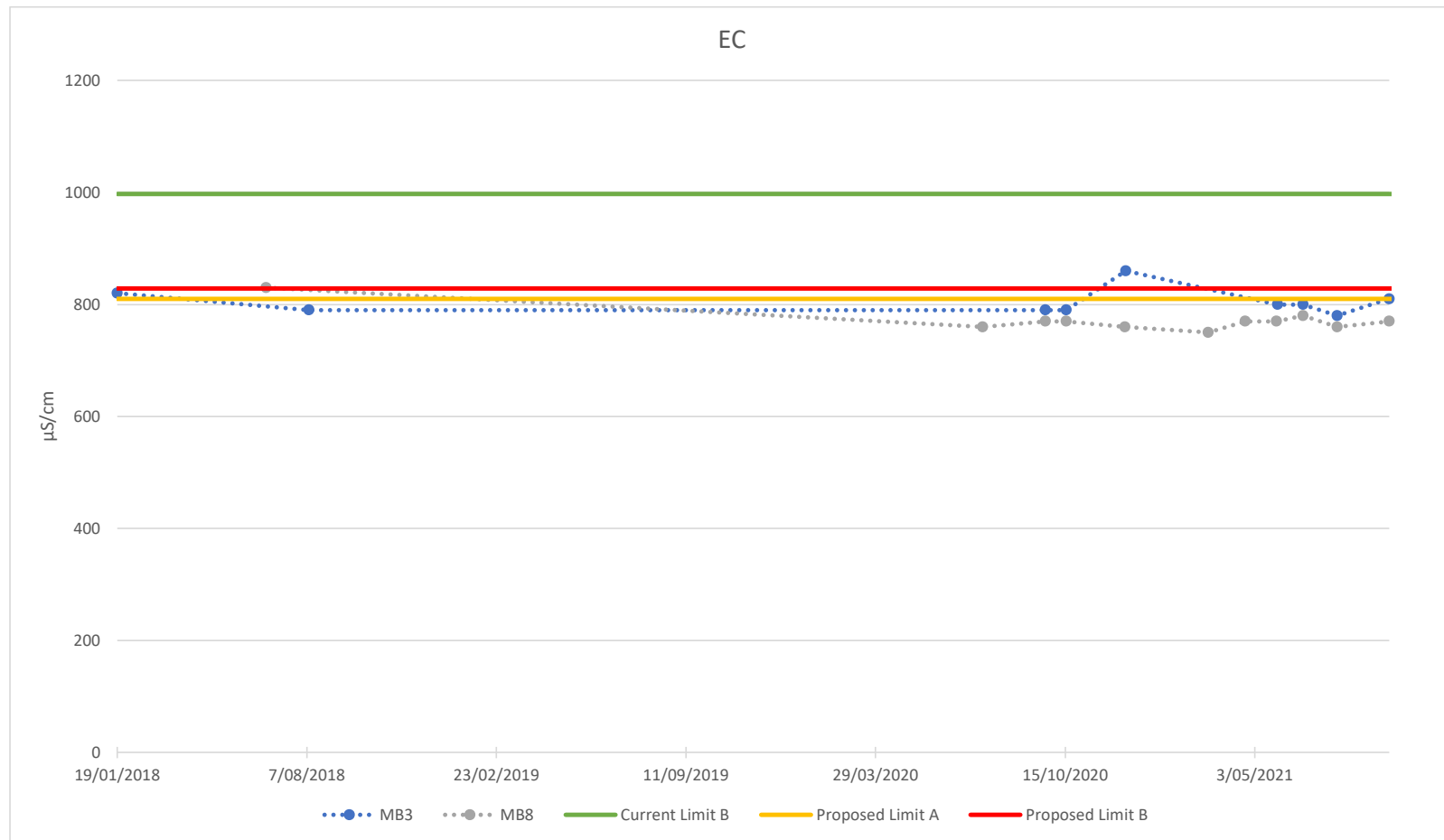
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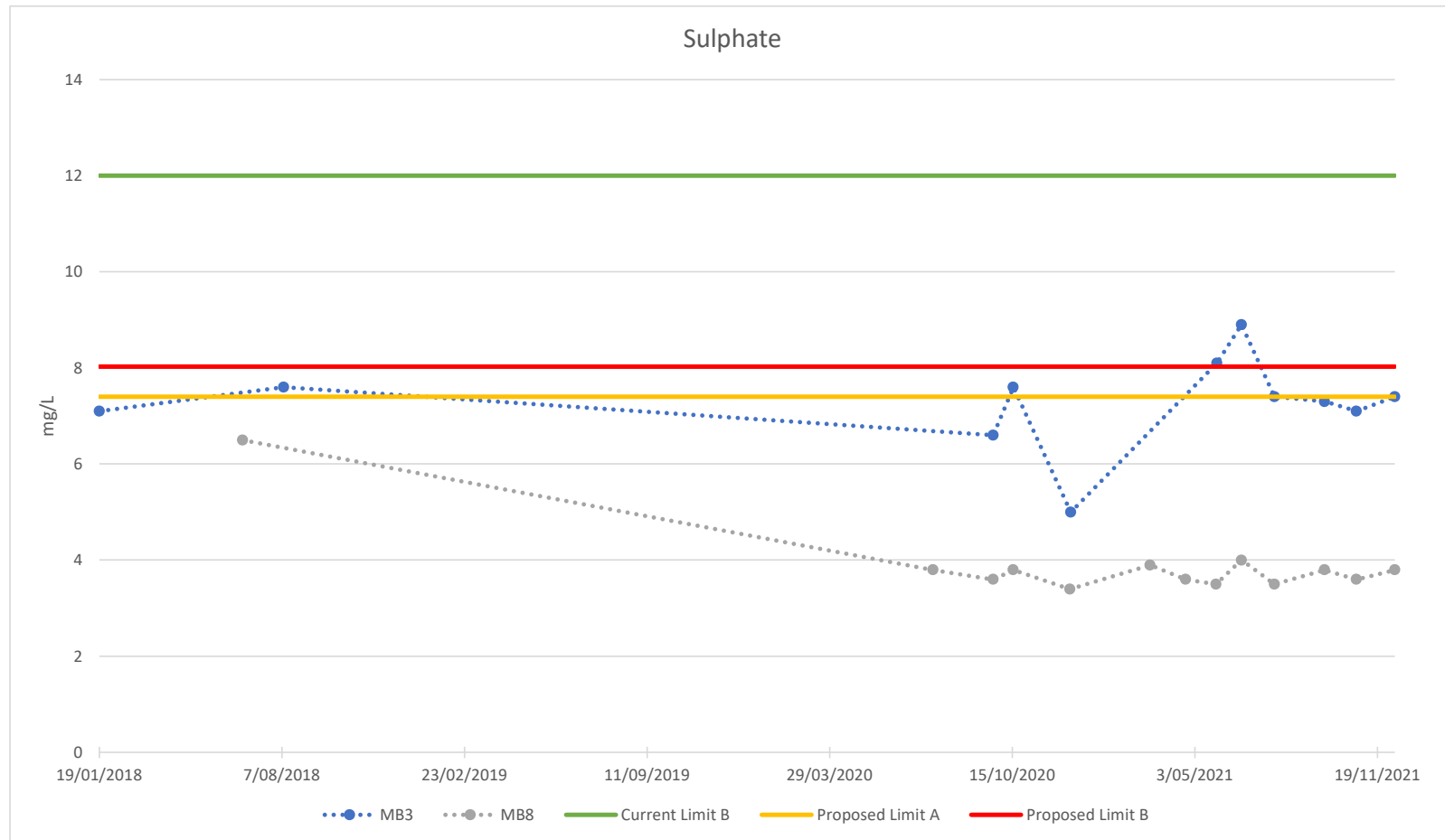




