Table 15 presents the modelled flow rates at the following key locations downstream of the Tailings Storage Facility.

- CP07 – downstream of the Tailings Storage Facility.
- CP05 – confluence of Spring and Majors Creeks.
- CP01 – downstream limit of the hydrological model, approximately 3.5km downstream of the Project Site boundary.

Table 15
Downstream Dilution Modelling

Rainfall Event (ARI 72-hour)	Dilution in TSF		CP07		CP05		CP01	
		Spillway Flow (m^3)	Stream Flow (m^3)	Dilution Factor[1]	Stream Flow (m^3)	Dilution Factor[1]	Stream Flow (m^3)	Dilution Factor[1]
2 000	28	3 327	833 460	486	6 716 610	4 086	13 906 920	8 432
10 ,000	13	716	1 033 120	18 220	8 325 590	146 739	17 238 320	303 813
10 million	22	145 652	1 903 590	316	15 340 430	2 386	31 762 670	4 917
Note 1: Including upstream dilution								
Source: Knight Piésold (2015) – Table 4.9								

2.6.6.4 Supernatant Pond and Cyanide Management

In undertaking an assessment of the anticipated impact of a discharge of supernatant water from the Tailings Storage Facility, ToxConsult (2015b) identify that Spring Creek has been determined to be moderately to heavily disturbed. As a result, the ANZECC (2000) 95% species protection trigger level for slightly to moderately disturbed systems has been determined to be appropriate for Spring Creek. The relevant ANZECC (2000) trigger level for free (not WAD) cyanide is 7µg/L or 0.007mg/L. It is noted that this is substantially less than the World Health Organisation short-term drinking water guideline of 0.5mg/L and the Australian long-term drinking water guideline of 0.08mg/L. As a result, ensuring compliance with the ANZECC (2000) free cyanide trigger level would ensure compliance with the identified drinking water standards.

In order to ensure that adverse impacts associated with an extremely unlikely overtopping of the Tailings Storage Facility under a 1 in 2 000 year AEP rainfall event, the Proponent would ensure that cyanide concentrations within the supernatant pond are maintained at a level that would result in the concentration of free cyanide in Spring Creek being less than 0.007mg/L.

In summary, in order to achieve a free cyanide concentration of 0.007mg/L in Spring Creek and assuming a dilution factor of 486 associated with a 1 in 2000 year AEP rainfall event, the free cyanide concentration within the supernatant pond would need to be less than 0.007mg/L x 486 or 3.4mg/L. Assuming, based on the work of CSIRO (2014), that free cyanide comprises 35% of WAD cyanide, this would translate to a WAD cyanide concentration of 9.7mg/L. ToxConsult (2015) note that lower dilutions are expected for a 1 in 10 million year AEP rainfall event. However, given the extreme rarity of that event, the Proponent has assumed the dilution factors associated with the more common event.

In addition, the Proponent notes that higher concentrations of WAD cyanide would be acceptable during periods when the available stormwater storage capacity exceeds the minimum 142 439m^3. As a result, the Proponent would ensure that the concentration of cyanide in the supernatant pond is sufficiently low at all times to ensure that in the extremely unlikely event of an overtopping of the Tailings Storage Facility that the concentration of free cyanide in Spring Creek would be less than 0.007mg/L. This would be achieved through the following.

- Initial monitoring of both WAD and free cyanide concentrations in the supernatant pond to determine the appropriate ratio between the species within the supernatant pond. Once determined, the Proponent would continue to routinely monitor WAD cyanide concentrations, with occasional check analysis of free cyanide concentrations.
- Estimation on a routine basis of the volume of the supernatant pond and the volume of available stormwater storage. Based on this information, the concentration of WAD cyanide in the supernatant pond that would be required to achieve the identified 0.007mg/L free cyanide concentration in Spring Creek would be determined.
- In the event that the measured supernatant pond concentration approaches the concentration that would result in an exceedance of the identified criteria, the Proponent would implement procedures to reduce the supernatant pond concentration. These measures may include the following.
  - Increasing reagent use within the cyanide destruction circuit to reduce the discharge concentration from that circuit.
  - Reducing the volume of the supernatant pond to increase the dilution factor in the event of a major storm event.
  - Discharging of flotation tailings to the Tailings Storage Facility in preference to using that material for pastefill, effectively diluting the concentration of WAD cyanide by 10 times.

The Proponent contends that achieving the required WAD cyanide concentration in the supernatant pond would be relatively simple for the following reasons.

- The Proponent has previously committed to ensuring that the concentration of WAD cyanide on discharge from the cyanide destruction circuit would be less than 30mg/L at all times and less than 20mg/L 90% of the time. In order to achieve this, target concentrations will need to be between 10mg/L and 20mg/L.
- The concentrate tailings would, for significant proportions of the time, be combined with flotation tailings, effectively diluting the WAD cyanide concentration by a factor of 10.
- WAD cyanide degrades relatively quickly within the Tailings Storage Facility, meaning that concentrations on discharge from the spigots are likely to be substantially higher than concentrations in the supernatant pond.

Finally, the Proponent notes that probability of overtopping the facility once during the 65 month life under a 1 in 2 000 year rainfall event is 0.05%. As a result, the Proponent contends that the likelihood of such a discharge occurring would be very rare and the consequence if it did occur would be negligible. As a result, the Proponent contents that this risk has been more than adequately addressed.

2.6.7 Decommissioning and Rehabilitation of the Facility

Decommissioning and rehabilitation of the Tailings Storage Facility would be largely consistent with that described in Section 2.14.8 of RWC (2010a) and the approved Mining Operations Plan (RWC, 2012c). In summary, the all infrastructure would be removed and the facility would be permitted to dry out and settle. Once that component is complete, the facility would be:

- shaped to form a free draining landform with appropriate surface water control structures, including a suitable final spillway capable of catering for a Maximum Probable Flood rainfall event;
- capped with suitable material to create separate impermeable and capillary barriers;
- spread with growth medium and soil material to create a store and release cover; and
- revegetated with species consistent with a native grassland.

The final land use would be consistent with the current land use, namely agriculture, principally grazing.

Environmental monitoring would continue following decommissioning and rehabilitation of the facility until such time as the relinquishment criteria identified in the updated *Mining Operations Plan* have been achieved to the satisfaction of relevant government agencies.

2.7 AMENDED HARVESTABLE RIGHTS PROGRAM

The Proposed Modification would result in a number of amendments to the approved harvestable rights program, including the following.

- Increase in the harvestable rights capacity.

  The Proponent has purchased the "Slings" property and incorporated that land within the Project Site (see Section 1.3). The additional land associated with the "Slings" property has increased the Proponent's landholdings from approximately 396ha to 452ha. However, consistent with the procedure implemented in RWC (2010a) the Proponent has removed the area of the Tailings Storage Facility (16ha) from the total area calculation, leaving 436ha. As a result, the Proponent's harvestable rights volume under Section 53 of the *Water Management Act 2000* has increased to approximately 37ML[1].

[1] Estimated using the NSW Office of Water's Harvestable Rights calculator - http://www.water.nsw.gov.au/water-licensing/basic-water-rights/harvesting-runoff/calculator (accessed 6 May 2015).

- Removal of two harvestable rights dams.

  As a result of the Proposed Modification, the following harvestable rights dams would not be constructed.

  – HRD-E – This approved dam is within the footprint of the proposed Eastern Waste Rock Emplacement and, as a result, would not be constructed.

  – HRD-F – This approved dam is at the toe of the approved Tailings Storage Facility. The proposed enlargement of the facility would result in the clean water catchment of the dam being reduced to an extent that construction cannot be justified

Table 16 presents the proposed volumes of the approved harvestable rights dams. **Figure 11** presents the locations of the approved harvestable rights dams,

Table 16
Revised Harvestable Rights Dam Capacities

Dam Identifier	Revised Volume (ML)
HRD-A	9.5
HRD-B	2.4
HRD-C	5.2
HRD-D	6.1
HRD-E	-
HRD-F	-
HRD-G	2.8
HRD-H	11.0
Total	**37.0**
Source: Big Island Mining Pty Ltd	

Water within the approved harvestable rights dams would be used for the compensatory flow regime described in Section 2.10.2.6 of RWC (2010a). Section 4.5.4.5 of this document provides the water balance for that program in light of the revised sizes of the harvestable rights dams.

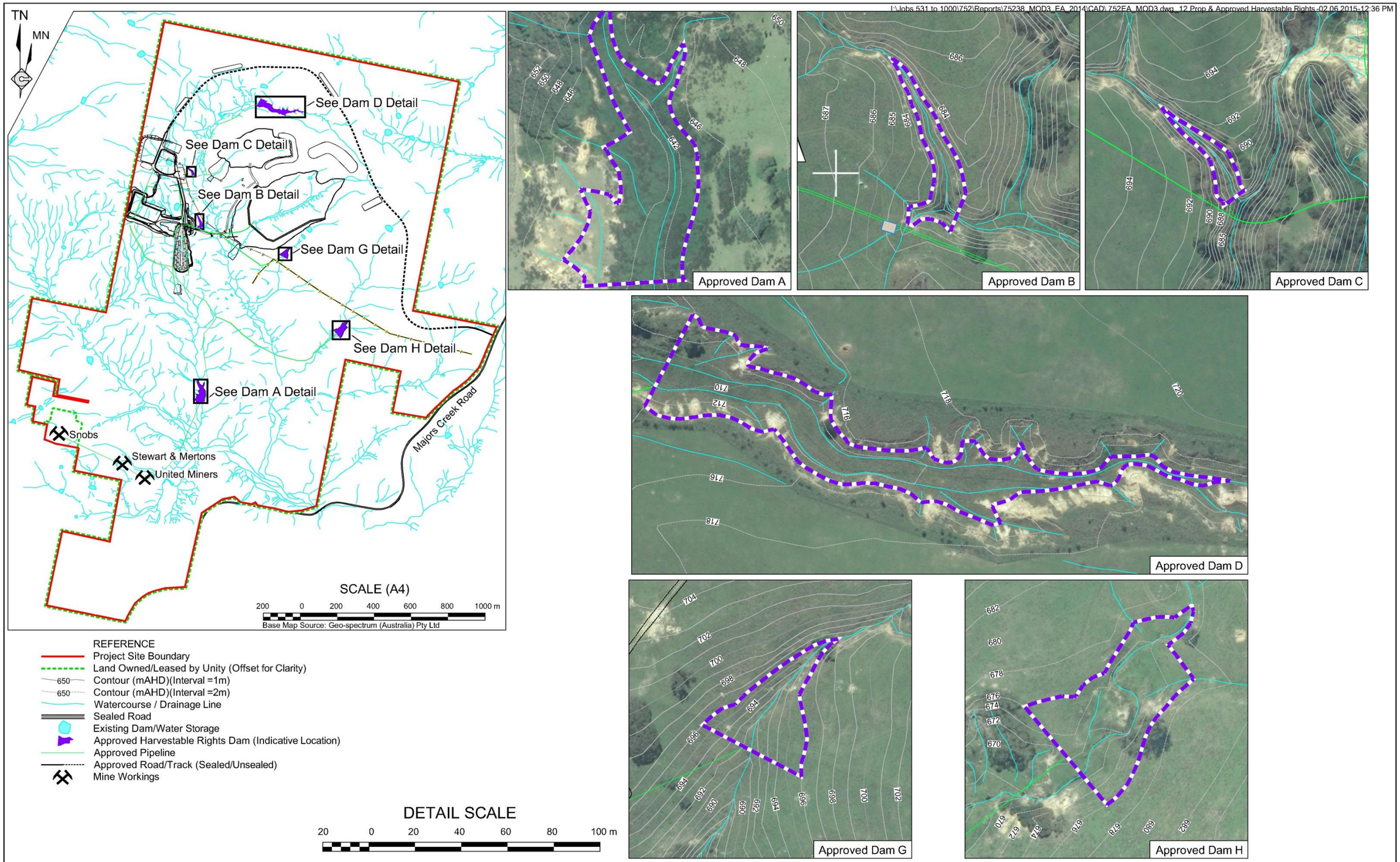
2.8 MODIFIED EMPLOYMENT, CAPITAL COST AND ECONOMIC CONTRIBUTIONS

During its review of the Project, the Proponent revised its assumptions in relation to the employment, capital cost and economic contributions of the Project, assuming that the Proposed Modification is granted. The following presents an overview of the revised assumptions, with the original assumptions presented in parenthesis.

- Direct full-time employment.

  – Site establishment – approximately 120 full-time equivalent positions (100 positions).

  – Operations – approximately 100 full-time equivalent positions (80 positions). It is the Proponent's intention that all these positions be residential, with no positions offered on a fly in/fly out roster.



Note: Dam F has been removed

Source: Big Island Mining Pty Ltd

Figure 11
INDICATIVE LAYOUT OF THE APPROVED HARVESTABLE RIGHTS DAMS

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- Capital cost – the proposed carbon-in-leach plant would have an additional capital cost of approximately $10.42 million.
- Economic contributions.
  - Local and regional economies – $6 million to $10 million per year ($3 million to $7 million).
  - State and national – $10 million to $31 million per year (unchanged).
- Taxes and royalties – $1 million to $8 million per year to the State and national governments (unchanged).

In addition, the Proponent undertook detailed financial modelling of the Project based on two scenarios, namely off-site processing of gold concentrate at the Proponent's mothballed Kangaroo Flat Gold Mine (as described in RWC (2010a)) and on-site processing as described in this document (Modified Project option). While the detail of that modelling remains confidential and market sensitive, the results may be summarised as follows.

- Annual ore tonnages, grades, recoveries, revenue and assumed gold price were the same for both scenarios.
- The Modified Project would result in a net Project cash flow approximately $20 million greater than the approved Project.
- The Modified Project would result in a Net Present Value approximately $14 million greater than the approved Project.
- The Modified Project would result in an all in sustaining cost, namely the cost to complete the mining lifecycle from exploration to closure, approximately $76 per ounce less than the approved Project.

