DARGUES
GOLD MINE

Statement of Environmental Effects
for the
Dargues Gold Mine

Modification 4
MP10_0054

November 2018

Prepared by

R.W. CORKERY & CO. PTY. LIMITED

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Big Island Mining Pty Ltd ABN 12 112 787 470

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Prepared for:

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November 2018

R.W. CORKERY & CO. PTY. LIMITED

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1. INTRODUCTION

1.1 SCOPE

This *Statement of Environmental Effects* has been prepared by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Big Island Mining Pty Ltd (the Proponent) to support an application to modify Project Approval MP10_0054 (the Proposed Modification, Modification 4 or MOD4).

The Dargues Gold Mine (the Project) was initially proposed in December 2009. Project Approval PA10_0054 was granted by the Land and Environment Court on 7 February 2012, with subsequent modifications granted on:

- 12 July 2012 (MOD1) to permit the use of back fill;
- 24 October 2013 (MOD2) to regularise the approved layout following minor changes during the detailed design phase of the Project; and
- 10 August 2016 (MOD3) to allow the construction and use of the Eastern Waste Rock Emplacement, the construction and use of a crossing across Spring Creek and to accommodate an extension to the mine life.

Figure 1 presents the location of the Dargues Gold Mine on the western slopes of the Great Dividing Range, approximately 60km southeast of Canberra, approximately 13km south of Braidwood and immediately to the north of the village of Majors Creek. The Project is located on land that is, owned or controlled by the Proponent, and is referred to hereafter as “the Project Site”.

Construction of the Project commenced on 11 February 2013 and the Project was placed into care and maintenance in December 2013. Construction of surface infrastructure for the Project commenced on 27 March 2017, with underground mining starting in May 2018 and process plant construction planned to commence in January 2019.

As a result of further detailed design and optimisation work undertaken, adjustments to the Project are proposed to be made. In order to facilitate these adjustments, the Proponent is seeking approval to modify MP10_0054 to further refine the approved activities, including.

- Relocation of the approved heavy vehicle crossing of Spring Creek approximately 400m upstream to the north.
- Reinstatement of the previously approved access track to the Tailings Storage Facility (TSF) from the Site Access Road.
- An update to the Project’s approval conditions (Appendix 1 – Schedule of Land) to reflect the purchase of Lot 210, DP 755934 by Dargues Gold Mine Pty Ltd from B & C James.

These modifications are sought to:

- ensure that the Project is operated in an economical and sustainable manner;
- reduce, to the maximum extent practicable, the overall environmental impact of the Project; and
- minimise, to the maximum extent practicable, the impact on the local community and other stakeholders.

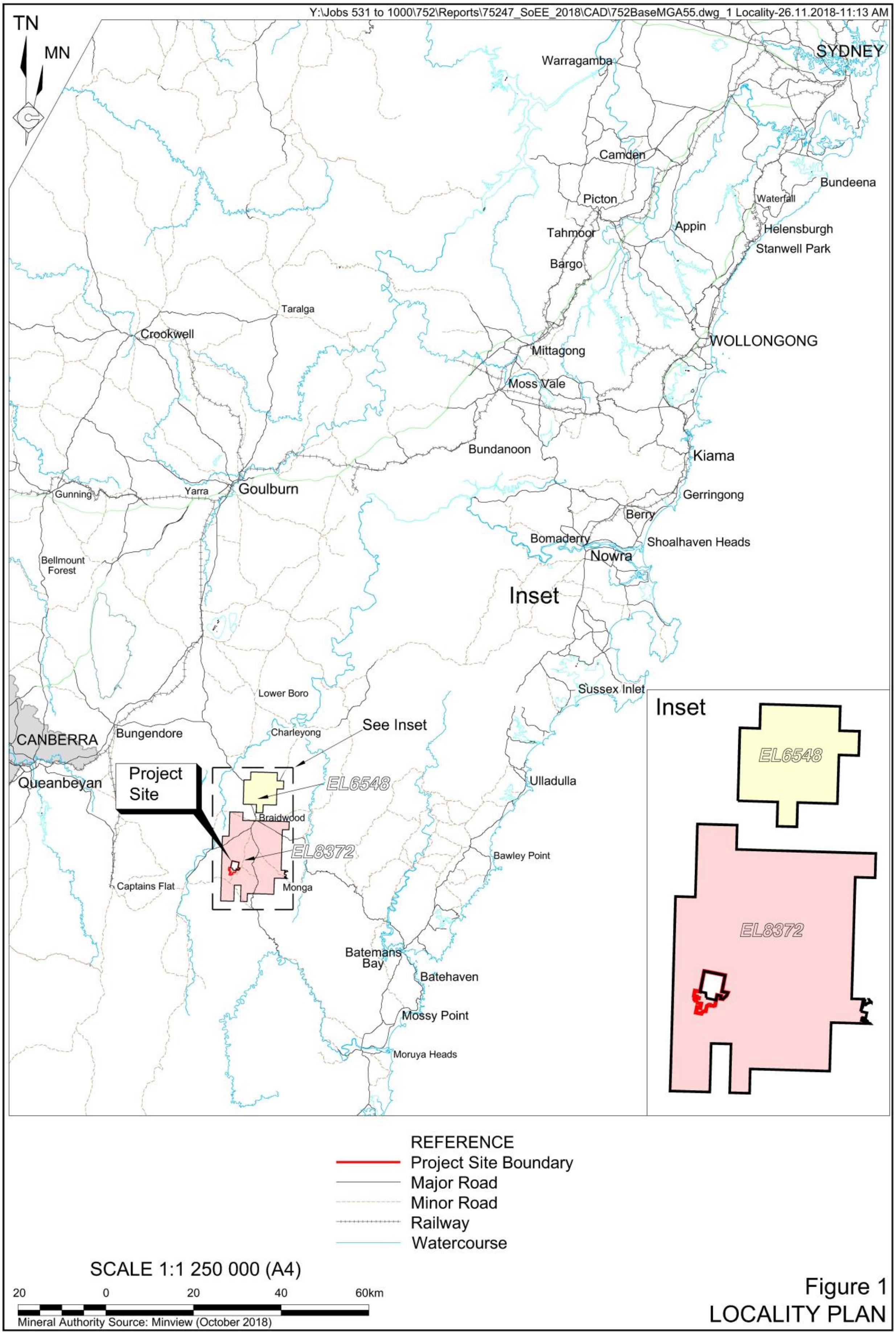


Figure 1
LOCALITY PLAN

The information contained in this document relates only to those components of the Project that would be the subject of MOD4. Aspects of the Project that would not be modified would continue to be undertaken in accordance with the following.

- The *Environmental Assessment* dated September 2010 (RWC, 2010a).
- The *Response to Submissions* dated December 2010 and associated documentation and correspondence (RWC, 2010b).
- The *Environmental Assessment – Modification 1* dated April 2012 (RWC, 2012a).
- The *Response to Submissions* dated June 2012 (RWC, 2012b).
- The *Environmental Assessment – Modification 2* dated July 2013 (RWC, 2013a).
- The *Response to Submissions* dated September 2013 (RWC, 2013b).
- The *Environmental Assessment – Modification 3* dated July 2015 (RWC, 2015a).
- The *Response to Submissions* dated November 2015 (RWC, 2015b).
- Project approval MP10_0054 MOD3 and its associated conditions, statement of commitments and plans.
- Other licences and approvals held by the Proponent for the Project.

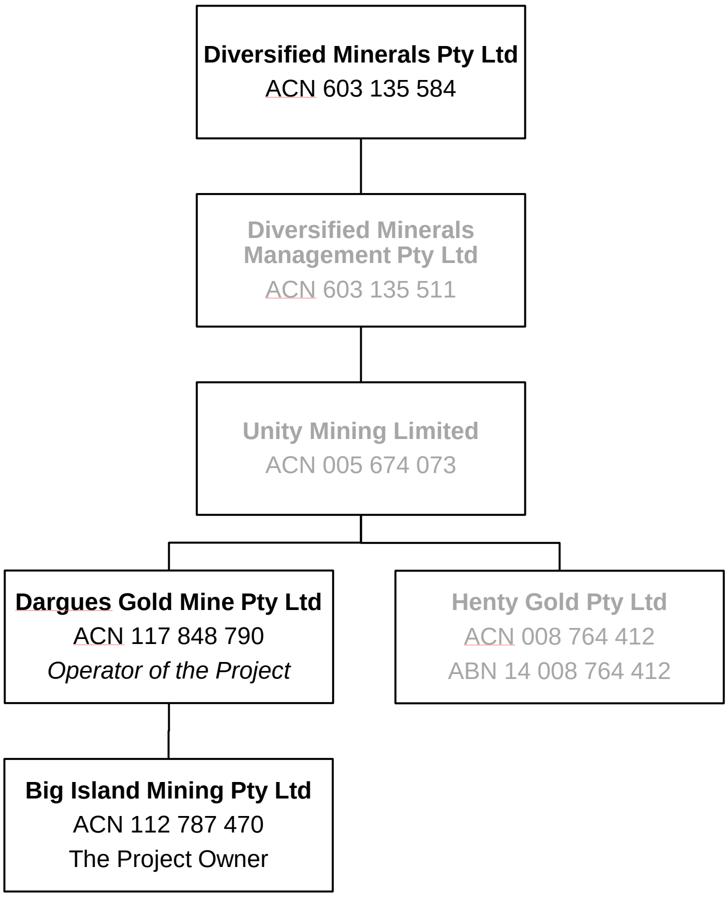
As a result, this document should be read in conjunction with the above. Section 2.1.2 presents an overview of those activities which would be amended as a result of MOD4.

1.2 THE PROPONENT

The Proponent, Big Island Mining Pty Ltd, is a privately-owned company, whose ultimate parent is Diversified Minerals Pty Ltd (Diversified Minerals), which also owns and operates the Henty Gold Mine. The Project is owned by Big Island Mining Pty Ltd, a wholly owned subsidiary of Dargues Gold Mine Pty Ltd (DGM). DGM is a subsidiary of Unity Mining Limited (Unity). The company structure of Unity was retained following the purchase of Unity and its subsidiaries by Diversified Minerals, with Unity becoming a subsidiary of Diversified Minerals Management Pty Ltd (DMMPL), which is itself a subsidiary of Diversified Minerals. The company structure is provided in **Figure 2**.

Notwithstanding the purchase of Unity by Diversified Minerals, the entities that control the Project remain unchanged from previous applications.

The Proponent is committed to continuing the development and operation of the Project in a manner that achieves environmentally responsible outcomes and benefits the local community and broader region. The Proponent recognises that the Proposed Modification should not be achieved to the detriment of the local community or the environment. Rather, the Proponent believes that the Proposed Modification would further minimise the potential for adverse Project-related environmental impacts while providing the maximum economic and other benefits for all stakeholders, including its employees and contractors, the surrounding community, State and Commonwealth governments, Queanbeyan – Palerang Regional Council and the Proponent's shareholders.



Source: Diversified Minerals Pty Ltd

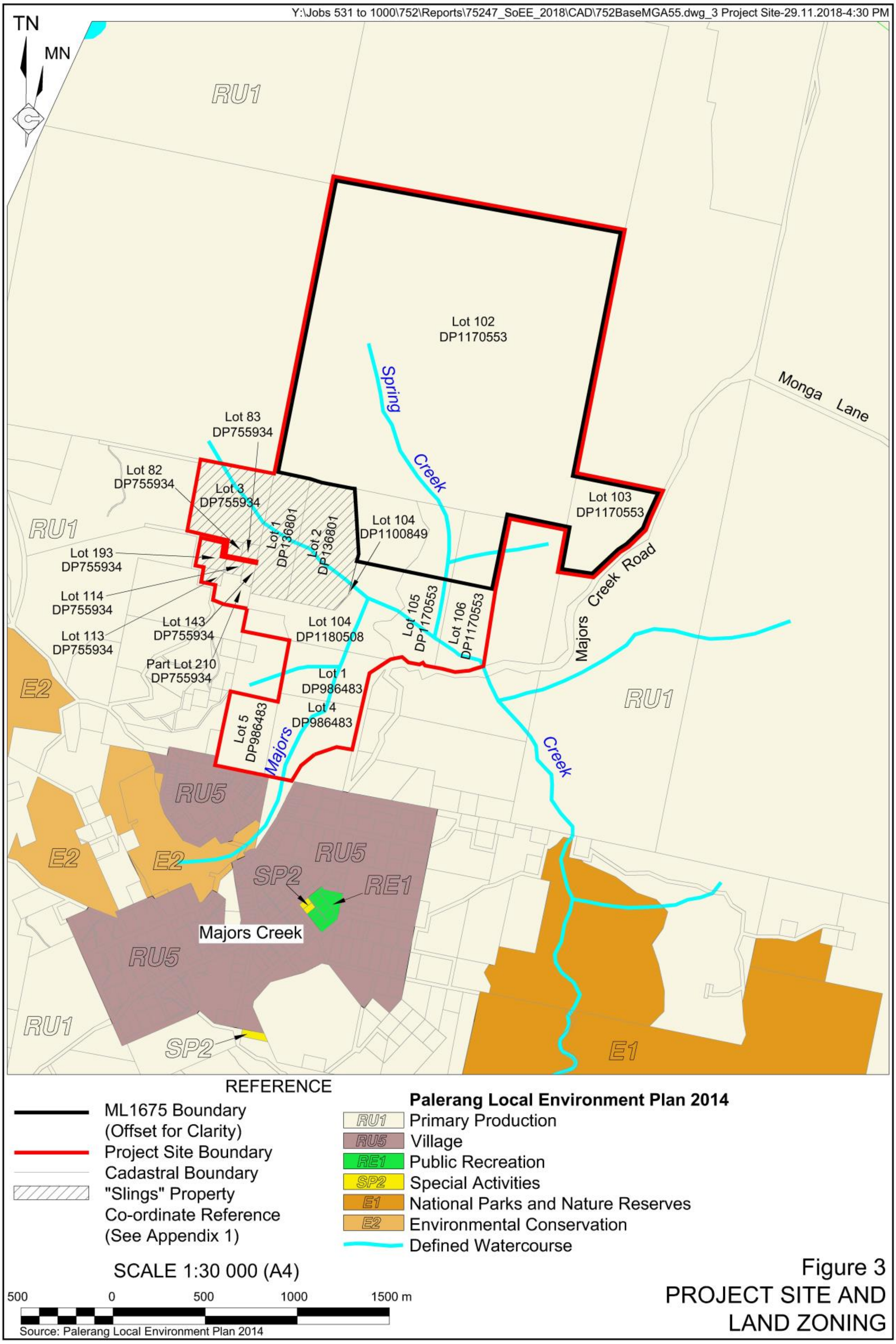
Figure 2
COMPANY STRUCTURE

1.3 PROJECT SITE AND LAND ZONING

The Project Site comprises 19 land titles of which 18 are owned by the Proponent. One parcel of land, namely Lot 193, DP755934 is Crown Land and is leased by the Proponent under Special Lease 132905. It is the Proponent’s intention to make an application to purchase that land and has submitted an expression of interest to the NSW Department of Industry to do so. A further parcel of land, namely Lot 210, DP755934 was purchased from B and C James in July 2017, as outlined in Section 2.4.

Table 1 presents the original and updated folio number for all land within the modified Project Site. **Figure 3** presents the location of each of these parcels of land.

All land within the Project Site is zoned RU1 – Primary Production under the *Palerang Local Environmental Plan 2014* which was gazetted on 19 September 2014 and came into effect on 31 October 2014.



Source: Palerang Local Environment Plan 2014

Figure 3
PROJECT SITE AND LAND ZONING

Table 1
Project Site Land Titles

RWC (2010a) Folio Number		**Revised/Additional Folio Number**			
Lot	**DP**	**Lot**	**DP**	**Ownership**	**Comment**
102	755934	102	1170553	Dargues Gold Mine Pty Ltd	Resurveyed and renumbered land titles
1021	1127185	103	1170553		
2	986483	105	1170553		
3	986483	106	1170553		
104	1100849	104	1180508		
1	986483	1	986483		Original land titles retained
4	986483	4	986483		
5	986483	5	986483		
Part 210	755934	Part 210	755934		
		104	1100849		Land identified as not falling within surrounding land titles
		1	136801		Land associated with the “Slings” property
		2	136801		
		3	755934		
		82	755934		
		83	755934		
		113	755934		
		114	755934		
		143	755934		
		193	755934	Crown Land	Leased and associated with the “Slings” property
Source: Big Island Mining Pty Ltd					

1.4 BACKGROUND TO THE PROPOSED MODIFICATION

1.4.1 Introduction

The Proponent and its associated predecessors have controlled exploration licences over the Project Site since 2002. At that time, an exploration program was commenced to identify additional hard rock gold resources associated with the historic Jembaicumbene, Majors Creek (also known as Elrington) and Araluen alluvial goldfields. Through this exploration program the Dargues Reef Gold Deposit was defined and subsequently determined to be economically recoverable following a Definitive Feasibility Study in 2010.