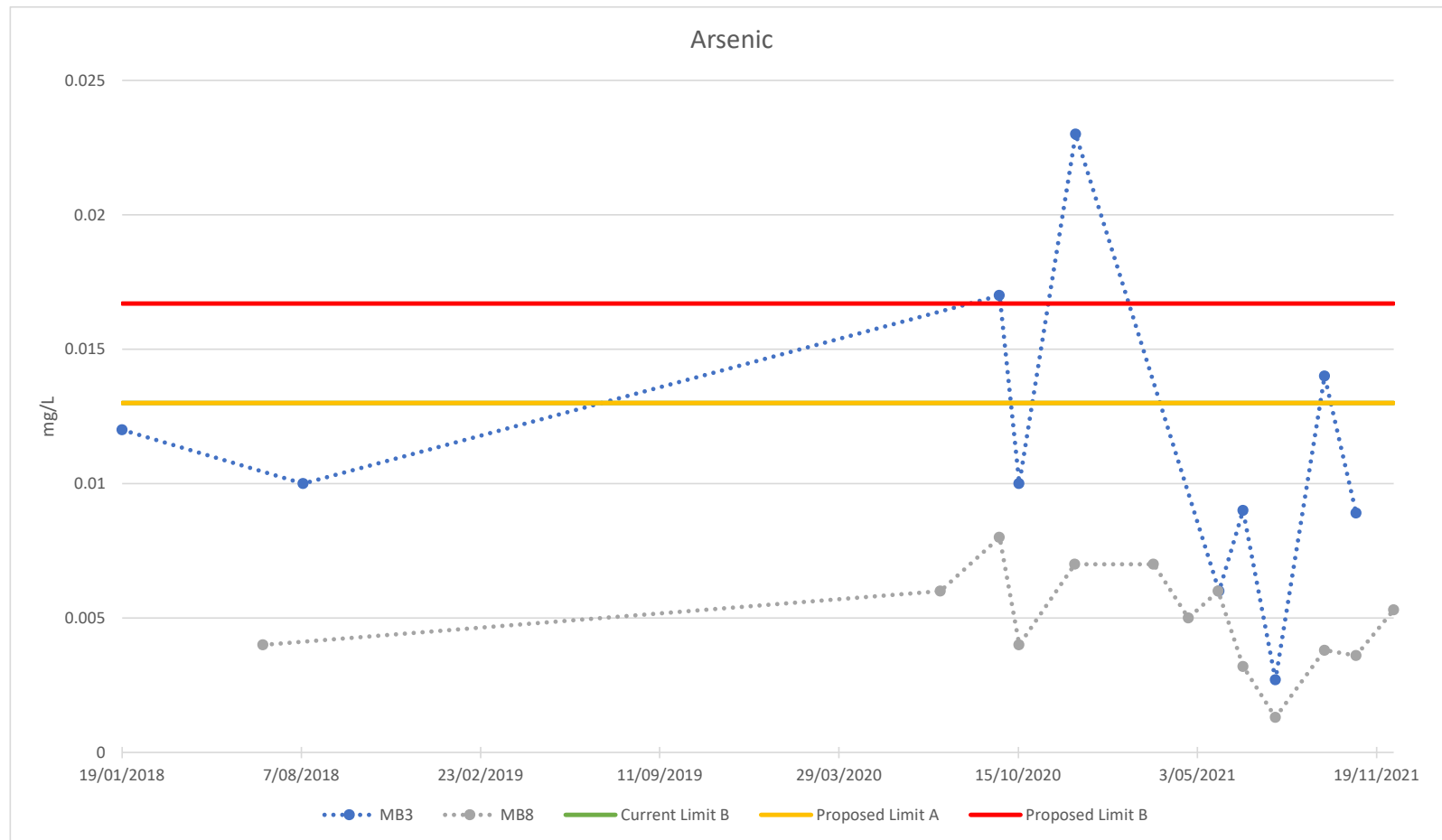
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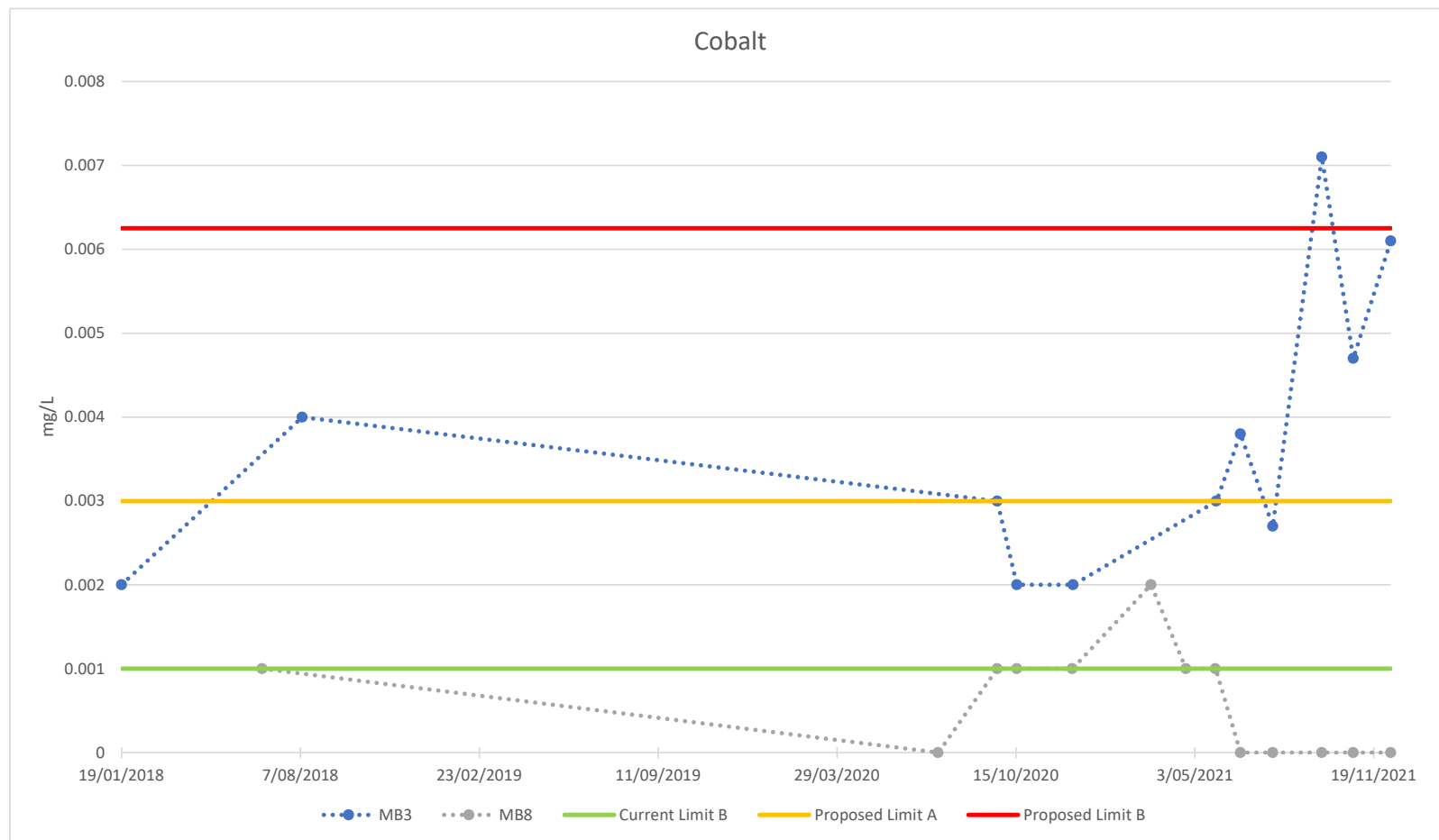
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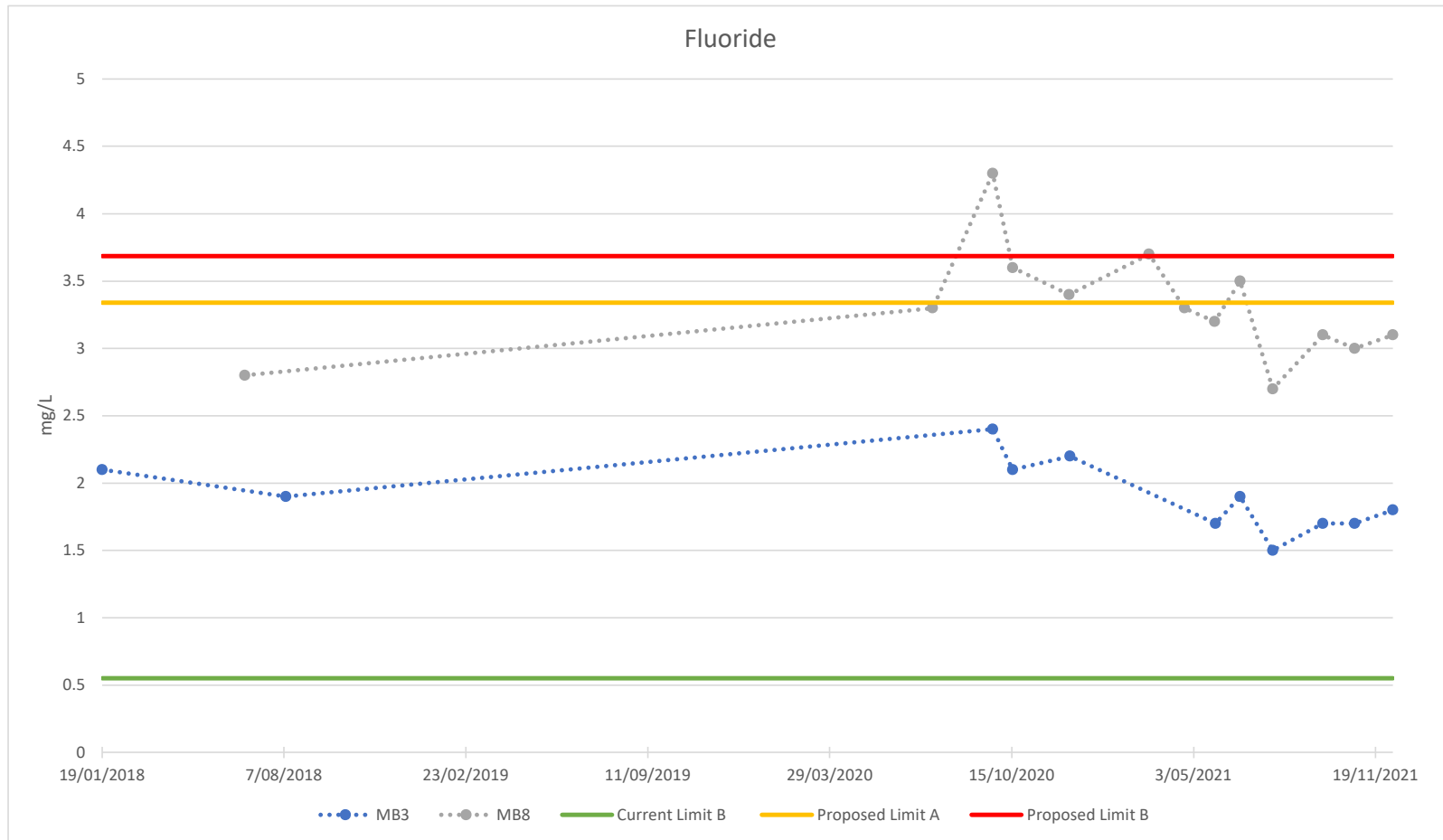
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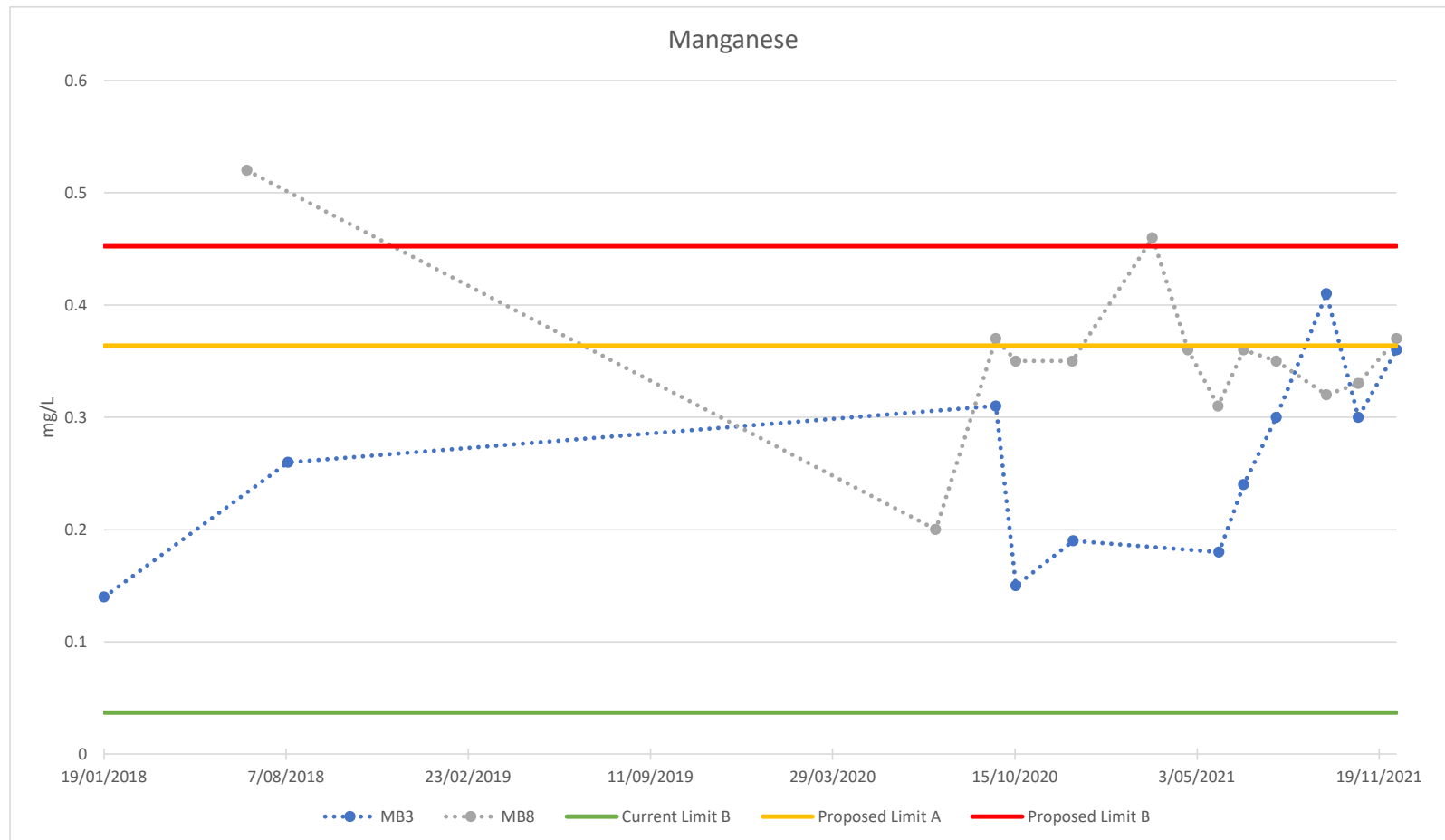
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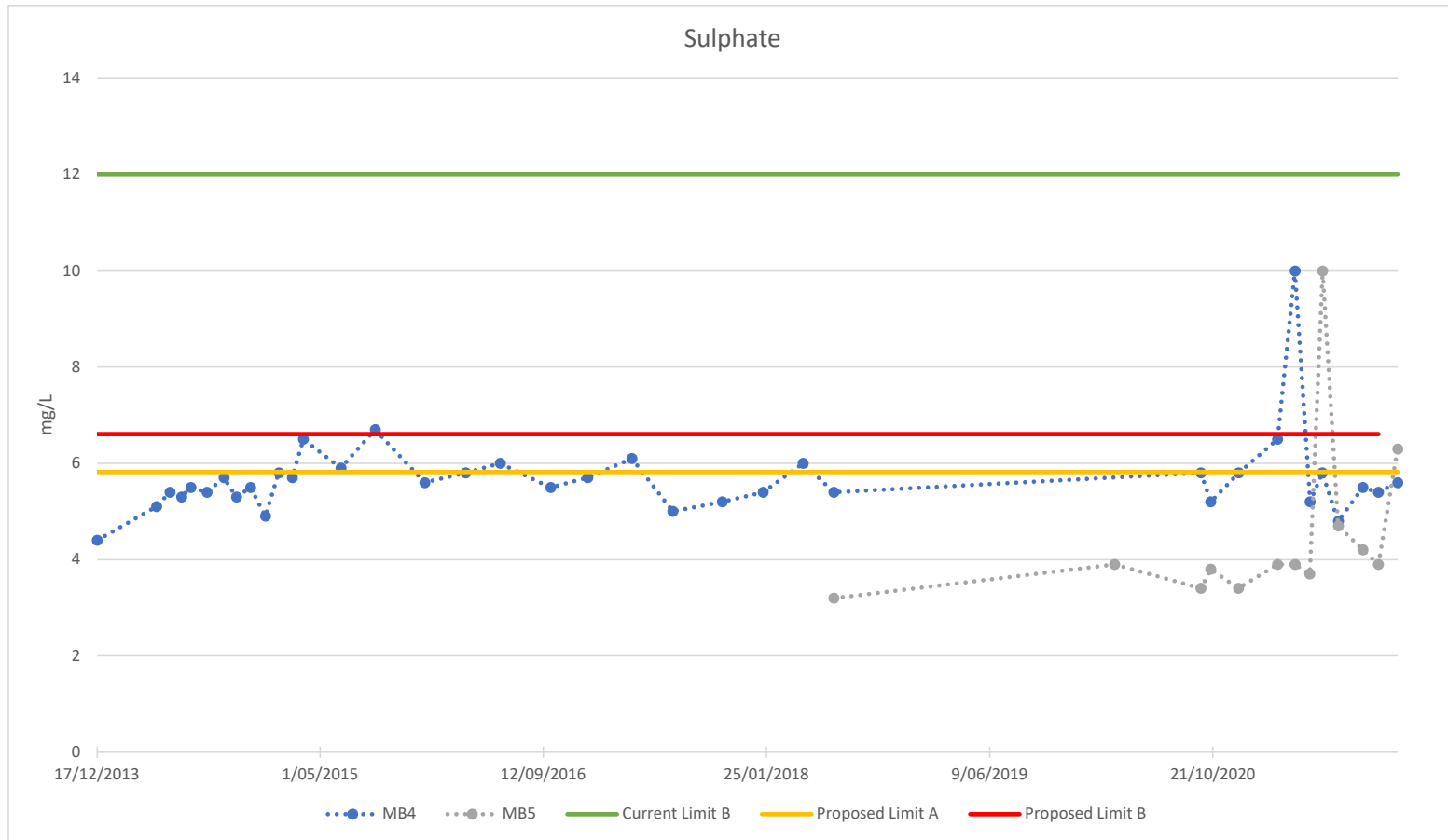
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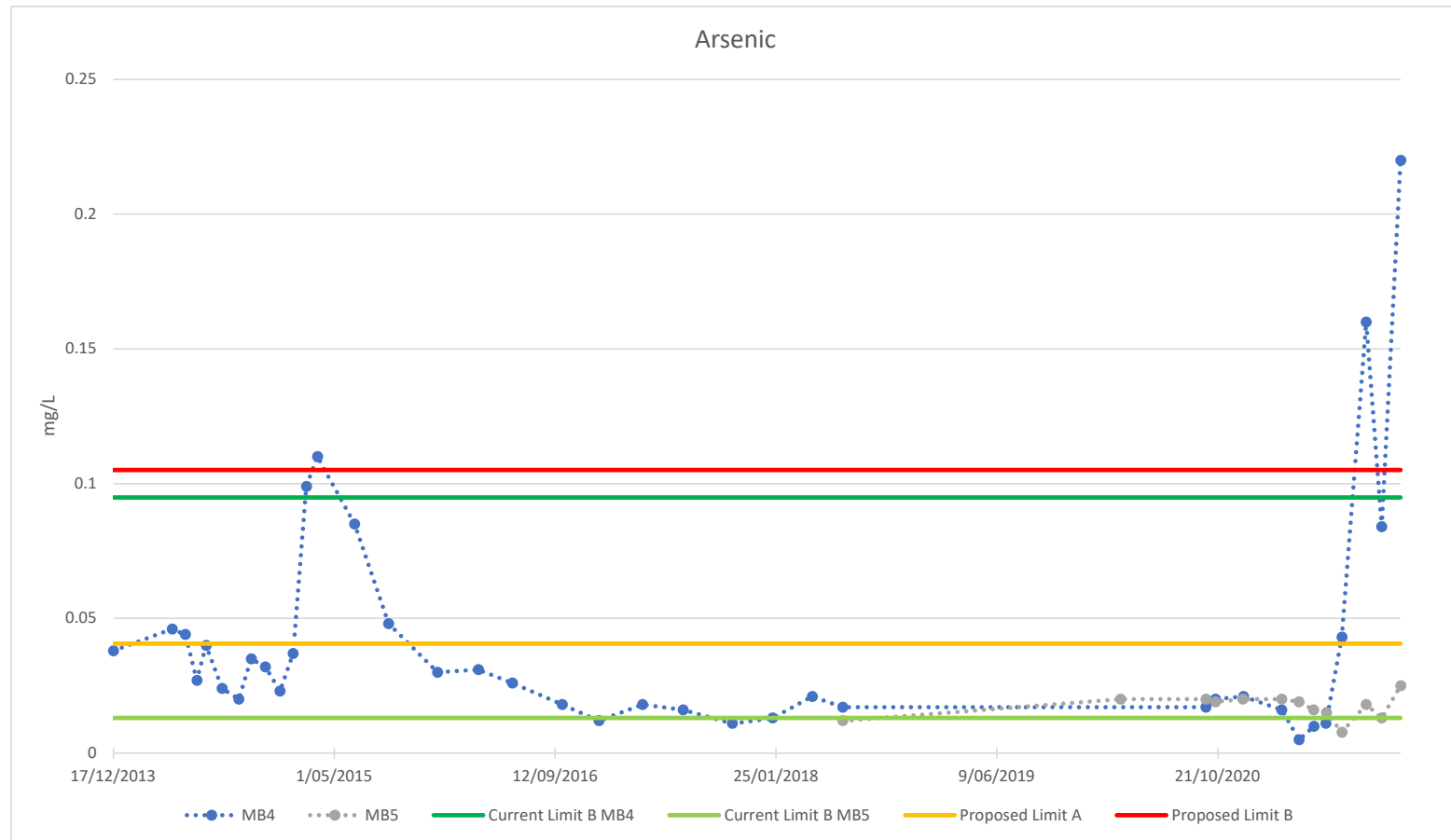
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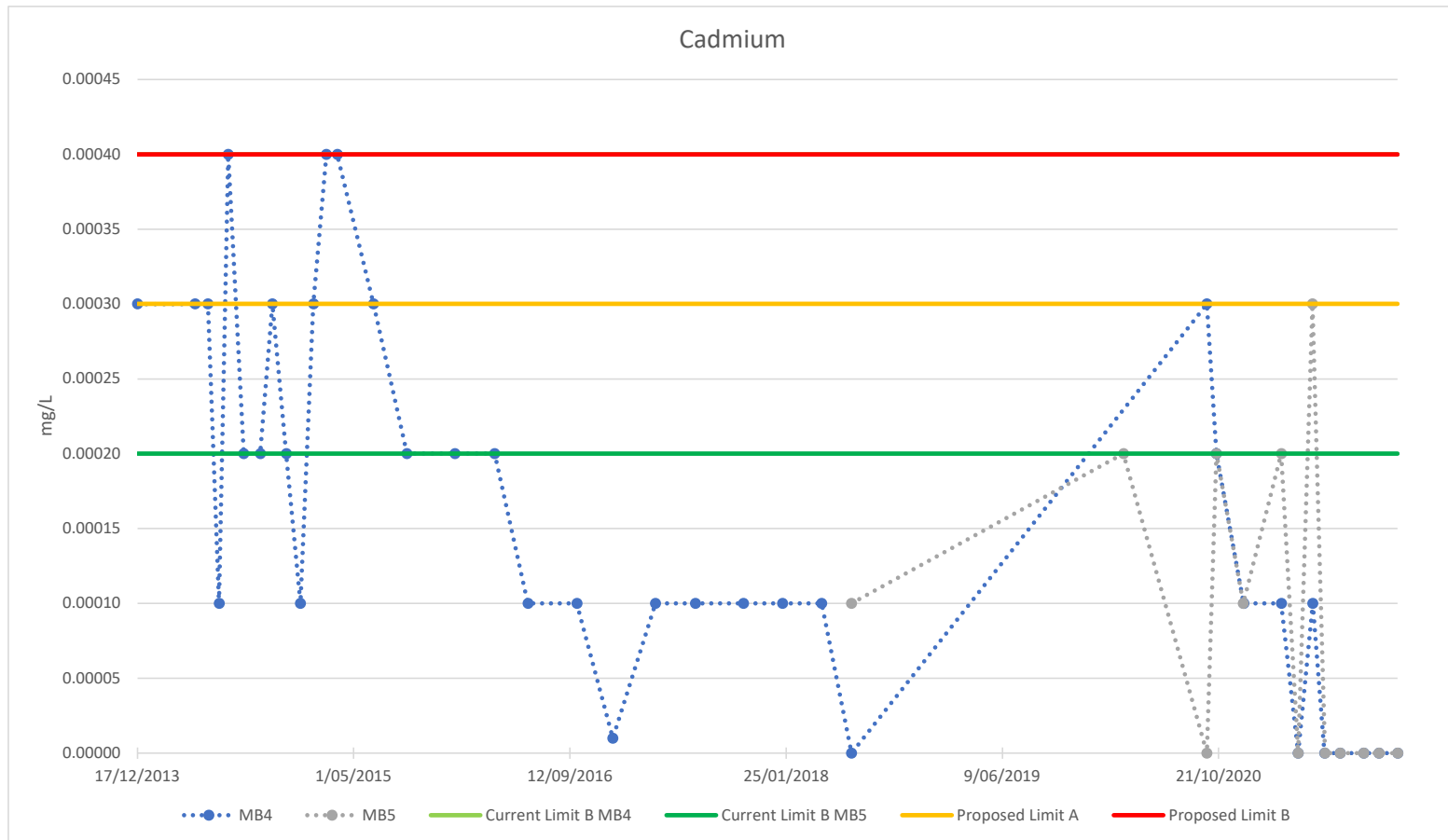
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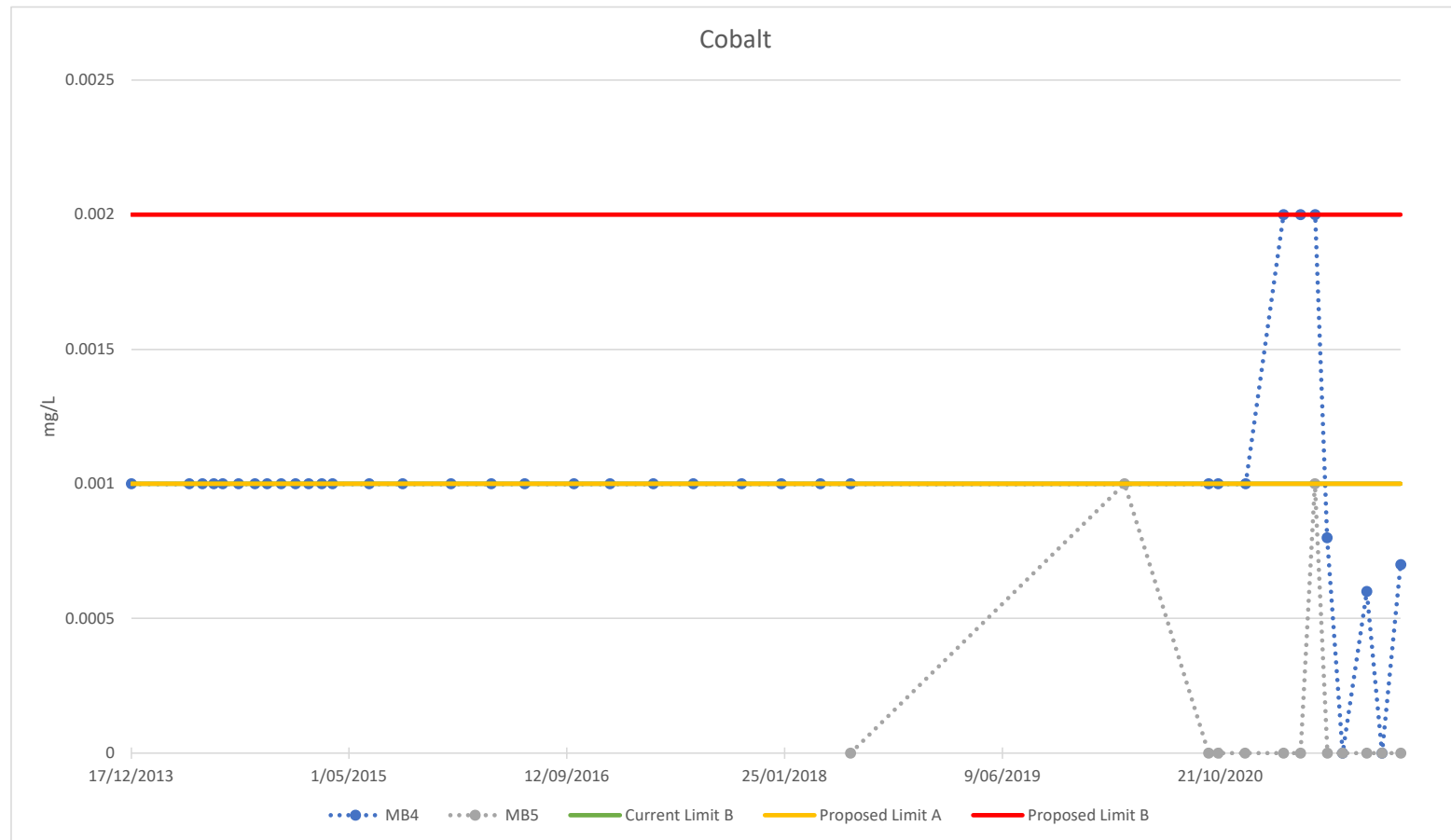
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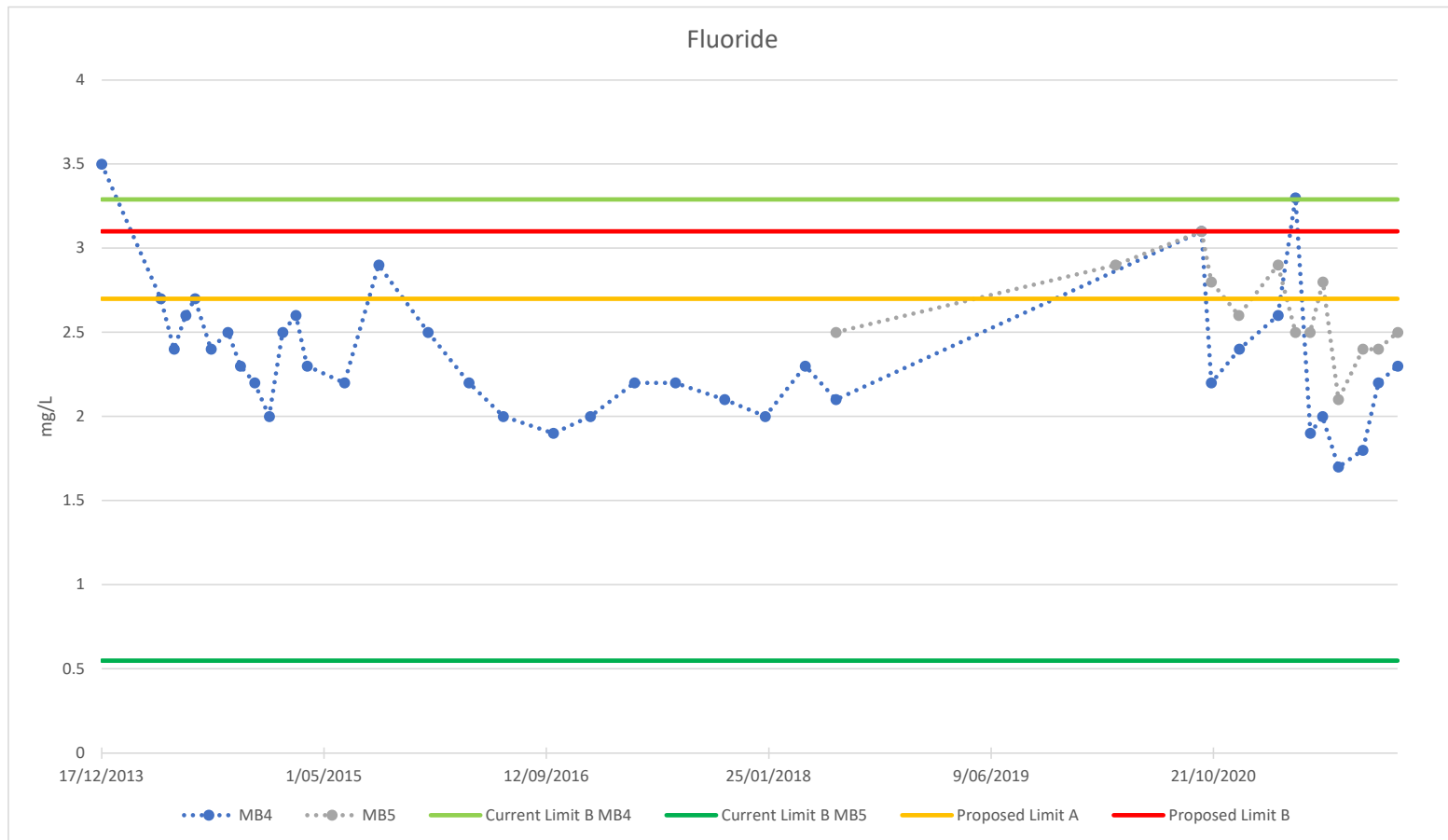
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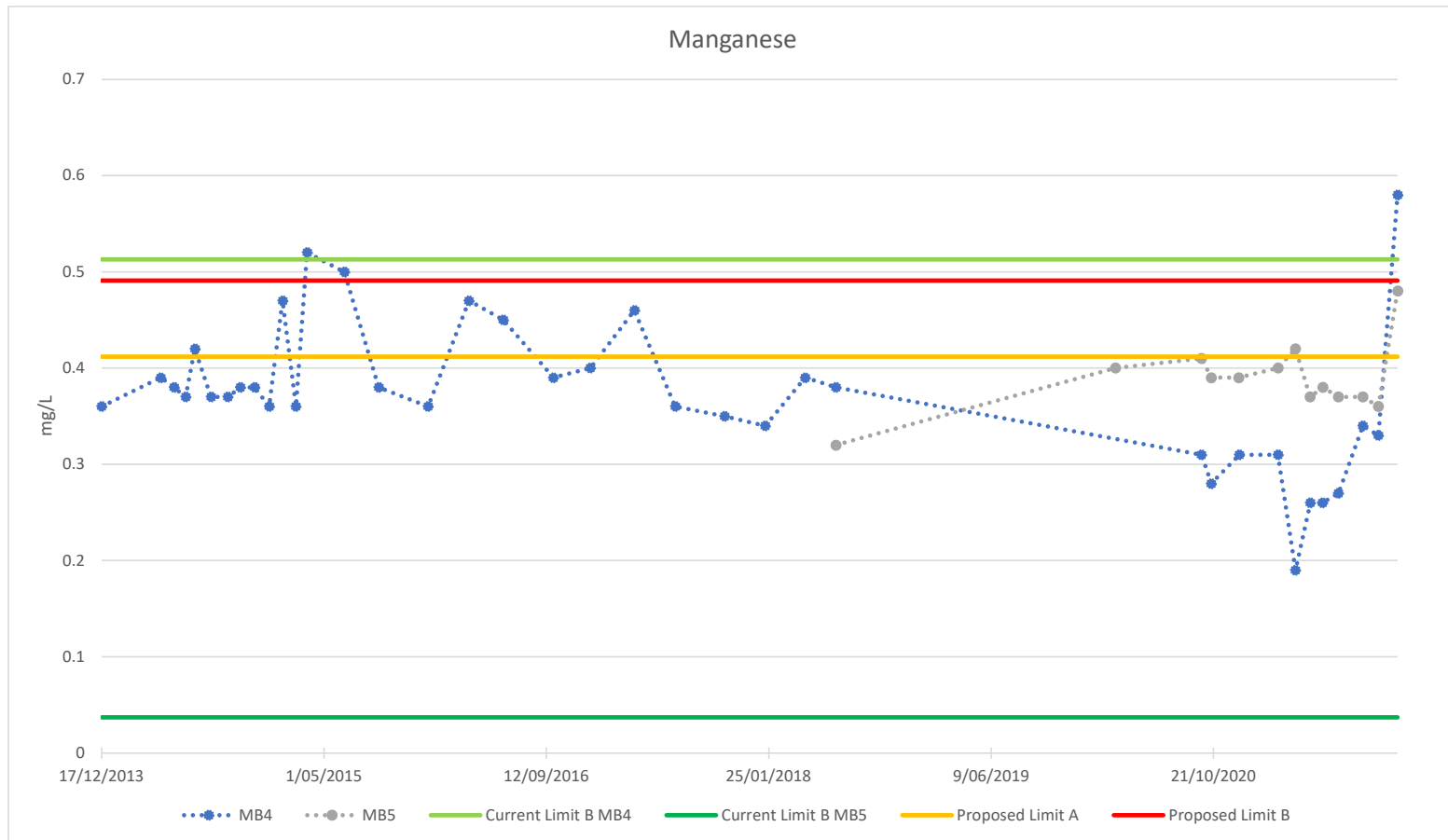
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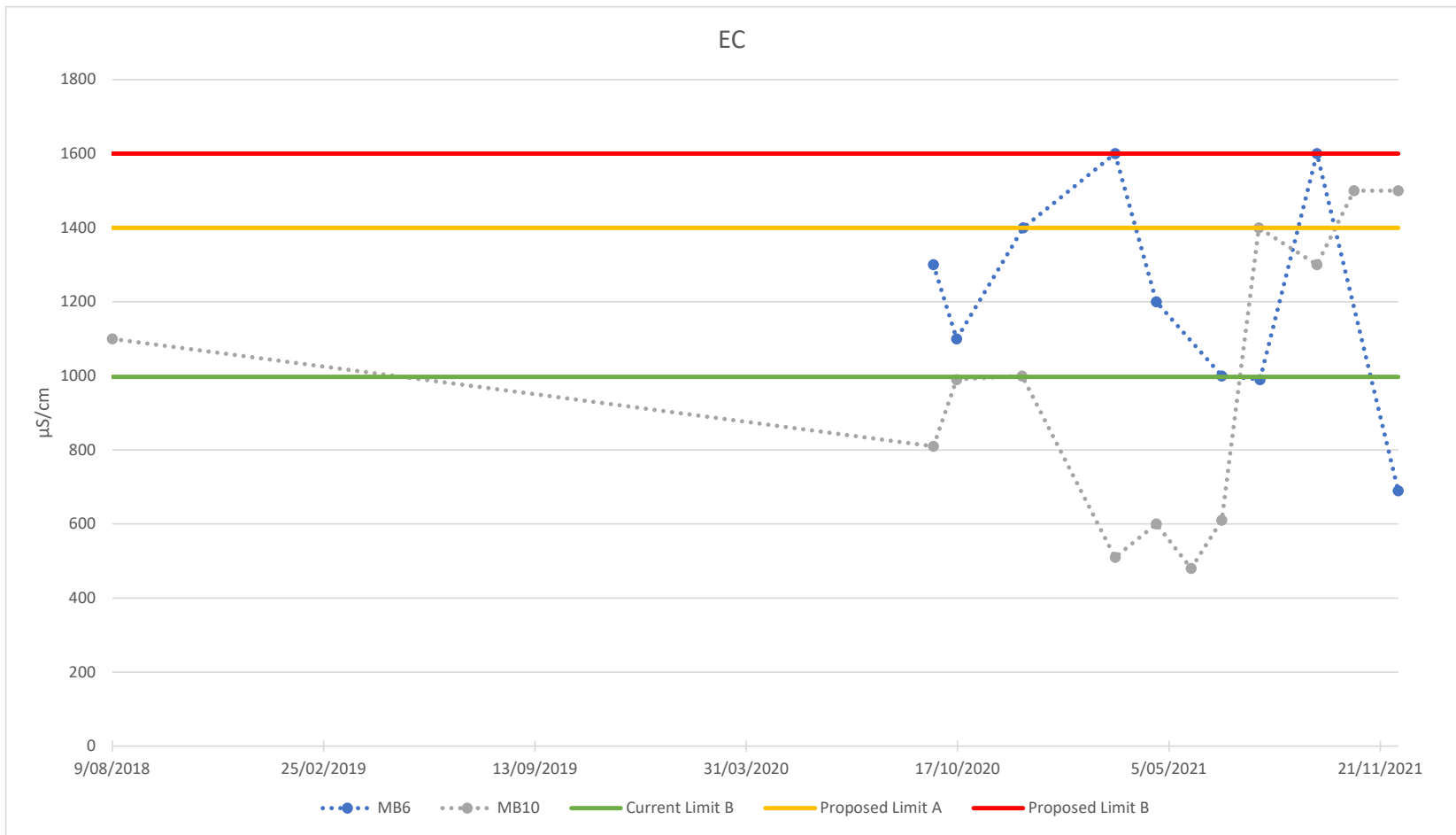