In light of the above, the Proponent contends that the Proposed Modification is required to secure the Project in the most efficient manner and to ensure that sufficient resources are available to meet the Proponent's objectives identified in Section 2.1.1. In particular, the Proposed Modification is required to:

- maximise the efficiency of the mining, material handling and processing operations; and
- develop the Project in the most robust manner possible to ensure sufficient resources are available to manage the Project in a manner that is consistent with best practice and to maximise the benefits for the community, local businesses, the Proponent's employees and contractors and the Proponent's shareholders.

2.9 SITE REHABILITATION AND DECOMMISSIONING

2.9.1 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* dated May 2012. That document 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.

2.9.2 Final Landform and Land Use

Figure 12 presents the proposed final landform and land use. In summary, the proposed final landform would remain unchanged with the exception of the following.

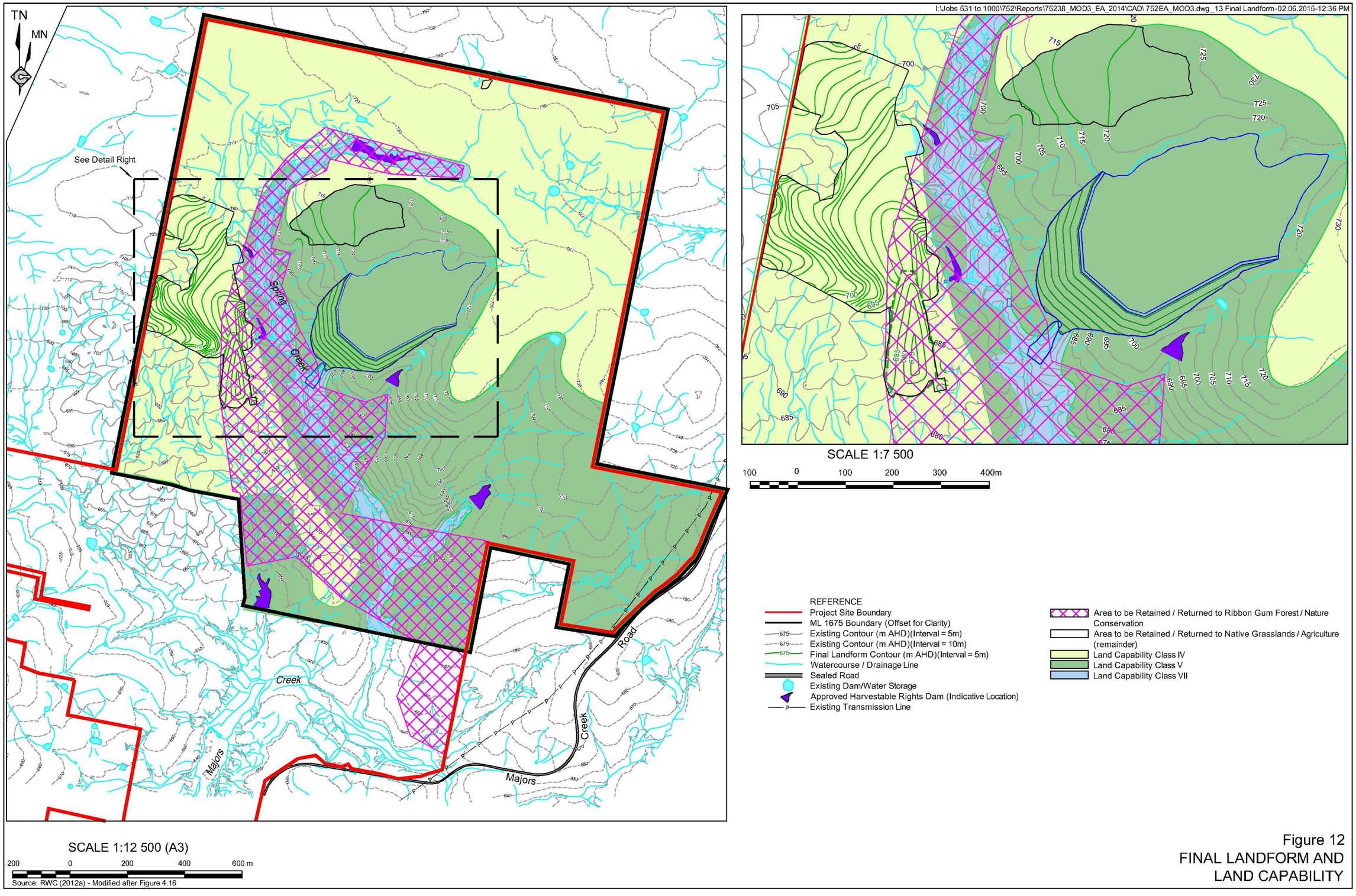
- The Eastern Waste Rock Emplacement following extraction of waste rock required to rehabilitate the Tailings Storage Facility and backfill the box cut would be rehabilitated to form an appropriately shaped, covered and vegetated landform with slopes of less than 1:5 (V:H) with a final land use of managed agricultural operations.
- The Spring Creek Crossing would remain following the completion of the Project to facilitate subsequent agricultural land use. If, however, it is determined in consultation with the Division of Resources and Energy 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.
- The modified Tailings Storage Facility would be reshaped to create a free-draining landform and capped to ensure that the potential for infiltration of surface water.

Finally, it is noted that DRE has previously requested that the box cut be backfilled to reinstate the pre-mining landform. The Proponent has committed to establishing a landform with slopes of 1:3 (V:H) or less, including by blast profiling if required. However, given the uncertainties in relation to the volume of waste rock that would be available at the end of the Project life, the Proponent would prioritise use of that material for rehabilitation and capping of the Tailings Storage Facility. However, should sufficient material be available following rehabilitation of the Tailings Storage Facility, the Proponent would use that material to backfill the boxcut, including to reinstate the current landform if sufficient material is available.

2.10 ALTERNATIVES CONSIDERED

2.10.1 Introduction

In undertaking its review of the Project efficiencies, the Proponent reviewed numerous operational scenarios. This subsection provides a review of a range of alternatives considered and identifies, why each was, after careful consideration, rejected. The coverage of issues in this subsection reflects the order that each issue is described previously in this section, not the order of importance of each issue.



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

Figure 12
FINAL LANDFORM AND LAND CAPABILITY

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2.10.2 No Extension of Mine Life or Maximum Extraction Amount

As identified in Section 2.2, the Proponent has identified additional reserves within the approved mining envelope as a result of identification of a more efficient way to develop the Project. As a result, the total reserves identified exceeded the amount of ore that is permitted to be extracted under Condition 6 of Schedule 2 of MP10_0054. In addition, the Proponent notes that there have been delays commencing mining operations. These delays, together with the required additional time required to mine the enlarged resource will result in mining operations not being completed by 31 August 2022. As a result, an extension of the approved life of mine is proposed.

Failure to increase the amount of ore permitted to be extracted over the life of the Project or to extend the life of the Project would result in underutilisation of an identified resource, potentially making the project less financially robust and reducing the Project benefits that would flow to the community with no significantly reduced environmental benefit.

2.10.3 No Additional Waste Rock Emplacement

As identified in Section 2.3.2, following the review of the Project the proposed mine development plan was amended from a "top down" to a "bottom up" mining method. As a result the amount of waste rock to be generated during the early stages of the mine would be significantly greater than originally anticipated. As a result, the approved waste rock emplacement would not have sufficient capacity to store the additional waste rock that would be bought to the surface.

As a result, a failure to construct an additional waste rock emplacement at the surface would require the mine to be developed in a suboptimal manner, reducing the robustness of the Project and adversely impacting on the Proponent's ability to support its employees, contractors and suppliers.

2.10.4 Alternative Locations for the Waste Rock Emplacement

The Proponent considered two alternative locations to store the additional waste rock that would be brought to surface. The two locations rejected in favour of the Eastern Waste Rock Emplacement and the principal reasons why each of these alternatives was rejected are as follows.

- Expansion of the approved waste rock emplacement.

  The approved waste rock emplacement could potentially store additional waste rock to the south and east of the current emplacement. However, these areas have been rehabilitated and are in direct line of sight of the village of Majors Creek. As a result, placement of waste rock in this area would result in adverse visual amenity and potentially noise impacts for the residents of the village.

- Waste rock emplacement to the north of the processing plant.

  A potential emplacement to the north of the approved processing plant was considered. This option was rejected because it would also have been in direct line of sight of the village of Majors Creek. This option would have also required underground haul trucks to pass in close proximity of the processing plant and office area, with potential adverse safety issues.

2.10.5 No Spring Creek Crossing

In reviewing the Project design, the Proponent considered the option of not constructing a crossing over Spring Creek. This option would however require transportation of approximately 214 000m^3 of waste rock to the tailings storage facility via the site access road, an additional distance of approximately 2.8km. This would result in additional noise, air quality, visual amenity and traffic-related impacts.

2.10.6 Alternative Location for the Spring Creek Crossing

The Proponent considered a range of locations for the Spring Creek crossing. However, the proposed location was selected because it provided the most suitable approaches to the crossing. The proposed location also limited the amount of disturbance that would be required to construct the crossing. Alternative locations would have required substantial additional disturbance both within the creek and along the banks of the creek to construct suitable approaches.

The Proponent notes that a site of Aboriginal heritage significance, namely Site GTOS2 comprising two artefact, would be disturbed by the proposed Spring Creek Crossing (see Section 4.6.2). Artefact (2015) notes that the Site has low archaeological significance because it is located in an area of prior disturbance, namely a former dam wall. The dam is interpreted to have serviced former historic mining operations that were active in the late 1800s and early 1900s. In addition, consultation with the Aboriginal community undertaken during the preparation of Artefact (2015) identified that the Aboriginal community did not object to recovery and recording of the objects, provided a range of management measures identified in Section 4.6.4 are implemented.

In light of the substantial additional disturbance that would be required to construct the crossing at an alternative location and the management measures proposed in Section 4.6.4, the Proponent determined that an alternative location for the Spring Creek Crossing could not be justified.

2.10.7 No On-site Leaching Operations

The Proponent carefully reviewed the use of on-site leaching operations during completion of the optimisation studies for the Project. Matters that were relevant to the continuation of the approved off-site transportation and leaching of concentrate included the following.

- A commitment made to the community during the initial stages of public consultation in 2008 that cyanide leaching would not be undertaken on site.
- The fact that off-site transportation has been previously approved.

Matters that were relevant to the introduction of on-site leaching operations included the following.

- The fact that on-site processing would remove the requirement to transportation up to 30 000tpa of concentrate to an off-site processing facility, likely to be located up to 900km from the Project Site, with the resulting traffic and greenhouse gas impacts associated with that transportation.

- The fact that cyanide leaching is a commonly used and well understood technology that can be undertaken safely and without harming the environment.
- The fact that on-site processing is likely to be more efficient than off-site processing because additional costs associated with transportation and establishment of a remote processing facility would not be incurred.
- The fact that the Proponent investigated a very significant number of off-site processing facilities and that for a range of reasons, none were suitable or available for the proposed use.

In light of the above, the Proponent determined that, on balance, on-site processing operations would permit construction of a more robust Project without adversely impacting on the environment.

2.10.8 Alternative Cyanide Delivery or Generation

The Proponent considered the following alternate cyanide delivery or generation methods.

- Delivery in $1m^3$ bulka bags.

  Solid sodium cyanide, particularly imported sodium cyanide, is commonly delivered in $1m^3$ bulka bags in wooden boxes in locked shipping containers. This material requires personnel to work in close proximity to the solid material to remove the boxes from the shipping containers and to mix the cyanide solution. In addition, potential exists for spillage during transportation and storage because the shipping container is not designed to withstand traffic accidents. Finally, this delivery methodology generates significant cyanide-contaminated waste that requires managing. As a result, the Proponent elected not to use this delivery method.

- On-site generation of cyanide.

  As described in Section 2.5.2.4, an alternative and less common source of cyanide includes onsite generation through the supply of natural gas or LPG and nitrogen to an on-site electrical-powered plasma reactor. The carbon in the natural gas or LPG separates from the other compounds and reacts with the nitrogen to form cyanide. The Proponent is experimenting with this method of generating cyanide at its Henty Gold Mine in Tasmania. However, it is at a very early stage of development and is not currently commercially viable.

2.10.9 Separation of Flotation and Concentrate Tailings

The Proponent considered separate storage of the flotation and concentrate tailings. Separate storage would have the advantage of ensuring that the concentrate tailings would remain available for subsequent use, including for the generation of sulphuric acid through roasting of the pyrite by a third party off site. However, the Proponent was advised that preferable sources of pyrite exist and that the distance to the closest facility capable of roasting the pyrite would make transportation costs prohibitive. In addition, as the concentrate tailings would be likely to

be potentially acid generating, the Proponent determined that the potential benefits of separate storage were outweighed by the disadvantages. As a result, the Proponent proposes co-placement of the flotation and concentrate storage.

2.10.10 Alternative Location and Design of the Tailings Storage Facility

The Proponent considered a range of alternative locations for the Tailings Storage Facility, including to the north of the Project Site. That location would have required access to land not currently owned by the Proponent. The owner of that land has indicated that they have no interest in selling the land or in allowing its use for mining-related purposes.

The Proponent also considered an alternative location within the Project Site to the south of the approved processing plant and boxcut. That location, as well as the location to the north of the Project Site would require construction of a rectangular "turkey's nest" or paddock-fill facility rather than a valley-fill facility as proposed. **Figure 13,** however, presents an overview of the conceptual design for valley-fill and "turkey's nest" facilities.