This subsection provides an overview of the approvals, licences, mineral authorities and permits held by the Proponent, a brief overview of mineral exploration activities undertaken and an overview of the resources and reserves within the Project Site. This subsection also provides a brief overview of the approved activities, status of Project construction and environmental performance to date.

1.4.2 Existing Approvals, Licences, Mineral Authorities and Permits

Table 2 presents the consents, licences and approvals held by the Proponent in relation to the Dargues Gold Mine.

Table 2
Dargues Gold Mine – Existing Consents, Licences and Approvals

Issuing / Responsible Authority	Approval Number	Date of Issue	Expiry	Comments
Project Approval – NSW EP&A Act				
Department of Planning and Industry (under delegation)	PA10_0054 (NSW)	07/02/2012	13/08/2018	Original project approval as prescribed by the Land and Environment Court
Department of Planning and Environment (under delegation)	MP10_0054 MOD 1	12/07/2012	13/08/2018	Modification of the Project Approval to allow the use of Back Fill
Department of Planning and Environment (under delegation)	MP10_0054 MOD 2	24/10/2013	13/08/2018	Modification to regularise changes to the site layout.
Department of Planning and Environment (under delegation)	MP10_0054 MOD 3	10/08/2016	30/06/2025	Modification to allow the construction and use of the Eastern Waste Rock Emplacement, a crossing across Spring Creek, and an extension of mine life.
Controlled Action Approval – Commonwealth EPBC Act				
C'wlth Minister for the Environment	2010/5770	27/09/2011	30/09/2020	
C'wlth Minister for the Environment	EPBC 2015/7539	February 2017	30/06/2025	Modification of the Project Approval to extend the end date of mining operations and for additional infrastructure.
Environment Protection Licence				
EPA	EPL20095	18/05/2012	-	
Mineral Authorities				
Minister for Resources and Energy	ML1675	13/04/2012	12/04/2045	
	EL6548	5/04/2006	5/04/2020	
	EL8372	21/05/2015	20/05/2021	
Water Licences				
Natural Resources Access Regulator	WAL39281	29/03/2017	-	Extraction of up to 320ML/y of groundwater from the Dargues Gold Mine
	WAL39282	19/10/2017	-	Extraction of up to 39ML/y of groundwater from the Snobs workings
	WAL39287	29/03/2017	-	Extraction of up to 16ML/y of groundwater from the Steward and Merton's workings
	WAL39292	29/03/2017	-	Extraction of up to 24ML/y of groundwater from the United Miners workings
Other Approvals, Licences and Permits				
Dams Safety Committee	Design conforms to the Committee's requirements.	9/12/2016	-	-

Source: Big Island Mining Pty Ltd

The Proponent understands that further approvals would not be required for the harvesting of surface water within the Project Site as the Proponent would ensure that the total volume of surface water storage is less than or equal to the Proponent’s maximum harvestable right dam capacity.

1.4.3 Exploration Operations

Gold was first discovered at Majors Creek on 5 October 1851, with a number of significant alluvial goldfields being established in the following years. The vast majority of gold extracted within the vicinity of the Project Site was won by alluvial mining in the mid to late 1800s. The mineral authorities held by the Proponent encompass the Majors Creek (Elrington) Goldfield, the Jembaicumbene alluvial Goldfield and a small section of the Araluen Goldfield. Past historic production comprises approximately 1.25 million ounces sourced from alluvial (98%) and lode gold (2%) workings. The area surrounding the Project Site represents the richest alluvial goldfield in NSW.

The Dargues Gold Deposit has been evaluated and drill tested by several mining companies. To date, in excess of 40 000m of reverse circulation and diamond drilling has been completed, with the majority targeting along-strike and down-dip extensions of the known mineralised gold lodes that make up the Dargues Gold Deposit.

The Proponent has identified a range of associated prospects in the vicinity of the Dargues Gold Deposit, including Chinaman's, Ruby Lode, Copper Ridge, Excalibur and the Carmine Prospects. These and other mineralised zones are the focus of current and future mineral exploration activities. However, these prospects do not form a component of the Mine or the Proposed Modification. Should mineralisation with the potential to be economically extracted be identified, a further modification to MP10_0054 and/or a new development consent would be sought.

1.4.4 Identified Resources and Reserves

Gold mineralisation within the Dargues Gold Deposit occurs as a number of discrete gold lodes positioned within zones of structural weakness and intense alteration within the host Braidwood Granodiorite. The Dargues Gold Deposit has a JORC-compliant mineral resource of 1.59Mt @ 6.8 g/t gold for 348 000 ounces of gold. The ore reserve, namely that component of the mineral resource that can be mined using current mining techniques, is 1.17Mt @ 5.7g/t Au (214 000 ounces of gold).

1.4.5 Approved Activities

The approved Project is fully described in RWC (2010a), RWC (2012a), RWC (2013a) and RWC (2015a). However, for completeness, the approved activities include the following (**Figure 4**).

- Extraction of waste rock and ore material from the Dargues Gold Deposit using underground sublevel open stope mining methods with a suitable crown pillar, and internal pillars and sills to prevent surface subsidence and ensure geotechnical stability of the approved mine.

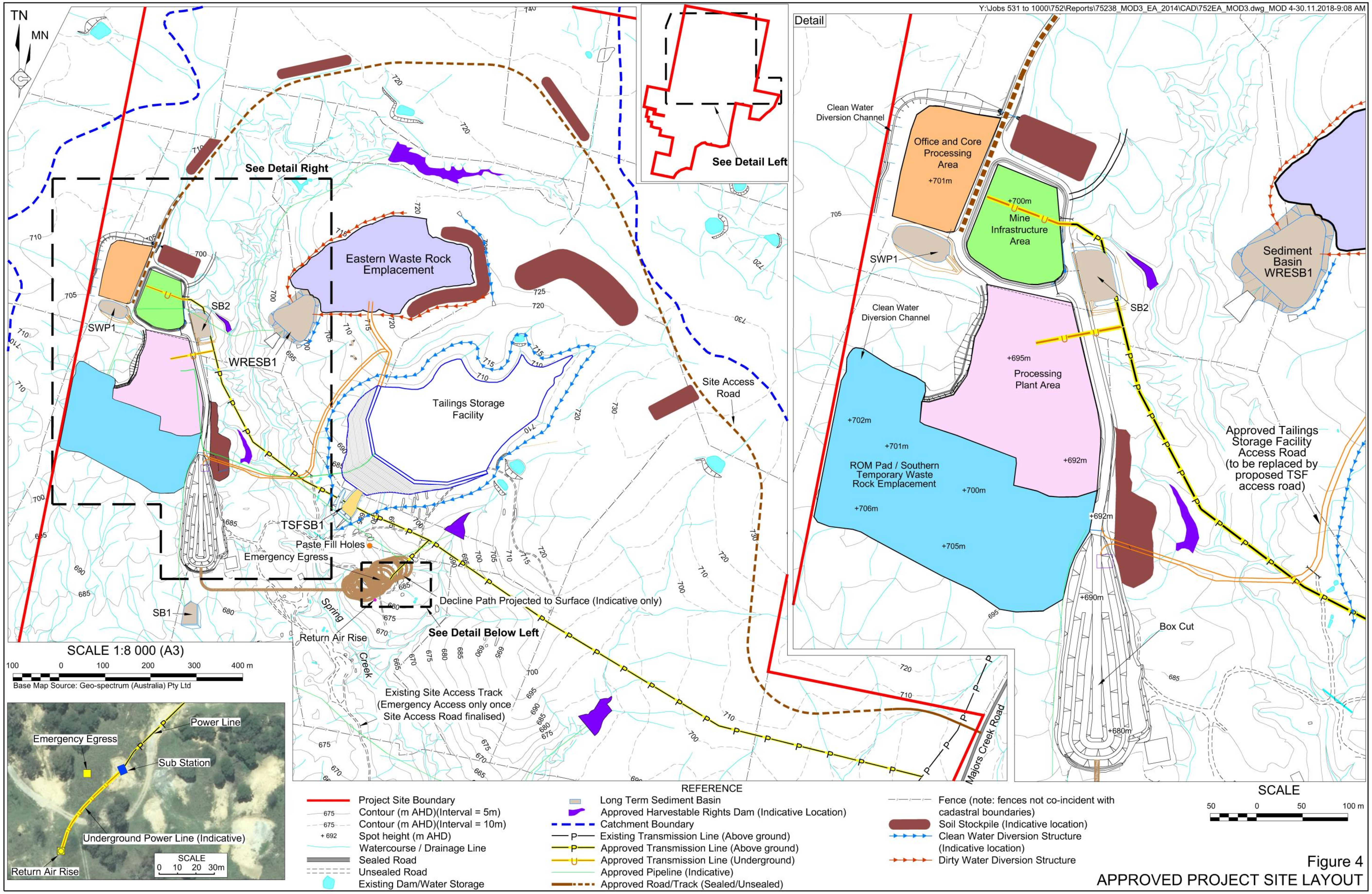


Figure 4
APPROVED PROJECT SITE LAYOUT

- Filling of voids created during underground mining using a combination of back fill (a mixture of tailings and cement) and waste rock.
- Construction and use of surface infrastructure required for the underground mine, including a box cut, portal and decline, magazines, fuel store, ventilation rises, back fill hole(s) and power and water supply.
- Construction and use of a processing plant and office area which would include an integrated run-of-mine (ROM) pad/temporary waste rock emplacement, crushing and grinding, gravity separation and flotation circuits, Proponent and mining contractor site offices, workshop, laydown area, ablution facilities, stores, car parking, and associated infrastructure.
- Construction and use of a tailings storage facility.
- Construction and use of a water management system, including construction and use of eight harvestable rights dams and an associated water reticulation system, to enable the harvesting and supply of water for environmental flows. It is noted that the proposed water harvesting operations would be consistent with the Proponent’s rights under Section 53 of the *Water Management Act 2000*.
- Construction and use of a site access road and intersection to allow site access from Majors Creek Road.
- Transportation of sulphide concentrate from the Project Site through Braidwood via public roads surrounding the Project Site using covered semi-trailers.
- A heavy vehicle crossing of Spring Creek to permit direct access between the process plant and the Tailings Storage Facility.
- Construction and use of the Eastern Waste Rock Emplacement for the storage of waste rock.

1.4.6 Status of the Project

Construction activities within the Project Site commenced on 11 February 2013. The Project was placed into care and maintenance in December of that year pending completion of optimisation studies and finalisation of funding arrangements. Construction of surface infrastructure for the Project recommenced in March 2017, with underground mining starting in May 2018. Process plant construction is scheduled to commence in January 2019. **Figure 5** presents the currently constructed site layout at the time of finalisation of this document. **Plates 1** to **4** show the Project Site and mine infrastructure as currently constructed. **Plates 5** to **8** show offsite construction of process mill components and **Plates 9** to **11** show surface earthworks and underground works in progress.

Table 3 identifies the status of the various components of the construction activities that had been completed or were in progress at the time of finalisation of this document.

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Plate 1: Aerial view of the Project Site looking South (November 2018)

Plate 2: Mine Infrastructure Area looking northwest

Plate 3: View of the Portal from western side of Box Cut with temporary fan and ventilation ducting

Plate 4: Aerial view of Box Cut looking southeast

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Plate 5: Primary Ball Mill shell welding in progress

Plate 6: Regrind Mill shell welding completed

Plate 7: Primary Ball Mill feed head-drilling completed

Plate 8: Regrind Mill feed head and discharge head blasting and primer completed

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Plate 9: Concentrate Shed Site looking south

Plate 10: Process Plant earthworks looking north from ROM Pad Ramp

Plate 11: Decline face approximately 300m from Portal

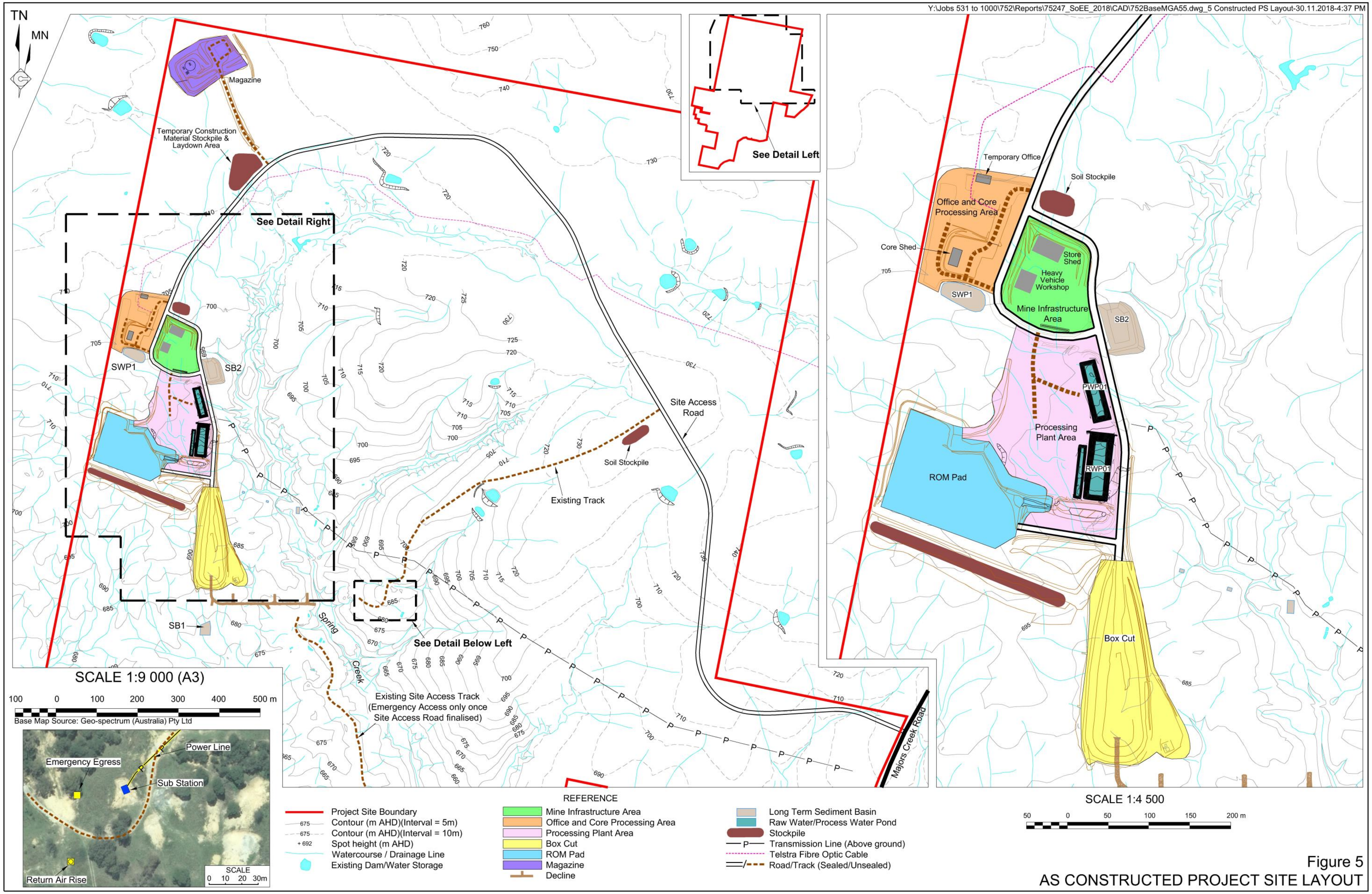

Figure 5
AS CONSTRUCTED PROJECT SITE LAYOUT

Table 3
Overview of the Status of the Project

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Component Area	**Commencement Date**	**Status/Percentage Complete at 30 November 2018**	**Estimated Completion Date**	**Comment/Discussion**
Intersection of Site Access Road and Majors Creek Road	July 2013	100%	Complete	The intersection of the Site Access Road and Major Creek Road has been constructed consistent with Conditions 3(38), 3(39) and 3(39A) of MP10_0054 and has been inspected and approved by Palerang Council.
Site Access Road	11 February 2013	100%	Complete	The Site Access Road has been constructed consistent with Condition 3(38) of MP10_0054 and has been inspected and approved by Palerang Council.
Power Line	27 November 2017	100%	Complete	The 22kV powerline that connects the Project to the Essential Energy network has been completed and was energised in May 2018.
Mine Infrastructure Area Earthworks	October 2013	100%	Complete	All bulk earthworks for the Mine Infrastructure Area have been completed.
Office and Core Processing Area Earthworks	5 November 2018	100%	Complete	Earthworks for the Office and Core Processing Area have been completed with only minor drains and batters to be completed following construction of the office buildings.
Explosives Storage Area	June 2013	100%	Complete	The Explosives Storage Area earthworks were completed in December 2013. However, the facility was not commissioned until May 2018 with the commencement of mining.
ROM Pad	11 February 2013	100%	Complete	The ROM Pad has been completed consistent with the approved plans included in MP10_0054 MOD2.
Box Cut	11 February 2013	100%	Complete	The box cut was commenced early during the land preparation phase for the Project to provide material for the construction of other components of the Mine, principally the ROM Pad. Approximately 130 000m^3 of material has been removed from the Box Cut, with all of that material transferred to the ROM Pad. During 2013-2014, two blasts were required to fragment non-friable material in the base of the Box Cut. The upper batters of the Box Cut have been shaped, topsoil spread and revegetated with native grasses.