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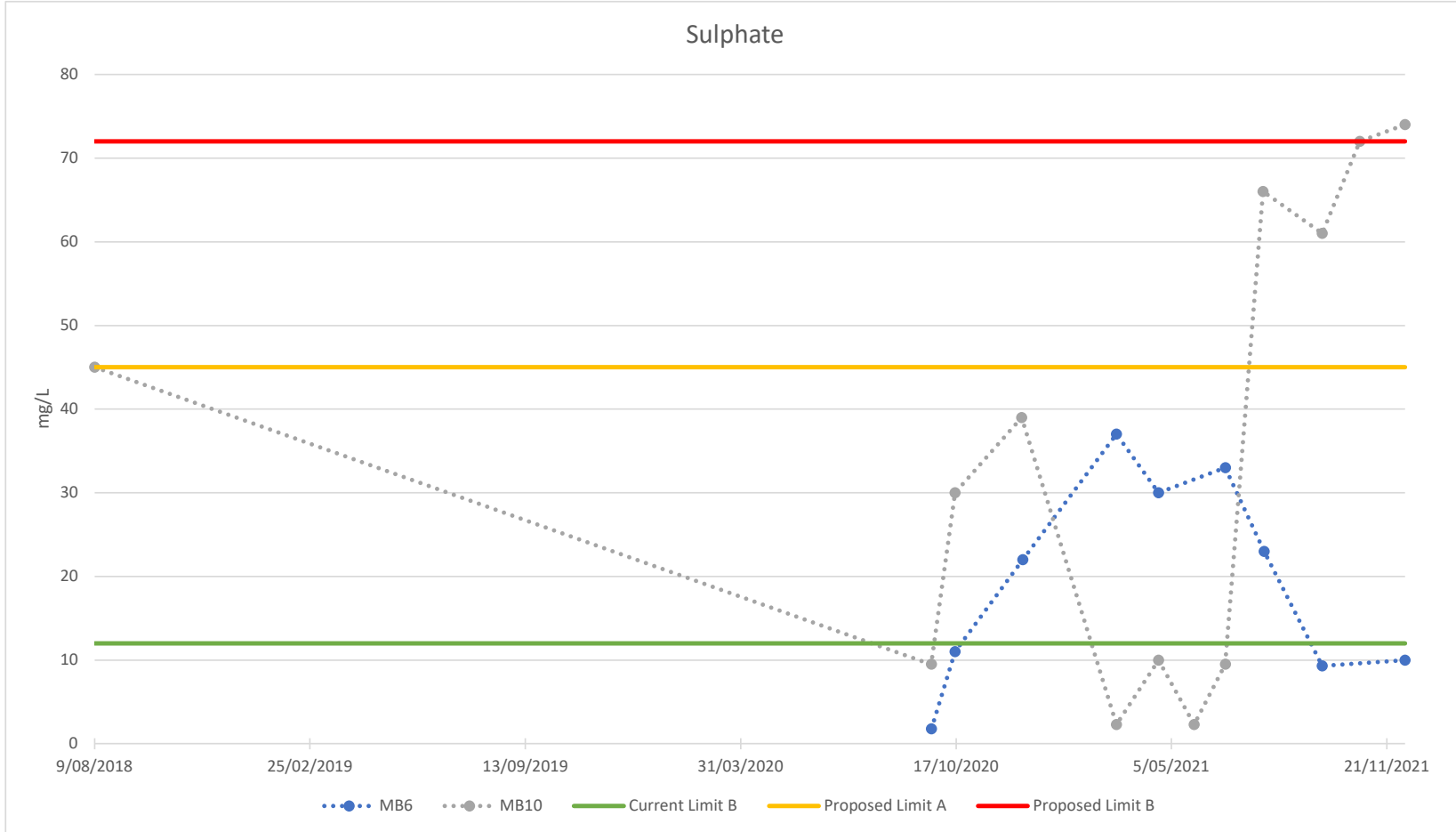
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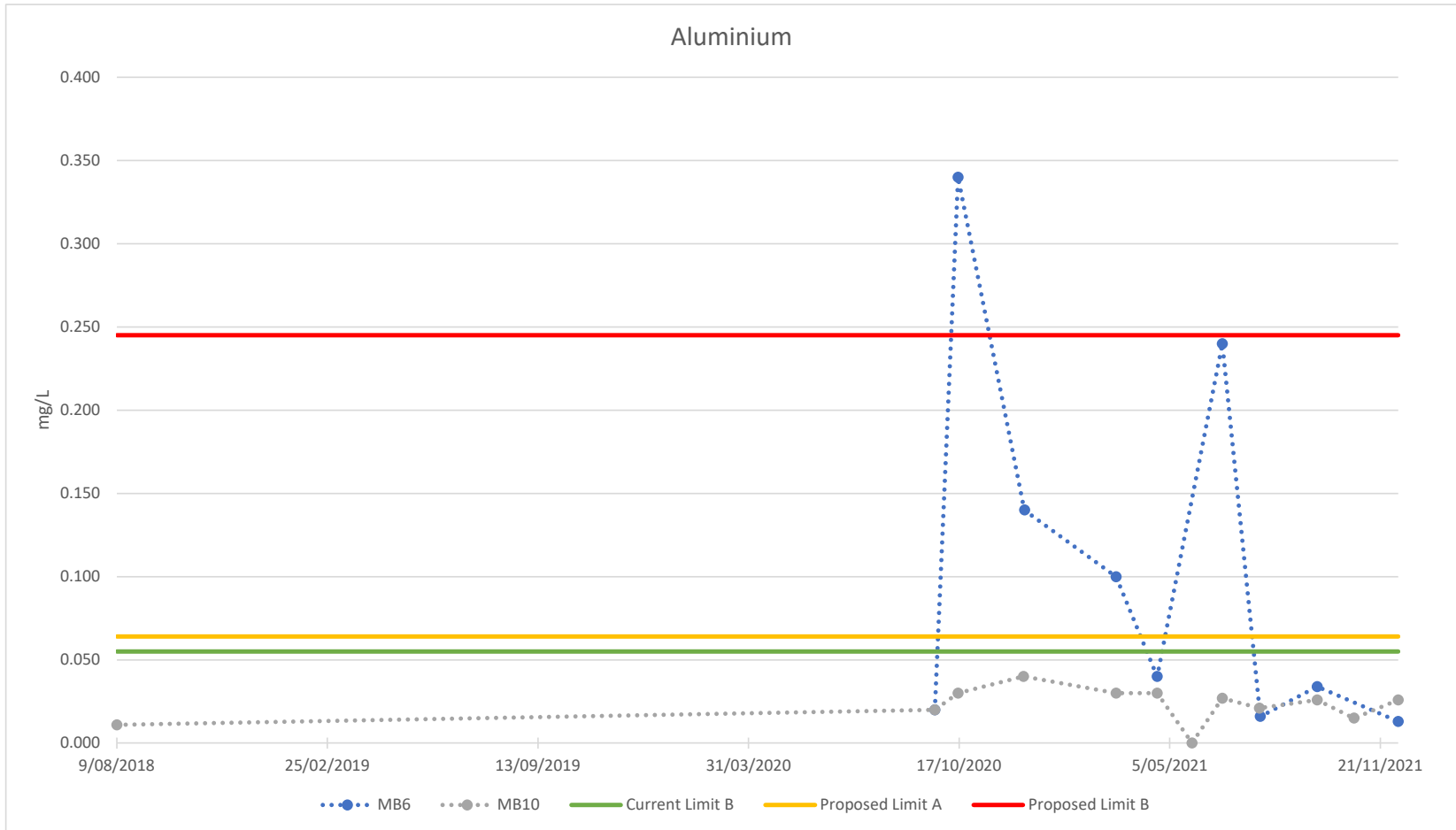
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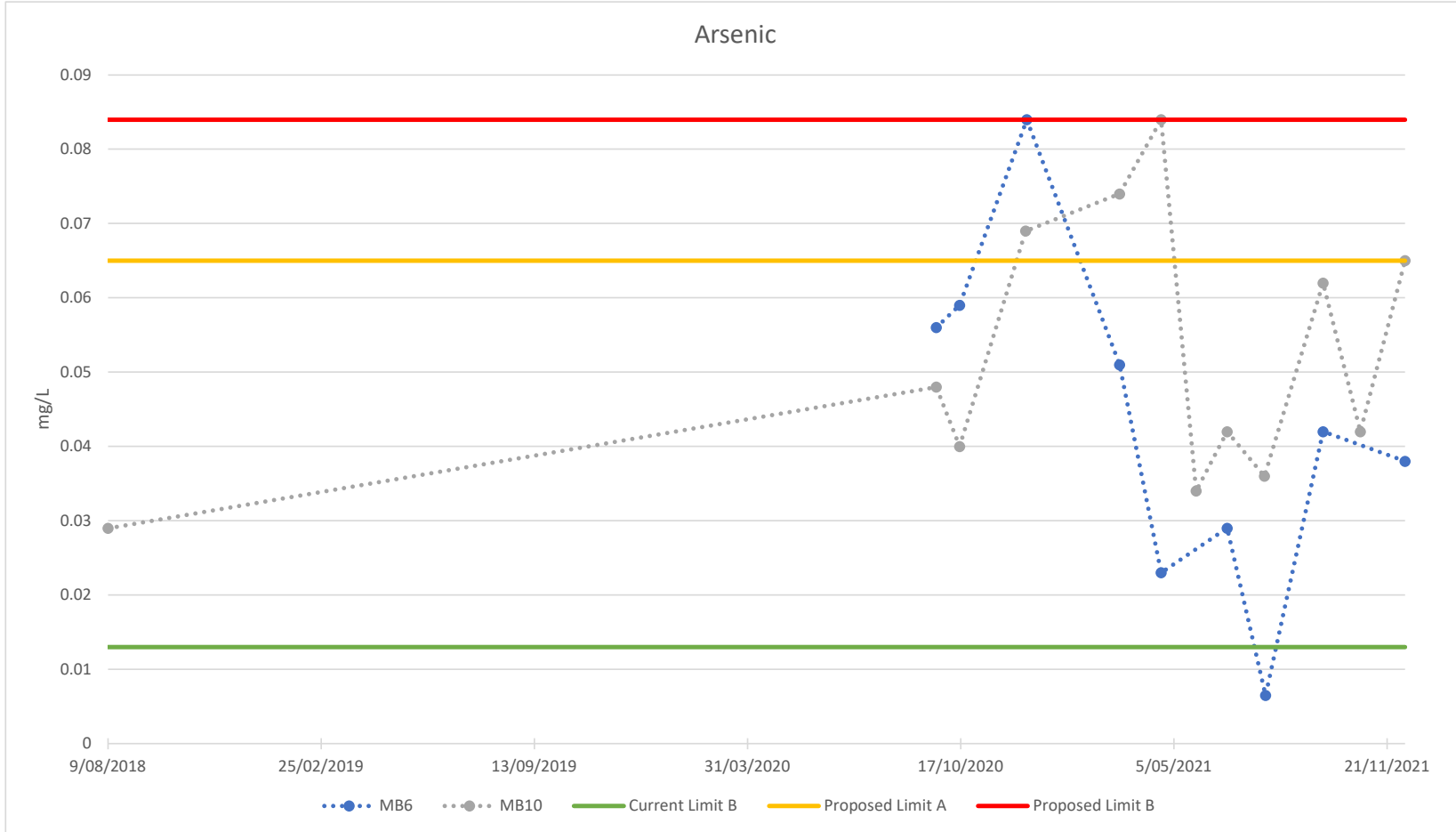
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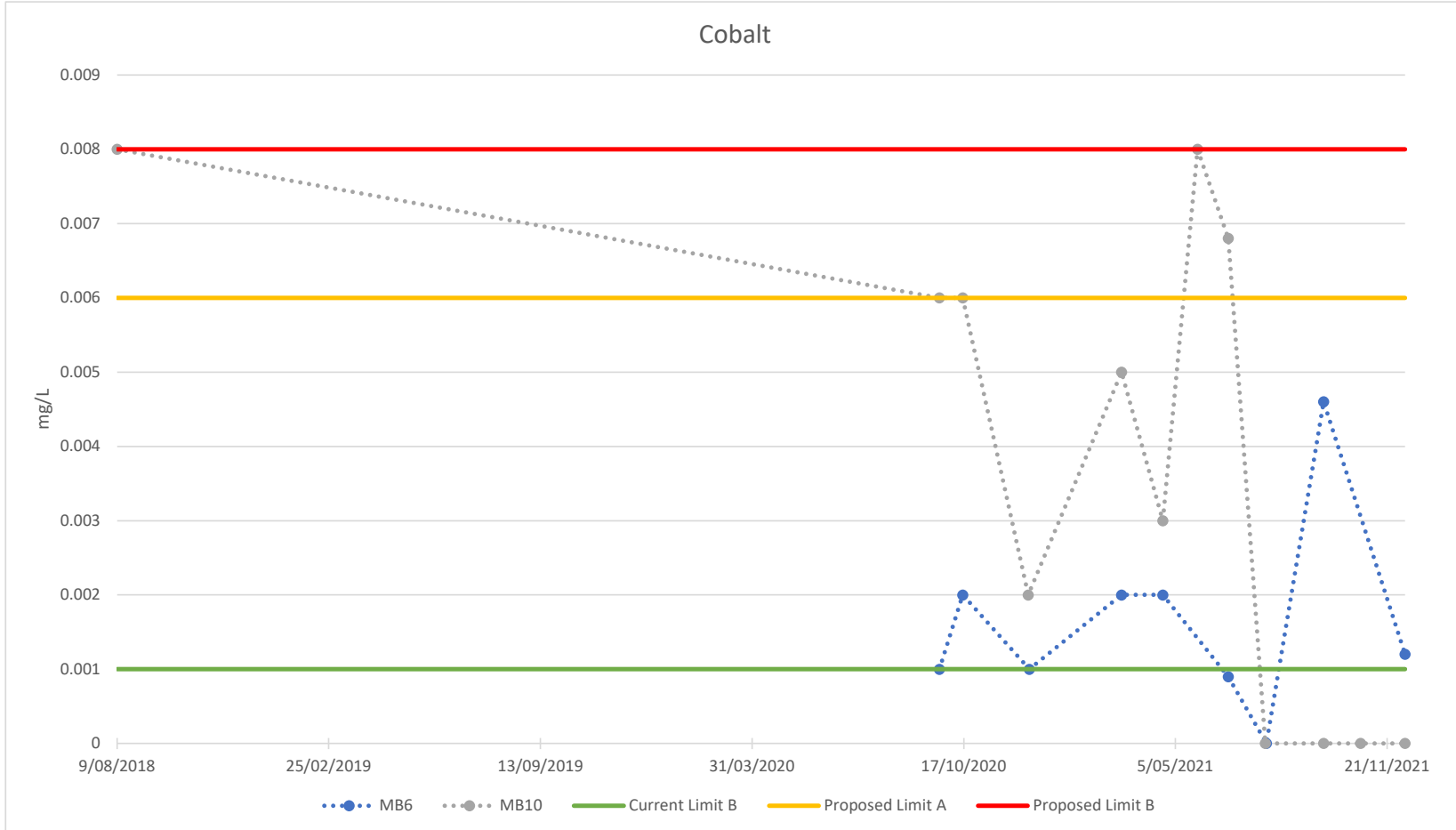
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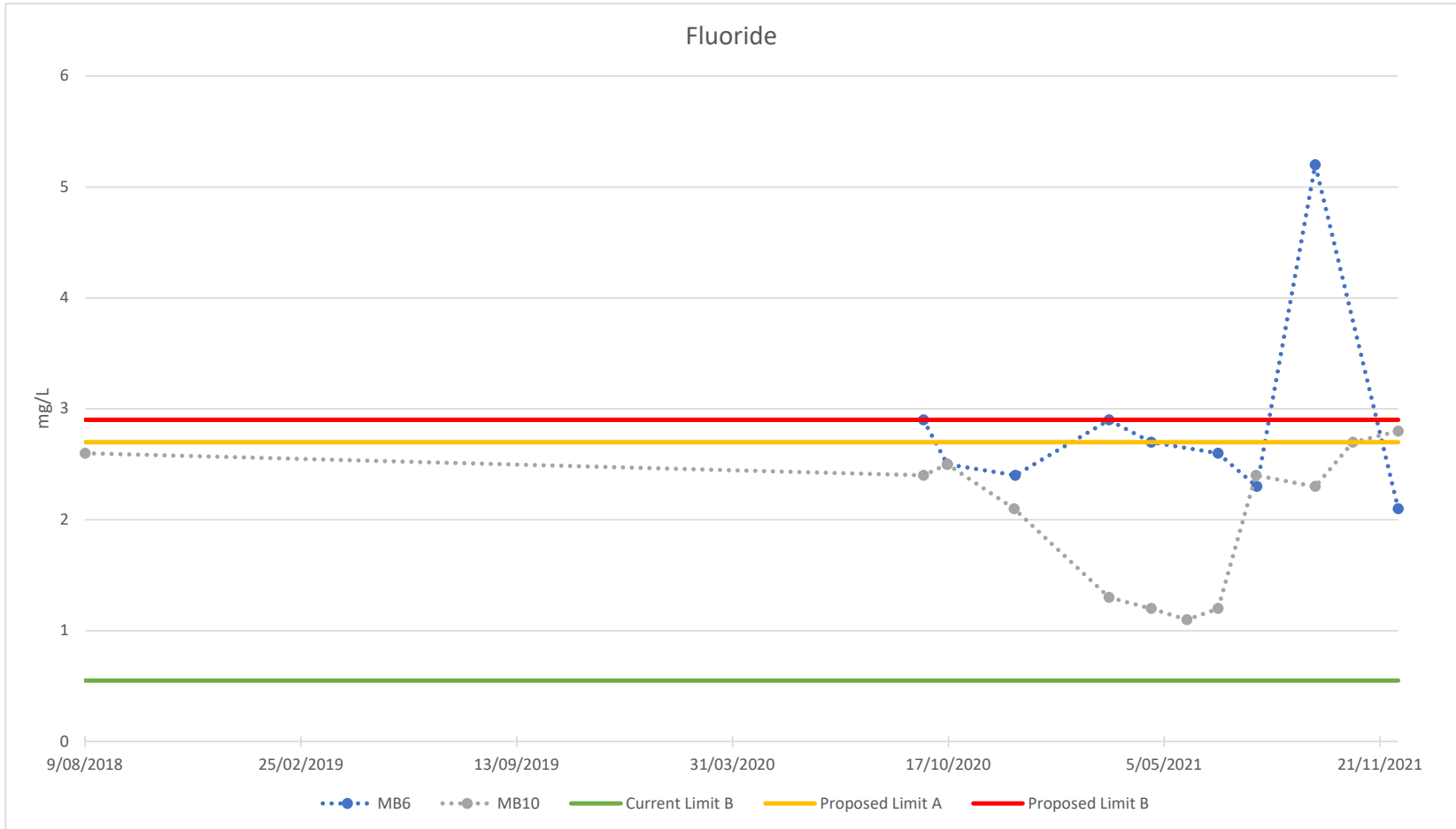
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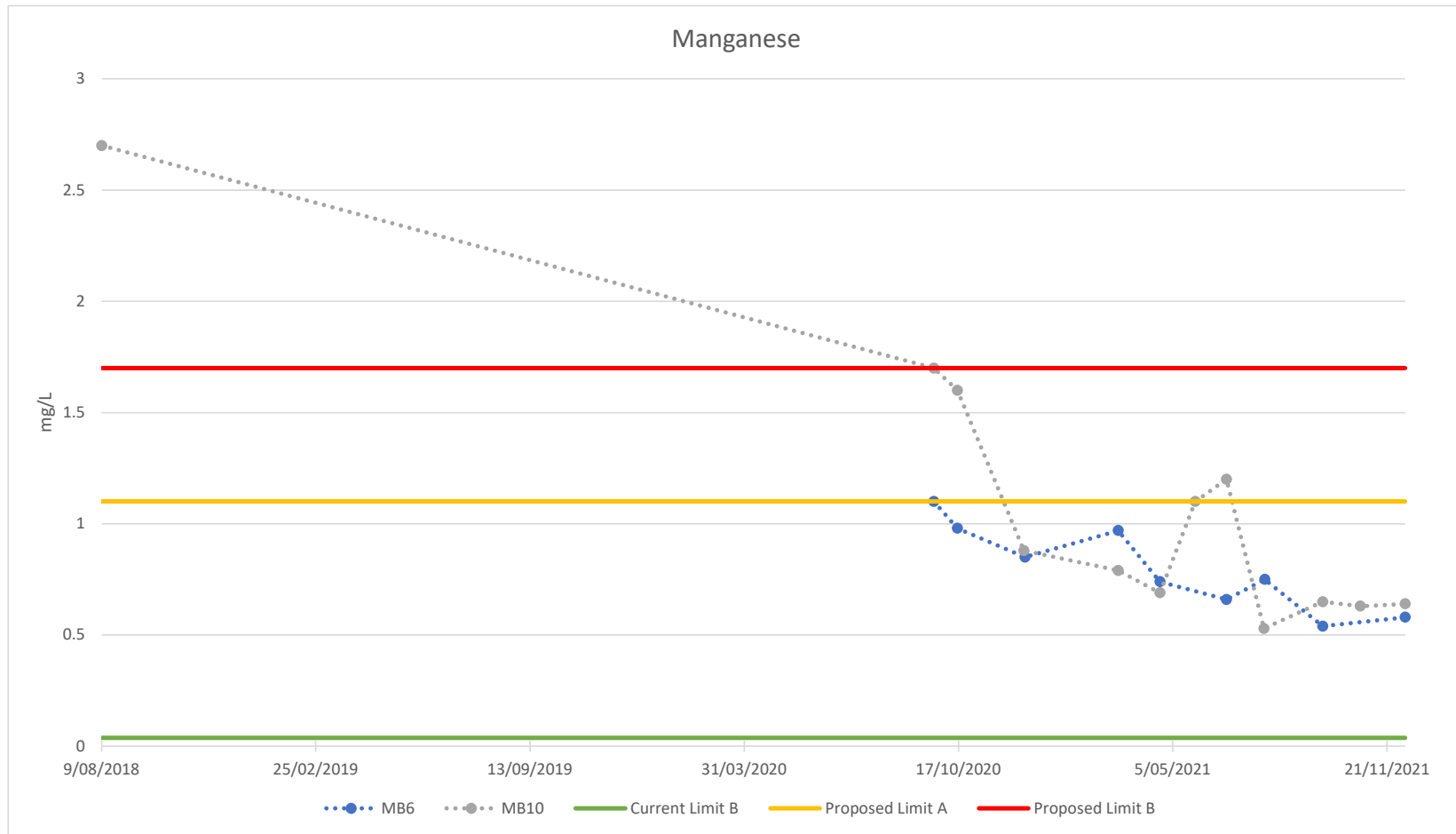
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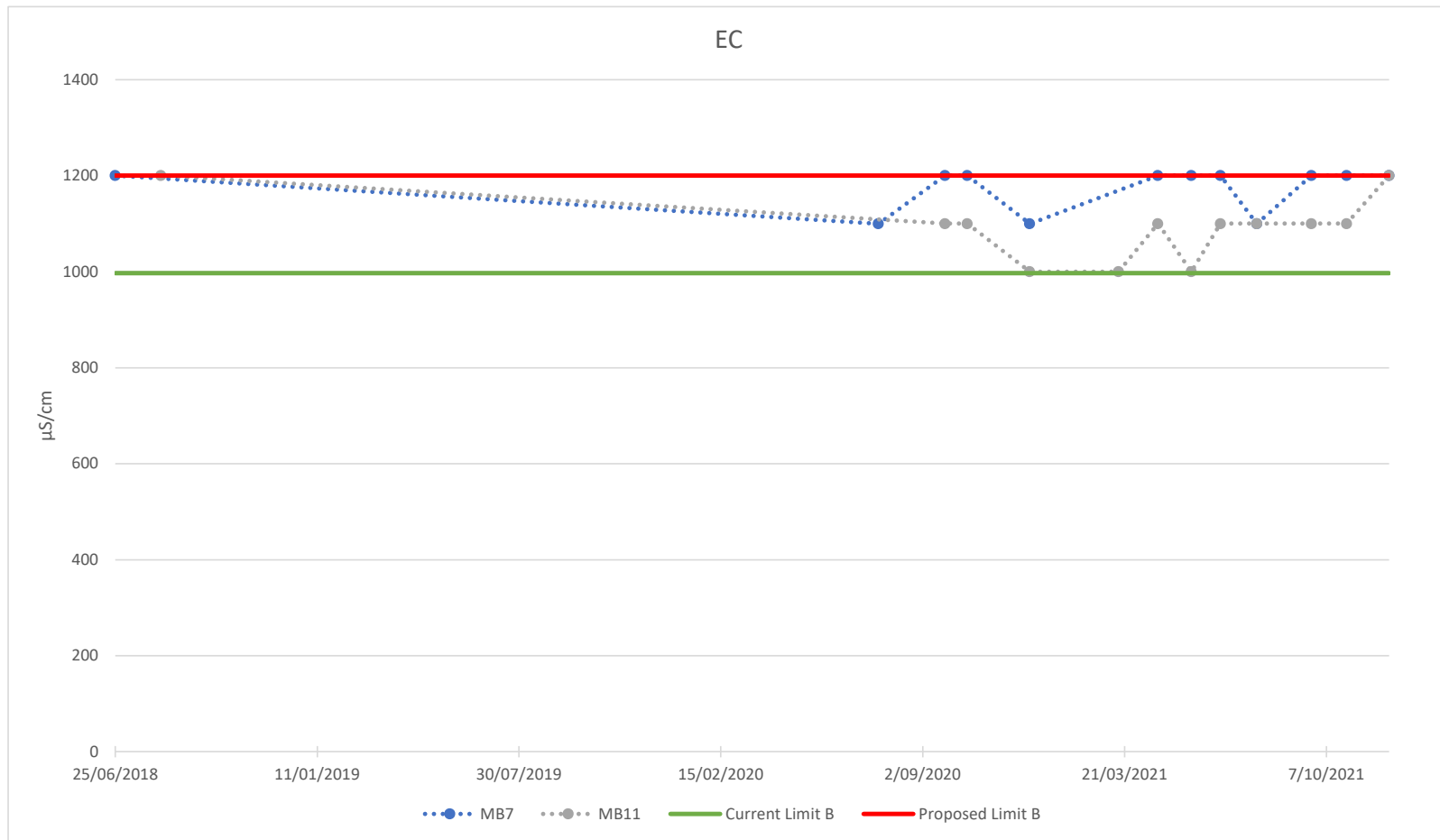
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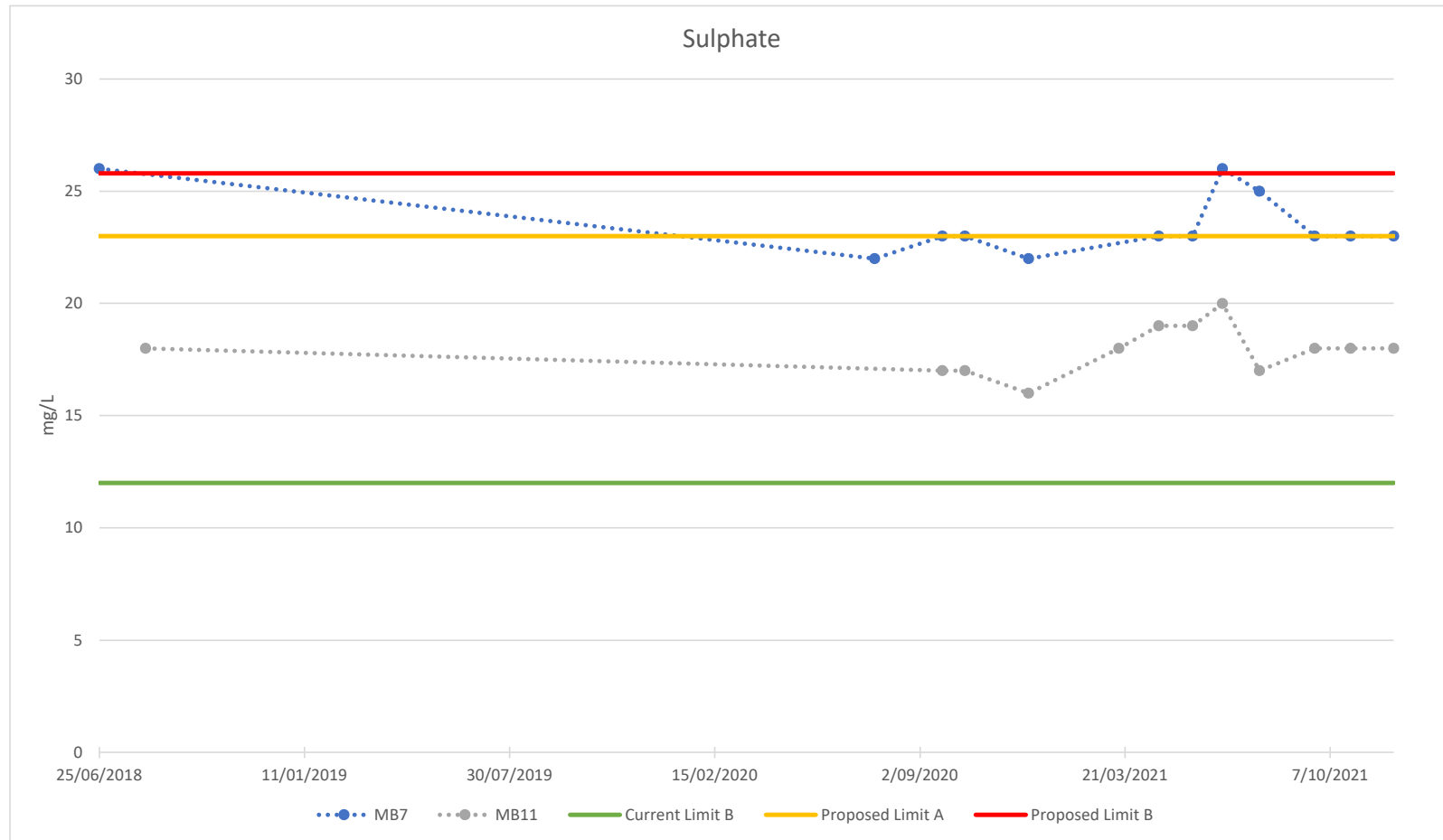
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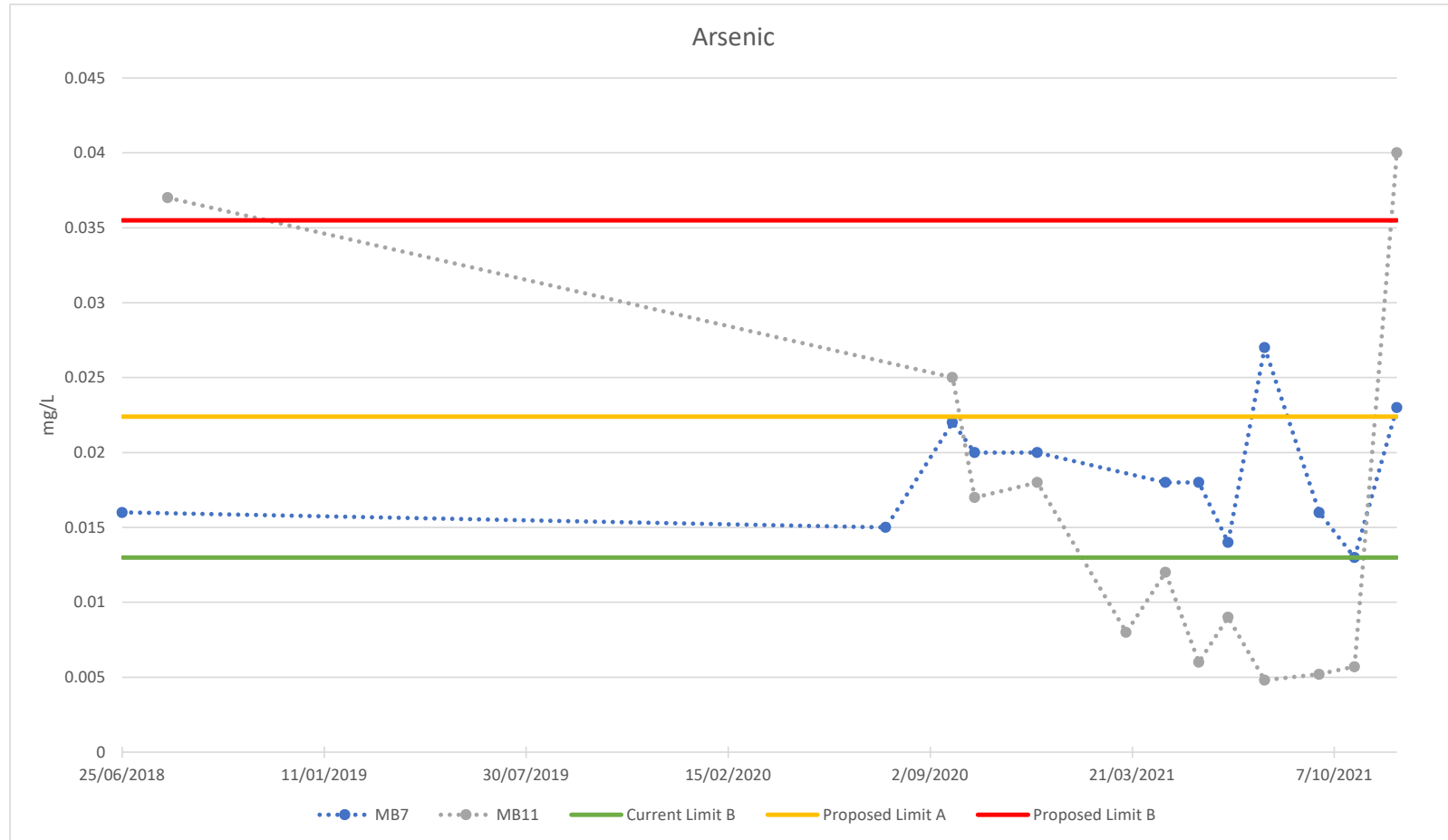
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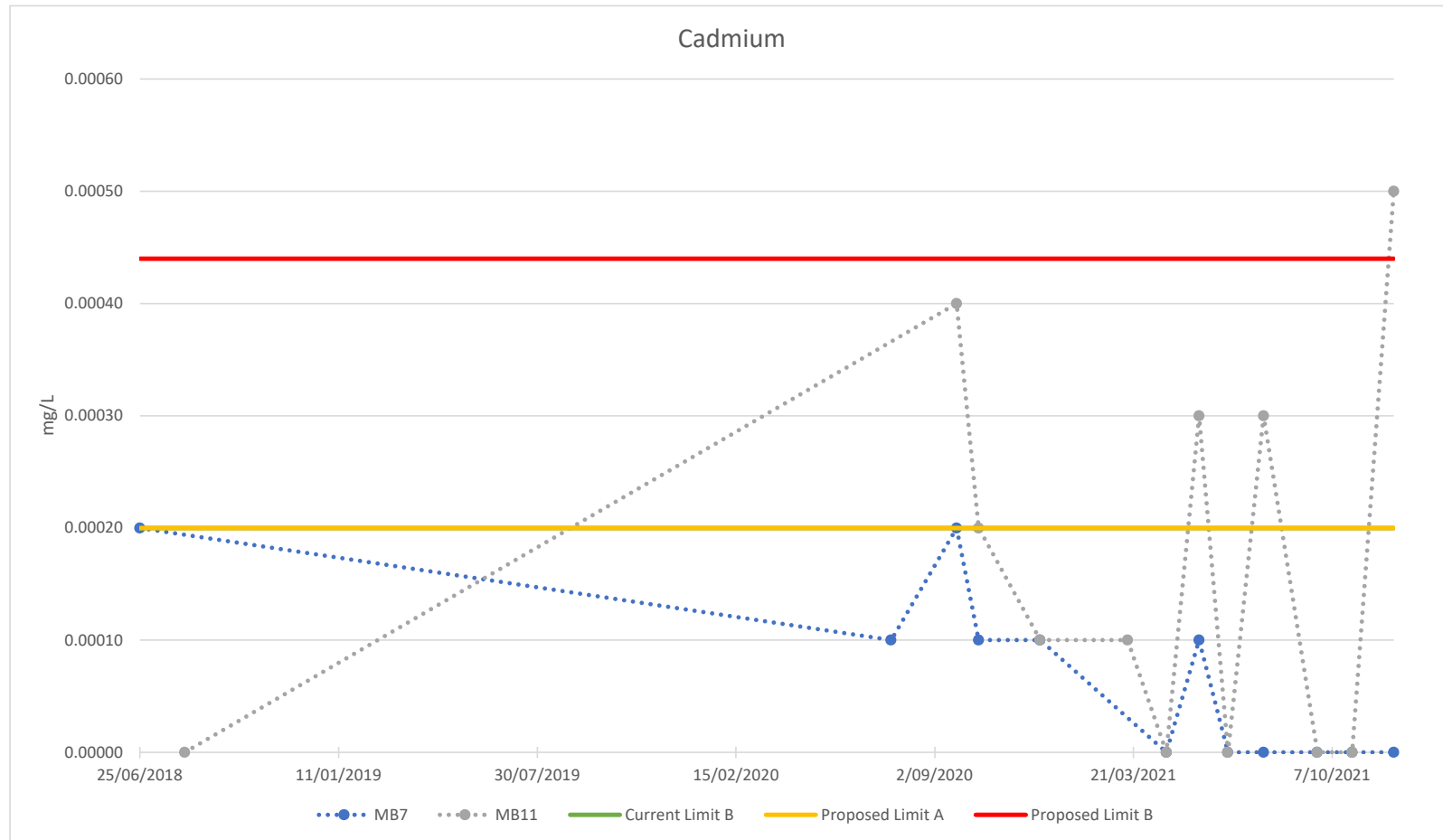