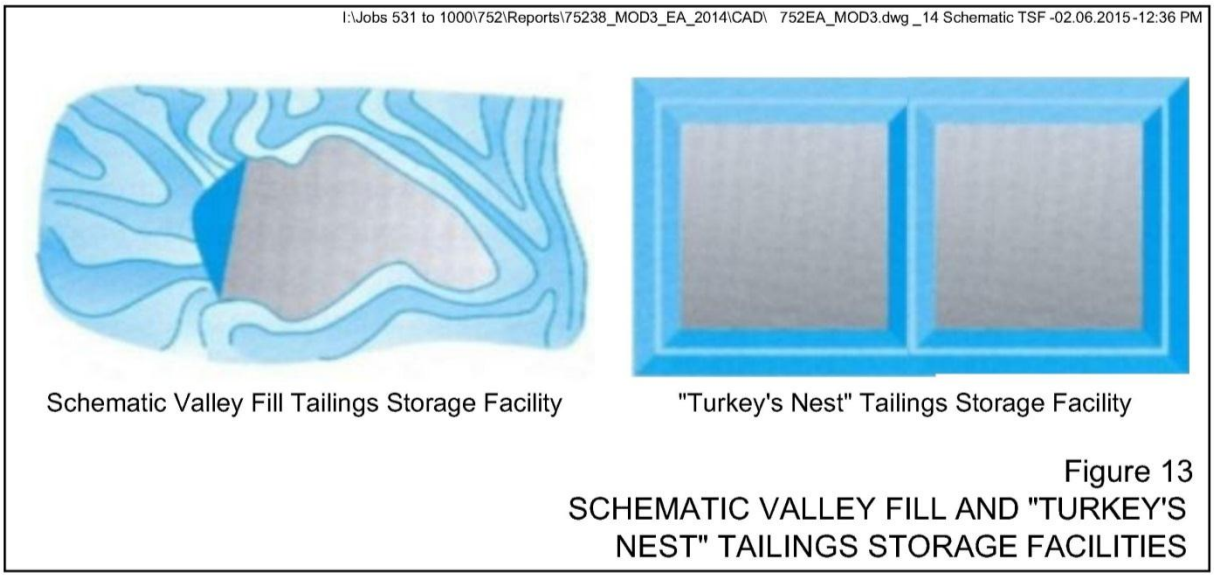

Figure 13
SCHEMATIC VALLEY FILL AND "TURKEY'S NEST" TAILINGS STORAGE FACILITIES

Despite the fact that the location of the Tailings Storage Facility has been previously approved, the following presents an overview of the reasons why the proposed valley-fill facility was considered preferable to an alternative "turkey's nest" design.

- Land ownership – the Proponent does not own the land to the north of the Project Site and the owner of that land has not indicated a desire to sell the land.
- Disturbance area – the proposed valley-fill facility would require disturbance of approximately 16ha of land. By contrast the alternative "turkey's nest" facility would require disturbance of approximately 24ha of land.
- Waste rock volume – the proposed valley-fill facility would require approximately 670 000m^3 of waste rock to construct a single embankment. The alternative "turkey's nest" design would require approximately 946 000m^3 of waste rock to construct embankments on all sides of the facility. Each facility would also

require additional waste rock for capping material during rehabilitation. Assuming a capping thickness of 1m, a further 160 000m^3 and 240 000m^3 of waste rock would be required for the proposed facility and the alternative "turkey's nest" facility.

- Visual amenity – the proposed facility would be located within a valley and would not be visible from outside the Project Site. By contrast, the alternative "turkey's nest" facility would be located on elevated land that would be highly visible during both its active life and following rehabilitation from publicly available vantage points including from the Gourock Range (approximately 15km to the west-northwest of the Project Site), Mt Gillamatong (approximately 9km to the north of the Project Site) and Monga Mountain (approximately 13km to the east of the Project Site).

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. In addition, the Proponent acknowledges that the Proposed Modification, in particular the proposed use of cyanide processing, represents a substantial departure from previous commitments. 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 Reef Community Consultative Committee (Section 3.2.2);
- consultation with the local and regional communities (Section 3.2.3);
- consultation with neighbouring landowners (Section 3.2.4); and
- consultation with State and local government agencies (Section 3.2.5 and 3.2.6).

3.2.2 Consultation with the Dargues Reef Community Consultative Committee

Quarterly meetings of the Dargues Reef Community Consultative Committee (DRCCC) have been suspended pending recommencement of operations at the Project Site. Notwithstanding this, the Proponent convened a meeting of the DRCCC on 11 November 2014 to discuss the Proposed Modification prior to it being made public. This meeting was attended by the following.

- Peter Gordon – Independent Chairperson.
- Belinda Royds – Community Member.
- Tony Hayman – Community Member (proxy for Jackie French).
- Pete Harrison – Mayor of Palerang Council.
- Brett Corven – Eurobodalla Shire Council.
- Tony Davis – Chief Operating Officer with Unity Mining.
- James Dornan – Project Engineer with Unity Mining.

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

- The changing nature of the Project and associated uncertainty for the community (Section 4.13).
- Previous commitments made to the community, in particular not to use cyanide within the Project Site (Section 4.13).
- The effects of cyanide, particularly the impact on the environment and community (Section 2.5.2 and Section 4).

3.2.3 Consultation with the Community

3.2.3.1 Introduction

The Proponent has consulted extensively with the communities of Majors Creek, Braidwood, Araluen, Moruya and Batemans Bay with regards to the Proposed Modification. This consultation included public meetings, community information sessions, a site visit to the Proponent's Henty Gold Mine in Tasmania and communication via the Proponent's Dargues Gold Mine Information Line. The following subsections present an overview of that consultation.

The Proponent acknowledges that there is a high level of community interest and concern in relation to the Proposed Modification, in particular, the transportation, use and management of sodium cyanide. This is particularly in light of previous statements by the Proponent in relation to plans not to use sodium cyanide within the Project Site. As a result, much of the community consultation has involved providing factual information in relation to the use and effects of sodium cyanide in general and Project-specific information in relation to the anticipated use, management and effects within and surrounding the Project Site. As an indication of the Proponent's commitment to community consultation, an estimated $100 000 has been spent on this program at the time of finalisation of this document.

3.2.3.2 Majors Creek Community Meeting

An initial public meeting was held between 5:30pm and 8:30pm on 11 November 2014 at the Majors Creek Hall in Majors Creek to introduce the Proposed Modification to the local communities. This meeting was attended by approximately 40 members of the Majors Creek, Araluen and Braidwood communities and was chaired by Tania Parkes of Tania Parkes Consulting. Tony Davis, Chief Operating Officer with the Proponent provided an in depth presentation on the Proposed Modification and answered questions on a range of issues. Technical input in relation to questions from the floor was provided by:

- James Dornan, Project Engineer with the Proponent;
- Mitchell Bland, Principal Environmental Consultant with R. W. Corkery; and
- Tony McKay, Senior Process Engineer with DRA Pacific.

The key issues raised during the meeting included the following. The section of this document where each issue is addressed is presented in parenthesis. Where the matter is not addressed elsewhere in the document, a response is provided below in italics.

- The effects of cyanide, including whether cyanide can bio-accumulate in the environment (Section 2.5.2).
- The changing nature of the Project and associated uncertainty for the community (Section 4.13).
- The proposed water balance and whether water consumption would increase as a result of the Proposed Modification (Section 2.5.4.3).
- Whether local residents will be able to access jobs and how they can become qualified for the range of jobs available prior to project commissioning (Section 4.13).
- Potential for lead contamination. *The material to be processed within the Project Site does not include elevated levels of lead.*
- Breaking of previous commitments (Section 4.13).
- Concern over future planning modifications. *The Proponent notes that the Proposed Modification includes all proposed modifications that it could reasonably be expected to be aware of at the time of finalisation of this document.*
- Importation of ore from other sources. *Importation of ore is not an approved activity and is not a component of the Proposed Modification.*
- Continued support of community events/clubs. *The Proponent notes that continued support of community events and clubs is contingent on its financial viability and that that is, at least in part, contingent on the Proposed Modification being approved.*
- That the use of cyanide was not advertised in advance of the community meeting. *The Proponent notes that the purpose of the Majors Creek community meeting was to update the community on all aspects of the Project, including the use of cyanide.*

Finally, the Proponent mooted the concept of arranging a visit to an operating gold mine to enable community representatives to gain an understanding of how such operations operate and the nature of the onsite activities typically undertaken.

3.2.3.3 Henty Gold Mine Site Visit

As a result of a commitment made during the initial public meeting, the Proponent organised a site visit to its Henty Gold Mine, located in northwest Tasmania, on 10 December 2014. The Henty Gold Mine is an operating gold mine with a processing plant and Tailings Storage Facility similar to those proposed for the Project.

An invitation for expressions of interest to participate in the site visit was distributed on 25 November 2014 via email to all community members that registered at the initial public meeting, the Downstream Water Users Register, Palerang and Eurobodalla Councils and the local media. The invitation was further distributed by members of various community and environmental groups within the region.

The Proponent received ten expressions of interest to attend the site visit. Of those who registered, two were unavailable on the selected date. All other applicants were accommodated on the site visit.

The Proponent charted a plane to fly from Canberra to Burnie in Tasmania. Participants were then driven by car to the Henty Gold Mine. Community members who participated in the site visit included the following.

- Richard Pearce – Majors Creek community member.
- Peter Cormick – Moruya community member.
- David Lever – Araluen community member.
- Damien Bigg – Majors Creek community member.
- Julia MayoRamsay – Moruya community member.
- Brett Corven – Eurobodalla Shire Council employee.
- Carmen McIntosh – Editor of the Bay Post.
- James Bennett – Journalist with the ABC in Canberra.

Representatives of the Proponent who participated in the site visit included the following.

- Andrew McIlwain – Chief Executive Officer with the Proponent.
- Scott Jones – General Manager with the Henty Gold Mine.
- Darren French – Sustainability and Information Manager with the Henty Gold Mine.

The tour provided the attendees an opportunity to observe the Henty Gold Mine in operation, including the following aspects.

- Operation of the processing plant, including the ROM Pad, crushing and grinding circuit, carbon-in-leach tanks and cyanide destruction circuit.
- Observe a gold pour and develop a better understanding of the final processing of the gold to produce gold doré bars, including the operation of the gold room furnace.
- Visit the Tailings Storage Facility to see how tailings are distributed and stored and observe the discharge of water to the environment, including the infrastructure and processes that allow this to happen.
- Inspect a decommissioned Tailings Storage Facility that has been rehabilitated.
- Meet and ask questions of the with Henty Gold Mine staff.

Plates 5 to **12** present photographs taken on the day of the site inspection.

Plate 5: Attendees at the Henty Gold Mine site inspection
(Source: Bay Post - CLM_4317)

Plate 6: Henty Gold Mine - Cyanide solution storage area
(Source: Bay Post - CLM_4338)

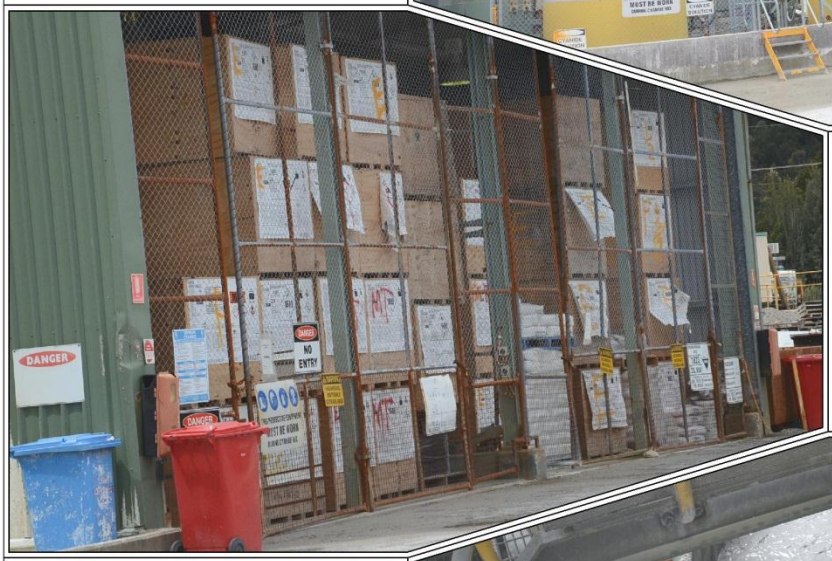

Plate 7: Henty Gold Mine - Dry reagent storage shed
(Source: Bay Post - CLM_4339)

Plate 8: Henty Gold Mine - Leach Tank
(Source: Bay Post - CLM_4378)

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Plate 9: Henty Gold Mine - Activated Carbon
(Source: Bay Post - CLM_4380)

Plate 10: Henty Gold Mine - Thickener. Note clarified water for re-use in processing plant
(Source: Bay Post - CLM_4385)

Plate 11: Henty Gold Mine - Gold room furnace with fume hood (not pictured)
(Source: Bay Post - CLM_4395)

Plate 12: Henty Gold Mine - Majors Creek resident Damien Bigg with an unrefined gold bar
(Source: Big Island Mining Pty Ltd)

3.2.3.4 Braidwood and Moruya Drop-in Sessions

The Proponent held drop-in information sessions at:

- the Braidwood Meeting Room on Tuesday, 16 December 2014 between 1:00pm and 7:00pm; and
- the Lahana Motel conference room in Moruya on Wednesday, 17 December 2014, between 1:00pm and 7:00pm.

These information sessions were attended by representatives of the Proponent, including the following.

- Andrew McIlwain – Chief Executive Officer with the Proponent.
- Tony Davis – Chief Operating Officer with the Proponent.
- James Dornan – Manager – Projects with the Proponent.
- Tony McKay – Senior Process Engineer – DRA Pacific.
- Simon Smith – Senior Engineer – Knight Piésold.
- Dr Roger Drew – Toxicologist and Risk Assessor – ToxConsult.

The primary objective of the drop-in information sessions was to provide an opportunity for members of the communities and other interested stakeholders to obtain further information about the Project and the Proposed Modification. The information was provided by technical experts in the fields of processing, tailings storage, mining and environment to ensure that accurate and comprehensive information could be passed on to those who attended the information sessions.

The information session held in Braidwood was attended by approximately 30 members of the Braidwood and Majors Creek communities. Issues raised and discussed included the following. The section of this document where each issue is addressed is presented in parenthesis. Where the matter is not addressed elsewhere in the document, a response is provided below in italics.

- Potential for seepage from the Tailings Storage Facility (Section 2.6.5.3).
- The composition and toxicity of the tailings within the Tailings Storage Facility (Section 2.5.2 and 2.6.3).
- Noise impacts associated with the Project (Section 4.2).
- Visual amenity (Section 4.11).
- Air quality (Section 4.10).
- Importation of ore from outside the mining lease. *Importation of ore is not an approved activity and is not a component of the Proposed Modification.*
- The storage capacity of the Tailings Storage Facility (Section 2.6.2).
- Project delay (Section 4.13).
- Previous commitments made to the community, in particular not to use cyanide within the Project Site (Section 4.13).