Table 3 (Cont'd)
Overview of the Status of the Project

Page 2 of 2

Component Area	Commencement Date	Status/Percentage Complete at 30 November 2018	Estimated Completion Date	Comment/Discussion
Office and Core Processing Area Building Construction	March 2017	30%	May 2019	Construction of the Core Shed has been completed, while the office buildings, crib room, ablutions and muster room are on order with delivery expected April – May 2019
Mine Infrastructure Area Building Construction	March 2017	60%	March 2019	The Stores Shed and Heavy Vehicle Workshop have been completed, with the fuel bay and washdown bay expected to be constructed in the first quarter of 2019.
Processing Plant Area Earthworks	5 November 2018	30%	21 December 2018	The Process Plant earthworks commenced on 5 November 2018 and are being completed by a local earthmoving contractor.
Process Plant Construction	7 January 2019	5%	25 December 2019	The detailed design phase for the Process Plant has been completed, with mobilisation of the Process Plant construction contractor expected to occur on 7 January 2019 with commissioning planned for December 2019. Manufacture of long lead equipment has commenced offsite.
Underground Mine Infrastructure	11 May 2018	4%	February 2024	The underground mine is being progressed to schedule with first ore anticipated to be mined in September 2019 in advance of completion of the Process Plant.
Tailings Storage Facility Stage 1	Not Commenced	0%	October 2019	The Tailings Storage Facility has yet to be constructed and no disturbance has occurred in this area. Construction of Stage 1 is timed to be complete just in advance of the Process Plant being commissioned.

Source: Big Island Mining Pty Ltd

1.4.7 Environmental Performance

1.4.7.1 Introduction

Information presented in this subsection has been drawn from the *Annual Review for the Dargues Gold Mine* (Big Island Mining, 2018) which is available for download from the Diversified Minerals website (http://www.divminerals.com.au/dargues-gold-mine/environment/reporting/http://www.unitymining.com.au/reporting/). As a result, this subsection provides an overview of the environmental performance of the Dargues Gold Mine for the 12 months to 30 June 2018 (the Reporting Period). Environmental performance for the previous reporting periods is presented in the previous Annual Environmental Management Reports, also available for download from that website.

1.4.7.2 Air Quality

Deposited dust is monitored at five locations within and surrounding the Project Site. During the Reporting Period, the maximum monthly deposited dust level was 3.4g/m^2/month. The highest average deposited dust level of all five monitoring locations was 0.99g/m^2/month. This is significantly less than the annual average performance criteria of 4g/m^2/month.

PM$_{10}$ monitoring was not undertaken during the Reporting Period.

1.4.7.3 Blasting

Blasting commenced on 24 May 2018 and is monitored at three locations surrounding the Project Site. Monitoring systems are managed by an external consultant. The reporting system has the ability to allocate recorded data with manually entered blast times.

All blasting results, since the Project recommenced in May 2017, have been below the floor level set at the fixed monitors of 0.5mm/sec

No exceedances of blasting limits were recorded during the Reporting Period.

1.4.7.4 Threatened Flora and Fauna

Terrestrial Fauna

A fauna monitoring program was originally implemented in December 2013 and is undertaken in summer each year. During the 2017/2018 summer, fauna monitoring was conducted at four sites within the on-site Biodiversity Offset Area and included monitoring for diurnal birds, nocturnal birds and mammals, microchiropteran bats, and ground fauna (amphibians, mammals, reptiles). The results may be summarised as follows.

- Seven reptile species were observed, with the species *Lampropholis guichenoti* (Garden Skink) being the most abundant and widespread. None of the reptiles observed were threatened species.
- Fifteen mammal species were observed, with seven recorded through scat analysis. *Vombatus ursinus* (Common Wombat) was present at every site. None of the mammals observed were threatened species.

- Twelve microbat species were recorded using Anabat ultrasonic recorders deployed at the four fauna monitoring sites. Recorded species included Falsistrellus tasmaniensis (Eastern False Pipistrelle) and Miniopterus schreibersii (Eastern Bent-winged Bat), both listed as Vulnerable under the NSW Biodiversity Conservation Act 2016 (BC Act).

Terrestrial Flora

Flora monitoring was undertaken using the Biobanking Assessment Methodology (BBAM) by EcoLogical Australia on 18 and 19 April 2018 at the six previously established flora monitoring sites (EcoLogical Australia 2018b). Autumn 2018 represents the eleventh monitoring season at most of these flora sites.

A total of 104 species (consisting of 79 native species and 25 exotic species) were recorded across all six flora monitoring sites. This represents a reduction of 10 species in comparison to autumn 2018. Native species richness increased by one and exotic native species richness decreased by 10.

Terrestrial flora and fauna monitoring results do not indicate any substantial changes in species composition or abundance since operations commenced. The on-site open forest sites remain in moderate condition, with a relatively low cover of exotic species. In contrast, both on-site native grassland Site 1 and off-site native grassland Site 6 are in relatively degraded condition, with a high abundance and cover of exotic perennial and annual species. Both of these sites are subject to ongoing agricultural management (cattle grazing).

Aquatic Ecology

Two aquatic ecology surveys were completed during the Reporting Period, namely, in October 2017 and April 2018.

Macroinvertebrate communities had a relatively high taxa richness, with 55 taxa across all sites. There were six taxa with SIGNAL scores of 8 across the sites. As these species are highly sensitive to pollution, this is an indication that water quality and habitat are in good condition.

Ecological conditions in autumn 2018 are similar to spring 2017, despite a dry spell resulting in low flow at most of the sites. The sites upstream of the mine continue to be in poorer condition than downstream. This suggests that the Dargues Gold Mine continues to have minimal influence, if any, on the aquatic ecology of Majors Creek and Spring Creek. Changes that have occurred can be related to environmental events e.g. floods and dry spells, and surrounding land use such as agriculture and historical mining.

Results from 2018 autumn monitoring showed no significant changes from the previous monitoring seasons.

Sites were in relatively good condition, considering the relative dryness. Continued recovery from the flood event in 2017 is evident.

1.4.7.5 Noise

One attended noise monitoring survey was undertaken at five monitoring locations during the Reporting Period. During the survey, noise sources were determined to be typical of rural environments, with noise generally associated with local traffic or from insects and birds. Project-related noise could be heard at various monitoring locations, and was most audible from receptor R108, which has been purchased by the Proponent. The measured levels complied with the project noise limits at that receptor. No exceedance of the trigger value of 35dB(A) was attributable to activities at the Project during the Reporting Period.

1.4.7.6 Surface Water

Surface water quality monitoring is described in Section 7.5 of the *Water Management Plan*. Routine surface water monitoring was carried out during the Reporting Period. **Table 4** presents the results of that program along with discussion regarding the exceedance of any preliminary trigger values. It is noted that monitoring at the following locations has not been undertaken for the following reasons.

- CF1 – the compensatory flow program has yet to commence.
- TSF1 – the Tailings Storage Facility has yet to be constructed.

Table 4
Overview of Surface Water Monitoring Results

Page 1 of 2

					ANZECC Trigger	
Parameter	**Unit**	**Min**	**Avg.**	**Max**	**Value**	**Exceeded**
Aluminium	µg/L	20	65.7	1000	N/A	N/A
Arsenic	µg/L	1	1.05	2	13	No
Bicarbonate Alkalinity as $CaCO_3$	mg/L	28	105.2	182	85	Yes
Cadmium	µg/L	0.05	0.05	0.05	1.6	No
Calcium	mg/L	5.25	36.9	83.1	35	Yes
Carbonate Alkalinity as $CaCO_3$	mg/L	0.1	0.1	0.1	1	No
Chloride	mg/L	9.8	62.36	177	75	Yes
Chromium	µg/L	0.001	0.001	0.002	1	No
Cobalt	µg/L	0.2	0.34	1.3	N/A	N/A
Electrical Conductivity @ 25°C	µS/cm	107	432.73	857	450	Yes
Iron	mg/L	0.01	0.40	4.67	N/A	N/A
Lead	µg/L	0.2	0.21	0.7	63	No
Magnesium	mg/L	2.66	13.95	27.6	15	Yes
Manganese	µg/L	1	72.01	624	N/A	N/A
Mercury	µg/L	0.1	0.1	0.1	0.6	No
Nickel	µg/L	1	2.26	8.2	78	No
Nitrate as N	mg/L	0.05	0.24	1.21	0.65	Yes
Nitrite + Nitrate as N	mg/L	0.05	0.24	1.21	N/A	N/A
Oil and Grease	mg/L	1	1	1	10	No
pH	unit	7.24	7.77	8.17	6.5-8.5	No

Table 4 (Cont'd)
Overview of Surface Water Monitoring Results

Page 2 of 2

Parameter	Unit	Min	Avg.	Max	ANZECC Trigger	
					Value	**Exceeded**
Potassium	mg/L	0.1	1.1	3.2	2.5	Yes
Reactive Phosphorus as P	mg/L	0.02	0.02	0.04	N/A	N/A
Sodium	mg/L	10.8	26.91	42.9	25	Yes
Sulfate	mg/L	0.5	15.66	42.6	25	Yes
Suspended Solids (SS)	mg/L	2	7.13	103	50	No
Total Alkalinity as $CaCO_3$	mg/L	28	105.33	182	85	Yes
Total Kjeldahl Nitrogen as N	mg/L	0.1	0.31	1.37	N/A	N/A
Total Nitrogen as N	mg/L	0.1	0.54	2.09	N/A	N/A
Total Phosphorus as P	mg/L	0.01	0.025	0.15	0.2	No
Zinc	µg/L	5	9.6	78	57	No

Alkalinity

Nearly all monitoring sites exceeded the bicarbonate trigger value at some stage during the Reporting Period. The high bicarbonate readings do not show a correlation with the seasons or location that the sample was obtained. It is thought that the surface water in the region is naturally high in bicarbonate.

Calcium

Samples that exceeded the trigger value were obtained principally from monitoring locations SW2 and SW3. SW2 and SW3 are immediately downstream of the old mine workings, which are thought to be hydraulically connected to Spring Creek. This is thought to be the source of the raised calcium levels.

Chloride

Samples that exceeded the trigger value were obtained from monitoring locations SW2 and SW3. These sampling locations are adjacent to or immediately downstream of the old mine workings, which are known to be hydraulically connected to Spring Creek. This is thought to be the source of the raised chloride levels. These results are consistent with the previous Reporting Period and not thought to be related to the current activities being conducted within the Lease Area.

Electrical Conductivity

Samples that exceeded the trigger value were obtained from sampling locations SW2 and SW3. These locations are within Spring Creek and are adjacent to or downstream of old mine workings. It is believed that Spring Creek and the old mine workings are hydraulically connected and that this results in the elevated readings at these locations.

Metals

Samples that exceeded the trigger value for magnesium and potassium were obtained principally from monitoring locations SW2, SW3, SW5 and SW7. There were two exceedances of magnesium from SW2 and SW3. These sampling locations are adjacent to or downstream of the old mine workings, which are known to be hydraulically connected to Spring Creek.

Compounds of Nitrogen

Exceedance of the Trigger Value for nitrate was detected at SW1, SW2 and SW3. The reason for these exceedances is unknown. However, exceedances of the Nitrate trigger value have been periodically recorded at these sites during previous Reporting Periods. These exceedances are not related to activities conducted by the Mine.

Suspended Solids

There were no exceedances for suspended solids.

Sodium

Trigger values were exceeded at monitoring locations SW1, SW2, SW3 and SW6. These sampling locations are associated with Spring and Majors Creeks. The source of the sodium is thought to be a background level as there are seasonal variations consistent at all sampling locations. These results are consistent with the previous Reporting Period. No water extraction or other surface water related activities were undertaken during the reporting period. As such the slightly elevated levels are not thought to be related to activities being conducted within the mine lease area.

Sulphate

All samples that exceeded the trigger value were obtained from monitoring locations SW2 and SW3. SW2 and SW3 are located adjacent to or immediately downstream of the old mine workings, which are known to be hydraulically connected to Spring Creek. This is thought to be the source of the raised sulphate levels.

1.4.7.7 Groundwater

Ground water quality monitoring is described in Section 9.5 of the *Water Management Plan*. Routine groundwater monitoring is carried out at site monitoring bores. **Table 5** provides a summary of the results of groundwater monitoring for the parameters identified in Table 15 of the *Water Management Plan*, together with an assessment of compliance with the trigger levels identified in Table 21 of that document.

It is noted that trigger levels for certain elements were exceeded in all samples in particular bore DRWB03. Taking into account the fact that no activities with the potential to adversely impact on water quality have been undertaken within the Lease Area, the Proponent contends that the initial trigger values are not necessarily appropriate for determining whether the Mine is having an impact on surrounding groundwater quality and as a result will implement the Trigger, Actions and Response Plan included in Section 9.7 of the *Water Management Plan* during construction of the Mine.

Table 5
Overview of Groundwater Monitoring Results

Parameter	**Unit**	**Min**	**Avg.**	**Max**	**ANZECC Trigger**	
					Value	**Exceeded**
Aluminium	µg/L	20	225.6	3090	N/A	N/A
Ammonia as N	mg/L	0.1	0.13	0.3	N/A	N/A
Arsenic	µg/L	1	1.38	5	2	Yes
Bicarbonate Alkalinity as $CaCO_3$	mg/L	0.1	156.1	342	200	Yes
Cadmium	µg/L	0.05	0.06	0.49	N/A	N/A
Calcium	mg/L	22.4	68.5	118	110	Yes
Carbonate Alkalinity as $CaCO_3$	mg/L	0.1	2.89	60.4	0.1	Yes
Chloride	mg/L	30.4	79.45	202	300	No
Chromium	mg/L	1	1.13	2	1	No
Cobalt	µg/L	0.2	0.79	5.1	N/A	N/A
Copper	µg/L	1	1.40	8	0.7	Yes
Electrical Conductivity @ 25°C	µS/cm	238	619.86	1140	1300	No
Hydroxide Alkalinity as $CaCO_3$	mg/L	0.1	18.57	327	0.1	Yes
Iron	µg/L	0.01	0.33	3.73	N/A	N/A
Lead	µg/L	0.2	0.35	2.7	1.2	Yes
Magnesium	mg/L	0.05	14.16	31.3	50	No
Manganese	mg/L	0.00	0.26	0.89	N/A	N/A
Mercury	mg/L	0.1	0.102	0.2	0.2	Yes
Nickel	mg/L	1	4.47	10.6	3	Yes
Nitrite + Nitrate as N	mg/L	0.05	0.509	4.02	N/A	N/A
pH	unit	6.84	7.71	11.7	6.5-8.5	Yes
Potassium	mg/L	0.4	1.902	14.1	1.8	Yes
Reactive Phosphorus as P	mg/L	0.02	0.17	5.24	N/A	N/A
Sodium	mg/L	12	30.6	62.3	60	Yes
Sulfate	mg/L	3	19.21	65.3	110	No
Suspended Solids (SS)	µg/L	3	154.1	2680	N/A	N/A
Total Alkalinity as $CaCO_3$	mg/L	61	177.38	342	200	Yes
Total Kjeldahl Nitrogen as N	mg/L	0.05	0.288	1.13	N/A	N/A
Total Nitrogen as N	mg/L	0.05	0.76	4.28	3.2	Yes
Total Phosphorus as P	mg/L	0.01	0.248	5.72	0.71	Yes
Zinc	mg/L	0.005	0.038	0.223	57	No

Arsenic

The trigger value for arsenic was only exceeded at DRWB11. The arsenic values are not thought to be related to activities being carried out within the lease area as this location is upslope away from disturbed areas and no mineral extraction or processing has occurred. The raised values are likely a result of the geology that the bore is located in.

Alkalinity

All exceedances were detected at DRWB01, DRWB02 DRWB10, DRWB11, DRWB12 and DRWB13. Given the consistency of the results from these bores during the Reporting Period it is thought that this is the natural water quality of the bore. Further, these results are consistent with the previous Reporting Period.

Chromium

There were no exceedances for chromium.

Copper

The exceedances of the trigger value occurred at a range of monitoring locations. These exceedances are consistent with the previous Reporting Period. As no mining activity has taken place yet these exceedances are thought to be as a result of the natural geology and not related to activities carried out within the lease area.

Electrical Conductivity

No exceedances were recorded during the reporting period.