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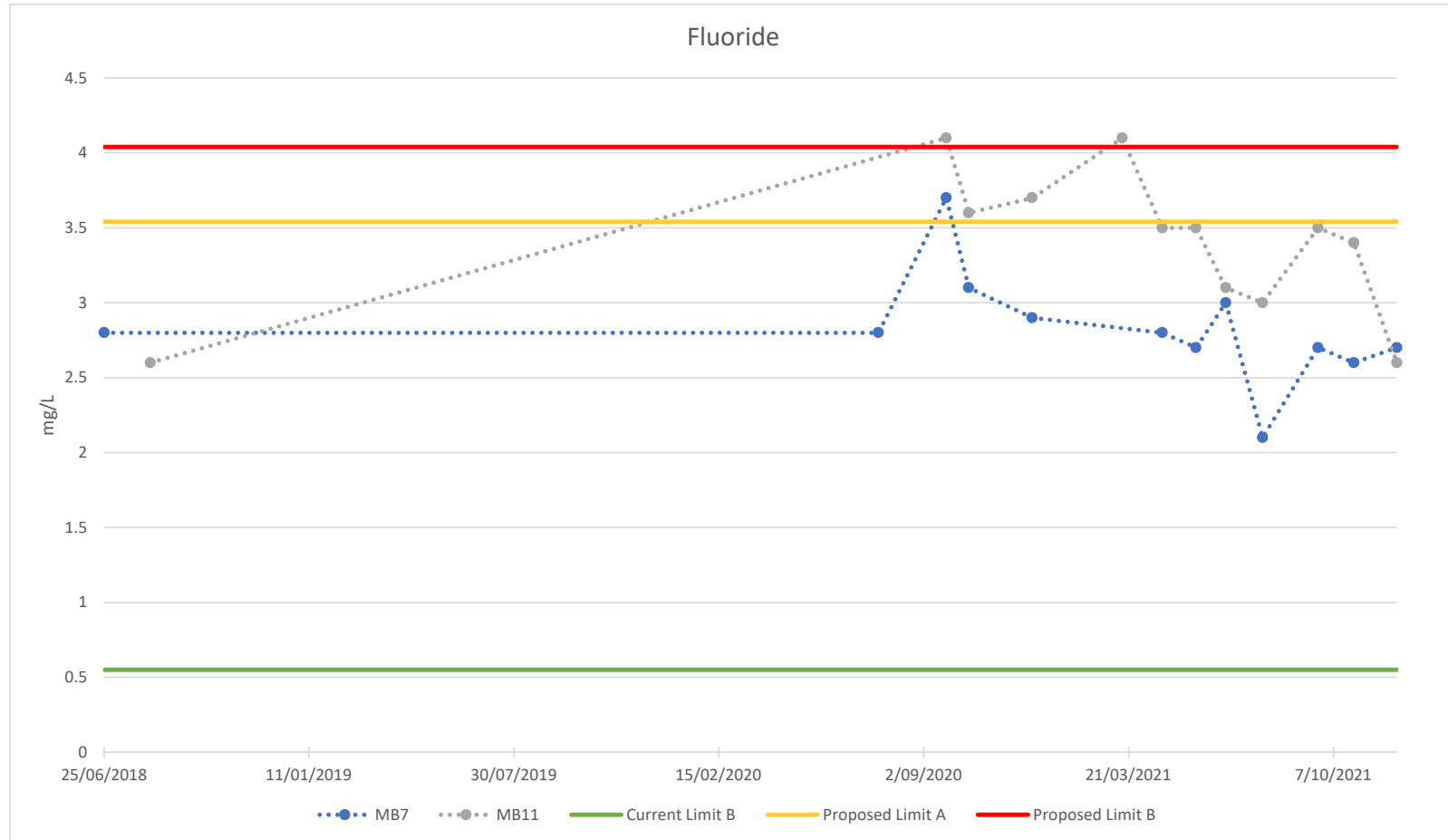
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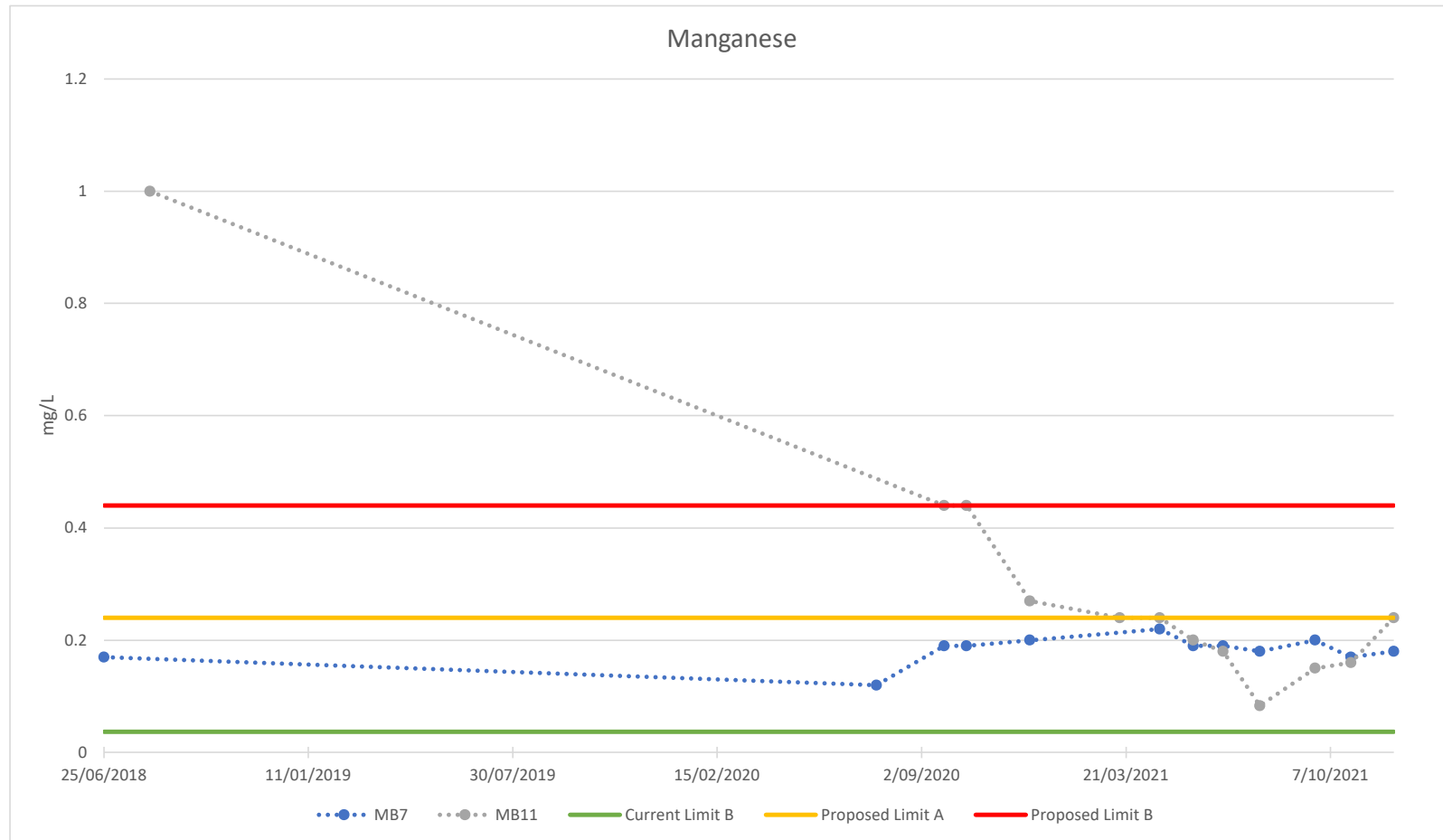
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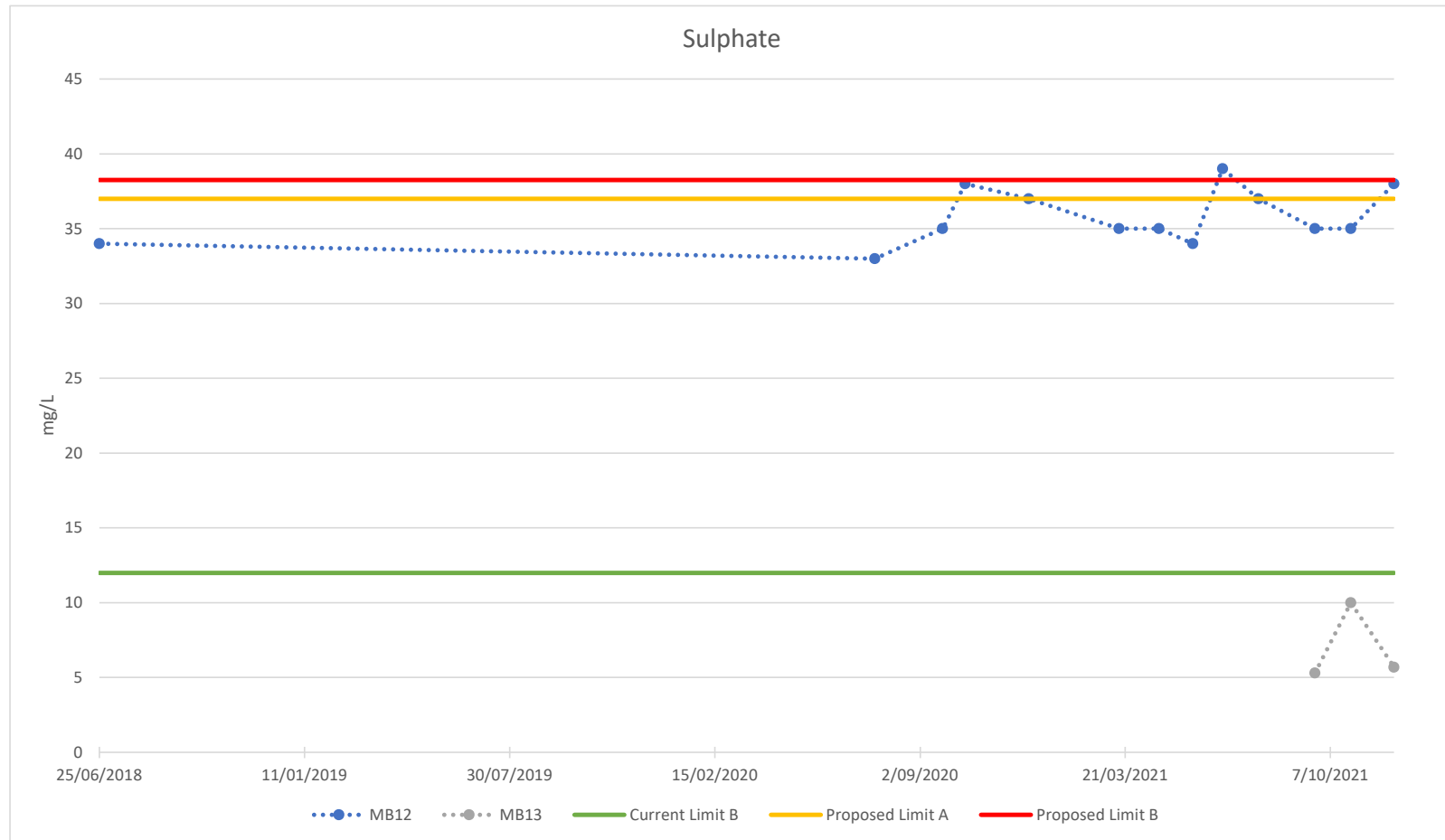
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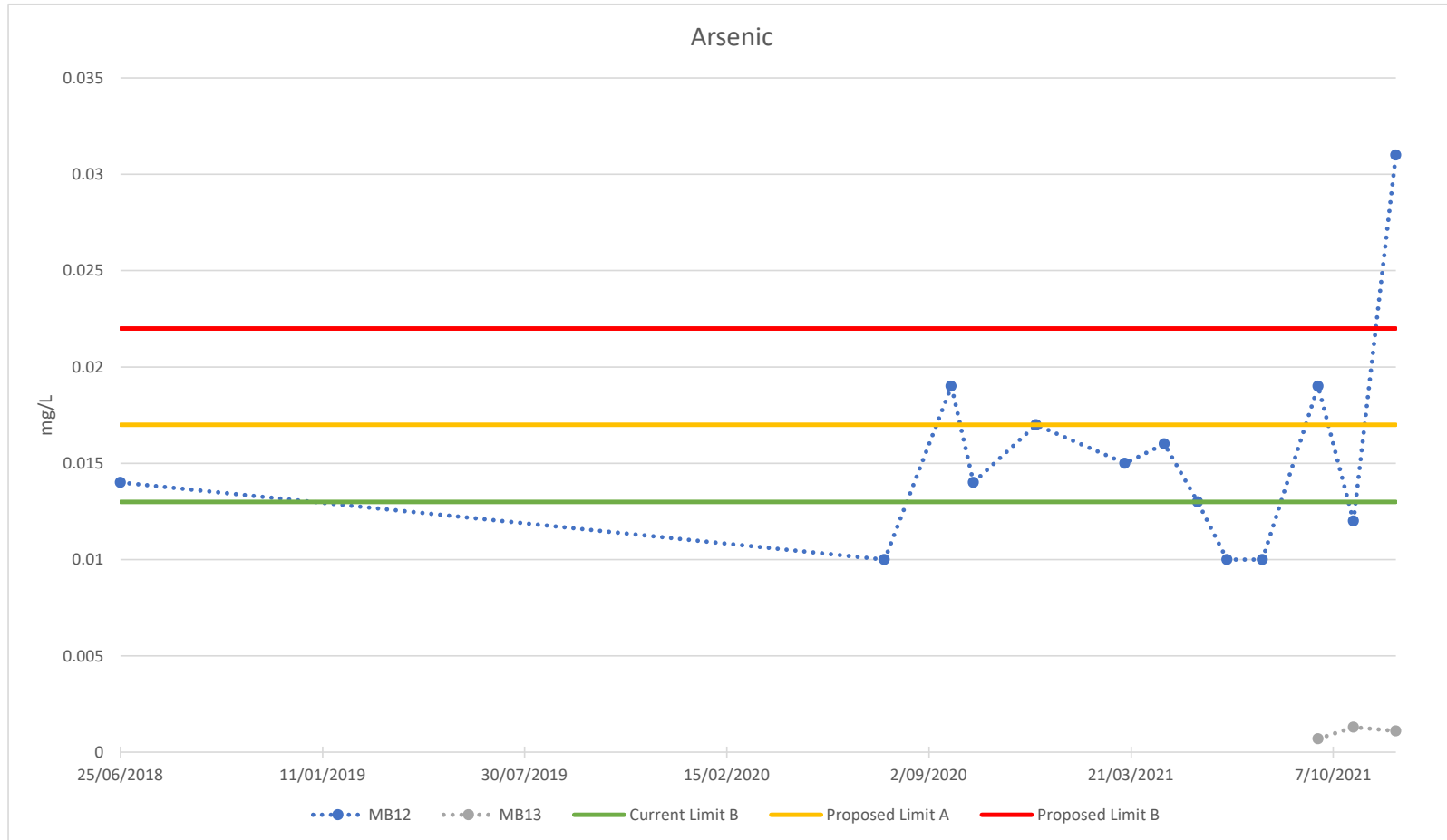
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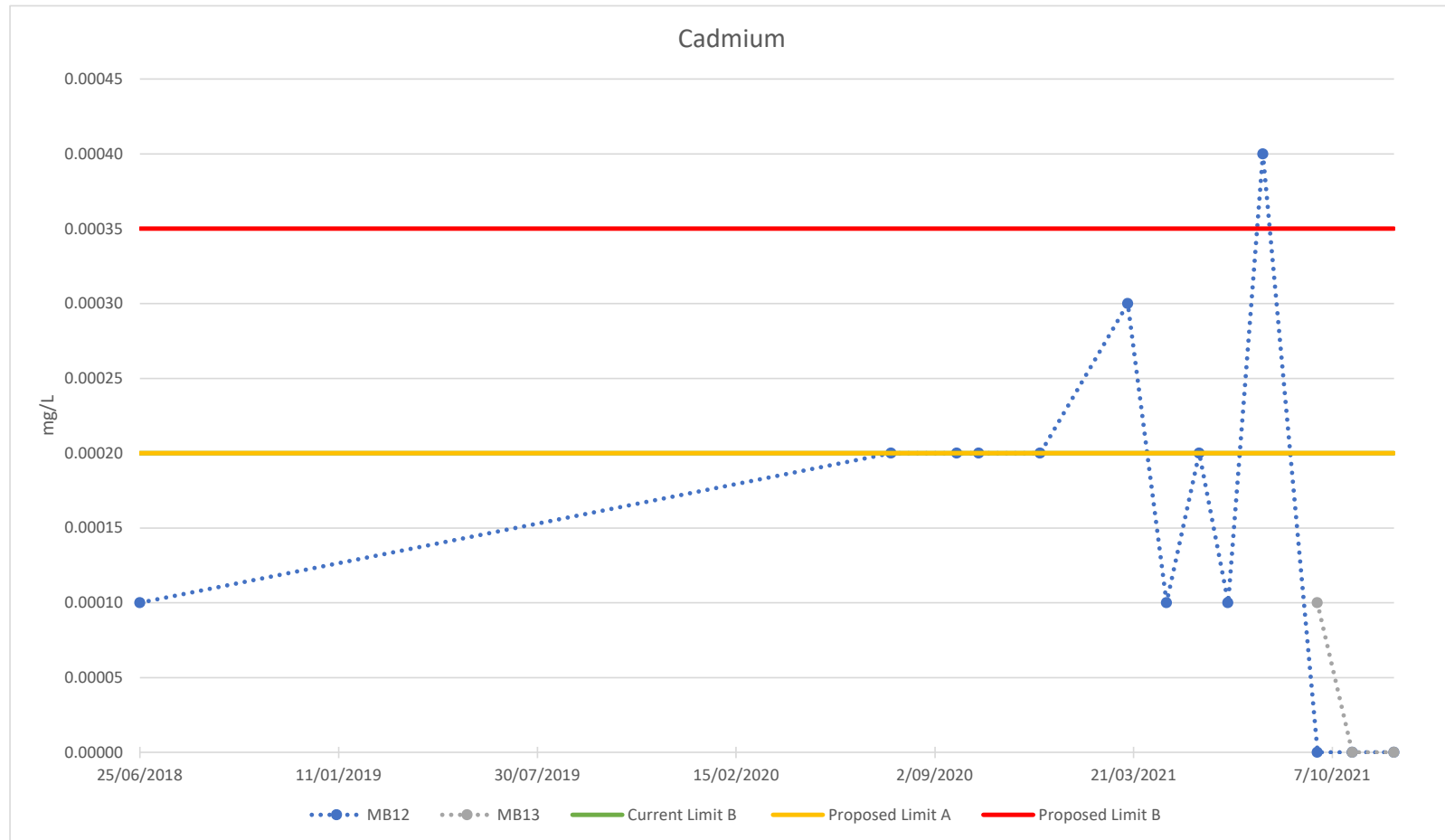
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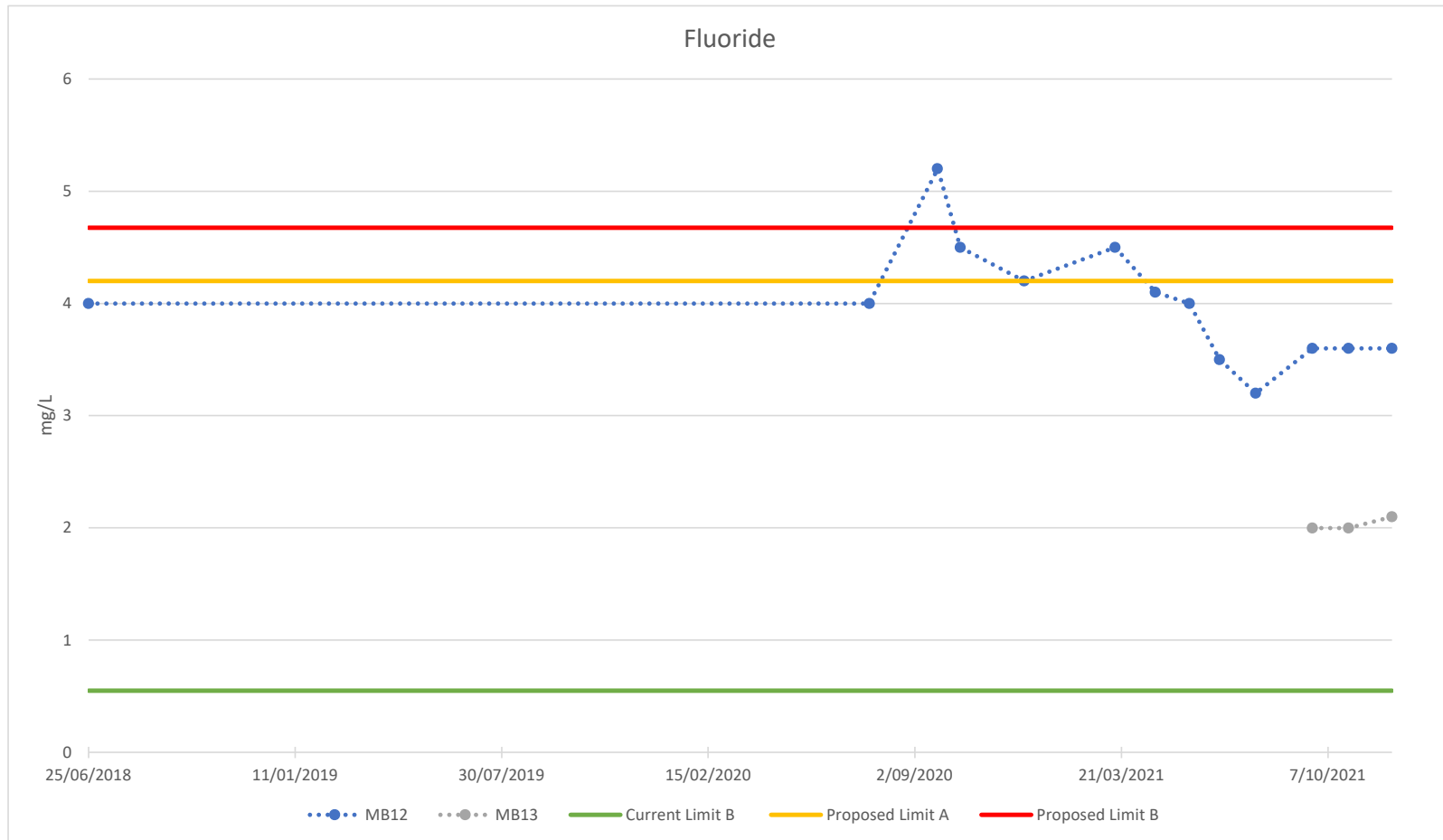
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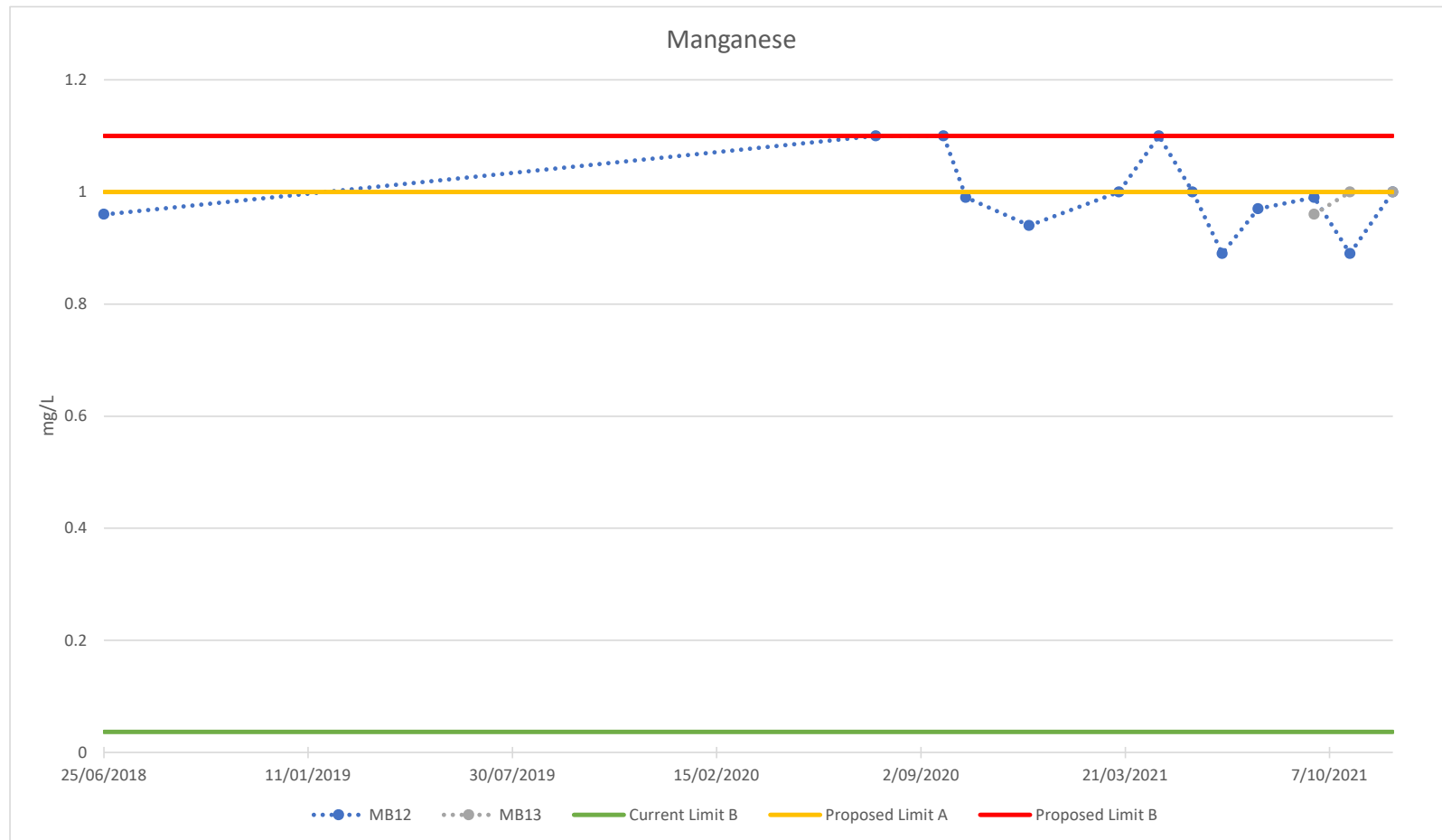
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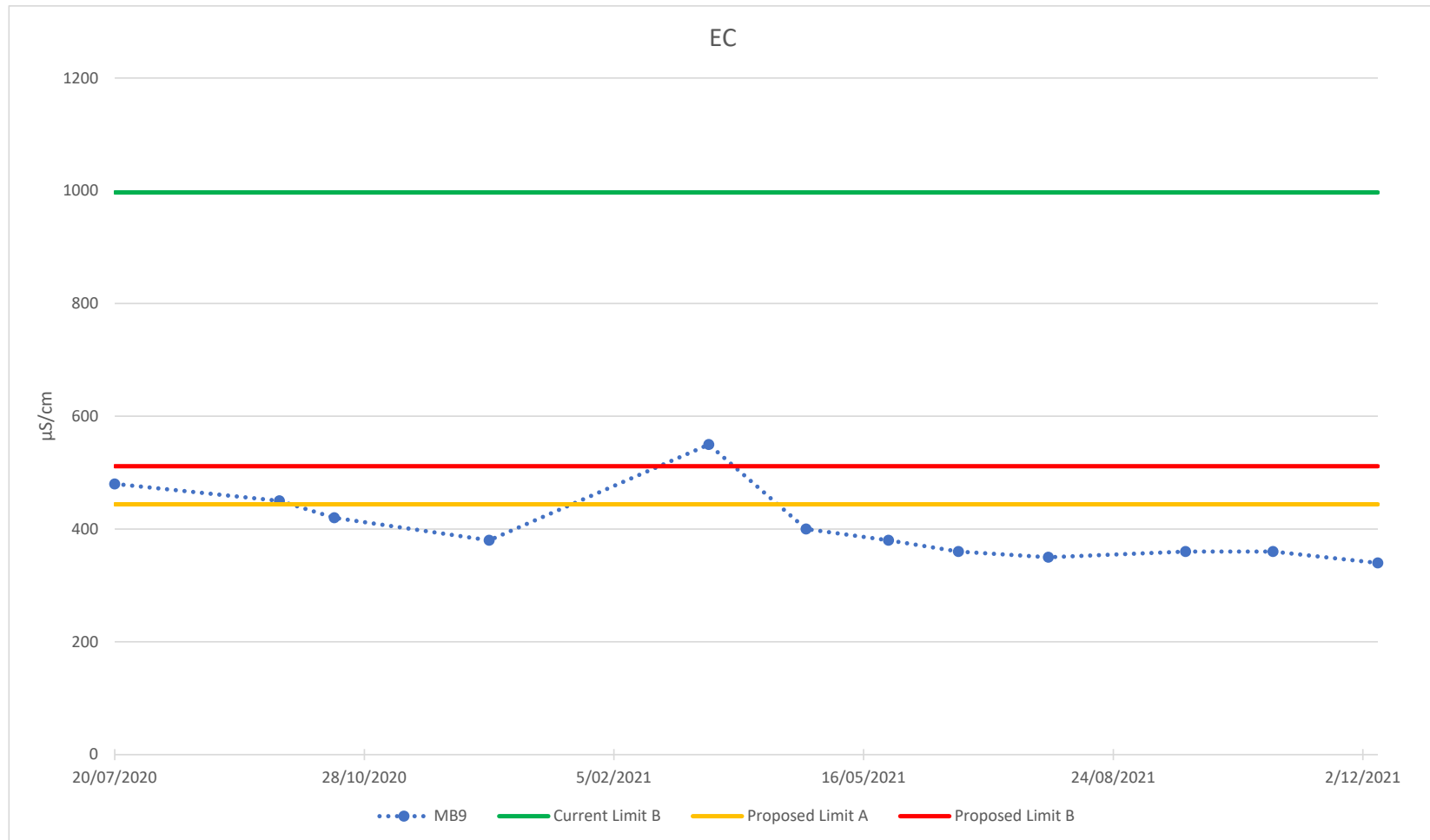
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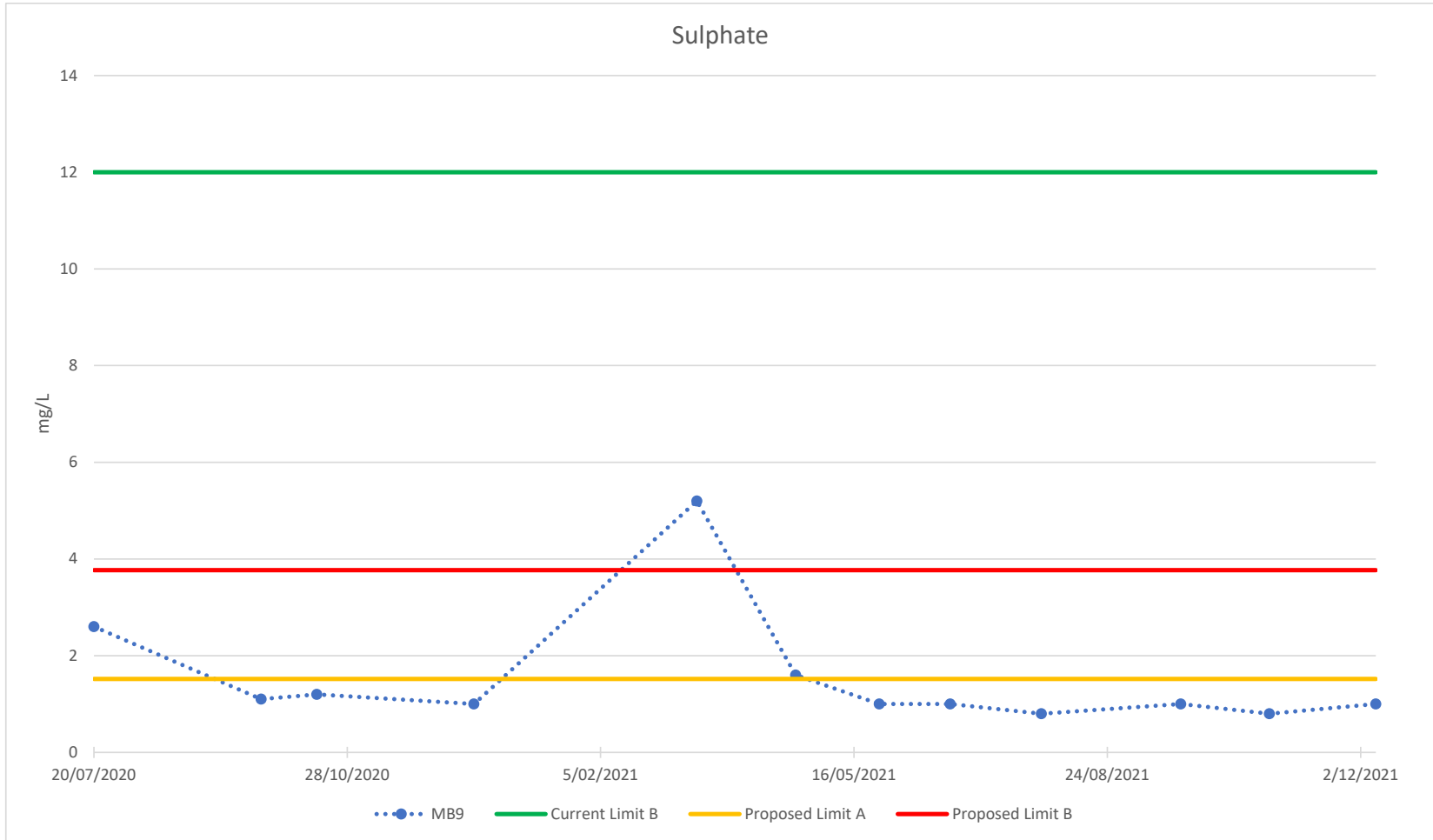
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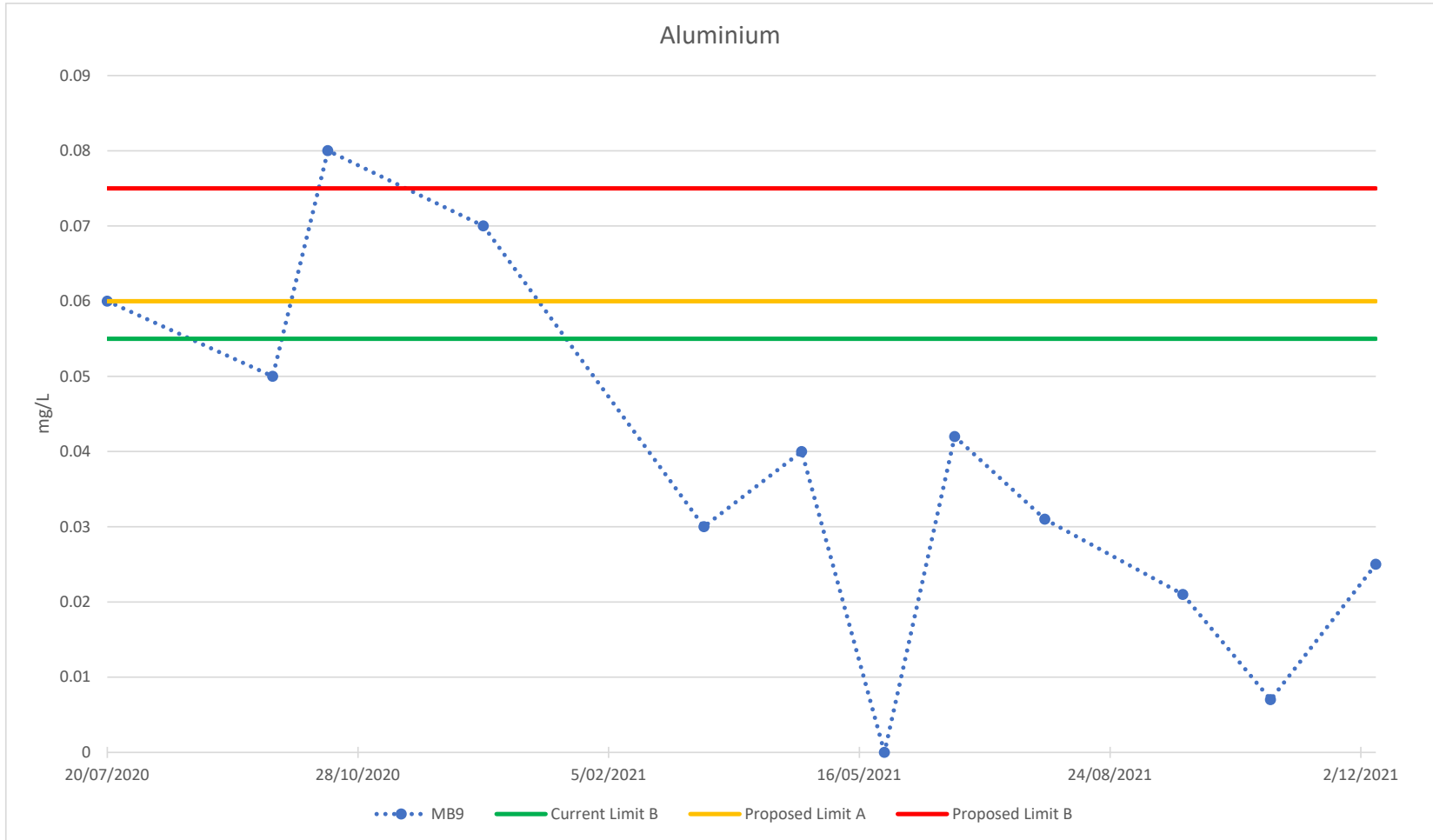