- Concern over future other planning modifications. *The Proponent notes that the Proposed Modification includes all proposed modifications that it could reasonably be expected to be aware of at the time of finalisation of this document.*
- Local employment opportunities (Section 4.13).
- Continued support of community events/clubs. *The Proponent notes that continued support of community event and clubs is contingent on its financial viability and that that is, at least in part, contingent on the Proposed Modification being approved.*

The drop-in session held in Moruya was attended by approximately 130 members of the Batemans Bay and Moruya communities. Issues raised and discussed included the following. The section of this document where each issue is addressed is presented in parenthesis. Where the matter is not addressed elsewhere in the document, a response is provided below.

- Whether the project would include operation of a "lead smelter". *The material to be processed within the gold room does not include elevated levels of lead and that the gold room furnace would therefore not constitute a "lead smelter".*
- Potential impacts on drinking water supplies (Section 4.5.4.4).
- Heavy metals and bioaccumulation of these in the ecosystem (Section 2.6.3).
- Ecologically sustainable development (Section 5.1).
- Notification of stakeholders once the *Environmental Assessment* is submitted. *The Proponent will notify the community when the Environmental Assessment is publicly available via emails to all individuals on its consultation database and via its website. In addition, the Proponent is aware that the DPE will advertise the exhibition of the Proposed Modification in local newspapers and that the Proposed Modification will receive considerable coverage in the local media.*
- Long term integrity of the Tailings Storage Facility liner and potential for migration of heavy metals into groundwater (Section 2.6.5.3).
- Population at risk and suitability of consequence assessment/hazard rating (**Appendix 6**).
- Site selection for the Tailings Storage Facility at the head of a catchment. *Construction of the facility at the head of a catchment ensures that there is limited potential for surface water to run into the facility, ensuring that erosion following decommissioning of the facility is not an issue requiring management.*
- Design of Tailings Storage Facility for storm events, allowance for site-specific climatic conditions (Section 2.6.64.2).
- Lack of economic benefits and opportunities for coastal residents. *The Proponent notes that the Project Site is located approximately 70km from Moruya. Residents and businesses located in coastal areas would be well placed to seek employment or to supply services to the Project.*

- The changing nature of the Project and associated uncertainty for the community (Section 4.13).
- Concern over future other planning modifications and "Mission Creep". *The Proponent notes that the Proposed Modification includes all proposed modifications that it could reasonably be expected to be aware of at the time of finalisation of this document.*

3.2.3.5 Araluen Community Meeting

A community meeting was held at the request of the Araluen Progress Association at the Federal Hall in Araluen on 17 December 2014, between 9:00am and 10:30am. This meeting was attended by approximately 40 members of the Araluen community. Tony Davis provided the same presentation as that provided at the Majors Creek Community Meeting and the attendees were provided with an opportunity to ask questions of the Proponent's representatives.

Issues raised during the meeting included the following. The section of this document where each issue is addressed is presented in parenthesis. Where the matter is not addressed elsewhere in the document, a response is provided below in italics.

- Water quality monitoring - how, what, where and when. *This issue is addressed in detail in the publicly available Water Management Plan and is not addressed further in this document.*
- Lead smelting (Section 3.2.3.4).
- Potential seepage from the Tailings Storage Facility (Section 2.6.4.3).
- Rainfall data and design parameters for the Tailings Storage Facility (Section 2.6.4.2).
- Adequacy of the Tailings Storage Facility design (Section 2.6.4.2).
- The changing nature of the Project and associated uncertainty for the community (Section 4.13).
- Concern over future other planning modifications and "Mission Creep". *The Proponent notes that the Proposed Modification includes all proposed modifications that it could reasonably be expected to be aware of at the time of finalisation of this document.*

3.2.3.6 Araluen Water Monitoring Demonstration

Following on from a commitment made at the Araluen community meeting, a water information session was held at the Federal Hall in Araluen on 18 April 2015. The purpose of this session was to.

- demonstrate water monitoring techniques and discuss the environmental monitoring data that is collected through this monitoring;
- discuss how analysis of laboratory and field samples is carried out and where copies of the results can be obtained;

- demonstrate how the flocculation and coagulation of sediment laden water is carried out at the Project Site; and
- provide further information on the Downstream Water Users Register.

3.2.4 Consultation with Neighbouring Landowners

The Proponent contacted by telephone all owners of land surrounding the Project Site. In most cases, messages were left, with a request to return the call to discuss the Proposed Modification. Direct contact was made, or return calls were received from, five land owners. In each case, no specific concerns were identified, however, each individual identified a desire to have an opportunity to review the final version of this document once it is on public exhibition and to request additional information at that time if required. The Proponent committed to providing a copy of the final version of this document in a suitable format and to be available to meet separately with each landowner if requested.

It is also noted that the Proponent has developed a close relationship with a number of surrounding landowners and others in the community through leasing of land and agistment of stock and horses within the Project Site not required for Project-related activities. The Proponent also works co-operatively with its neighbours to manage fence maintenance, soil protection works, pests and weeds, with substantial success in the latter in particular.

3.2.5 Consultation with Councils

Representatives of the Proponent met separately with both Palerang Council and Eurobodalla Shire Council on 10 November 2014, prior to the initial public meeting. These meetings were attended by representatives of both Councils, including the following.

- Peter Bascomb – General Manager of Palerang Council.
- John Wright – Director of Planning and Infrastructure Services of Palerang Council.
- Bill Ellison – Director of Infrastructure Planning of Palerang Council.
- Catherine Dale – General Manager of Eurobodalla Shire Council.
- Warren Sharpe – Director Infrastructure and Services of Eurobodalla Shire Council.
- Lindsay Usher – Planning and Sustainability Services of Eurobodalla Shire Council.
- Brett Corven – Division Manager, Water and Sewer of Eurobodalla Shire Council.

Representatives of the Proponent included:

- Tony Davis – Chief Operating Officer; and
- James Dornan – Manager – Projects.

The purpose of these meetings was to provide both Councils with information regarding the Proposed Modification, in advance of it being made publicly available, and to assist each Council to engage with key personnel of the Proponent.

The Proponent offered to meet again with representatives of both Palerang Council and Eurobodalla Shire Council in advance of the community information sessions to provide an opportunity for each of the Councils to discuss the Proposed Modification with the Proponent's technical experts. This offer was not accepted by either Council.

Finally, the Proponent invited each Council to nominate a representative to attend the Henty Gold Mine site inspection, with Eurobodalla Shire Council nominating Brett Corven. Palerang Council elected not to nominate an attendee.

3.2.6 Consultation with Government Agencies

Government agency consultation in relation to the Proposed Modification has been undertaken in two phases, namely an initial phase in early 2014 and a subsequent phase between late 2014 and early 2015. The following presents an overview of the government agency consultation.

Early 2014 Consultation

In early 2014, the Project approval included the Spring Creek crossing and an additional waste rock emplacement. Following initial discussions with the Department of Planning and Infrastructure (now Department of Planning and Environment) it was agreed that a formal planning focus meeting with relevant government agencies was not required for the Proposed Modification as it was then understood. Rather, it was agreed that the Proponent should provide a *Background Paper* to the relevant agencies and seek their requirements for matters to be included in this document. An email requesting agency requirements was provided to the following agencies on 18 March 2014. Dates in parenthesis indicate the dates that each agency responded. Where no date is provided, no written response was received.

- Department of Planning and Infrastructure (10 November 2014).
- Environment Protection Authority (19 March 2014).
- Office of Environment and Heritage (4 April 2014).
- NSW Office of Water (28 March 2014).
- Division of Resources and Energy (25 March 2014).
- Palerang Council.
- Eurobodalla Shire Council.

Late 2014 / Early 2015 Consultation

Following identification of the requirement to include on-site leaching of gold ore, as well as finalisation of the design of the Eastern Waste Rock Emplacement, the Proponent met with representatives of the Department of Planning and Environment on 15 September 2014. The Department requested that the Proposed Modification be summarised in a brief letter which was subsequently provided. The Department indicated at that time that it would not be seeking formal requirements from the relevant agencies.

The Proponent also met with representatives of the Environment Protection Authority on 17 September 2014 to advise the Authority of the proposed activities.

On 6 February 2015, a draft version of the *Environmental Assessment* was provided to the Department of Planning and Environment for comment. Following clarification of a range of matters, an amended *Environmental Assessment* was provided to the following agencies on 3 March 2015. Dates in parenthesis indicate the dates that each agency responded. Where no date is provided, no written response was received.

- Environment Protection Authority (20 March 2015).
- Office of Environment and Heritage (23 March 2015).
- Division of Resources and Energy (23 March 2015).
- Department of Primary Industries (30 March 2015).

Relevant matters raised in all correspondence have been addressed in this document. A separate response has been prepared and provided to the Department of Planning & Environment identifying where each issue has been addressed, or if not addressed, why not.

3.3 REVIEW OF PLANNING ISSUES

3.3.1 Introduction

As identified in Section 1.1, the Project is an 'approved project' under the (now repealed) Part 3A of the EP&A Act. As a result, the Project is 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, continues to apply to the Project. This modification application is accordingly made under Section 75W of the EP&A Act.

Section 75R of the EP&A Act identifies that State Environmental Planning Policies and local environmental planning instruments do not generally apply to the assessment of applications made under Part 3A of the Act. However, the Minister may, take into account the provisions of any environmental planning instrument that would apply, but for Section 75R. As a result, the following subsections present a discussion of relevant environmental planning instruments.

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

As stated above, State and local environmental planning instruments do not generally apply to the assessment of applications made under Part 3A of the EP&A Act.

Clause 20 of Schedule 6A of the EP&A Act contains savings and transitional provisions that apply to the modification of approved projects relating to mining or petroleum development on strategic agricultural land. The effect of those provisions is to require compliance with Part 4AA of the *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (Mining SEPP) to those applications that are subject to Clause 20. Clause 20 only applies, however, if the application relates to mining development on:

- land shown on the Strategic Agricultural Land Map, or
- any other land that is the subject of a site verification certificate.

The Project Site does not contain land shown on the Strategic Agricultural Land Map and no part of it is the subject of a site verification certificate. As a result, Clause 20 of Schedule 6A of the EP&A Act does not apply.

The Mining SEPP also specifies matters requiring consideration in the assessment of any mining-related development. While these are not strictly required to be considered as part of the approval process, **Table 17** presents an overview of the matters the Minister may consider and where each is addressed in the *Environmental Assessment*.

Table 17
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant SEPP Clause	Description	EA Section
12AA: Significance of resource	Consideration is given to the significance of the resource that is the subject of the application, having regard to:	
	• the economic benefits, both to the State and the region; and	4.13
	• the advice provided by the DG of DTIRIS as to the relative significance of the resource in comparison with other mineral resources across the State.	-
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	-
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.	-
	Measures proposed to avoid or minimise any incompatibility are considered.	4 (generally)

Table 17 (Cont'd)
Application of SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Relevant SEPP Clause	Description	EA Section
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.	-
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.	4.10.4
	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.	2.2
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;	2.9.2 and the MOP
	• the appropriate management of development generated waste;	2.3 and 2.6
	• 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.	2.9.2

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 would result in the requirement for cyanide to be delivered to the Project Site in 22t isotainers for use within the processing plant. It is envisaged that the cyanide would be delivered as solid sodium cyanide and mixed with water within a dedicated mixing facility to produce a cyanide solution. Further information related to the use of cyanide is presented in Section 2.5.4.4.

To assist the Minister should they wish to consider the requirements of this SEPP, an assessment of the Proposed Modification has been undertaken in accordance with the document entitled *Hazardous and Offensive Development Application Guidelines: Applying SEPP 33* (DP&I, 2011). Hazardous materials are defined within that document as substances falling within the classification of the *Australian Code for Transportation of Dangerous Goods by Road and Rail* (Dangerous Goods Code).

Appendix 6 presents a risk screening undertaken in accordance with the requirements of the above documents. That risk screening indicates that the Project is classified as potentially hazardous based on the use, storage and transportation of sodium cyanide. As a result, a preliminary hazard analysis (PHA) has been undertaken and is also presented in **Appendix 6**.

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 Regional and Local Planning Issues

3.3.3.1 Drinking Water Catchments Regional Environmental Plan No 1

Clause 6 of the *Drinking Water Catchments Regional Environmental Plan No 1* (Drinking Water Catchments REP) identifies the upper Shoalhaven River catchment as part of the land covered by this plan. As noted in Section 3.2.3.3 of RWC (2010a), the northern-most section of the Project Site extends into this catchment; however, no surface disturbing activities would be undertaken within the upper Shoalhaven River catchment. In addition, that section also identifies the anticipated reduction in groundwater discharge within that catchment.

As the Proposed Modification would not result in changes to the approved groundwater discharge to the upper Shoalhaven River catchment, the Proponent contends that the Drinking Water Catchments REP is not relevant to the Proposed Modification.

3.3.3.2 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) and Section 4 RWC (2013a) 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 3. 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

4.2.1 Introduction

The Proponent notes that changes to noise-related impacts as a result of the Proposed Modification may result principally from the construction and operation of the Eastern Waste Rock Emplacement and Spring Creek Crossing, as well as other minor modifications outlined within this document.

Spectrum Acoustics developed a noise model and assessed potential noise-related impacts to support the original development application for the Project (Spectrum, 2010). That noise model was subsequently revised to account for proposed changes to the noise environment as a result of Modifications 1 and 2. Spectrum Acoustics was engaged to further revise the noise model and to assess the changes to the noise environment based on the Proposed Modification. The resulting letter report presenting the revised noise assessment is presented in **Appendix 8** and is referred to hereafter as Spectrum (2015). The following subsections present an overview of the results of that report.

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 and they are not discussed further within this document.

4.2.2 Existing Environment and Assessment Criteria

No significant changes in the noise environment surrounding the Project Site have occurred since finalisation of RWC (2010a). As a result, the default *Industrial Noise Policy* assessment criteria identified in Section 4.2.3 of that document remains valid, namely:

- an $L_{eq(15\text{-minute})}$ operational noise assessment criterion for all periods of the day of 35dB(A); and
- an $L_{1(1\text{-minute})}$ sleep disturbance criterion of 45dB(A).

These criteria are consistent with those embodied in Condition 3(1) of MP10_0054.