Lead

Exceedance of the trigger value only occurred at DRWB03. As previously reported DRWB03 has unique chemistry and consistently shows high levels of dissolved metals, pH and EC. These results are consistent with the previous reporting period.

pH

All exceedances of the trigger value were from DRWB03. This bore has unique chemistry and has consistently showed high electrical conductivity since being installed. These exceedances are not related to activities carried out within the Lease Area.

Potassium

DRWB03 and DRWB11 exceeded the preliminary trigger value. DRWB03 has unique chemistry and has consistently shown high readings for the full suite of parameters since being installed. These exceedances are not related to activities carried out within the lease area.

Sodium

DRWB11 was the only exceedance during the reporting period. DRWB11 like DRBW03 has different background chemistry to the rest of the bore field and generally has slightly elevated metals levels.

Sulphate

No exceedances were recorded during the reporting period.

Total Phosphorus

Two exceedances were recorded in December 2017 at DRWB06 and DRWB11. This only occurred during December when there was a sharp spike. This may have been related to fertilizer spreading in the area.

Groundwater Level

Standing water levels in all bores have been reasonably consistent, with no discernible pattern of rising or lowering of water levels over the Reporting Period.

1.4.8 Compliance with Approvals and Licences

1.4.8.1 NSW Project Approval

Condition 8 of Schedule 5 of MP10_0054 requires the Proponent to commission an independent audit by a suitably "qualified experienced and independent team of experts whose appointment has been endorsed by the Director-General."

The second Independent Audit was undertaken in June 2017 by Senversa Pty Ltd. In summary, there were:

- no non-compliances with the conditional requirements of MP10_0054; and
- no non-compliances with the commitments embodied in the Statement of Commitments in Appendix 5 of MP10_0054.

1.4.8.2 Commonwealth Controlled Activity Approval

Condition 22 of Controlled Activity Approval 2010/5770 under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) requires submission of an annual compliance report for the 12 months July to June of each reporting year. Reports are available for the period from 1 July 2012 to 30 June 2018 on the Dargues Gold Mine website (http://www.divminerals.com.au/dargues-gold-mine/environment/reporting/epbc-reporting/http://www.unitymining.com.au/reporting/).

1.4.8.3 Environment Protection Licence

The Proponent holds Environment Protection Licence (EPL) 20095 for the Project, which was issued on 12 May 2012. There were no non-compliances reported for the period 1 July 2017 to 30 June 2018.

1.5 FORMAT OF THE REPORT

This *Statement of Environmental Effects – Modification 4* has been compiled in a single volume with five sections of text as follows.

Section 1: Introduces the Proposed Modification, the Proponent, the Project Site and provides relevant background information.

Section 2: Describes the Proponent's objectives and the Proposed Modification in sufficient detail to enable the application for modification to be fully understood.

Section 3: Provides a description of the process used to identify and prioritise the key issues for assessment, including stakeholder consultation and a review of relevant planning instruments.

Section 4: Describes the anticipated impacts associated with the Proposed Modification.

Section 5: Evaluates the Proposed Modification in terms of Ecologically Sustainable Development and biophysical, economic and social considerations. A conclusion relating to the acceptability of the Project based on the above is also presented.

Section 6: Lists the various source documents referred to for information and data used during the preparation of the *Environmental Assessment*.

Section 7: Lists the commonly used Terms, Acronyms and Symbols.

Appendices: Present the following additional information.

- **Appendix 1** – Spring Creek Crossing Civil Works.
- **Appendix 2** – Spring Creek Crossing Erosion and Sediment Control Plan.
- **Appendix 3** – Ecological Assessment.

1.6 MANAGEMENT OF INVESTIGATION

This document has been prepared by Mr Gordon Barnes (M.Sc. Geol, B.Sc. Geol), Senior Environmental Consultant with RWC. Internal peer review of the document was undertaken by Mr Mitchell Bland (B.Sc (Hons), MEconGeol, LLB (Hons)), Director/Principal Environmental Consultant with RWC.

Mr James Dornan, Project Development Manager at Diversified Minerals Pty Ltd provided information on project background and proposed activities, and reviewed and approved this document for release.

In addition, specialist advice in relation to the Proposed Modification has been provided by:

- Mr Jason Armstrong, Senior Civil Designer and Mr Mark Passfield, Director with Strategic Environment and Engineering Consulting; and
- Ms Karen Spicer, Senior Ecologist with EcoLogical Australia.

2. DESCRIPTION OF THE PROPOSED MODIFICATION

2.1 INTRODUCTION

2.1.1 Objectives of the Modification

The Proponent's objectives in developing the Project were identified in Section 2.1.1 of RWC (2010a). The Proponent's objectives in modifying MP10_0054 are as follows.

- To ensure that the Project is operated in an economical and sustainable manner.
- To reduce, to the maximum extent practicable, the overall environmental impact of the Project.
- To minimise, to the maximum extent practicable, the impact on the local community and other stakeholders.

2.1.2 Overview of the Proposed Modification

This Proposed Modification would include the following components or activities (**Figure 6**).

- Relocation of the approved heavy vehicle crossing of Spring Creek approximately 400m upstream (see Section 2.2).
- Reinstatement of the previously approved road that from the Site Access Road to the Tailings Storage Facility (see Section 2.3).
- An update to the Project's approval conditions (Appendix 1 – Schedule of Land) to reflect the purchase of Lot 210, DP 755934 by Dargues Gold Mine Pty Ltd from B & C James (see Section 2.4).

2.2 PROPOSED MODIFIED SPRING CREEK CROSSING

2.2.1 Introduction

As part of MOD3 the Proponent sought, and was granted, approval for the construction and operation of a heavy vehicle crossing across Spring Creek to improve access to the Eastern Waste Rock Emplacement and the Tailings Storage Facility (**Figure 4**). The heavy vehicle crossing was also designed to carry the tailings pipeline and decant return pipeline, between the process plant and the Tailings Storage Facility. Since receiving approval, the Proponent has applied significant resources to completing the engineering and detailed design of the process plant, underground mine and surface infrastructure. This work has resulted in re-evaluation of the currently approved Spring Creek Crossing and presented opportunities to further reduce the environmental impact of the Project.

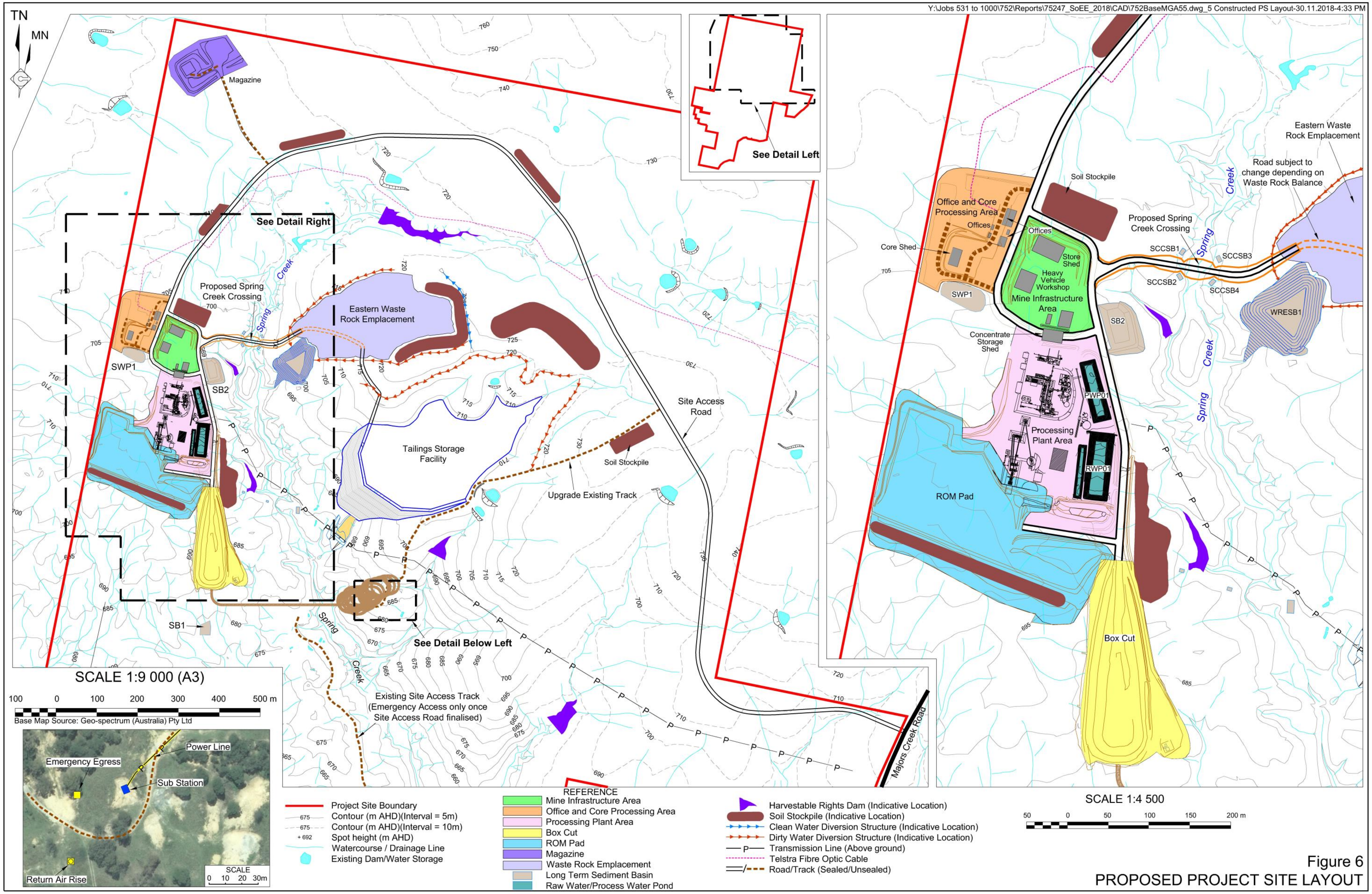

Figure 6
PROPOSED PROJECT SITE LAYOUT

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2.2.2 Site Selection

The Proposed Spring Creek Crossing is proposed to be constructed approximately 400m upstream (north) of the approved Spring Creek Crossing (**Figure 6**). This location has been selected because:

- it has previously been used as a crossing, with the remains of a concrete ford still present within the creek bed;
- it presents the shortest distance between the operational area of the Project Site and the Waste Rock Emplacement;
- that section of Spring Creek is heavily degraded and actively eroding, despite the removal of cattle from the area; and
- it would be significantly easier to construct than the currently approved Spring Creek Crossing and, as a result, would present less risk to sediment and erosion control.

An aerial view of the current site infrastructure and proposed crossing is presented in **Plate 12**. **Plates 13** to **16** present ground views of the proposed crossing site.

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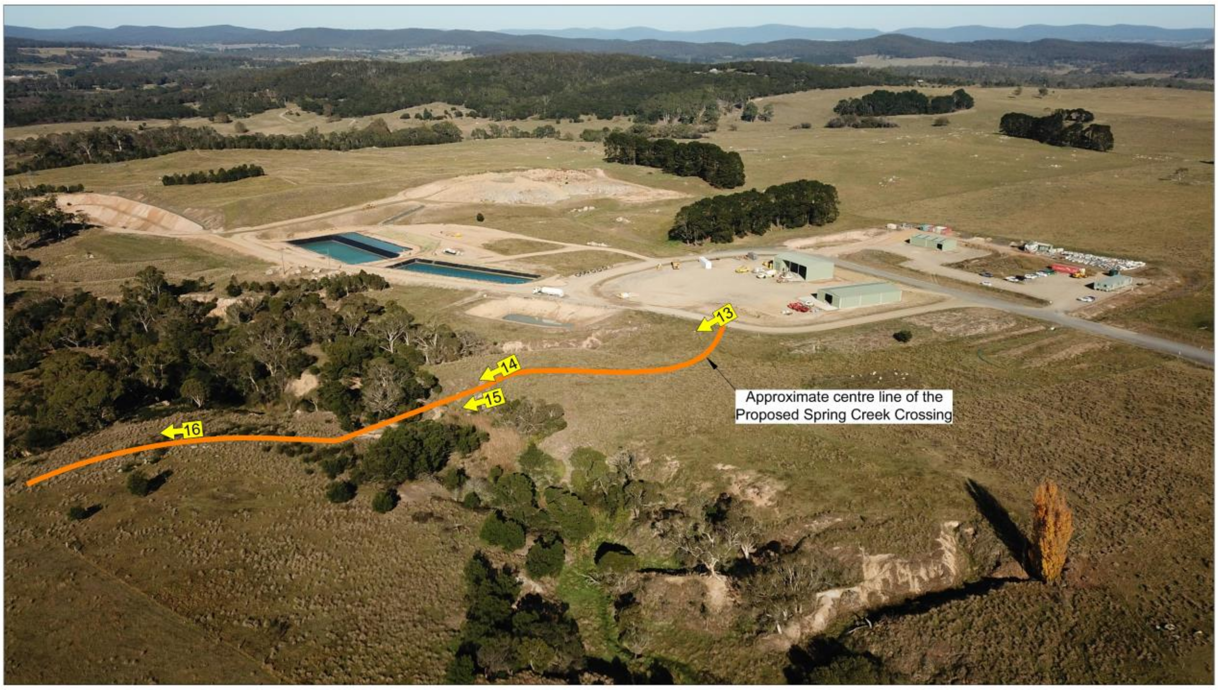

Plate 12: Aerial view of Project Site (May 2018) looking southwest showing the Proposed Spring Creek Crossing and locations of Plates 13 to 16.
(Ref: DJI_0024)

REFERENCE
13 Plate Number with Direction of View

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Plate 13: Looking east from Infrastructure Area towards Spring Creek

Plate 14: Looking east along Proposed Spring Creek Crossing

Plate 15: Spring Creek at proposed crossing

Plate 16: Looking east towards the Waste Rock Emplacement and WRESB01

2.2.3 Design of the Proposed Crossing

This subsection describes the proposed Spring Creek crossing and presents measures that would be implemented to minimise potential adverse impacts.

The proposed crossing has been designed by Strategic Environment and Engineering Consulting (SEEC), a consulting environmental and engineering firm. The resulting design report is referred to hereafter as SEEC (2108a) and is included in **Appendix 1**. **Figure 7** presents a plan of the proposed crossing, while **Figure 8** presents cross sections through the proposed crossing and its approaches. The final design would be consistent with:

- *Guidelines for watercourse crossings on waterfront land* published by Office of Water in July 2012.
- *Why do fish need to cross the road? Fish passage requirements for waterway crossings* published by Fisheries NSW in 2003; and
- relevant Australian and other standards.

The indicative design criteria for the proposed crossing are as follows.

- Surface – unsealed, all weather compacted road base suitable for use by heavy vehicle, unchanged from the approved crossing.
- Length – the road length would be approximately 300m, approximately 400m shorter than the approved crossing
- Width – the road surface would be approximately 6.5m wide, approximately 2.5m wider than the approved crossing to accommodate changes to the haul road safety standards used by the Proponent.
- Maximum gradient – approximately 1:7 (V:H), unchanged from the approved crossing.
- Surface water controls – to be installed in accordance with a detailed and staged *Sediment and Erosion Control Plan* prepared by SEEC in accordance with *Managing Urban Stormwater Volumes 1 and 2C* (Landcom, 2004 and DECC, 2008a). This plan is referred to hereafter as SEEC (2018b) and is presented in **Appendix 2** and is summarised in Section 2.2.4.
- Roadside batter slopes – approximately 1:3 (V:H) where cut and fill is required, unchanged from the approved crossing.
- Culvert – box culvert approximately 2.4m wide and 1.8m high. This compares with an oval-shaped culvert for the approved crossing.