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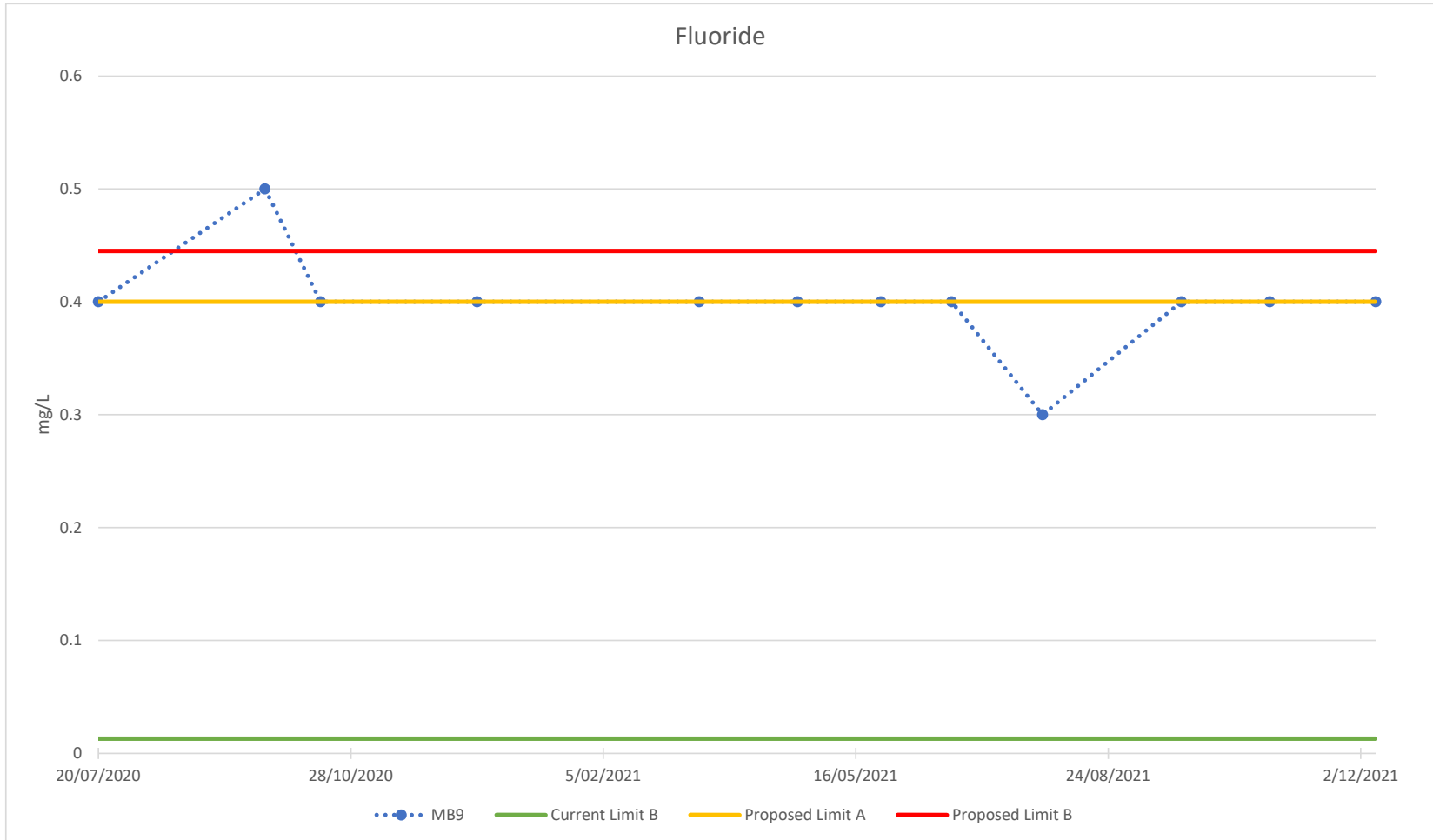