4.2.3 Assessment Methodology

The noise assessment methodology used to assess the anticipated impacts associated with the Proposed Modification is as described in Spectrum (2010).

For the purposes of this assessment, Spectrum (2015) assessed two construction noise scenarios and one operational noise scenario as follows.

- Scenario 1a – 24hr (night-time) site establishment operations.
- Scenario 1b – Day-time only site establishment operations.
- Scenario 2 – 24hr operations.

These scenarios are broadly similar to those described in Section 4.2.4.1 of RWC (2010a), with the exception that relevant noise sources have been relocated to reflect the proposed modified activities. In addition, noise emissions associated with the operation of the carbon-in-leach plant were incorporated into the noise model. The modelled operational and 24hr night-time scenarios included a worst-case 4°C/100m temperature inversion. **Figures 14** and **15** present the revised noise modelling scenarios.

For each scenario, Spectrum (2015) has presented the noise results for those residences determined by previous modelling to be likely to be most affected.

4.2.4 Management and Mitigation Measures

All management and mitigation measures identified in RWC (2010a) and the approved *Noise Management Plan for the Dargues Reef Gold Project* would continue to be implemented. No additional noise management or mitigation measures are proposed, nor are any required.

4.2.5 Assessment of Impacts

4.2.5.1 Scenario 1a – 24hr (Night-time) Site Establishment Operations

Table 18 presents the results of the noise assessment for Scenario 1a during night-time temperature inversions. For comparison, the predicted noise levels for the original Project and MOD2 are also presented. Spectrum (2015) states that the noise levels for this scenario differ by only the first decimal place.

Table 18
Predicted Scenario 1a Noise Levels – Inversion Assessment[1]

Residence[2]	Original Project September 2010	MOD2 July 2013	MOD3 November 2014	Variance MOD2 to MOD3	Criterion
R15	29	29	29	0	*35*
R27	30	30	30	0	*35*
R29	21	21	21	0	*35*
R30	27	27	27	0	*35*
R31[1]	35	35	35	0	*35*
R32	31	31	31	0	*35*
R33	30	30	30	0	*35*
R107	33	33	33	0	*35*
R108	34	34	34	0	*35*

Note 1: Units = dB(A), $L_{eq(15min)}$
Note 2: For residence locations, see **Figure 16.**
Note 3: Residence is Project-related.
Source: Spectrum (2015) – After Table 2

The Proposed Modification is likely to result in a negligible change to the noise levels associated with 24-hour site establishment operation at surrounding residences.

4.2.5.2 Scenario 1b – Day-time only Site Establishment Operations

Table 19 presents the results of the noise assessment for Scenario 1b for day-time only site establishment operations.

Table 19
Predicted Scenario 1b Noise Levels[1]

Residence[2]	Original Project September 2010	MOD2 July 2013	MOD3 November 2014	Variance MOD2 to MOD3	Criterion
R15	32	32	32	0	*35*
R27	34	34	34	0	*35*
R29	26	26	26	0	*35*
R30	30	30	30	0	*35*
R31[1]	35	35	35	0	*35*
R32	33	32	33	+1	*35*
R33	32	32	34	+2	*35*
R107	32	31	33	+2	*35*
R108	32	32	33	+1	*35*

Note 1: Units = dB(A), $L_{eq(15min)}$
Note 2: For residence locations, see **Figure 18.**
Note 3: Residence is Project-related.
Source: Spectrum (2015) – After Table 3

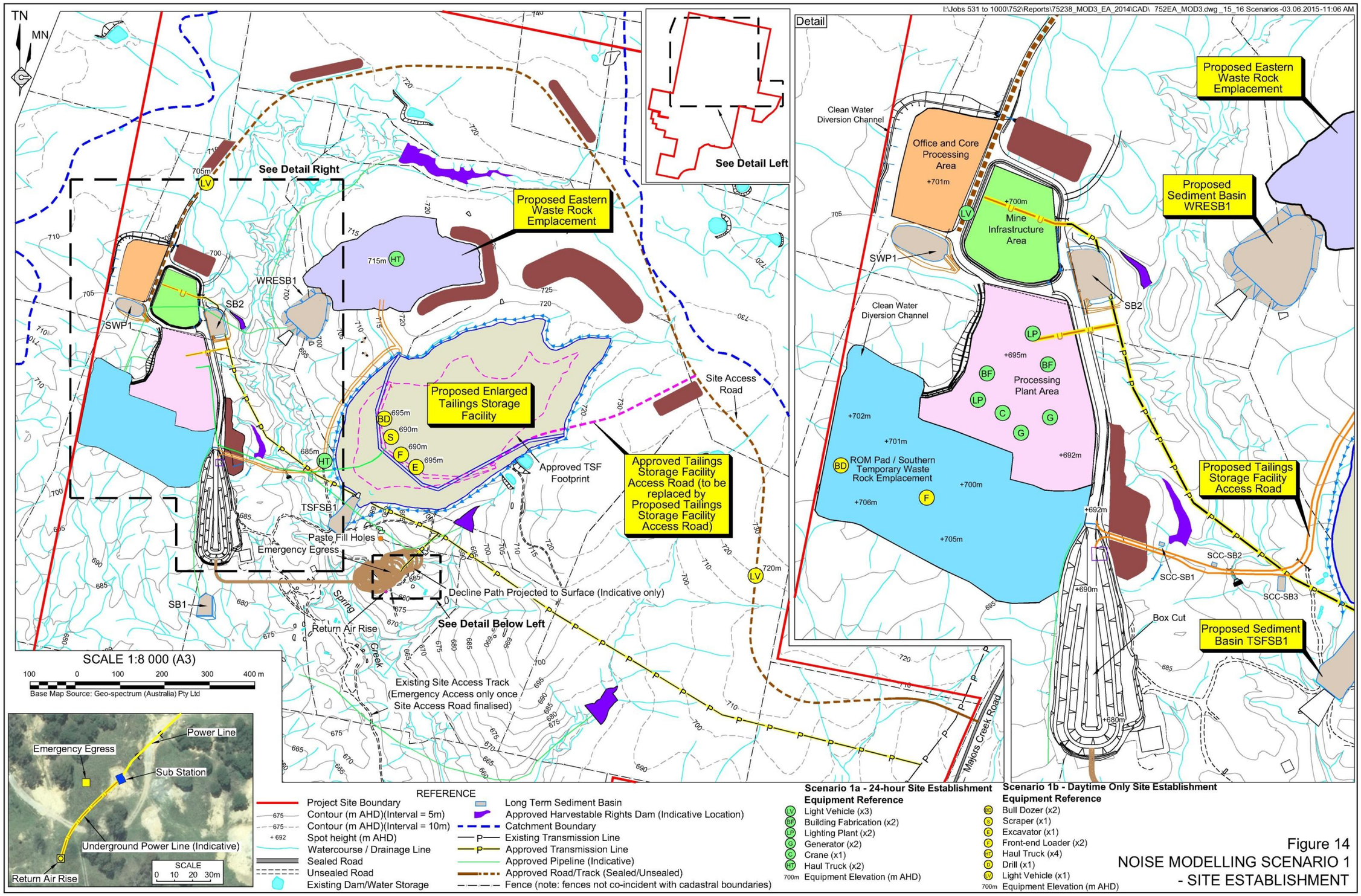

Figure 14
NOISE MODELLING SCENARIO 1 - SITE ESTABLISHMENT

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See Detail Right

See Detail Left

Detail

Proposed Eastern Waste Rock Emplacement

Proposed Enlarged Tailings Storage Facility

Approved Tailings Storage Facility Access Road (to be replaced by Proposed Tailings Storage Facility Access Road)

Approved TSF Footprint

Site Access Road

Proposed Sediment Basin WRESB1

Proposed Tailings Storage Facility Access Road

Proposed Sediment Basin TSFSB1

Clean Water Diversion Channel

Office and Core Processing Area +701m

Mine Infrastructure Area +700m

Processing Plant Area +695m

ROM Pad / Southern Temporary Waste Rock Emplacement +702m +701m +706m +705m +700m

WRESB1

TSFSB1

SB1

SB2

SWP1

SCC-SB1

SCC-SB2

SCC-SB3

Paste Fill Holes

Emergency Egress

Spring

Return Air Rise

Decline Path Projected to Surface (Indicative only)

See Detail Below Left

Existing Site Access Track (Emergency Access only once Site Access Road finalised)

Box Cut

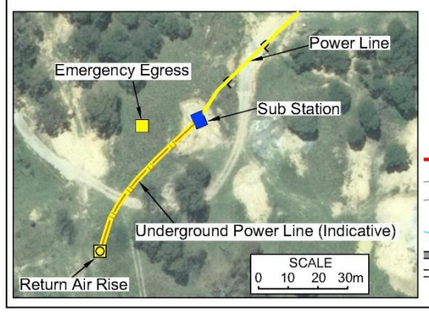
Majors Creek Road

Creek

SCALE 1:8 000 (A3)

100 0 100 200 300 400 m

Base Map Source: Geo-spectrum (Australia) Pty Ltd



REFERENCE

- Project Site Boundary
- Contour (m AHD)(Interval = 5m)
- Contour (m AHD)(Interval = 10m)
- Spot height (m AHD)
- Watercourse / Drainage Line
- Sealed Road
- Unsealed Road
- Existing Dam/Water Storage
- Long Term Sediment Basin
- Approved Harvestable Rights Dam (Indicative Location)
- Catchment Boundary
- Existing Transmission Line
- Approved Transmission Line
- Approved Pipeline (Indicative)
- Approved Road/Track (Sealed/Unsealed)
- Fence (note: fences not co-incident with cadastral boundaries)

Equipment Reference

- F Front-end Loader
- RB Rock breaker (on a campaign basis) (X1)
- WP Diesel water pump/electric water pump (X1)
- HT Haul Trucks (X2)
- C Crusher and Screens (X1)
- BM Ball Mill (X1)
- FC Flotation Cells (X1)
- CIL Carbon-in-leach (X1)
- LV Light vehicle (X1)
- VF Ventilation Fan (X1)
- 700m Equipment Elevation (m AHD)

Figure 15
NOISE MODELLING SCENARIO 2 - OPERATIONS

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The only predicted changes to noise levels as a result of the Proposed Modification would involve a slight increase in noise levels at residences R32 (1dB(A)), R33 (2dB(A)), R107 (2dB(A)) and R108 (1dB(A)). In summary, the Proposed Modification is likely to result in a negligible change to the noise levels at surrounding residences with only slight increases at some residences, noting that all noise levels are less than the criterion level.

4.2.5.3 Scenario 2 – 24hr Operations

Table 20 presents the results of the noise assessment for the predicted operational noise levels, including temperature inversion conditions.

Table 20
Predicted Operational Noise Levels[1]

Residence[2]	Original Proposal September 2010	MOD2 July 2013	MOD3 November 2014	Variance MOD2 to MOD3	Criterion
R15	33	32	32	0	*35*
R27	31	31	31	0	*35*
R29	23	25	25	0	*35*
R30	25	26	26	0	*35*
R31[3]	31	31	31	0	*35*
R32	31	28	28	0	*35*
R33	30	29	29	0	*35*
R107	33	30	30	0	*35*
R108	31	33	33	0	*35*

Note 1: Units = dB(A), $L_{eq(15min)}$
Note 2: For residence locations, see **Figure 18.**
Note 3: Residence is Project-related.
Source: Spectrum (2015) – After Table 4

The only predicted changes to noise levels as a result of the Proposed Modification would be a 1dB(A) increase at residence R31, from 31dB(A) to 32dB(A), substantially less that the relevant criterion of 35dB(A).

4.2.5.4 Summary of Results

As a result of revised noise modelling undertaken by Spectrum (2015), 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 the Proposed Modification. All anticipated noise levels would remain below the relevant criterion levels.

4.2.6 Monitoring

As the predicted noise impacts associated with the Project are broadly in line with those associated with the approved Project, no changes to the existing monitoring program outlined in the *Noise Management Plan* are proposed.

4.3 ECOLOGY

4.3.1 Introduction

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 biodiversity monitoring has been undertaken by Gaia and EnviroKey Pty Ltd (EnviroKey), with the resulting reports presented on the Project website.

EnviroKey undertook an assessment of the potential ecology-related impacts resulting from the Proposed Modification, taking into account the proposed additional management measures. That report is presented as **Appendix 9** and is referred to hereafter as EnviroKey (2015). The following subsections provide a range of background information and summarise the findings of EnviroKey (2015).

4.3.2 Existing Environment and Approved Disturbance

Figure 16 presents the vegetation communities identified in Gaia (2010) together with the proposed modified Project Site layout. In addition, **Table 21** presents the approved area of disturbance within each community. In summary, the Proposed Modification would result in further disturbance of the following vegetation communities identified in RWC (2010a), with the extent of the additional disturbance presented within the parenthesis.

- Community 4 – Regenerating Wattles (0.2ha).
- Community 7 – Native-dominated Pasture (19.5ha).