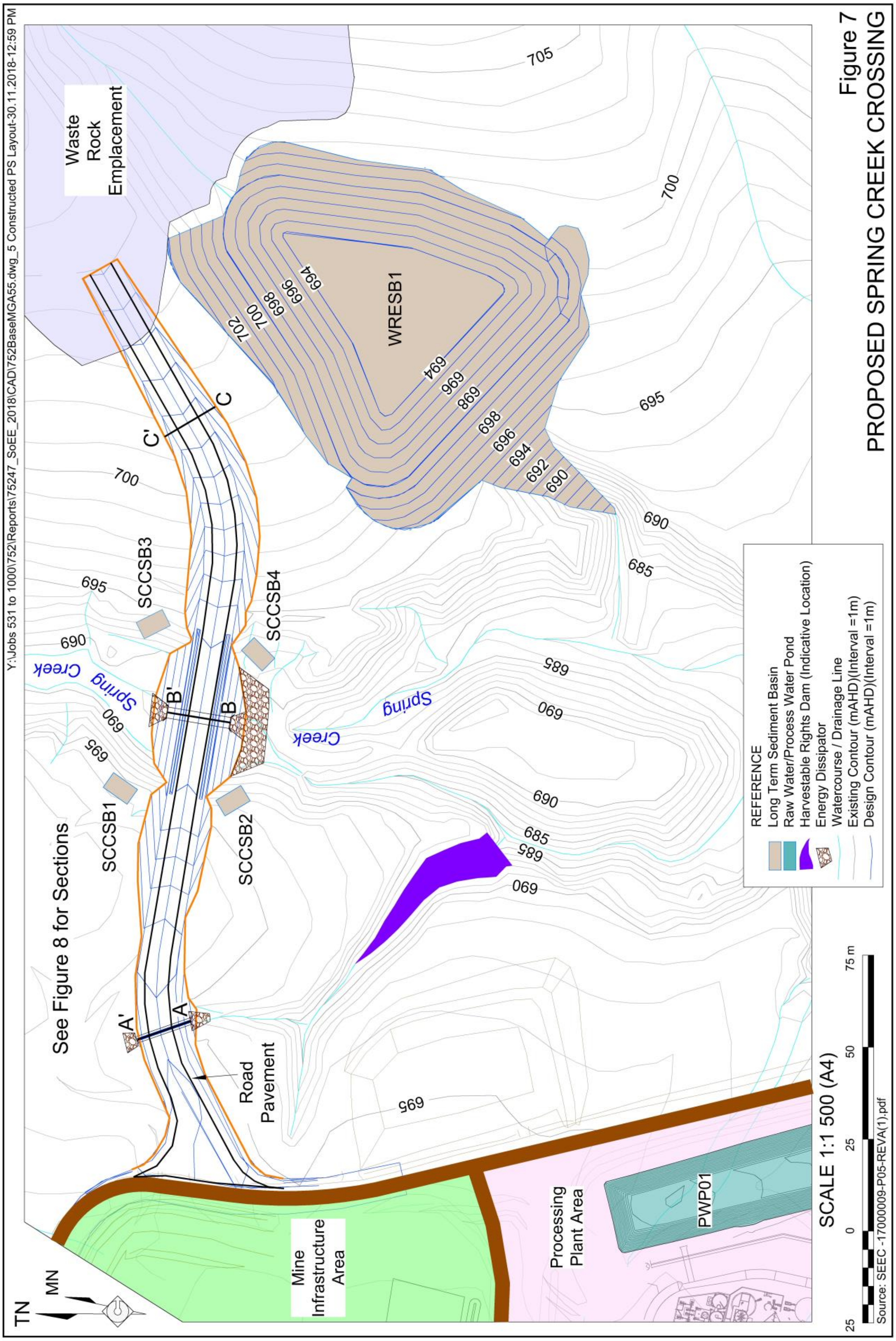

Figure 7
PROPOSED SPRING CREEK CROSSING

Source: SEEC -17000009-P05-REVA(1).pdf

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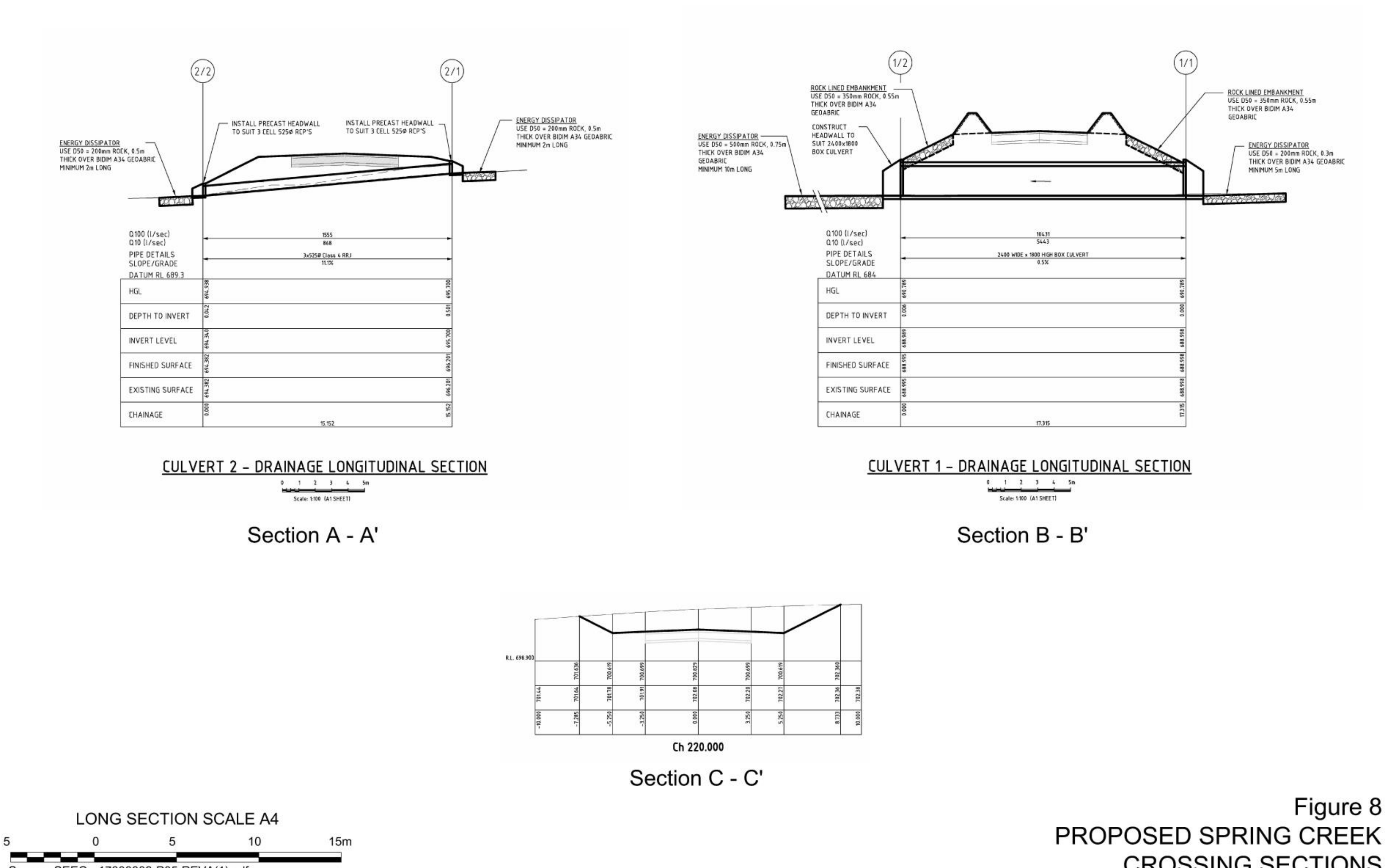


Section A - A'

Section B - B'

Section C - C'

Figure 8
PROPOSED SPRING CREEK
CROSSING SECTIONS

Source: SEEC - 17000009-P05-REVA(1).pdf

The Proposed Spring Creek Crossing would continue to be used to install the tailings pipeline and decant return pipelines consistent with the currently approved heavy vehicle crossing. As indicated in Modification 3, these pipelines would be protected from inadvertent damage by heavy vehicles through the use of a safety bund between roadway and service corridor. In addition, the Proponent would implement the following to ensure that neither tailings nor decant return water would be permitted to enter Spring Creek.

- The pipelines would be installed within a bunded trench of sufficient capacity or would be surrounded by secondary pipes to ensure that tailings or decant return water would be retained in the event of a pipeline failure.
- Multiple leakage detection and automatic shutoff systems would be implemented. These may include pump pressure or load detectors or direct leakage detection within the pipes.
- Regular inspection and maintenance regimes would be implemented, including visual inspections multiple times each day and physical and remote sensing inspections at manufacturer-recommended intervals. The Proponent would ensure that any planned or inspection-related maintenance requirements would be promptly implemented by suitably experienced personnel.

2.2.4 Erosion and Sediment Control

2.2.4.1 Introduction

The Proponent engaged SEEC to prepare a detailed *Erosion and Sediment Control Plan* (SEEC 2018b) for the proposed Spring Creek crossing and approach roads in accordance with the requirements of Landcom (2004) and DECC (2008a). A copy of that plan is presented as **Appendix 2**.

SEEC (2018b) includes recommendations regarding the staging, design, construction and management of erosion and sediment controls for the crossing. It is the Proponent's intention to implement all recommendations provided in that document. The following subsections present a brief summary of proposed sediment and erosion control works to be installed.

2.2.4.2 General Road Construction

SEEC (2018b) identifies the following range of erosion and sediment controls to be installed on the approaches to the proposed crossing and the procedures for their implementation.

- Where possible, all works are to be scheduled for the period April to May or July to September, these months being the lowest rainfall months.
- Install barrier fencing to delineate the work area and limit the potential for inadvertent ground disturbance.
- Install sediment fencing as appropriate downslope of all areas to be disturbed prior to construction commencing.
- Construct stabilised dirty water diversion drains, including energy dissipaters, at the discharge locations down slope of proposed areas of disturbance prior to construction commencing.

- Construct and operate two sediment basins to the north of Spring Creek and two to the south prior to construction commencing. **Table 6** presents the proposed volume and spillway design criteria for the basins.

Table 6
Sediment Basin and Spillway Design Criteria

Basin[1]	**Sediment Storage Volume (m^3)**	**Settling Volume (m^3)**	**Total Basin Volume (m^3)**	**Basin Spillway**			
				Depth (m)	**Side Slope (V:H)**	**Base Width (m)**	**Top Width (m)**
SB1	3	48	51	0.08	3:1	2	2.32
SB2	3	39	42	0.08	3:1	2	2.32
SB3	6	86	92	0.08	3:1	2	2.32
SB4	7	93	100	0.80	3:1	2	2.32
Note 1: see **Figure 7** for locations							
Source: Modified after SEEC (2018b) - Tables 3 and 4							

- Construct clean water diversions upslope of all areas of proposed disturbance prior to construction commencing.
- Install temporary waterway crossings at all locations where the proposed road crosses a natural drainage line until the final crossing/culvert can be installed.
- Progressively stabilise completed areas.
- Ensure appropriate supplies of geotextile fabric or plastic are maintained on site to cover exposed areas, as required, in the event of forecast rain.
- Implement a procedure to ensure that all erosion and sediment controls are inspected and re-instated, if required, in the event that rain is predicted within the next 24 hours.
- Inspect all sediment controls following rainfall and remove accumulated sediment as required. Treat, test and discharge accumulated water within sediment basins within 5 days. In the event, for whatever reason, appropriate water quality is not able to be achieved, water within the sediment basins would be removed and used for Project-related purposes or irrigated to land, with measures implemented to ensure that that water is not able to enter a watercourse.

2.2.4.3 Spring Creek Crossing

Installation of erosion and sediment controls associated with the construction of the Spring Creek crossing would occur in three stages as follows.

- Stage 1 – Site Establishment and Clean Water Diversion Installation.
  - Ensure Stage 1 activities are undertaken during a period of at least five days with no rain predicted.

  - Install upstream and downstream sandbag bunds within Spring Creek to isolate the proposed crossing from stream flow. Pump or siphon stream flows around road construction works via temporary diversion pipes.
  - Construct a temporary vehicle crossing, including a temporary culvert/pipes, with the discharge located downstream of all proposed works.
  - Install stabilised bunds up and down stream of the proposed ground disturbing works.
  - Remove the sandbag bunds and associated pump/syphon system and direct stream flow through the temporary culvert/pipe.
- Stage 2 – Construction of the Proposed Crossing.
  - Ensure all construction works are completed within two months to limit potential for rainfall events and sediment accumulation within the works area.
  - Prioritise construction of the permanent culvert to allow stream flow to be diverted to this structure as soon as possible.
  - Progressively stabilise all exposed surfaces.
- Stage 3 – Removal of Temporary Access and Lined Earth Bunds.
  - Ensure Stage 3 activities are scheduled during a period of at least three days with no rain predicted.
  - Separate stream flow from on-site water by re-installing temporary upstream and downstream sandbag bunds within Spring Creek. Pump or siphon stream flows around road construction works via temporary diversion pipes.
  - Remove the temporary vehicle crossing, including temporary culverts/pipes.
  - Complete final rehabilitation and stabilisation of disturbed or exposed soil.
  - Remove sandbag bunds and pump system.

2.2.5 Operation of the Proposed Crossing

The proposed road would be used to transport waste rock directly from the approved underground mine to the Tailings Storage Facility or proposed Eastern Waste Rock Emplacement using underground haul trucks.

Loaded haul trucks would exit the box cut to the north onto an existing road on the eastern side of the processing plant and mine infrastructure areas (**Figure 6**). The proposed road would intersect this road adjacent to the mine infrastructure area. In order to minimise disturbance associated with the proposed road, it has been designed to be a width is suitable for one-way heavy vehicle traffic when used for transportation of waste rock or two-way traffic when restricted to light vehicles only. Traffic using the road would be managed using the same procedure that would be used to manage one-way traffic within the underground mine, namely two-way radios would be used to advise other traffic of vehicle movements on the proposed road, with laden vehicles having right of way over unladen vehicles and heavy vehicles having right of way over light vehicles.

The proposed road would be inspected as part of the routine inspection program for the Project. In addition, all sediment and erosion controls would be inspected prior to and following rainfall.

2.3 REINSTATEMENT OF TAILINGS STORAGE FACILITY ACCESS ROAD

The Proponent would reinstate the Tailings Storage Facility access road that was removed in Modification 3. The purpose and use of this road remain as was previously approved, namely to permit alternative vehicle access for inspection, maintenance and construction purposes to the Tailings Storage Facility. Construction of the Tailings Storage Facility access road would involve upgrading an existing track to an all-weather, unsealed two lane road suitable for use by light vehicles and intermittent use by heavy vehicles during the construction of each lift of the Tailings Storage Facility.

2.4 ADMINISTRATIVE MODIFICATIONS

The Proponent proposes to update the Project's approval conditions (specifically Appendix 1 – Schedule of Land) to reflect the purchase of Lot 210, DP 755934 by Dargues Gold Mine Pty Ltd from B & C James. This land is listed in **Table 1** and shown in **Figure 3**.

2.5 SITE REHABILITATION AND DECOMMISSIONING

2.5.1 Introduction

Section 2.14 of RWC (2010a) provides an overview of the approved Project Site rehabilitation and decommissioning activities. In addition, the Proponent has prepared a *Mining Operations Plan* May 2017. That document was approved by the Resources Regulator on 24 May 2017 and provides a detailed description of the anticipated rehabilitation objectives, indicators and criteria for each of the rehabilitation domains within the Mining Lease. The Proponent would prepare an amended *Mining Operations Plan* to reflect the revised Project Site layout should the Proposed Modification be approved.

This subsection provides an overview of the Project Site rehabilitation and decommissioning activities that would be implemented.

2.5.2 Final Landform and Land Use

Figure 9 presents the proposed final landform and land use. In summary, the proposed final landform would remain unchanged with the exception of the Spring Creek Crossing, which would remain following the completion of the Project. This would facilitate subsequent agricultural land use. If, however, it is determined in consultation with the Resources Regulator that retention of the crossing is not consistent with a permissible use of the land following relinquishment of the Mining Lease, the crossing would be completely removed, and that section of Spring Creek would be rehabilitated.

3. CONSULTATION AND PLANNING ISSUES

3.1 INTRODUCTION

In order to undertake a comprehensive assessment of the Proposed Modification, appropriate emphasis needs to be placed on those issues likely to be of greatest significance to the local environment, neighbouring landowners and the wider community. To ensure that relevant issues are identified and prioritised and that the community is appropriately informed of the proposed activities and likely impacts, an extensive program of community and government consultation was undertaken, as well as a review of other environmental documentation. The following subsections provide a summary of the results of consultation activities and a review of relevant planning legislation, plans and guidelines.