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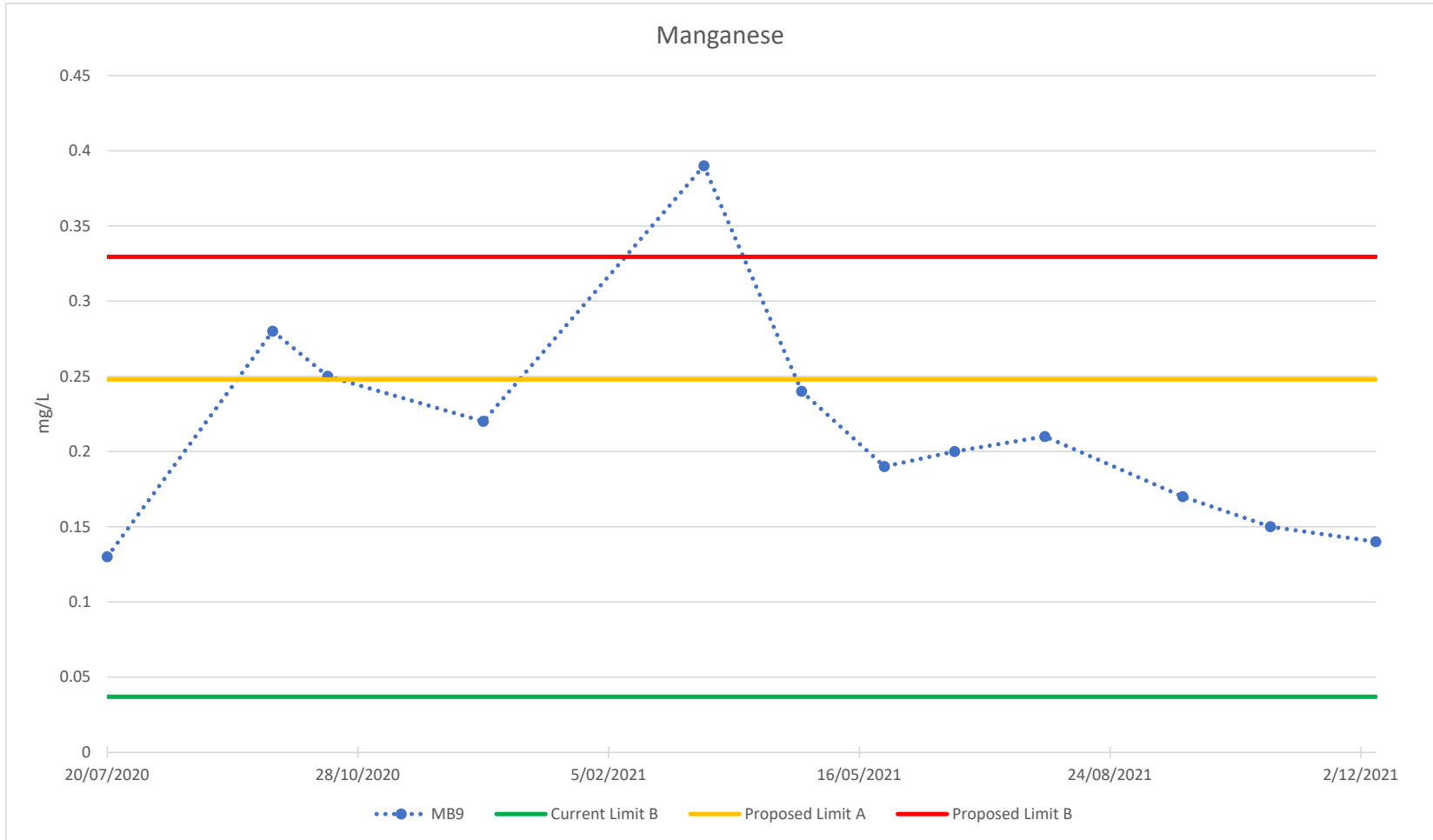