Table 21
Vegetation Communities – Comparison of Approved and Proposed Disturbance

Vegetation Community	Area to be disturbed (ha)			Total Area within Gaia (2010) Survey Area (ha)
	Original Application[1]	Modification 2 (2013)	Modification 3	
1 – Ribbon Gum – Snow Gum Grassy Open Forest	0.1	0.1	0.1	28.2
2 – Fragmented Ribbon Gum – Snow Gum Grassy Open Forest	0.1	0.1	0.1	7.1
3 – Woody Weeds Shrubland	0.1	0.1	0.1	30.1
4 – Regenerating Wattles	-	-	0.2	18.5
5 – Exotic Vegetation	0.2	0.2	0.1	5.6
6 – Native Grassland	0.2	0.2	0.2	0.2
7 – Native-dominated Pasture	23.6	25.3	44.8	280.1
8 – Exotic-dominated Pasture	-	0.3	0.5	2.5
9 – Largely Disturbed Land	2.2	2.2	0.5	23.1
10 – River Peppermint Open Forest	-	-	-	1.3
Total	**26.5**	**28.5**	**46.6**	**396.6**

Note 1: Areas of disturbance are consistent with Figure 4.17 of RWC (2010a). This does not include minor areas between individual infrastructure items

Source: After RWC (2010a) Figure 4.17 and RWC (2013a) Table 10 and **Figure 16**

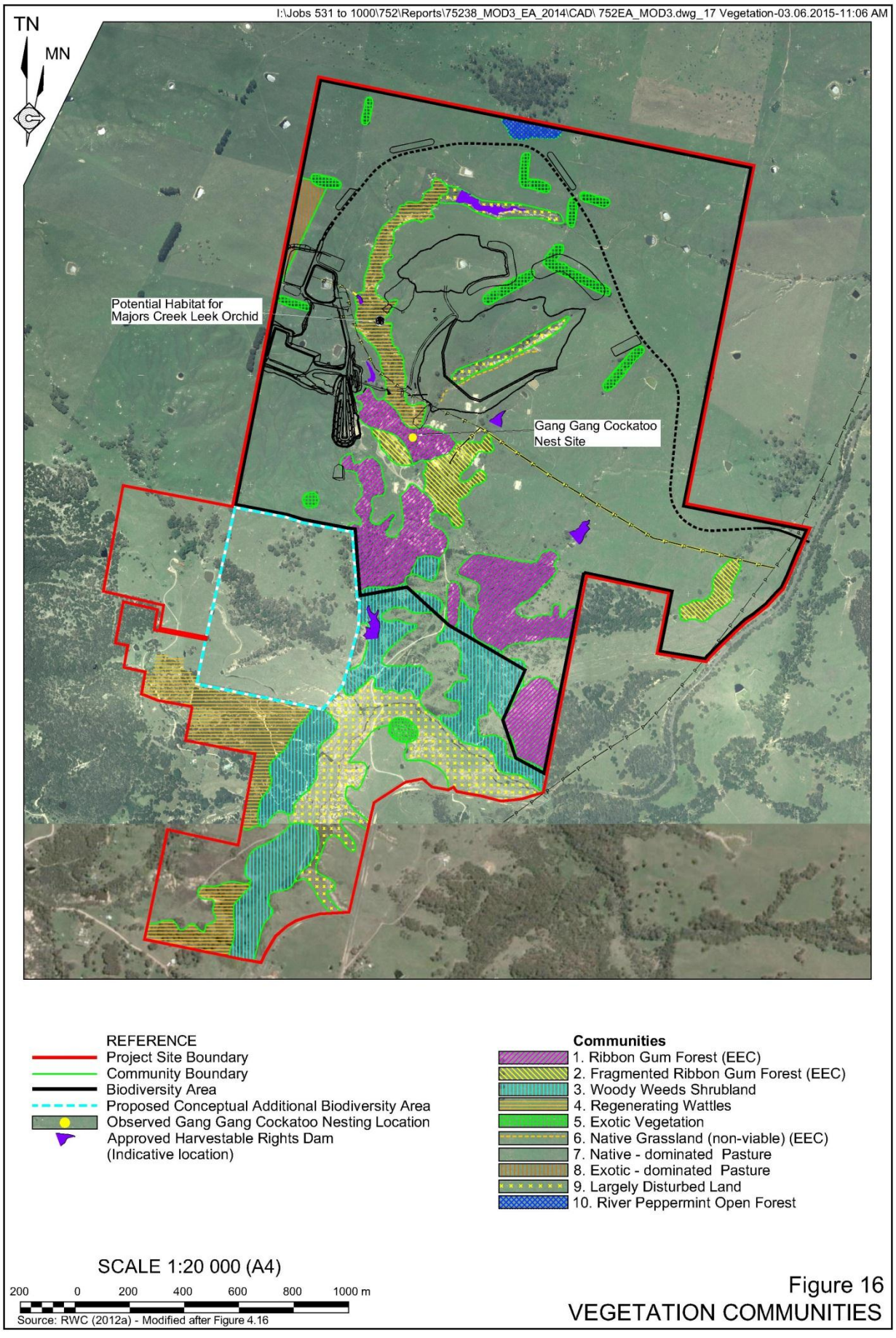

Figure 16
VEGETATION COMMUNITIES

Community 4 Regenerating Wattles was described by Gaia (2010) as containing patches of Black Wattle and Blackwood up to 5m high and often containing Broom and/or Blackberry in the shrub layer and exotic grasses, such as Rye Grass in the groundcover. This community is restricted to areas of prior agricultural disturbance.

Community 7 Native-dominated Pasture covers the majority of the Project Site and was described in by Gaia (2010) as being of low-diversity and forming a continuum with Community 6 – Native Grassland and Community 8 – Exotic-dominated pasture. This community has previously been the subject of extensive grazing and agriculture, including application of phosphorus-based fertiliser.

The Tableland Basalt Forest Endangered Ecological Community (EEC) was listed as an endangered ecological community within the *Threatened Species Conservation Act 1995* by the NSW Scientific Committee in 2008. Flora surveys undertaken from October 2009 to June 2010 to support the original application (RWC, 2010a) did not identify this EEC within the Project Site (Gaia (2010)). However, subsequent to that assessment and in accordance with the precautionary principle, Community 1 – Ribbon Gum Forest and Community 2 – Fragmented Ribbon Gum Forest has been assumed to be a variant of the Tableland Basalt Forest EEC.

Community 4 – Regenerating Wattles, shares a single species with the Tableland Basalt Forest EEC, namely Blackwood which is described in the Tableland Basalt Forest EEC listing as one of a number of possible small shrubs that may be present. EnviroKey (2015) note that this species is also indicative of other vegetation communities and, given the abundance of Broom, Blackberry and exotic grasses, Community 4 is not part of any EEC.

Community 7 – Native-dominated pasture was determined by Gaia (2010) to also not be consistent with any EEC. This finding was raised by the Proponent during the Land and Environment Court appeal to the original approval and was not contested.

4.3.3 Listed Species, Communities Habitat likely to Occur

EnviroKey (2015) undertook a review of the following databases for listed species within a 5km radius search area centred on the Project Site.

- BioNET – Atlas of NSW Wildlife for species and communities listed under the NSW *Threatened Species Conservation Act 1995.*
- Protected Matters Search Tool for species and communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999.*

Table 3 of EnviroKey (2015) presents the results of that search. That table also includes an assessment of whether the identified species or communities have been previously recorded within the Project Site or within the locality and the likelihood of each occurring within the Project Site. Of the 41 listed species and 5 listed vegetation communities identified, EnviroKey (2015) determined that ten threatened, two migratory species and one vegetation community occurred or could potentially occur within the Project Site. Each of those species and the vegetation community is discussed in detail in Section 4.3.5.

In addition, EnviroKey (2015) reviewed the document *Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands* published by the then Department of Environment and Conservation and Department of Natural Resources in 2006 to identify the vegetation communities and, by extension fauna habitat with the above search area. Based on that information, EnviroKey (2015) identified the areas of habitat described in **Table 22** within 5km of the Project Site.

Table 22
Fauna Habitat Surrounding the Project Site

Fauna Habitat	Area (ha)	Percentage
Cleared	5 615	71.3%
Rainforest	21	0.3%
Forest	1 354	17.2%
Woodland	672	8.5%
Grassland	215	2.7%
Total	**7 877**	**100%**
Source: EnviroKey (2015) – after Table 2		

4.3.4 Management and Mitigation Measures

All management and mitigation measures identified in RWC (2010a) and the approved *Biodiversity Management Plan for the Dargues Reef Gold Project* (approved by the Department of Planning and Infrastructure in 2012) would continue to be implemented. In addition, the sediment and erosion control measures identified in the *Erosion and Sediment Control Plan for the Spring Creek Crossing* (presented as **Appendix 2**) would be fully implemented to minimise the potential for damage to riparian habitat within and downstream of the Project Site.

4.3.5 Assessment of Impacts

4.3.5.1 Disturbance-related Impacts

TSC Act-listed Species

EnviroKey (2015) presents a detailed assessment of the anticipated significance of impacts on TSC Act species and communities identified as occurring or potentially occurring within the Project Site as a result of the approved Project and the Proposed Modification. That assessment was undertaken in accordance with the factors identified in Section 5A of the EP&A Act. **Table 23** presents an overview of that assessment.

EPBC Act-listed Species

EnviroKey (2015) presents a detailed assessment of the anticipated significance of impacts on EPBC Act species identified as occurring or potentially occurring within the Project Site as a result of the approved Project and the Proposed Modification. **Table 24** presents an overview of that assessment.

Table 23
Overview of TSC Act Significance Assessment

Species/Community	Overview of the Assessment	Significance Effect?
Eastern False Pipistrelle	The approved and proposed disturbance would be negligible in the context of the surrounding foraging habitat.	Unlikely
Eastern Bentwing-bat	The approved and proposed disturbance would be negligible in the context of the surrounding foraging habitat.	Unlikely
Gang-gang Cockatoo	A known nesting tree occurs within the Project Site. This site would not be disturbed. Removal of 0.2ha of potential foraging habitat would be negligible in the context of the surrounding foraging habitat.	Unlikely
Speckled Warbler	Removal of 0.2ha of marginal, potential foraging habitat would be negligible in the context of the remaining foraging habitat.	Unlikely
Varied Sittella	Removal of 0.2ha of marginal, potential foraging habitat would be negligible in the context of the remaining foraging habitat.	Unlikely
Scarlet Robin	Removal of 0.2ha of marginal, potential foraging habitat would be negligible in the context of the remaining foraging habitat.	Unlikely
Flame Robin	The removal of approximately 19.7ha of habitat is considered negligible in the context of the potential habitat that remains on the Project Site and in the locality.	Unlikely
Diamond Firetail	Removal of 0.2ha of marginal, potential foraging habitat would be negligible in the context of the remaining foraging habitat.	Unlikely
Spotted-tailed Quoll	Removal of 0.2ha of marginal, potential foraging habitat would be negligible in the context of the remaining foraging habitat.	Unlikely
Majors Creek Leek Orchid	Fencing and identification of the know habitat for this species would prevent inadvertent disturbance	Unlikely
Tablelands Basalt Forest EEC	The Proposed Modification would not disturb an vegetation identified as part of this vegetation community	Unlikely
Source: EnviroKey (2015)		

Table 24
Overview of EPBC Act Significance Assessment

Species/Community	Overview of the Assessment	Significance Effect?
Migratory Species		
Cattle Egret	The Project Site does not comprise “important habitat” for either species	Unlikely
Latham’s Snipe		Unlikely
Threatened Species		
Spotted-tailed Quoll	The Proposed Modification will not lead to a long-term decrease in the size of fragmentation of a population, reduce the occupancy or affect critical habitat of the species or disrupt the breeding cycle of the Species	Unlikely
Source: EnviroKey (2015)		

4.3.5.2 Cyanide-related Impacts

ToxConsult prepared a risk assessment for the ecological and human health impacts associated with the use of cyanide for the Proposed Modification. That report, referred to hereafter as ToxConsult (2015b) is presented in **Appendix 3**. This subsection provides a brief overview of the key findings of that assessment.

In relation to impacts to species accessing the Tailings Storage Facility, ToxConsult (2015b) assumed that the maximum concentration of WAD cyanide within the Tailings Storage Facility supernatant pond would be 30mg/L. As discussed in Section 2.6.6.4, this is a highly conservative assumption. In summary, the risk assessment determined the following.

- Acute impacts, namely rapid death as a result of ingestion or inhalation of cyanide is the principal risk to wildlife, birds and bats the most susceptible fauna as terrestrial fauna would be excluded by a 1.8m high fence, with a chain mesh fencing extending into the ground to prevent access to the facility by burrowing fauna.
- Birds – The mallard duck was determined to be most susceptible bird species. Based on experimental evidence, ToxConsult (2015b) determined that this species is unlikely to be adversely effected by drinking water with a concentration of 30mg/L WAD cyanide.
- Bats – ToxConsult (2015b) noted that insect breeding is typically limited at WAD concentrations of over 5mg/L. As a result, it is unlikely that bats would be foraging over the Tailings Storage Facility and would therefore be exposed to cyanide primarily while drinking (ingestion) or flying over the Tailings Storage Facility to drink (inhalation). While there are limited studies into the toxicity of cyanide for bats, there is sufficient data to determine that rats are more susceptible to cyanide than bats. As a result, ToxConsult (2015b) reviewed toxicology data for rats as a surrogate for bats. That review determined that bat mortality would be significantly less than 1% and that there would be a negligible impact as a result of the Proposed Modification.

In relation to impacts associated with an overtopping of the Tailings Storage Facility, ToxConsult (2015) determined that there would be negligible impacts provided that the concentration of cyanide in the supernatant pond is managed such that the concentration of free cyanide within Spring Creek in the highly unlikely event of an overtopping of the facility would be less than the ANZECC (2000) 95% protection level of 0.007mg/L. As the Proponent has committed in Section 2.6.6.4 to achieve this requirement, impacts associated with this highly unlikely scenario would be negligible. Furthermore, as the ANZECC (2000) trigger level is substantially less than the World Health Organisation short term exposure guideline of 0.5mg/L total cyanide and the Australian drinking water guideline of 0.08mg/L, ensuring compliance with the ANZECC (2000) trigger level would ensure that adverse impacts to human health would be negligible.

4.3.6 Biodiversity Offsets

The Proponent notes that the following biodiversity offsets have been negotiated and are embodied in MP10_0054.

Onsite Biodiversity Offset

Condition 3(32) of MP10_0054 describes the approved Onsite Biodiversity Offset and **Figure 16** shows the approved extent of the approved Biodiversity Area.

The expert report of Greg Stone, the Proponent's botanist at the time of the Land and Environment Court appeal to the original approval, states that the intent of the Onsite Biodiversity Offset is to.

- "re-establish a vegetation community, namely native grassland, that has been very extensively disturbed regionally;
- protect and enhance an area of remnant forest that was later reclassified as Tablelands Basalt EEC, without allowing that community to replace the grassland community;
- provide for an ongoing beneficial use of the Biodiversity Offset Area; and
- provide an example of appropriate agricultural land management for surrounding farmers".

That description was not challenged during the Court proceedings and is largely consistent with Condition 3(33) of MP10_0054.