3.2 CONSULTATION

3.2.1 Introduction

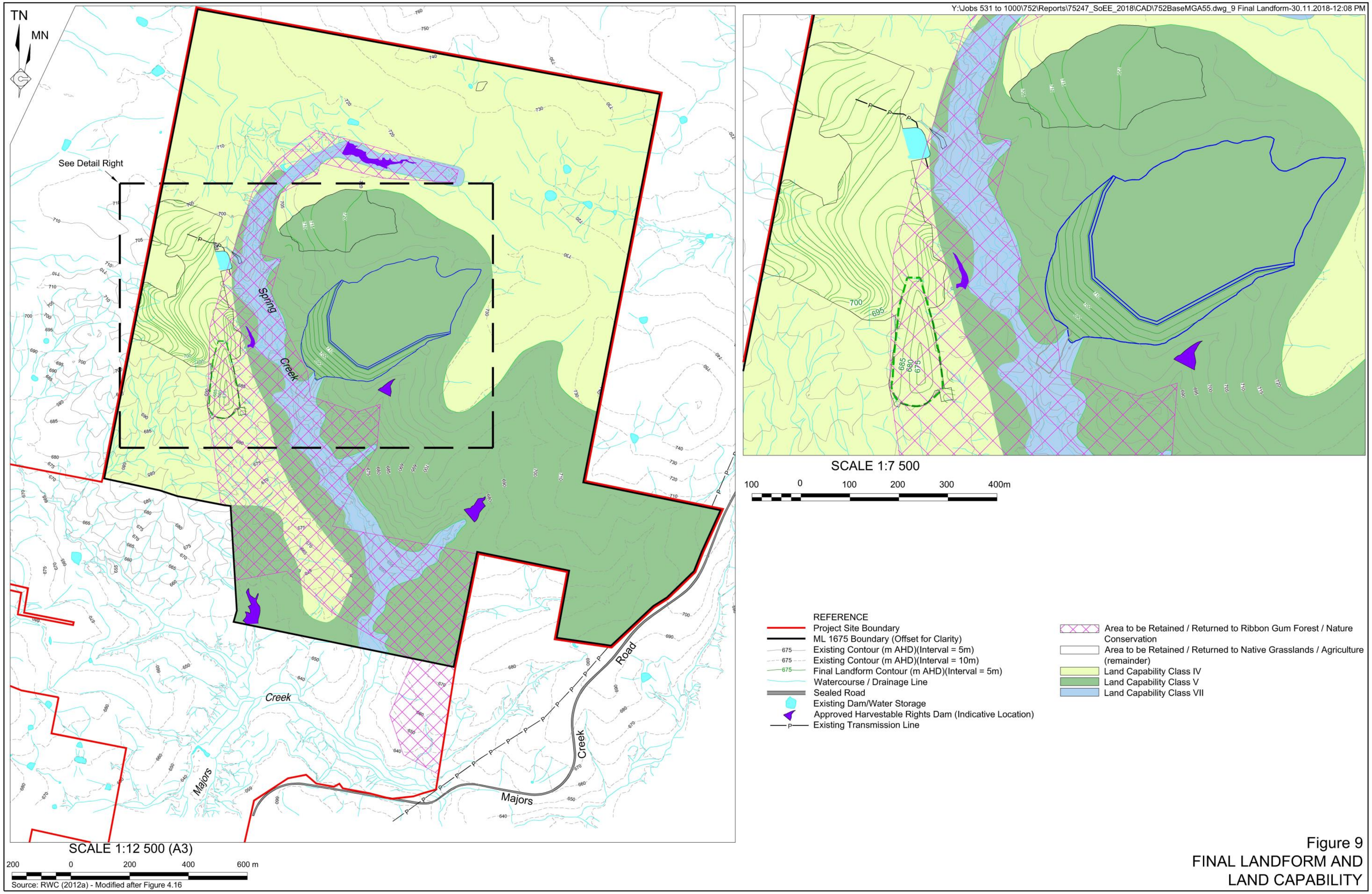
Identification of environmental issues relevant to the Proposed Modification involved:

- consultation with the Dargues Community Consultative Committee (Section 3.2.2);
- consultation with neighbouring landowners (Section 3.2.3); and
- consultation with State and local government agencies (Section 3.2.4 and 3.2.5).

3.2.2 Consultation with the Dargues Community Consultative Committee

During preparation of this *Statement of Environmental Effects* a copy of the *Dargues Gold Mine – Background Paper – Modification 4* was provided to the Chair of the Dargues Community Consultative Committee (DCCC) for distribution to the follow DCCC members:

- Brian Elton – Independent Chairperson.
- Belinda Royds – Community Member.
- Mr Bill Waterhouse – Community Member.
- Mr David Lever – Community Member.
- Mr Matt Darwon – Community Member.
- Mr Peter Cormick – Community Member.
- Ms Rebecca Bigg – Community Member.
- Mr Richard Roberts – Environmental Group Representative.
- Mr Pete Harrison –Palerang Council.
- Mr Brett Corven – Eurobodalla Shire Council.
- Mr Paul Rouse – Director Big Island Mining.
- Mr Len Sharp – Health, Safety, Environment and Community (HSEC) Superintendent.



Source: RWC (2012a) - Modified after Figure 4.16

Figure 9
FINAL LANDFORM AND LAND CAPABILITY

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The key issues raised included the following (the section of this document where each issue is addressed is presented in parenthesis).

- The level of information presented in the Background Paper was insufficient to allow informed assessment of the Proposed Modification (the entire *Statement of Environmental Effects* provides substantially more detail than was available in the *Background Paper*).
- Visual amenity impacts from truck lights utilising the proposed Spring Creek Crossing (Section 4.13).
- The timing of the Proposed Modification and public consultation periods. Completion and submission of the document will trigger the public exhibition of the Modification 4 application and public consultation process. The Proponent will continue to consult with the Committee during this process.

The Proposed Modification has been placed on the agenda for discussion at the next DCCC meeting scheduled for Tuesday, 17 December 2018. This meeting will include an inspection of the site for the proposed Spring Creek Crossing.

3.2.3 Consultation with the Neighbouring Landowners

During preparation of the *Statement of Environmental Effects* a copy of the *Dargues Gold Mine – Background Paper – Modification 4* was provided as a hard copy to the following landowners.

- Owen Gwin;
- James Royds;
- Marcus Lyons (property manager Grendaruel),
- Dennis Callan; and
- Brian and Chris James.

No formal response was received from the adjoining land owners.

3.2.4 Consultation with Councils

During preparation of the *Statement of Environmental Effects* a copy of the *Dargues Gold Mine – Background Paper – Modification 4* was provided via email to.

- Queanbeyan - Palerang Regional Council; and
- Eurobodalla Shire Council.

No response was received from either Council.

3.2.5 Consultation with Government Agencies

During preparation of the *Statement of Environmental Effects* a copy of the *Dargues Gold Mine – Background Paper – Modification 4* was provided via email to:

- Environment Protection Authority;
- Office of Environment and Heritage;
- Division of Resources and Geosciences;
- Department of Primary Industries;
- Dam Safety Committee;

No responses were received from agency consultation apart from the Department of Primary Industry – Water, who acknowledged receipt of the *Background Paper – Modification 4*.

In addition, the following agencies inspected the site of the Proposed Modification during a site visit on Monday, 19 November 2018, and were provided with a copy of the *Background Paper – Modification 4* at that time.

- Department of Planning and Environment – Compliance; and
- Division of Resources and Geoscience.

3.3 REVIEW OF PLANNING ISSUES

3.3.1 Classification of the Project

The Project was approved under the (now repealed) Part 3A of the EP&A Act. As a result, the Project was a 'transitional Part 3A Project' in accordance with Clause 2(1)(a) of Schedule 6A of the Act and Part 3A of the Act, as in force immediately before the repeal of that Part, continued to apply to the Project. As a result, previous modifications were made under Section 75W of the Act.

The Project was transitioned to State Significant Development on 23 November 2018 and, as a result, Section 75W of the Act no longer applies. This modification is made under Section 4.56 of the Act. Section 5.2.3 presents an assessment of the matters that must be considered under that Section.

3.3.2 State Planning Issues

3.3.2.1 Permissibility

The Project Site occurs within the Palerang Local Government Area. The entire Project Site is within 'Zone RU1 – Primary Production' under the *Palerang Local Environment Plan 2014* (Palerang LEP), gazetted on 31 October 2014. **Figure 2** presents the Project Site and the land zoning defined within the Palerang LEP.

Underground mining is not identified as permissible with consent within Zone RU1. However, Clause 70(1)(b) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) identifies that mining is permissible, with consent, on any land where agriculture is permissible. As agriculture is permissible in Zone RU1 under the Palerang LEP, underground mining is also permissible, with consent.

3.3.2.2 Mining SEPP / Strategic Agricultural Land

The Mining SEPP also specifies matters requiring consideration in the assessment of any mining-related development. **Table 7** presents an overview of the matters the Minister may consider and where each is addressed in the *Statement of Environmental Effects* (SoEE) or other documents as outlined in **Table 7**.

Table 7
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Page 1 of 2

Relevant SEPP Clause	Description	SoEE Section
12AB: Non-discretionary development standards for mining	Consideration is given to development standards that, if complied with, prevents the consent authority from requiring more onerous standards for those matters.	4 (generally)
12: Compatibility with other land uses	Consideration is given to: • the existing uses and approved uses of land in the vicinity of the development;	Section 4.1.5 of RWC (2010a)
	• the potential impact on the preferred land uses (as considered by the consent authority) in the vicinity of the development; and	4 (generally)
	• any ways in which the development may be incompatible with any of those existing, approved or preferred land uses.	
	The respective public benefits of the development and the existing, approved or preferred land uses are evaluated and compared.	5.2.3
	Measures proposed to avoid or minimise any incompatibility are considered.	4 (generally)
13: Compatibility with mining, petroleum production or extractive industry	Consideration is given to whether the development is likely to have a significant impact on current or future mining, petroleum production or extractive industry and ways in which the development may be incompatible.	-
	Measures taken by the Proponent to avoid or minimise any incompatibility are considered.	-
	The public benefits of the development and any existing or approved mining, petroleum production or extractive industry must be evaluated and compared.	-

Table 7 (Cont'd)
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Page 2 of 2

Relevant SEPP Clause	Description	SoEE Section
14: Natural resource and environmental management	Consideration is given to ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure: • impacts on significant water resources, including surface and groundwater resources, are avoided or minimised;	4.4, 4.5
	• impacts on threatened species and biodiversity are avoided or minimised; and	4.3
	• greenhouse gas emissions are minimised and an assessment of the greenhouse gas emissions (including downstream emissions) of the development is provided.	4.10
	Consider any certification by the Chief Executive of OEH or the DG of DPI that measures to mitigate or offset the biodiversity impact of the proposed development would be adequate.	-
15: Resource recovery	The efficiency of resource recovery, including the reuse or recycling of material and minimisation of the creation of waste, is considered.	-
16: Transportation	The following transport-related issues are considered. • The transport of some or all of the materials from the Project Site by means other than public road.	4.9
	• Limitation of the number of truck movements that occur on roads within residential areas or roads near to schools.	4.9
	• The preparation of a code of conduct for the transportation of materials on public roads.	4.9
17: Rehabilitation	The rehabilitation of the land affected by the development is considered including: • the preparation of a plan that identifies the proposed end use and landform of the land once rehabilitated;	2.5.2 and the MOP
	• the appropriate management of development generated waste;	-
	• remediation of any soil contaminated by the development; and	-
	• the steps to be taken to ensure that the state of the land does not jeopardize public safety, while being rehabilitated or at the completion of rehabilitation.	2.5.2

3.3.2.3 Infrastructure SEPP

The *State Environmental Planning Policy (Infrastructure)* 2007 (Infrastructure SEPP) identifies, amongst other things, the matters to be considered in the assessment of development adjacent to particular types of infrastructure.

The Proposed Modification does not seek to amend any activities in the vicinity of the classes of infrastructure identified by the Infrastructure SEPP. As a result, the Infrastructure SEPP is not relevant to this application.

3.3.2.4 SEPP 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 – Hazardous and Offensive Development (SEPP 33) identifies that hazardous and offensive industries, and potentially hazardous and offensive industries, may pose a significant risk in relation to the locality, to human health, life or property, or to the biophysical environment without the implementation of appropriate impact minimisation measures.

The Proposed Modification is not classified as hazardous and offensive development. As a result, no further consideration of SEPP 33 is required.

3.3.2.5 SEPP 44 – Koala Habitat Protection

The former Tallaganda Local Government Area, which includes the Project Site, is identified in Schedule 1 of *State Environmental Planning Policy No. 44 – Koala Habitat Protection* (SEPP 44) as an area that could provide habitat for Koalas.

The Proposed Modification would not result, however, in disturbance of any additional areas of habitat suitable for Koala. As a result, no further consideration of SEPP 44 is required.

3.3.2.6 State Environmental Planning Policy No. 55 – Remediation of Land

State Environmental Planning Policy No. 55 – Remediation of Land (SEPP 55) provides a State-wide approach to the remediation of contaminated land.

The prior land use history of the Project Site is one primarily of agricultural operations and mineral exploration, neither of which is likely to result in contamination of the land. As a result, the Proponent is satisfied that no contaminated land occurs on the Project Site. SEPP 55 is therefore not considered further in this document.

3.3.3 Palerang Local Environment Plan 2014

As identified in Section 3.3.2.1, the entire Project Site is within ‘Zone RU1 – Primary Production’ under the Palerang LEP and that while underground mining is not identified as permissible with consent within that zone, Clause 70(1)(b) of the Mining SEPP has the effect that mining is permissible with consent within the Project Site.

The Palerang LEP is not otherwise relevant to this modification application.

4. ASSESSMENT OF KEY ENVIRONMENTAL ISSUES

4.1 INTRODUCTION

Section 4 of RWC (2010a) provides a range of background information in relation to aspects of the environment within and surrounding the Project Site. That section also provides an assessment of anticipated impacts associated with the Project, as it was then understood. Section 4 of RWC (2012a), Section 4 RWC (2013a) and Section 4 RWC (2015a) each provide an assessment of changes to the approved level of impacts associated with the Project, as modified. This section similarly provides an assessment of anticipated changes to the Project's impacts that would result from Modification 4. The structure of this section broadly reflects the structure of Section 4 of RWC (2010a). Where no changes to the approved level of impacts are anticipated, a brief explanation as to why that is the case has been provided.

Finally, the following background information that has not changed significantly since RWC (2010a) was finalised and is not repeated in this document. For ease of reference, text in parenthesis identifies the relevant Sections of that document.

- Topography and drainage (Section 4.1.2 of RWC (2010a)).
- Climate (Section 4.1.3 of RWC (2010a)).
- Local and regional geology (Section 4.1.4 of RWC (2010a)).
- Surrounding land ownership, residences and land use (Section 4.1.5 of RWC (2010a)).
- Surrounding community (Section 4.1.6 of RWC (2010a)).

4.2 NOISE AND BLASTING

RWC (2015a) presented a revised noise assessment that was undertaken by Spectrum Acoustics for Modification 3. It found that noise levels would remain below the relevant noise criterion at all times, with minor increases in noise levels during construction operations of between 1dB(A) or 2dB(A) at a limited number of residences as a result of Modification 3. All anticipated noise levels would remain below the relevant criterion levels.

Modification 4 would result in noise emissions associated with transportation of waste rock across Spring Creek being a further 400m away from sensitive receivers in Majors Creek. In addition, as waste rock transportation would comprise only a small fraction of the overall operation, operational noise emissions would either remain unchanged or would be reduced as a result of Modification 4.

No changes to blasting or off-site transportation operations are proposed. As a result, no changes to the noise or vibration-related impacts associated with these issues are anticipated.

4.3 ECOLOGY

An *Ecology Assessment* to support the original application for Project Approval was undertaken by Gaia Research Pty Ltd (Gaia) and included comprehensive fauna and flora surveys of the Project Site (Gaia, 2010). In addition, ongoing annual biodiversity monitoring has been undertaken by Gaia, EnviroKey Pty Ltd (EnviroKey) and EcoLogical Australia Pty Ltd (EcoLogical Australia), with the resulting reports presented on the Project website. EnviroKey (2015) also undertook an assessment of the potential ecology-related impacts resulting from Modification 3. EcoLogical Australia undertook an assessment of the potential ecology-related impacts resulting from the Proposed Modification, which included a site visit by Senior Ecologist Ms. Karen Spicer on 21 November 2018. The resulting letter report is hereafter referred to as EcoLogical Australia (2018) and is presented in **Appendix 3**. **Table 8** presents the assessment of the impacts on biodiversity values of the approved and proposed Spring Creek crossings. In summary, the proposed new crossing of Spring Creek would have a lower ecological impact compared to the approved crossing because:

- it was previously used as a crossing with a concrete ford still present within Spring Creek and is highly cleared /disturbed land;
- it presents the shortest distance between the process plant and the tailings storage (approximately 240m shorter than the approved road), thus reducing impacts on the native dominated pasture;
- the new proposed crossing would not require the removal of any mature native vegetation; and
- the impacts of biodiversity values as listed in **Table 8**, demonstrate that a net reduction in impacts to biodiversity values will result.

Finally, the reestablishment of the Tailings Storage Facility access track from the Site Access Road would not result in additional ecological impacts because the track is an existing farm track and only minor works and additional disturbance would be required to upgrade the track.

As a result, Modification 4 would not have a significant impact on any NSW *Biodiversity Conservation Act 2016* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* listed species, population or community.