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PART B

ATTACHMENTS

PRCP SCHEDULE

APPENDIX 1 – PRCP Schedule

APPENDIX 2 – EA EPVL00864413

APPENDIX 3 – Flood Model Results (CDM Smith, 2018)

APPENDIX 4 – Groundwater Assessment Report (Ardent Group, 2022)

APPENDIX 5 – Final Landform Design (Ausrocks, 2024)

APPENDIX 6 – Geotechnical Report (AMC)

APPENDIX 7 – TSF Design Report (Golder, 2021)

APPENDIX 8 – Ecology Assessment Chapter – 2018 EA Amendment Application

APPENDIX 9 – Protected Plants Survey – 2022

MGT Minerals Pty Ltd ; ML20547, ML4349

APPENDIX 5 – Final Landform Design (Ausrocks, 2023)



ML4349 & ML20547

Final Landform Report

Prepared for MGT Minerals Pty Ltd

January 2024

AUQ00264

DOCUMENT CONTROL

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File Name	ML4349 & ML20547 Final Landform Report
Project No	AUQ00264
Distribution	Ardent Group, MGT Minerals Pty Ltd

Document Change Control

Version	Description (section(s) amended)	Author(s)	Date
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1.3	Revised Document for IR Submission	FF, CM	30/01/2024

Document Review and Sign Off

Name	Position	Role	Signature	Date Issued
Carl Morandy	Managing Director (Ausrocks)	RPEQ (22981) & QA Review		30/01/2024

This document has been prepared for the exclusive use of the Client based on instructions, information and data supplied by the Client as of January 2024. This document has been prepared by Ausrocks Pty Ltd (Ausrocks). Ausrocks has no financial association with the Client other than carrying out this report as requested by the Client.

Introduction

Ausrocks Pty Ltd (Ausrocks) were commissioned by Ardent Group Pty Ltd on behalf of MGT Minerals Pty Ltd to carry out a Final Landform Design at the Mt Veteran Mine in Mount Garnet, QLD. Ausrocks received pit and site layout design files from MGT engineers and were tasked with providing Final Landform documents to support a Progressive Rehabilitation and Closure (PRC) Plan. The MGT Minerals operation is located approximately 12km north of Mount Garnet within ML4349 & ML20547. The operation consists of historical mining works (including Tailings Dams), proposed Open Pits (Dalcouth and Summer Hills), Tailings Storage Facility and Waste Dump.

Landform Design Parameters

The following general factors were considered when determining the appropriate design parameters for the final landform:

- Geological factors and geotechnical stability of the materials
- Surface water runoff
- Site specific boundaries (property and mining lease boundaries)
- Final land use.

The design parameters provided in the MGT design files are shown in **Table 1** below. The pit design parameters were assumed to be safe and stable; the Dalcouth Pit is proposed to be fully backfilled, but the Summer Hill Pit will remain as a free-draining Open Cut.

Table 1 – Landform Design Parameters

Parameter		Value	Comment
Offsets	Mining Lease Boundary	-	None applied
Benches – Dalcouth Pit	Bench Height	5m	Low bench height
	Batter Width	3m	
	Batter Angle	85 degrees	Consistent with similar operations. Assume competent – Fresh rock with low geotechnical risk.
	Road Width	12m	Including provision for drainage and bunding.
	Road Gradient	12.5%	1 in 8 gradient which is suitable for off-highway trucks.
	Overall Slope	N/A	Design is generally <51 degrees
Benches – Summer Hill Pit	Bench Height	5m	Low bench height
	Batter Width	2.5m	
	Batter Angle	80 degrees	Consistent with similar operations. Assume competent – Fresh rock with low geotechnical risk.
	Road Width	12m	Including provision for drainage and bunding.
	Road Gradient	7.5%	1 in 13.3 gradient which is suitable for off-highway trucks.

	Overall Slope	<57 degrees	58 degrees maximum
Rehabilitation – Dalcouth Pit	Floor Level	RL660	The pit floor is backfilled to between 733mRL and 752mRL to meet the surrounding topography
	Floor Slope	-	The pit is backfilled to a level that is congruent with the surrounding landscape, including a free draining final landform and slopes that vary to match natural topography. An average slope of 12% is achieved.
Rehabilitation – Waste Dump	Waste Dump Batter Angle	1 in 4	Geotechnically stable final landform
	Ramp	-	No ramp required as direct access is available in the north eastern corner due to the design intercepting natural ground
Rehabilitation – Summer Hill Pit	Floor Level	RL760	The pit floor is assumed at 760mRL
	Floor Slope	1%	The pit floor is designed with a gentle slope towards the northwest of 1% to achieve a free draining final landform
	Ramps	-	No direct access ramps required, pit floor and upper benches accessed via natural topography from perimeter of pit.
Proposed Tailings Storage Facility	Capping Thickness	1m Min	Minimum 1m capping over TSF facility.
	Capping Slope	1%	Capping is designed to drain to the existing catch drains on either side of the TSF, the northern drain flows to the original spillway and the southern drain flows to a proposed spillway, both spillways are on the western side of the TSF.
	External Embankment Slope	1V in 2.5H	For long term stability. Rocky mulch to be applied to embankment to resist erosion.
	Drainage	N/A	No ponding of water around the toe of the TSF wall, drainage pipes to be min 1:50 slope.
Current Tailings Storage Facility	Capping	N/A	Existing material reprofiled only
	Slope	2%	Dam walls are removed and natural gully profile is restored, resulting in ~2% watercourse gradient and average 10% side slopes to match surrounding topography.
Rehabilitation – General	Topsoil Depth	0.15m	Standard topsoil depth

Material Balance

Material Schedules were provided to Ausrocks from MGT Minerals for both the Summer Hills and Dalcouth Pits. These schedules included Ore and Waste volumes for each 5m bench in the pits. This data was used to correlate the material balance and determine the quantities of waste movements. A topography surface was provided by MGT for the majority of the mining area, based on the resolution it is estimated the source of the information is a combination of ground survey and historical satellite generated topography (such as SRTM). The level of detail available in the contour data was sufficient for basic design consideration, however a higher level of accuracy is recommended for the detailed design phase.