In light of the above, and acknowledging that the Proposed Modification would disturb an additional 19.5ha of Native-dominated Pasture and 0.2ha of Regenerating Wattles, the Proponent proposes to extend the existing approved Biodiversity Area to include an additional 40ha of native-dominated pasture as minimum. **Figure 16** identifies the conceptual additional Biodiversity Area, pending confirmation of the vegetation classification. The Proponent notes that the proposed additional Biodiversity Area includes vegetation communities other than pasture communities which would also be protected.

Offsite Biodiversity Offset

The Offsite Biodiversity Strategy is embodied in Commitment 5.9a of Appendix 5 of MP10_0054. In summary, that commitment requires the Proponent to protect and enhance a minimum of 35.5ha of Tableland Basalt Forest EEC in the vicinity of the Project Site or to provide equivalent funding for the management of the EEC elsewhere. As the Proposed Modification would not result in additional disturbance of this community, no amendments to the approved Offsite Biodiversity Offset are proposed.

4.4 GROUNDWATER

4.4.1 Introduction

Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) prepared a *Groundwater Assessment* to accompany the original application for Project Approval. That document, referred to hereafter as AGE (2010), identified three classes of aquifers within and surrounding the Project Site as follows.

- A fracture-controlled, hydraulically "tight," massive, granodiorite-hosted aquifer with localised permeability along fracture or fault systems.
- A shallow, weathered, regolith-hosted aquifer.
- A shallow alluvial aquifer associated with the Majors Creek alluvial deposits. This aquifer comprises sand and clay with boulders adjacent to and within Majors Creek.

4.4.2 Previous Groundwater Assessments

AGE (2010) identified that the Project, as it was then proposed, would result in the following groundwater-related impacts.

- Inflow to the Dargues Gold Mine of between approximately 7.2L/s and 10.0L/s or approximately 227ML/ year to 315ML/year.
- Reduced groundwater discharge to Spring Creek of up to approximately 0.3L/s or 9.4ML/year.
- Reduced groundwater discharge to Majors Creek of up to approximately 1.8L/s or 56.8ML/ year.
- The standing water level in two non-Project related bores would be lowered by up to 7.5m. Four other bores would be at the anticipated limit of groundwater drawdown.

Subsequently, AGE prepared a second *Groundwater Assessment* to accompany the Proponent's application for the use of paste fill (MOD1). That assessment, referred to hereafter as AGE (2012), took into account the proposed backfilling of completed stopes using a combination of paste fill and waste rock. That assessment determined that there would be no significant changes to anticipated groundwater levels, the zone of drawdown or rates of discharge to Majors and Spring Creeks during the life of the mining operation as a result of that modification. However, following the cessation of mining operations, groundwater levels would recover more quickly than modelled due to the fact that the mine voids would be backfilled.

Finally, AGE prepared a third revised *Groundwater Assessment* in May 2013 (AGE, 2013). That assessment was prepared in accordance with Commitment 6.4e of Appendix 5 of MP10_0054. As the proposed changes to the rate of decline development and extension of the life of the mine were anticipated at that time, the Proponent incorporated them into the revised groundwater model. The associated report, referred to hereafter as AGE (2013), was appended to the 2012/2013 AEMR and a copy was provided to Department of Planning and Environment and NSW Office of Water at that time. AGE (2013) is presented as **Appendix 10**.

The revised modelling assumed and took into account the following.

- Development of the decline over a period of 32 months.
- Development to a total depth of approximately 500m below surface
- Mining for a period of 65 months, with mining operations commencing approximately 8 months after the commencement of the decline.
- Use of paste fill and rock fill to backfill selected stopes on completion.
- Rainfall and groundwater level monitoring data collected within and surrounding the Project Site prior to remodelling.

The above data was used to:

- undertake a transient calibration of the groundwater model;
- predict the impact of the Project on groundwater levels and stream flows using the recalibrated model;
- determine the groundwater flow recovery and flow directions after closure of the mine; and
- analyse the sensitivity of the adopted model parameters on model predictions.

The results of that assessment are presented in the following subsection.

Finally, the Proponent notes that the groundwater model will continue to be the subject of further recalibration and refinement as mining operations develop in accordance with Condition 3(30)(e) of MP10_0054 and that the above predictions will continue to be refined throughout the life of the Project.

4.4.3 Assessment of Impacts

4.4.3.1 Groundwater Inflow, Drawdown, Discharge and Recovery

The AGE (2013) revised groundwater model determined the following.

- Groundwater inflows to the underground mine would increase progressively to between 10L/s and 12L/s as the decline reaches its maximum depth in month 21, before decreasing gradually to approximately 8L/s in month 60. By contrast AGE (2010) determined that groundwater inflows would be between 9L/s and 10L/s until the decline reached its maximum depth around month 24, before decreasing progressively to between 7L/s and 8L/s.
- The zone of groundwater drawdown would be slightly smaller than that determined by AGE (2010), and, as a result, no privately-owned bores would be adversely impacted by the Project.
- The loss of baseflow in Majors Creek would increase progressively from zero to approximately 2.5L/s at the end of mining operations. This compares with an estimate of approximately 2.1L/s determined by AGE (2010). However, the loss was heavily dependent on withdrawal of water from the Snobs, United Miners and Stewart and Mertons workings. As the modelled rate of extraction from these workings is substantially greater than the likely rate of extraction, the Proponent contends that this assessment is likely to be highly conservative. Ongoing monitoring of base flows within Spring and Majors Creeks will provide a measured value for loss of base flow to be offset.
- The rate of groundwater recovery post mining would be similar to that determined by AGE (2010), with both estimates determining that groundwater levels would be fully recovered within 10 years of the completion of mining operations.

4.4.3.2 Groundwater Quality

A range of community members identified groundwater contamination as a result of the use and management of cyanide as a potential issue of concern. The Proponent contends that cyanide-related contamination of groundwater would be unlikely for the following reasons.

- Cyanide within the processing plant would be managed as described in Section 2.5.4, with appropriate bunding and containment of cyanide-containing solutions preventing discharge to the natural surface and subsequent infiltration into the underlying aquifer.
- The tailings stream from the leach tanks would be passed through a cyanide destruction circuit before being passed to the Tailings Storage Facility as described in Section 2.5.4.3. The WAD cyanide concentration of the tailings would be less than the relevant Environment Protection Licence discharge criteria of 20mg/L WAD cyanide (90% of the time) and 30mg/L WAD cyanide (at all times).
- The Tailings Storage Facility would be lined to achieve a demonstrated permeability of 1×10^{-9}mm/s over 900mm or better and a seepage collection system would be constructed.
- Cyanide in the environment typically breaks down with time to form non-biologically available compounds. ToxConsult (2015a) notes that the half life of HCN in water is less than 24 days as a result of biodegradation. In addition, WAD cyanide in groundwater environments typically reacts to form non-biologically available compounds. It is also noted that the porosity of the underlying aquifers is typically low. In addition, the Tailings Storage Facility would be within the approved cone of groundwater drawdown throughout its operational life. As a result, any seepage from the Tailings Storage Facility would have a long residence time prior to discharge. It is therefore likely that any WAD cyanide in seepage water would have been converted to non-biologically available forms well before it could be discharged to the surface water environment.

As a result of the above reasons, groundwater contamination-related impacts associated with the Proposed Modification are expected to be negligible.

4.4.4 Monitoring

The program of groundwater monitoring established within RWC (2010a) and the existing *Water Management Plan* would be maintained and expanded to include monitoring for WAD cyanide. In particular, the following would be monitored for WAD cyanide.

- All Tailings Storage Facility seepage collection structures.
- Monitoring bores TSFWB01 to TSFWB06 and DRWB05.

In addition, the Proponent would construct additional shallow monitoring bores immediately downslope of the Tailings Storage Facility as identified by Knight Piésold (2015) and these bores would also be monitored for WAD cyanide.

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 report is hereafter referred to as SEEC (2015a). SEEC has also prepared detailed *Erosion and Sediment Control Plans* for the Eastern Waste Rock Emplacement, the Spring Creek Crossing and construction of Stage 1 of the Tailings Storage Facility (hereafter referred to as SEEC (2015b), SEEC (2015c) and SEEC (2015d) respectively). Those plans are included as Appendixes within SEEC (2015a). SEEC (2015a) is included as **Appendix 2** to this document.

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 4**). 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 Boxcut to the Tailings Storage Facility and Eastern Waste Rock Emplacement, 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.

Construction of the Eastern Waste Rock Emplacement would result in the removal of a small, unnamed ephemeral tributary of Spring Creek, with the inclusion of a sediment basin and associated licenced discharge point (see Section 4.5.3).

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.

It is noted that the Proposed Modification would result in changes to the approved Harvestable Rights Dams and surface water harvesting program (see Section 2.7 for details).

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, the Eastern Waste Rock Emplacement and the Tailings Storage Facility. In particular, ensure that the detailed management and mitigation measures identified in SEEC (2015b, 2015c and 2015d) are fully implemented.
- Ensure that water accumulated within sediment basins is treated and tested prior to discharge within the timeframes identified in SEEC (2015b, 2015c and 2015d).
- 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 5mm of rain), measures are implemented to "bed down" disturbed areas as described in SEEC (2015b, 2015c and 2015d).
- 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

4.5.4.1 Eastern Waste Rock Emplacement

The construction of the Eastern Waste Rock Emplacement would remove a small ephemeral tributary of Spring Creek. The implementation of erosion and sediment control measures identified in SEEC (2015b) during the construction and operational stages would ensure potential impacts to the downstream environment, including Spring Creek, would be appropriately managed, resulting in negligible impacts.

4.5.4.2 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 2.4 and management measures proposed in Section 4.5.3, as well as the detailed Erosion and Sediment Control Plan presented in SEEC (2015c), it is considered that the residual impacts to the water quality and structure of Spring Creek would be negligible.

4.5.4.3 Construction of the Tailings Storage Facility

Construction of the Stage 1 of the Tailings Storage Facility has the potential to generate sediment laden water that may, in the absence of suitable controls, flow into Spring Creek. However, given the erosion and sediment controls proposed in Section 2.6.5.2 and management measures proposed in Section 4.5.3, as well as those described in the *Erosion and Sediment Control Plan* presented in SEEC (2015d), it is considered that the residual impacts to surface water in the vicinity of Spring Creek would be negligible.

4.5.4.4 Use of Cyanide

The Proponent acknowledges community concern in relation to the use of cyanide within the Project Site, in particular, potential impacts on drinking water supplies downstream of the Project Site. Section 2.5.4.4 identifies a range of cyanide management and mitigation measures that would be implemented to manage the transportation, storage, use and disposal of cyanide. In summary, the Proponent contends that the risk of contamination of surface water as a result of the use of cyanide have been reduced to an acceptable level for the following reasons.

- Sodium cyanide would be transported in specially designed isotainers and transferred to on-site storage tank(s) within a sealed and bunded area, with potential spills fully contained within the bunded area.
- Cyanide would be stored and used within fully bunded storage and leach tanks, with the bunding designed to contain at least 110% of the volume of the largest tank. All pipework would be within bunded areas or would be fitted with leak detection and shutoff equipment. In addition, the Proponent would ensure that surface water drainage within the processing plant is isolated from natural drainage under all circumstances in the event of a catastrophic or multi-tank failure of the cyanide containment system.
- Tailings would be passed through a cyanide destruction circuit to ensure WAD cyanide concentrations in tailings are less than the Environment Protection Licence nominated criteria.
- The Tailings Storage Facility would be constructed with the permeability of the floor and walls of the structure of 1×10^{-9}m/s over 900mm or better and seepage detection and collection infrastructure.
- A robust inspection and monitoring program would be implemented, including visual inspections and automatic monitoring of the processing plant, Tailings Storage Facility and associated infrastructure.

- The concentration of WAD and free cyanide in the supernatant pond would be managed to ensure that the concentration in Spring Creek in the extremely unlikely event of a discharge via the emergency spillway would be less than the ANZECC (2000) 95% species protection trigger level of 0.007mg/L free cyanide, substantially less than relevant drinking water standards (see Section 4.3.5.2).
- Surface water and groundwater monitoring would be undertaken to prevent or detect discharge of cyanide from the Project Site.

4.5.4.5 Harvestable Rights Capacities and Calculations

With the addition of the "Slings" property to the Project Site, the Proponent's total landholding has increased from approximately 396ha to 452ha. However, consistent with the approach taken in RWC (2010a), the Proponent has excluded the expanded Tailings Storage Facility from the area used to calculate its harvestable rights volume because surface water accumulating within that facility would not be permitted to flow to natural drainage. As a result, the Proponent's harvestable rights volume has increased from approximately 34.5ML to approximately 37ML.

In addition, the Proponent notes that Harvestable Right Dam HRD-E would not be constructed because it would be within the footprint of the Eastern Waste Rock Emplacement and Harvestable Right Dam HRD-F would not be constructed because the enlarged Tailings Storage Facility would reduce the available clean water catchment to a size that would not justify construction of the dam.

As a result, the remaining dams would be resized to account for the increase in the Proponent's harvestable rights volume and the reduced number of dams. **Table 25** presents the revised harvestable rights dam volumes for all harvestable right dams within the Project Site.

Table 25
Revised Harvestable Right Dam Capacities

Dam Identifier[1]	Indicative Volume (ML)
HRD-A	9.5
HRD-B	2.4
HRD-C	5.2
HRD-D	6.1
HRD-E(r)	-
HRD-F	-
HRD-G	2.8
HRD-H	11
Total	13.8
Note 1: See **Figure 11** for locations	
Source: SEEC (2015a) – Table 1	

SEEC (2015a) undertook revised harvestable rights calculations to ensure that the collection of water would continue to be used towards maintaining compensatory base flows in Majors Creek, utilising the water balance included within RWC (2010a) and SEEC's own "RATES" model. The revised modelling took into account the following.

- Composite rainfall records from the Bureau of Meteorology's station at Majors Creek (station number 070061) from September 1970 to June 2012. Selected gaps in the data were filled using data from the Braidwood station (number 069010). Data from May 1986 to May 1988 were excluded from the model because no rainfall data was available from the Majors Creek station and SEEC determined that the gap in the data was too large to be filled with data from the Braidwood station.
- Modelling undertaken by AGE (2013) that identified that the loss of baseflow in Majors Creek would increase progressively from zero to approximately 2.5L/s at the end of mining operations (see section 4.4.3.1). SEEC (2015a) conservatively assumed the maximum flow required for the compensatory flow program of 2.5L/s, despite the fact that this level of discharge would only be required in the last stages of the mining operations, if at all.