Table 8
Impacts on Biodiversity Values

Page 1 of 2

Biodiversity Value	Approved Crossing	Proposed New Crossing	Net Impact
Vegetation integrity	The vegetation integrity (composition, structure and function of the vegetation) has been reduced due to a long history of alluvial gold mining and grazing. The vegetation present on site is regenerating Acacia with a native dominated pasture. Ribbon Gum Forest (EEC) is present to the immediate south of the proposed crossing, which has higher vegetation integrity due to the patch size, condition and relative cover of Eucalypt canopy species.	The vegetation integrity (composition, structure and function of the vegetation) has been reduced due to a long history of alluvial gold mining and grazing. The vegetation present on site is regenerating Acacia with a native dominated pasture. One Snow Gum is adjacent to the proposed crossing. The vegetation integrity upstream and downstream is relatively poor, given the sparse cover of Ribbon Gum Forest canopy species.	The approved crossing is adjacent to higher integrity vegetation (Ribbon Gum Forest EEC), with some clearing of Ribbon Gums (approximately 2-3 trees) and 5 mature Blackwood likely to be required. In addition, indirect impacts to the Ribbon Gum Forest will likely result. No clearing of mature vegetation is required at the proposed new crossing. **Reduced impact to vegetation integrity**.
Habitat suitability	Several threatened species of birds and microbats have been previously recorded at the study area. The approved crossing has relatively poor habitat for threatened species given the site is highly disturbed. However, some mature native vegetation will require removal. Adjacent Ribbon Gum Forest to the south is more suitable habitat for threatened species, including a known nest tree for Gang-gang Cockatoo.	Threatened species habitat is relatively poor given the site is highly disturbed.	**Reduced impact to habitat suitability** given the proposed new crossing will not require the clearing a mature native vegetation and the site is not adjacent to more suitable threatened species habitat (Ribbon Gum Forest).
Threatened species abundance	The occurrence and abundance of threatened species is likely to be low, but adjacent Ribbon Gum Forest (EEC) to the immediate south is likely to have a higher abundance of threatened species. Some mature Blackwood and Ribbon Gums (diagnostic species of Basalt Tableland Forest EEC) are likely to require removal.	Ribbon Gum Forest (EEC) is not present at the site of the proposed crossing or in adjacent vegetation. The occurrence and abundance of threatened species is likely to be low relative to the Ribbon Gum Forest south of approved crossing.	**Reduced impact on threatened species abundance**
Vegetation abundance	Regenerating wattles are present within the site and Ribbon Gum Forest (EEC) occurs to the immediate south. Some mature native vegetation will be impacted.	Regenerating wattles are present within the site.	**Reduced impact on vegetation abundance**
Habitat connectivity	The site is relatively cleared but some mature vegetation will be removed, thus decreasing habitat connectivity.	The site is relatively cleared apart from native dominated pasture and regenerating native Acacias.	**Reduced impact on habitat connectivity** as the new proposed site will not require the removal of mature native vegetation. However threatened species of bats and birds recorded at the site are all highly mobile.

Table 8 (Cont'd)
Impacts on Biodiversity Values

Page 2 of 2

Biodiversity Value	Approved Crossing	Proposed New Crossing	Net Impact
Threatened species movement	The site is relatively cleared but some mature vegetation will be removed.	The site is relatively cleared apart from native dominated pastures and regenerating native Acacias	**Reduced impact on threatened species movement** as the new proposed crossing will not require the removal of mature native vegetation. However, threatened species of bats and birds previously recorded at the site are all highly mobile the crossing of Spring Creek is unlikely to reduce the movement of threatened species along the riparian corridor.
Flight path integrity	NA – as the proposed works are on the ground.	NA	**No impact** as the flight path of protected migratory species will not be impacted by the proposed crossing of Spring Creek.
Water sustainability			**No change in the net impact,** as both creek crossings will be designed to meet NSW Office of Water and NSW Fisheries guidelines.
Source:			

4.4 GROUNDWATER

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) prepared a *Groundwater Assessment* to accompany the original application for Project Approval (AGE 2010). Subsequently, AGE prepared second and third groundwater assessments to accompany the Proponent's application for Modification 1 (AGE 2012) and Modification 2 (AGE, 2013). Those studies concluded that potential groundwater impacts associated with the Project and its subsequent Modifications 1 and 2 were negligible. The Proposed Modification would not involve disturbance of groundwater resources and therefore potential impacts to those resources would be negligible.

4.5 SURFACE WATER

4.5.1 Introduction

The Proponent has engaged Strategic Environment and Engineering Consulting (SEEC) to undertake an assessment of surface water impacts associated with the Proposed Modification. The resulting reports on the civil works, SEEC (2018a), and on the erosion and sediment control plan, SEEC (2018b), are presented in **Appendices 1** and **2** respectively.

4.5.2 Existing Environment

A description of the regional, local and Project Site drainage is provided in Section 4.1.2 of RWC (2010a) and remains unchanged from the time that document was prepared. A brief summary of the drainage of Spring Creek is provided below.

Drainage within the northern section of the Project Site is dominated by Spring Creek and a number of unnamed ephemeral tributaries (see **Figure 5**). This watercourse is fed by a small spring and merges with Majors Creek in the southern section of the Project Site. The watercourse and its tributaries have been extensively disturbed by previous mining-related activities.

The Proposed Modification would involve the construction of an access road from the Process Plant area to the Eastern Waste Rock Emplacement and Tailings Storage Facility, including the crossing of Spring Creek and additional disturbance to areas required for stabilisation purposes. Potential impacts on Spring Creek include:

- erosion and sedimentation during construction of the proposed access road and Spring Creek Crossing; and
- changes to the stability of the watercourse or flow patterns as a result of installation of the crossing.

The Proposed Modification would not result in changes to the approved:

- overall site water balance;
- sources and flows of operational water within the Project Site;
- rate of groundwater recharge;

- management of pollutants; and
- management of waste water within the Project Site.

4.5.3 Management and Mitigation Measures

Commitments made previously regarding the management of surface water within the Project Site and described within RWC (2010a), RWC (2012a) and RWC (2013a) would remain. In addition, the following management and mitigation measures would be implemented.

- Ensure that best-practice erosion and sediment control measures as identified in Landcom (2004) and DECC (2008a and 2008b) are implemented during the construction and operation of the Spring Creek Crossing. In particular, ensure that the detailed management and mitigation measures identified in SEEC (2018b) are fully implemented.
- Ensure that water accumulated within sediment basins is treated and tested prior to discharge within the timeframes identified in SEEC (2018b).
- Ensure that topsoil is shallow ripped with gypsum (at a rate of 5t/ha) prior to stripping and stockpiling to limit dispersion once stockpiled.
- Ensure stabilisation of exposed surfaces occurs progressively through the use of the following methods.
  - Shallow ripping of surfaces with gypsum at a rate of 5t/ha.
  - Placement of treated topsoil over subsoil stockpiles.
  - Seeding, hydromulching (with seed), placement of locally sourced native mulch over soil and/or spraying with a polymer soil binder.
- Ensure that in the event that rainfall is forecast during construction (more than 50% probability of more than 10mm of rain), measures are implemented to “bed down” disturbed areas as described in SEEC (2018b).
- Implement a self-auditing program at least weekly and retain a log of inspections identifying the performance of design features, general erosion and drainage conditions.
- Ensure that adaptive environmental management practices are implemented in the event that monitoring or site inspections identify potential or actual impacts to the surrounding surface water environment.

4.5.4 Assessment of Impacts of Spring Creek Crossing

The construction of the proposed Spring Creek Crossing would require temporary diversions of Spring Creek. However, given the erosion and sediment controls proposed in Section 2.2.4 and management measures proposed in Section 4.5.3, as well as the detailed *Erosion and Sediment Control Plan* presented in **Appendix 2**, it is considered that the residual impacts to the water quality and structure of Spring Creek would be negligible.

4.6 ABORIGINAL HERITAGE

Three *Aboriginal Heritage Assessment* reports and an *Aboriginal Heritage Management Plan* have been completed at the Project since 2010, as detailed in RWC (2015a). The effective archaeological survey coverage is the full extent of the Project Site. As a result, the Proponent contends that the areas of proposed additional disturbance have been the subject of an archaeological survey. No sites of Aboriginal heritage significance were found within the area that would be disturbed by the Proposed Modification and therefore there would be no impact to Aboriginal cultural heritage.

4.7 NON-ABORIGINAL HERITAGE

Archaeological Surveys and Reports prepared a *Non-Aboriginal Heritage Impact Assessment* to support the original application for Project approval. That report, referred to hereafter as ASR (2010), identified a range of non-Aboriginal heritage sites, principally associated with prior mining activities within the Project Site. ASR (2010) identified that none of the identified sites are considered significant, based on the Heritage Council's criteria for heritage significance. As a result, the Proposed Modification would not result in additional impacts to sites of non-Aboriginal heritage significance.

4.8 BUSHFIRE

The Proposed Modification would not result in additional mining-related infrastructure being constructed in the vicinity of vegetated areas. During the land preparation activities, portable firefighting equipment would be positioned around the construction site to limit the potential for operating machinery to ignite spot fires within the surrounding vegetation.

As a result, the Proposed Modification would not result in an increase in the risk of bushfire within the Project Site and no additional bushfire-related impacts are anticipated to those previously assessed in RWC (2010a).

4.9 TRAFFIC AND TRANSPORTATION

The Proposed Modification would not change the number of vehicles that would access the Project Site. Therefore, there would be no additional traffic impact associated with the Proposed Modification.

4.10 AIR QUALITY

An *Air Quality and Greenhouse Gas Assessment* was undertaken by PAEHolmes (PAEHolmes, 2010) to support the original development application as it was then understood. Pacific Environment Limited were engaged to review the results of the 2010 assessment and determine the applicability of these results to the Modification 3 (PEL 2015). It was concluded that Modification 3 had limited potential to result in increased air quality-related impacts. The Proposed Modification would involve significantly less ground disturbance and road development than Modification 3. It is therefore concluded that there would be limited potential for increased air quality-related impacts from the Proposed Modification.

4.11 VISUAL AMENITY

The existing visual amenity currently surrounding the Project Site is typical of rural areas in the Southern Tablelands, with the outlook from most rural residences and other vantage points including land used for agriculture, nature conservation, transportation or other infrastructure. The rural landscape surrounding the Project Site is variably rolling to steeply incised. Vegetation varies from pasture to areas of remnant vegetation and regrowth, both native and woody weed vegetation, as well as wind breaks. As a result, elevated areas of land to the south and west the Project Site have, depending on the density of obscuring vegetation, views of land located within the Project Site, including areas of approved disturbance. Areas of lower elevation to the south of the Project Site, particularly those areas with surrounding vegetation, have very limited views of the Project Site or views of the southern section of the Project Site only.

Given that the location of the disturbance areas associated with the Proposed Modification are in a valley and the visual setting of the Project Site, the additional visual amenity impacts would be negligible, if indeed they can be viewed at all.

4.12 SOIL AND LAND CAPABILITY

An assessment of soil and land capability has been undertaken for the Proposed Modification, drawing information from RWC (2010a) to determine the potential impact of the additional soil disturbed. Any topsoil located within the areas of disturbance would be stripped to the nominated depths outlined in Table 2.2 of RWC (2010a) and stored at appropriate locations along the route, ensuring that the locations are not within drainage lines and are revegetated. The area affected by the Proposed Modification would be relatively minor and following the implementation of the previously assessed and accepted soil management and mitigation practices, it is determined that no unacceptable soil-related impacts are anticipated.

4.13 SOCIO-ECONOMIC

The socio-economic impacts of the Proposed Modification would be improved operational efficiencies and therefore Project robustness, minimising the potential for disruptions during downturns in the commodity cycle and maximising benefits for the community and surrounding businesses.

5. EVALUATION AND JUSTIFICATION OF THE PROPOSED MODIFICATION

5.1 ECOLOGICALLY SUSTAINABLE DEVELOPMENT

5.1.1 Introduction

Throughout the design of the Dargues Gold Mine in its original application for Development Consent as well as the Proposed Modification, the Proponent has endeavoured to address each of the sustainable development principles. The following subsections draw together the features of the Proposed Modification that reflect the four principles of sustainable development, namely:

- the precautionary principle;
- the principle of social equity;
- the principle of the conservation of biodiversity and ecological integrity; and
- the principle for the improved valuation and pricing of environmental resources.

5.1.2 The Precautionary Principle

The Precautionary Principle identifies that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

In preparing and planning for the Proposed Modification, the Proponent engaged the specialist consultants identified in Section 1.6 to provide advice or to assess critical aspects of the modified activities. Each of these specialists are experts in their field and provided the Proponent with detailed and specific advice and recommendations which the Proponent has adopted.

This approach demonstrates that throughout the development of the Proposed Modification, the Proponent and its consultants have, by undertaking an appropriate level of research and baseline investigations and environmental evaluation, adopted an anticipatory approach to potential impacts. The controls, safeguards and/or mitigation measures have therefore been planned with a comprehensive knowledge of the existing environment and the potential risk of environmental degradation posed by the Proposed Modification.

5.1.3 Social Equity

Social equity embraces value concepts of justice and fairness so that the basic needs of all sectors of society are met and there is a fair distribution of costs and benefits to the community. Social equity includes both inter-generational (between generations) and intra-generational (within generations) equity considerations.

The Project, as approved, and the Proponent, would ensure intra-generational equity through:

- its commitment to provide employment and training opportunities for members of the community surrounding the Project Site; and
- support for the community though increased economic activity, infrastructure improvements (e.g. continued contributions towards the maintenance of Majors Creek Road and upgrades to the Braidwood Recreation Ground) and formal and informal support via its voluntary planning agreement and other mechanisms.

Similarly, the Project, as approved, and the Proponent, would ensure inter-generational equity through the establishment of a final landform that would be stable, non-polluting, self-sustaining and suitable for a final land use of nature conservation and agriculture. In addition, the Proponent notes that ongoing weed management and habitat conservation works are already providing long-term benefits.

The Proposed Modification would ensure that the Project is as robust as possible, and that resources would continue to be available to ensure that these benefits would continue.

Finally, the Proponent acknowledges that the principle of social equity also includes aspects of ensuring that those with an interest in the Project are adequately consulted and informed about all aspects of the Project. The Proponent will continue to maintain an open line of communication with the community surrounding the Project Site to provide accurate, factually correct information in a timely manner and to respond to reasonable community concerns.

5.1.4 Conservation of Biological Diversity and Ecological Integrity

The protection of biodiversity and maintenance of ecological processes and systems are central goals of sustainability. It is important that developments do not threaten the integrity of the ecological system as a whole or the conservation of threatened species in the short- or long-term.

Additional disturbance associated with the Proposed Modification would be limited to native-dominated pasture and regenerating wattles. As a result, the Proposed Modification would minimise the potential impacts on threatened flora and fauna (and native vegetation and fauna habitats generally) to the greatest extent practicable.

The Spring Creek crossing has been designed by Strategic Environment and Engineering Consulting (SEEC), consulting engineers, and would be constructed and operated in accordance with the detailed management measures identified in SEEC (2018a and 2018b). As a result, the Proponent contends that construction of the proposed crossing would not adversely impact on the aquatic ecology of Spring Creek or Majors Creek.

5.1.5 Improved Valuation and Pricing of Environmental Resources

The issues that form the basis of this principle relate to the acceptance that all resources are appropriately valued, cost-effective environmental stewardship is adopted and the adoption of user pays prices based upon the full life cycle of the costs.

In line with these objectives, the Proponent's principal objective of the Proposed Modification is the design and operation of the Project in a manner that minimises impacts on the environment and surrounding residents, as well as researching, planning and designing of the environmental safeguards and mitigation measures to prevent irreversible damage to environmental resources. In doing so, the Proponent has and would continue to invest considerable resources in the management and mitigation of environmental risks. In addition, the Proponent contends that the Project, as modified, would be sufficiently robust to ensure that sufficient resources are available to undertake all environmental-related tasks and meet any commitments made to the local community.

5.1.6 Conclusion

The approach taken in planning for this Proposed Modification has been multi-disciplinary and involved consultation with the community, two specialist consultants and various government agencies. Emphasis has been on the application of appropriate safeguards to minimise any additional and potential environmental, social and economic impacts that require additional studies to those previously assessed as the result of the Proposed Modification. The design of the Proposed Modification has addressed each of the sustainable development principles and, on balance, it is concluded that the Proposed Modification achieves a sustainable outcome for the local and wider environment.

5.2 JUSTIFICATION OF THE MODIFICATION

5.2.1 Introduction

In assessing whether the Proposed Modification is justified, consideration has been given both to the predicted residual impacts on the local and wider environment and the potential benefits the Project, as modified, would have for the Proponent, surrounding communities, the Palerang LGA more generally, NSW and Australia. When considering the predicted residual impacts, a review of the proposed controls, safeguards and mitigation measures prepared by the Proponent was also undertaken to determine the emphasis placed on impact minimisation and the incorporation of the principles of Ecologically Sustainable Development.

This section also considers the consequences of the Project not proceeding.

5.2.2 Biophysical Considerations

The following presents an overview of the range of additional residual impacts on the biophysical environment should the Proposed Modification proceed.