Table 2 – Material Balance - Waste

Item	Volume (m ³)	Comment
Summer Hill Pit Waste (to 760mRL)	477,414	Based on MGT supplied data
Dalcouth Pit Waste	1,171,722	Based on MGT supplied data
Dalcouth Pit Backfill	1,074,739	Calculated from Pit base to Final Landform
Proposed TSF Capping	139,996	Calculated from Proposed TSF Surface to Final Landform with a minimum 1% gradient and minimum thickness of 1m. The Final Landform design includes capping of the TSF seepage pond also with a minimum 1% gradient for adequate drainage. Surface Areas remain within Maximum Disturbance Area limits provided by EA Table A1.
Existing TSF	-	recontouring only, no fill
Ancillary works	37,000	Estimate only, road maintenance, safety bunding, stormwater management, minor fill as required etc
Remainder for Waste Dump	397,401	Surplus waste from pit backfill & other works
Waste Dump Topsoil Volume	9,616	Based on surface area x 0.15m
Waste Dump Storage Volume	407,017	Required Storage within Waste Dump. Note available volume within Waste Dump Design is 417,695m ³

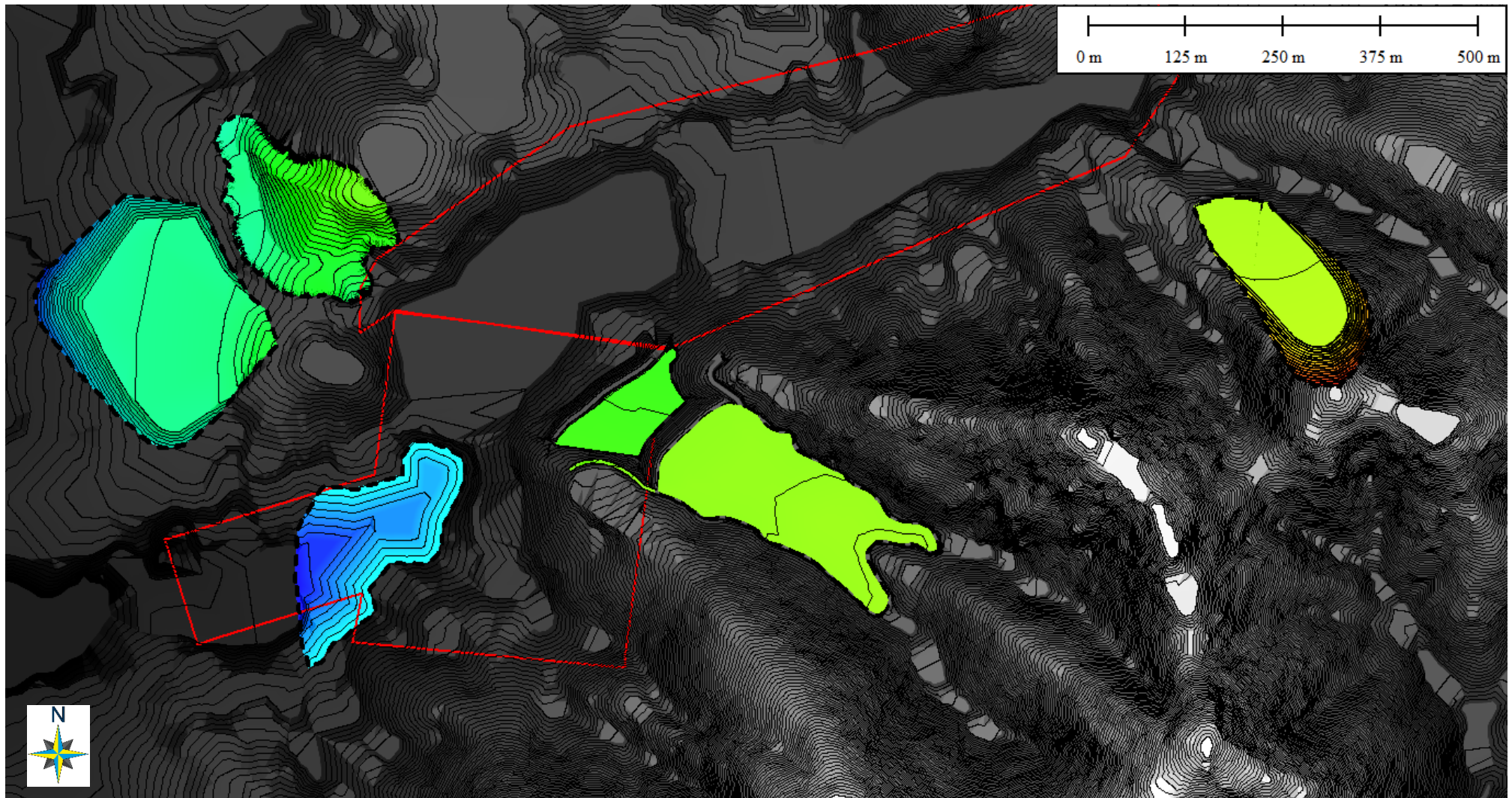
Table 3 –Topsoil

Item	Surface Area (m ²)	Topsoil Thickness (m)	Topsoil Volume (m ³)
Dalcouth Pit	34,433	0.15	5,165
Proposed TSF	47,766	0.15	7,165
Existing TSF	32,378	0.15	4,857
Waste Dump	64,104	0.15	9,616
Summer Hill Pit	29,690	0.15	4,454
Total			31,256

Final Landform Design

Figure 1 shows the final landform with 1m contours.

Figure 1 – Final Landform Design



Figures 2 to 5 detail a series of cross sections through the final landform design. The original pit shell has also been included for Dalcouth Pit for reference.

Figure 2 – Final Landform Design Dalcouth Pit and Waste Dump

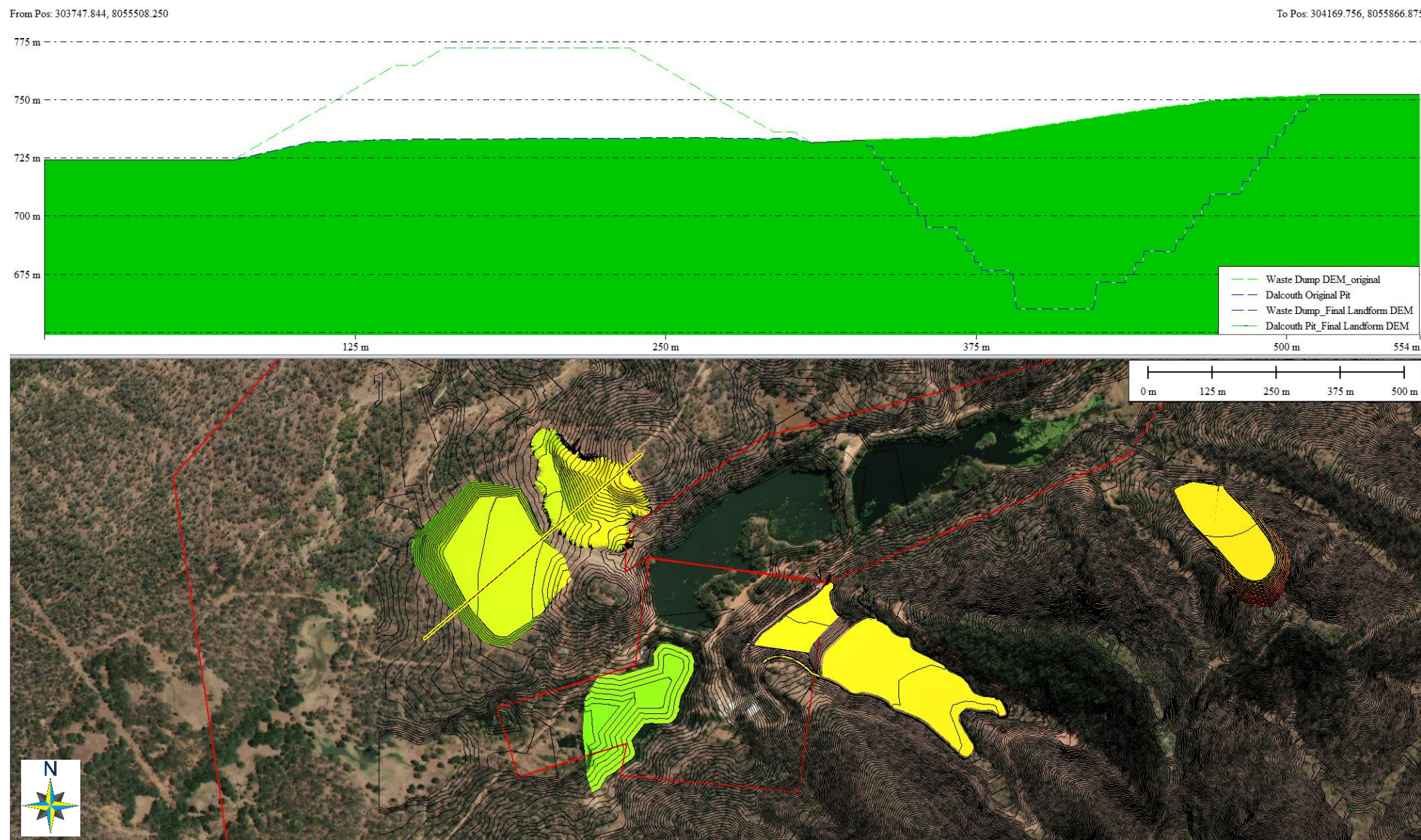


Figure 3 – Final Landform Design Existing TSF

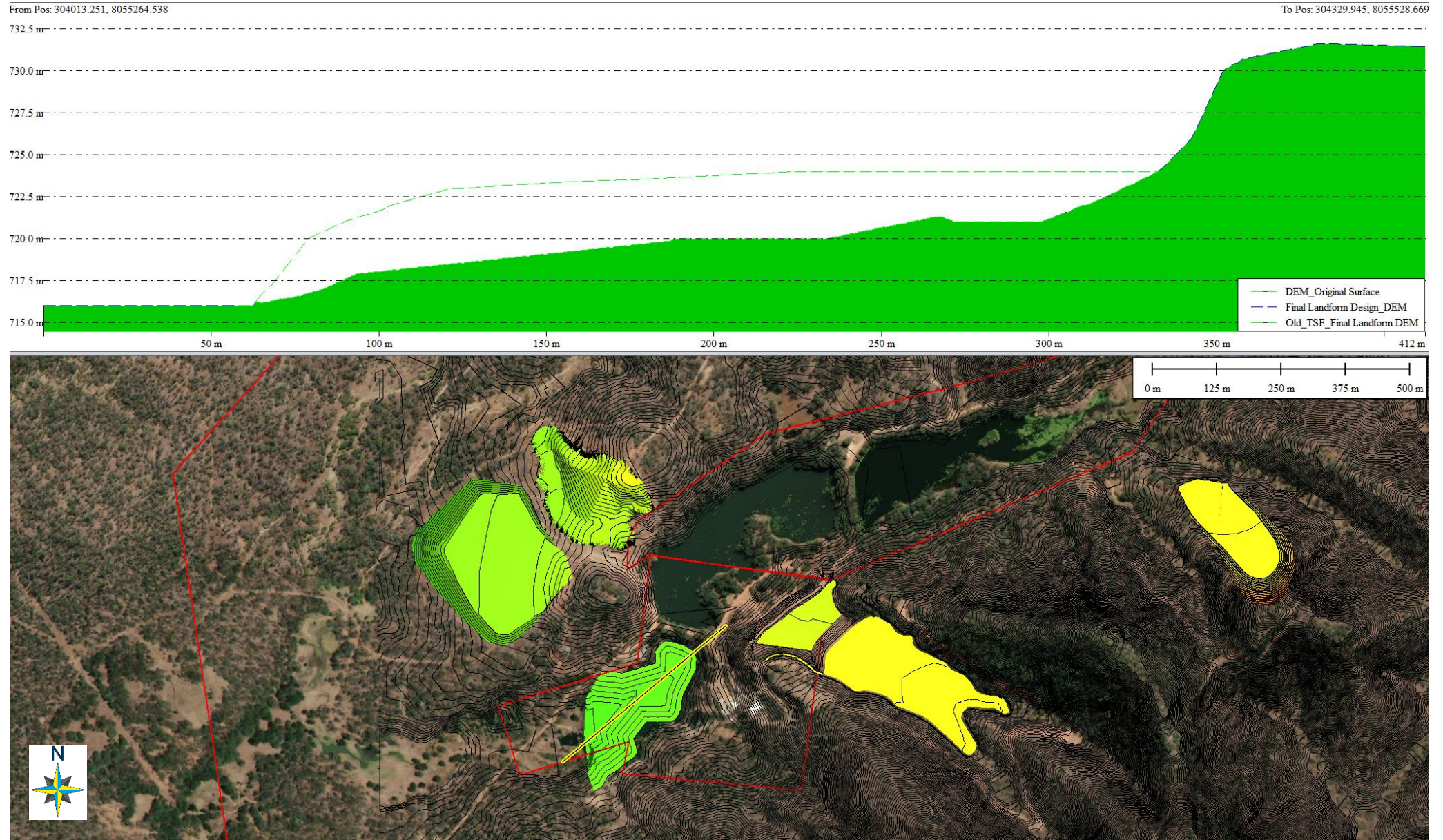


Figure 4 – Final Landform Design Proposed TSF

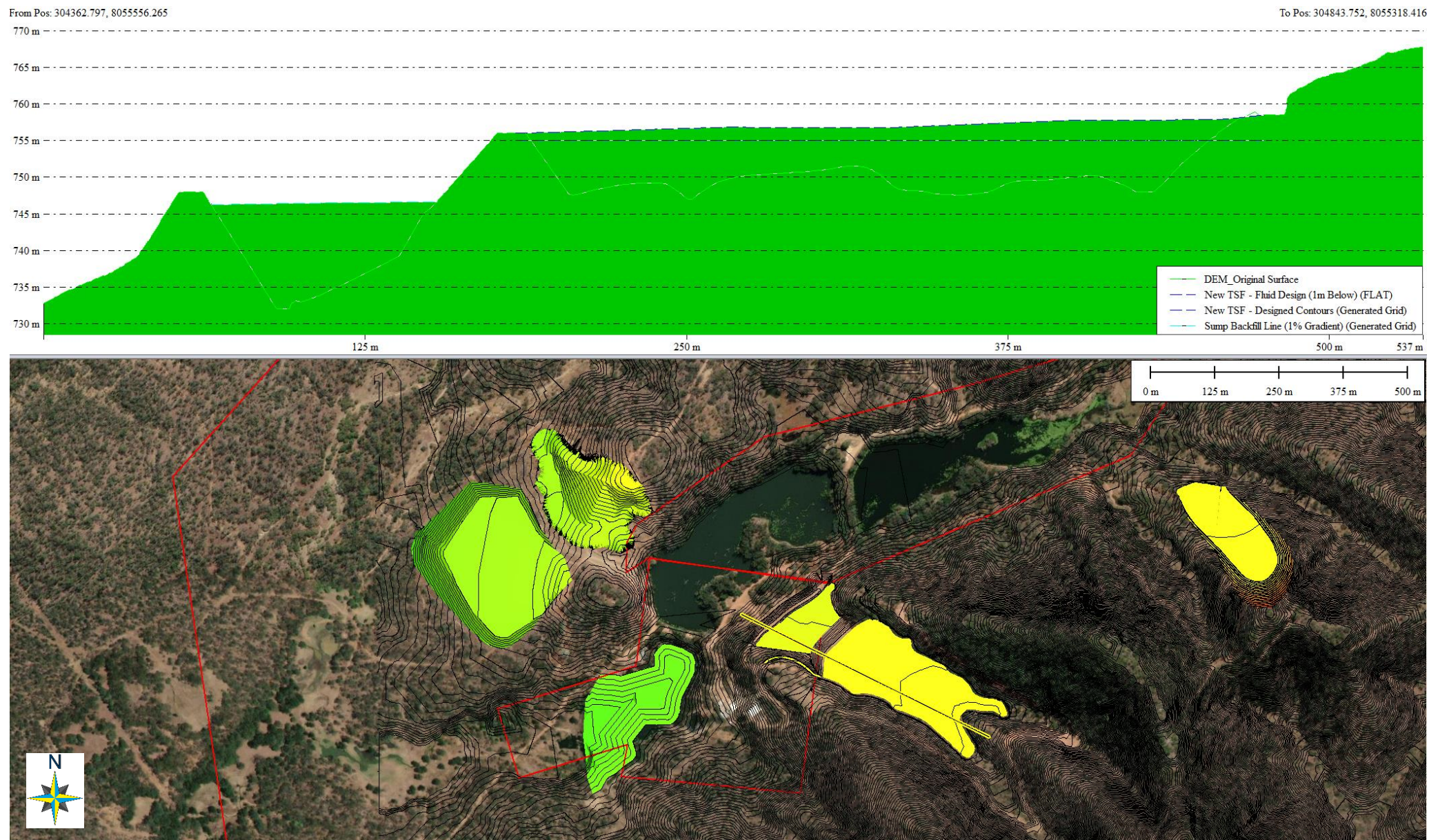
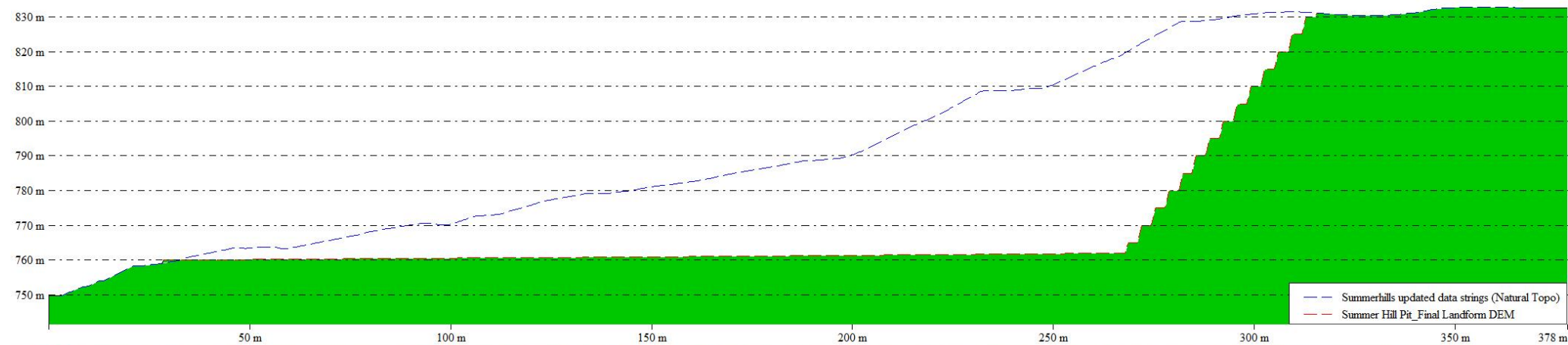


Figure 5 – Final Landform Design Summer Hill Pit

From Pos: 305211.915, 8055830.690

To Pos: 305455.459, 8055541.59



Watershed Analyses – Final Landform Design

The **Final Landform Design** is a free draining final landform (**Figure 6**) with no voids for water to collect. A second spillway has been added to the TSF landform to drain any rainfall from the southern side of the TSF to lower catchment areas. The TSF settling pond area will also be backfilled and have a 1% gradient towards the existing spillway.

Figure 6 – Watershed Analyses – Final Landform Design