- Noise and blasting – Modification 4 would result in noise emissions associated with transportation of waste rock across Spring Creek being a further 400m away from sensitive receivers in Majors Creek. As a result, noise emissions would either remain unchanged or would be reduced as a result of Modification 4.

  No changes to blasting or off-site transportation operations are proposed. As a result, no changes to the noise or vibration-related impacts associated with these issues are anticipated.

- Ecology – the proposed Spring Creek Crossing would result in reduced ecological impacts compared to the approved crossing. In addition, reinstatement of the Tailings Storage Facility access track from the Site Access Road would not result in additional disturbance. As a result, Modification 4 would not have a significant impact on any NSW *Biodiversity Conservation Act 2016* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* listed species, population or community.
- Surface water – the proposed crossing has been designed in accordance with the relevant guidelines (SEEC, 2018a) and sediment and erosion control measures would be implemented in a manner that is consistent with *Erosion and Sediment Control Plan* SEEC (2018b). As a result, the Proposed Modification would not result in adverse impacts on the surface water environment within and surrounding the Project Site.
- Aboriginal heritage – a number of Aboriginal heritage studies have been completed at the Project. No sites of Aboriginal heritage significance were found within the area that would be disturbed by the Proposed Modification and therefore there would be no impact to Aboriginal cultural heritage.

Finally, the residual impacts associated with groundwater, non-Aboriginal heritage, bushfire, visual amenity, traffic and transportation, air quality and soils and land capability would be negligible.

The Proposed Modification would therefore provide for the extraction and processing of valuable resources, whilst not imposing any significant adverse environmental impacts upon local residents and sensitive receivers.

5.2.3 Socio-economic Considerations

The Project, as approved, provides several direct economic benefits to the local and regional socio-economic setting, including the following.

- Direct full-time employment for approximately 120 full-time equivalent positions, during the site establishment and approximately 100 full-time equivalent positions during the operational phase of the Project. These positions will be residential positions where possible. Some allowance has been made for fly in-fly out drive in-drive out rosters, only for specialist positions or skills not available locally. Employees would preferably be sourced from within the Palerang local government area (LGA) and even if drawn from further afield, would be encouraged to reside locally.
- contribution of $6 million to $10 million per year to the local and regional economy through wages and purchases of local goods and services;
- support of local community services and projects;
- approximately $10 million to $31 million per year to the State and national economy through purchases of goods and services within NSW and Australia; and

- approximately $1 million to $8 million per year to the local, State and national governments through the payment of rates, taxes and royalties.

The Project will provide for the continued diversification of development / industry in the LGA which would lead to increased training and employment opportunities for the residents of the LGA.

The Project will also ensure that the identified resource is recovered to the maximum extent practicable through the proposed increase in the maximum amount of ore that may be extracted and that the generation of waste is minimised through the construction of the proposed Spring Creek crossing and placement of waste rock in a location that can be easily access during rehabilitation operations.

It is acknowledged that while impacts on the biophysical environment have been assessed as complying with nominated criteria or meeting accepted environmental standards, the cumulative effect of these minor impacts may have some adverse effect on the socio-economic setting. This is often expressed as a reduction in the amenity of the local area. However, the Proponent contends that Modification 4 would have negligible socio-economic impacts on the surrounding community.

5.3 CONSEQUENCES OF NOT PROCEEDING WITH THE PROPOSED MODIFICATION

The consequences of not proceeding with Modification 4 include the following.

- Reduced efficiencies in transportation of waste rock resulting in reduced profitability and a less robust Project.
- Failure to realise reduced environmental impacts associated with the proposed Spring Creek Crossing

It is therefore considered that the benefits of proceeding with the Project far outweigh the minor impacts on the environment that would result.

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7. COMMONLY USED ACRONYMS, SYMBOLS AND TERMS

GLOSSARY OF ACRONYMS

AHD – Australian height datum (in metres).

AHIMS – Australian Heritage Information Management System.

ARI – Annual Recurrence Interval.

AS – Australian Standard.

BL – Bore Licence.

BSAL – Biophysical Strategic Agricultural Land.

CIL – carbon-in-leach.

DA – Development Application.

dB(A) – decibels, A-weighted scale.

DP – Deposited Plan.

DPE – Department of Planning and Environment.

DRE – Division of Resources and Energy.

DTIRIS – NSW Department of Trade and Investment, Regional Infrastructure and Services.

EC – Electrical Conductivity.

EEC – Endangered Ecological Community.

EL – Exploration Licence.

EPA – Environment Protection Authority.

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth).

EP&A Act – *Environmental Planning and Assessment Act 1979* (NSW).

EPL – Environment Protection Licence.

ESD – Ecologically Sustainable Development.

HRD – Harvestable Rights Dam.

INP – Industrial Noise Policy.

JORC Code – Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves.

LEP – Local Environmental Plan.

LGA – Local Government Area.

LPG – Liquefied Petroleum Gas.

ML – Mining Lease.

MOD1 – Modification 1.

MOD2 – Modification 2.

MOD3 – Modification 3.

MOP – Mining Operations Plan.

NOW – NSW Office of Water

NPW Act – *National Parks and Wildlife Act 1974* (NSW).

NPWS – National Parks and Wildlife Service (NSW).

NTU – Nephelometric turbidity units.

OEH – Office of Environment and Heritage.

PHA – Preliminary Hazard Analysis.

PSA – Particle Size Analysis.

POEO Act – *Protection of the Environment Operations Act 1997* (NSW).

RBL – Rating Background Level.

ROM – Run-of-Mine.

RMS – Roads and Maritime Services.

RWC – R.W. Corkery & Co. Pty Limited.

SEPP – State Environmental Planning Policy.

SMU – Soil Mapping Unit.

TDS – Total Dissolved Solids.

TSC Act – *Threatened Species Conservation Act 1995* (NSW).

TSF – Tailings Storage Facility.

TSP – Total Suspended Particulate.

WAD – Weak acid dissociable.

WM Act – *Water Management Act 2000*.

GLOSSARY OF SYMBOLS AND UNITS

º – degrees.

ºC – degrees Celsius.

% – percentage.

$M – million dollars.

< – less than.

£ – less than or equal to.

> – greater than.

³ – greater than or equal to.

bcm – bank cubic metre – a volume of 1m3 in the ground prior to disturbance.

cm – centimetre (= 10mm).

CN$^-$ – Cyanide ion.

D% – dispersion percentage.

dB – decibel, unit used to express sound intensity.

dB(A) – the unit of measurement of sound pressure level heard by the human ear, expressed in “A” scale.

deg – degrees.

g – gram (= 0.001 kilogram).

g/m^2/month – grams per square metre per month – unit for deposited dust.

ha – hectare (100m x 100m).

HCN – Hydrogen cyanide.

kg – kilogram (= 1 000 grams).

kL – kilolitre (= 1 000 litres).

km – kilometre (= 1 000 metres).

km/hr – kilometres per hour.

L – litre.

L$_{1(1\text{-minute})}$ – Sound level exceeded 1% of the time during a 1 minute sampling period.

L$_{eq(15\text{-minute})}$ - The “equal energy” average noise levels.

lcm – loose cubic metre – a volume of 1m3 after excavation.

L/s – litres per second.

LA10 – sound level exceeded 10% of the sampling time.

LA90 – sound level exceeded 90% of the sampling time.

LAeq – the LAeq is the “equal energy” average noise levels and is used in some instances for the assessment of traffic noise effects or the risk of hearing impairment due to noise exposures.

LAeq 1 hour – the “equal energy” average noise level over 60 minutes – used for assessing impacts of noise from motor vehicles on public roads.

LAmax – the absolute maximum noise level measured in a given time interval.

m – metre.

m AHD – metres Australian Height Datum.

M – million.

m^2 – square metre.

m^3 – cubic metre.

m/s – metres per second.

Mbcm – million bank cubic metres.

mg – milligram (weight unit = 0.001 gram).

mg/L – milligrams per litre (parts per million).

ML – megalitre.

mm – millimetre (= 0.001 metres).

mm/s – millimetres per second.

Mt – million tonnes (metric tonne = 1 000kg).

Mtpa – million tonnes per annum.

NaCN – Sodium Cyanide.

NTU – Nephelometric turbidity units.

oz – ounces.

PM$_{10}$ – particulate matter <10mm in diameter.

SWL – standing water level.

t – tonne (= 1 000kg).

tpa – tonnes per annum.

V:H – vertical to horizontal ratio.

µS/cm – microsiemens per centimetre – unit of electrical conductivity.

µm – micrometres (= 0.001mm).

µg/m^3 – micrograms (1 x 10-6 grams) per cubic metre.

V:H – vertical to horizontal ratio.

GLOSSARY OF TERMS

alkaline – having a pH greater than 7.0.

alluvial – pertaining to material, such as sand or silt, deposited by running water (e.g. a creek or river).

amenity – the desirability of an area.

archaeology – the scientific study of human history, particularly the relics and cultural remains of the distant past.

artefact – anything made by human workmanship, particularly by previous cultures (such as chipped and modified stones used as tools).

background dust level – dust level in the absence of mining and processing activities.

background noise level – the level of the ambient sound indicated on a sound level meter in the absence of the sound under investigation (e.g. sound from a particular noise source; or sound generated for test purposes).

bank cubic metre – a volume of $1m^3$ in the ground prior to disturbance.

baseline monitoring – monitoring performed prior to site development.

batter – an engineered slope of soil or rock fill on either side upslope or downslope of a road, embankment or mine waste storage.

bore – a well, usually of less than 20cm diameter, sunk into the ground and from which water is pumped.

box cut – a surface excavation intended to provide access to rock of sufficient strength to permit establishment of a portal and decline.

concentration – the amount of a substance, expressed as mass or volume, in a unit volume of air or water.

conductivity – the measurement of the ability of a substance (either a measure of solid, liquid or gas) to transmit electricity; a measure of the salt content.

contractor – specialist brought in to perform a specific task, such as the construction of mine infrastructure.

cross-section – a two-dimensional representation of an area presented as if the area had been cut along its length.

culvert – large pipe, arch or other structure carrying water underneath a structure (e.g. a road).

Cyanide – a complex of carbon and nitrogen. For the purpose of this document, cyanide refers to a solution containing cyanide ion (see also sodium cyanide and WAD cyanide).

day time (noise) – that period of the day between 7:00am and 6:00pm.

decibel – unit expressing difference in power between acoustic signals.

decline – underground tunnel constructed to permit access to mineral resources for the purposes of exploration or mining.

Development Application – an application a local council or other Authority for approval of an activity deemed to require an approval prior to commencement.

drilling – the action of boring holes (usually less than 30 centimetres in diameter and up to several kilometres deep) into the ground, typically to establish a water bore or to investigate the geology found at depth.

dust – particles of mostly mineral origin generated by erosion of surfaces and the mining and handling of materials.

electrical conductivity (EC) – the ability of a substance (either solid, liquid or gas) to transmit electricity, often used as a measure of salinity.

ecology – the relationship between living things and their environment.

ecologically sustainable development (ESD) – using, conserving and enhancing the community's resources so that ecological processes on which life depends are maintained and the total quality of life, now and in the future can be increased.

emission – a discharge of a substance (e.g. dust) into the environment.

erosion – the wearing away of the land surface (whether natural or artificial) by the action of water, wind and ice.

evening (noise) – that period of the day between 6:00pm and 10:00pm.

fauna – a general term for animals (birds, reptiles, marsupials, fish etc.) particularly in a defined area or over a defined time period.

fill – material imported (either from elsewhere on-site or off-site) and emplaced to raise the general surface level of a site.

free Cyanide – a collective term for cyanide ions or hydrogen cyanide, whether gas or liquid.

groundwater – all waters occurring below the land surface; the upper surface of the soils saturated by groundwater in any particular area is called the water table.

groundwater depression – localised lowering of the regional water table.

groundwater surface – the upper surface of the water table.

habitat – the place where an organism normally lives; habitats can be described by their floristic and physical characteristics.

haul road – road used in a mine for haulage of material mined and for general site access.

haul truck – a truck specifically designed for off-road hauling of material mined.

heavy metal – normally trace metal of high density which occur in metallic deposits and may be environmentally hazardous.

heritage – the things of value which are inherited.

heritage significance – of aesthetic, historic, scientific, cultural, social, archaeological, natural or aesthetic value for past, present or future generations.

impact – the effect of human induced action on the environment.

in-situ – a term used to distinguish material (e.g. rocks, minerals, fossils, etc.) found in its original position of formation, deposition, or growth, as opposed to transported material.

indigenous – belonging to, or found naturally in, a particular environment (see also exotic).

infiltration – the process of surface water soaking into the soil.

inflow – flow directed into a particular feature, such as a lake or a mine pit.

infrastructure – the supporting installations and services that supply the needs of a project, e.g. road or rail.

intermittent – flows periodically, irregularly.

ion – an atom or compound that has gained or lost an electron, so that it is no longer electrically neutral but carries a positive or negative charge.

landform – a specific feature of a landscape (such as a hill) or the general shape of the land.

Local Environmental Plan (LEP) – a plan developed by a council to control development in part or all of their shire or municipality.

long-term – a period of time often associated with annual air quality standards. Long-term models usually address pollutant concentrations over several seasons to one year.

management strategy – a policy or direction that assists in actions required to address issues.

mitigation measure – measure employed to reduce (mitigate) an impact (such as the construction of a perimeter bund to reduce sound emissions).

monitoring – systematic sampling and, if appropriate, sample analysis to record changes over time caused by impacts such as mining; the regular measurement of components of the environment to understand a feature of the environment and/or establish that environmental standards are being met.

neutral – neither acidic nor basic (e.g. a pH equal to 7.0).

night time (noise) – that period of the day between 10:00pm and 7:00am.

operational phase – that period of the mining project, after construction and prior to decommissioning, during which extraction of the resource takes place.

ore – material (usually rock) with a sufficient concentration of a valuable metal or mineral to justify extracting and processing the material to extract the metal or mineral.

particulate matter – small solid or liquid particles suspended in or falling through the atmosphere - sometimes expressed by the term particulates.

back fill – a mixture of tailings and cement pumped into completed voids in an underground mine to support the surrounding rock mass and permit extraction of surrounding material.

pH – a measure of the degree of acidity or alkalinity of a solution; expressed numerically (logarithmically) on a scale of 1 to 14, on which 1 is most acid, 7 is neutral acid, and 14 is most basic (alkaline).

piezometer – a core drilled specifically for the monitoring of groundwater levels and water quality.

pollution – the alteration of air, soil, or water as a result of human activities such that it is less suitable for any purpose for which it could be used in its natural state.

Portal – surface entrance to a decline

precautionary principle – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation; a principle of ESD which states that decisions about any proposed development should be guided by careful management to avoid serious and irreversible damage to the environment.

progressive rehabilitation – rehabilitation of mine or disturbed areas as soon as practicable after they are released during the life of the mine or after the final landform is achieved.

Project approval – approval for a project granted by the Minister for Planning Part 3A of the Environmental Planning & Assessment Act.

rehabilitation – the preparation of a final landform after mining and its stabilisation with grasses, trees and shrubs. In mining, rehabilitation means restoring mined land so that it can be used for the same or some other purpose after mining has finished.

sediment – material such as mud and sand that has been moved and deposited by water, ice or wind.

sediment basin – a small excavation designed to trap the coarse material washed from disturbed areas.

Sodium Cyanide – a complex of sodium, carbon and nitrogen. For the purpose of this document sodium cyanide refers to solid briquettes mixed with caustic (see also cyanide and WAD cyanide).

species – a taxonomic grouping of organisms that are able to interbreed with each other but not with members of other species.

species diversity – a measure of the number of different species in a given area.

stakeholder – person, group or organisation or company with an interest in an activity or outcome.

stormwater – surface water runoff immediately after rainfall.

surface water – all water flowing over, or contained on, a landscape (e.g. runoff, streams, lakes, etc.).

suspended solids – analytical term applicable to water samples referring to material recoverable from the sample by filtration.

sustainable development – development that meets the needs of the present without compromising the ability of future generations to meet their needs (World Commission on Environment and Development 1990).

tailings – residual material remaining after ore material has been processed and the relevant materials have been removed.

terrestrial – of or relating to the land, as distinct from air or water.

total Cyanide – a collective term for all forms of cyanide, including free cyanide, WAD cyanide and other cyanide complexes.

total suspended particulates (TSP) – the mass of all particulate matter suspended in a solution.

total suspended solids – a common measure used to determine suspended solids concentrations in a waterbody and expressed in terms of mass per unit of volume (e.g. milligrams per litre).

WAD Cyanide – a collective term to describe free cyanide, as well as those complexes that may release the cyanide ion under weakly acidic conditions such as those that exist within the digestive tracts of fauna (see also sodium cyanide and cyanide).

waste rock – in the mining context refers to non-economic material to be removed to allow access to the ore material.

watercourse – as defined in the *Water Management Act 2000.* For the purposes of this document, this includes all rivers identified by a blue line on the smallest scale government published topography map for the area.