The results of the revised modelling are provided in **Table 26** and may be summarised as follows.

- During the 40 year modelling period, the harvestable right dams would be able to supply water for environmental flows 93% of the time, a decrease of 4% from that presented in RWC (2010a).
- In addition, during the driest year on record, the harvestable right dams would have run dry for a total of 150 days, a reduction of 32 days compared to the assessment presented in RWC (2010a).

Table 26
Results of Water Balance Modelling

Parameter	Results
Percent of time during the modelling period that demand for water return to Majors Creek was met by the harvestable right dams.	93%
Average amount of water required from the historic workings per year to make up the average shortfall.	6.9ML/yr (approx.)
Worst year in the model record - number of days the harvestable right dams were dry.	150 days
Worst year in the model record - amount of water that would be required from the historic workings in that year (assuming 2.5L/s).	32.4ML/yr (approx.)
Source: SEEC (2015a) – Table 2	

The above modelling is considered to be highly conservative for the following reasons.

- AGE (2013) determined the maximum baseflow losses in Majors Creek based on annual extraction from the Snobs, United Miners and Stewart and Mertons workings of 78.8ML. In reality, SEEC (2015a) indicate that an average shortfall of 6.9ML/y is anticipated, with 32.4ML required during the direst year in the model. As a result, the assumed drawdown in groundwater levels is unlikely to be achieved, resulting in turn in reduced requirements for compensatory flows.

- SEEC (2015a) assumed that the maximum rate of compensatory flows would be required during all years. In reality, the requirement to compensate for loss of baseflow would increase from nil in Year 1 to an assumed 2.5L/s at the end of mine life.

4.5.5 Monitoring

The program of surface water monitoring established within RWC (2010a) and the existing *Water Management Plan* would be maintained and expanded to include monitoring for cyanide within and immediately surrounding the operational areas of the Project Site and in surrounding water courses.

4.6 ABORIGINAL HERITAGE

4.6.1 Introduction and Background

Archaeological Surveys and Reports prepared an *Aboriginal Heritage Assessment* to support the original application for Project approval. That report is referred to hereafter as ASR (2010a).

Table 1 of ASR (2010a) identifies that the effective survey coverage within the Project Site was 403ha, corresponding with the full extent of the Project Site, with the exception of the "Slings" property. As a result, the Proponent contends that the areas of proposed additional disturbance have been the subject of an archaeological survey.

Following Project Approval being issued, Artefact Heritage Services (Artefact) prepared the *Aboriginal Heritage Management Plan* for the Project. That plan was subsequently approved by NSW DP&E in 2012 and is referred to hereafter as Artefact (2012).

Further to the above, during the initial planning phase for the second modification to the Project Approval (MOD2), disturbance of two previously identified Aboriginal heritage sites, namely Site GT OS1 and GT OS2 (**Figure 17**), was originally proposed. As a result, Artefact was engaged in 2013 to produce a letter report addressing the salvage of those sites. The recommendations within this report were included within the revised *Aboriginal Heritage Management Plan* and is referenced to as Artefact (2013).

In relation to the Proposed Modification, Artefact was again contracted to produce an updated letter report to determine if the Proposed Modification would impact upon any further identified sites, with the resulting report presented as **Appendix 11** and referred to hereafter as Artefact (2015).

Noting the above, the following subsections summarise the identified sites, their location and significance and proposed management and mitigation measures. A final assessment of residual impacts is also provided.

4.6.2 Existing Environment

ASR (2010a) identified five sites of Aboriginal heritage significance within the Project Site, none of which were to be disturbed by the Project as it was proposed at that time (**Figure 17**). A sixth site was subsequently discovered by the Proponent who activated the *Aboriginal Heritage Management Plan* (Artefact 2012), isolated the site, engaged Artefact to investigate the find in consultation with the registered Aboriginal parties and Office of Environment and Heritage and subsequently registered the site on the Aboriginal Heritage Information Management System (AHIMS). That site, together with a small potential archaeological deposit (PAD) is referred to hereafter as GT OS06.

An updated search was undertaken of the AHIMS register on 17 December 2014 over the current Project Site, including the "Slings" property. The only sites recorded were those described above with no new Aboriginal sites identified.

The Proponent notes that two sites, namely GT OS1 and GT OS2 would be disturbed by the Proposed Modification (**Figure 17**). These sites are described as follows, based on descriptions provided in ASR (2010a).

- GT OS1 – an open scatter, comprising three artefacts within 50m of each other comprising a silcrete flake and core and a metasedimentary flake.
- GT OS2 – an open scatter comprising two artefacts, namely a proximal fragment of a flake and a core/scraper.

ASR (2010a) and Artefact (2015) state that both Sites GT OS1 and GT OS2 have low archaeological significance due to the highly disturbed context.

4.6.3 2011 Site Survey and Consultation

Consultation with the registered Aboriginal parties was undertaken by Artefact (2015) between late 2011 and mid 2012 in relation to the MOD2 application. At that time, the Proponent proposed to disturb Site GT OS01 and GT OS02. Artefact attempted to locate and re-record Sites GT OS01 to GT OS05 on 5 October 2011 in the company of Bunja Smith of Batemans Bay Local Aboriginal Land Council. GT OS01 and GT OS05 could not be relocated due to growth of thick groundcover.

Subsequent to that site inspection a draft of Artefact (2015) was provided to each of the registered Aboriginal parties and feedback was requested. Table 2 and Appendix B of Artefact (2015) present the results of that consultation. In summary, however, the registered Aboriginal parties did not express objections to the proposed impacts to GT OS1 and GT OS2, with majority of stakeholders expressing a preference that the objects be collected and reburied within the Project Site in a location which would not be impacted. One group requested that the artefacts be reburied in natural fibres.

A copy of all formal correspondence undertaken is appended to Artefact (2015) in **Appendix 11** of this document.

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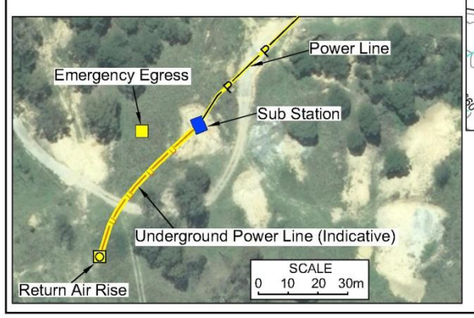
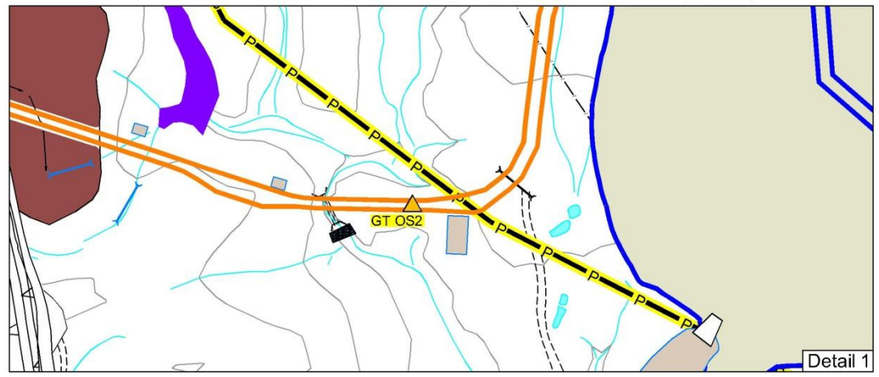
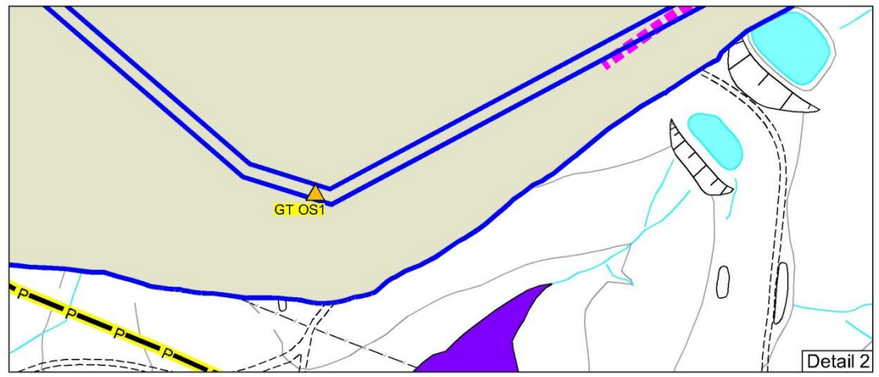
TN
MN

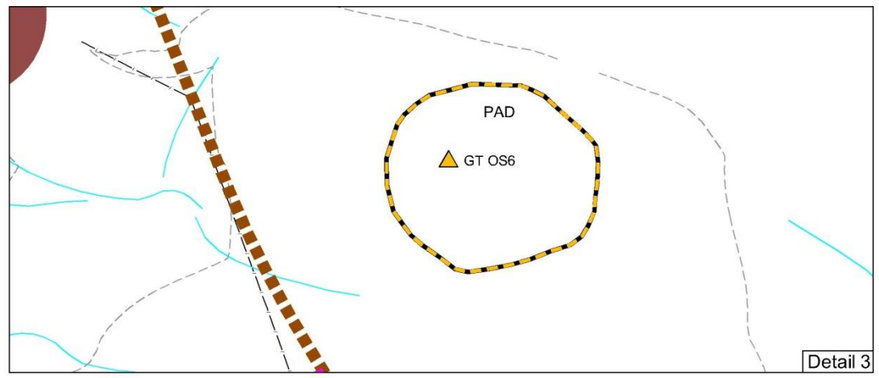
Proposed Sediment Basin WRESB1
Proposed Eastern Waste Rock Emplacement
Proposed Enlarged Tailings Storage Facility
Proposed TSFSB1
Approved TSF Footprint
Approved Tailings Storage Facility Access Road (to be replaced by Proposed Tailings Storage Facility Access Road)
Site Access Road
Paste Fill Holes
Emergency Egress
Decline Path Projected to Surface (Indicative only)
Return Air Rise
Existing Site Access Track (Emergency Access only once Site Access Road finalised)
SWP1
SB1
SB2
Spring Creek
GT ISO3
GT OS1
GT OS2
GT OS4
GT OS6
See Detail 1
See Detail 2
See Detail 3
See Detail Left
See Detail Below Left

SCALE 1:8 000 (A3)
100 0 100 200 300 400 m
Base Map Source: Geo-spectrum (Australia) Pty Ltd









DETAIL SCALE 1:2 500
25 0 25 50 75 100 125 m

REFERENCE

- Project Site Boundary
- Contour (m AHD)(Interval = 5m)
- Contour (m AHD)(Interval = 10m)
- Spot height (m AHD)
- Watercourse / Drainage Line
- Sealed Road
- Unsealed Road
- Existing Dam/Water Storage
- Long Term Sediment Basin
- Approved Harvestable Rights Dam (Indicative Location)
- Catchment Boundary
- Existing Transmission Line (Above ground)
- Approved Transmission Line (Above ground)
- Approved Transmission Line (Underground)
- Approved Pipeline (Indicative)
- Approved Road/Track (Sealed/Unsealed)
- Fence (note: fences not co-incident with cadastral boundaries)
- Soil Stockpile (Indicative location)
- Clean Water Diversion Structure (Indicative location)
- Proposed Modified Infrastructure
- GT OS6 Aboriginal Heritage Site
- GT OS2 Aboriginal Heritage Site (to be salvaged)

Figure 17
ABORIGINAL HERITAGE SITES

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4.6.4 Management and Mitigation Measures

The Proponent would ensure that the measures identified in Section 4.6.6 of RWC (2010a) and within RWC (2012a), RWC (2013a) and the *Aboriginal Heritage Management Plan* (Artefact, 2012) continue to be implemented throughout the life of the Project.

In addition, the following measures would be implemented as a result of consultation regarding the Proposed Modification.

- Artefacts located at Sites GT OS1 and GT OS2 would be salvaged, in consultation with and under the supervision of the registered Aboriginal parties and the Office of Environment and Heritage, from their existing location and reburied in natural fibres in a suitable location that is not proposed to be impacted by mining or associated activities.
- Site impact forms would be completed for both Site GT OS1 and Site GT OS2 and submitted to the Office of Environment and Heritage notifying them of the destruction of these sites.
- The new locations of the reburied artefacts would be registered within the *Aboriginal Heritage Management Plan* and with the AHIMS.
- Protocols implemented to protect previously identified sites would be extended to include the newly located site.

4.6.5 Assessment of Impacts

Given the mitigation measures proposed to manage the collection and reburial of artefacts from Sites GT OS1 and GT OS2, the registration of these artefacts, and the ongoing management of identified and potential heritage items located at the Project Site, it is considered that impacts to Aboriginal cultural heritage would be acceptable.

4.7 NON-ABORIGINAL HERITAGE

4.7.1 Introduction and Existing Environment

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 (2010b), identified a range of non-Aboriginal heritage sites, principally associated with prior mining activities within the Project Site. ASR (2010b) identified that none of the identified sites are considered significant, based on the Heritage Council's criteria for heritage significance.

The Proponent notes that the proposed Spring Creek crossing would utilise a former dam embankment within the footprint of Spring Creek to minimise the amount of disturbance within the watercourse. The embankment is approximately 25m long and up to 4m high with a break in the western section where Spring Creek has eroded the embankment. The embankment is constructed of earth, is not an engineered structure and no longer retains water. **Plates 2** and **3** present views of the embankment.

It is envisaged that the small amount of land to be utilised for the new maximum harvestable rights dam on the "Slings" property and the footprint of the Eastern Waste Rock Emplacement would not contain any non-Aboriginal heritage items due to the disturbed nature of the areas and the similar land characteristics with the surrounding Project Site that also did not contain any non-Aboriginal heritage items.

4.7.2 Impact Assessment

The following presents the NSW Heritage Council's criteria for heritage assessment and assesses the significance of the former embankment within the footprint of Spring Creek against each criterion.

- *Criterion (a) an item is important in the course, or pattern, of NSW's cultural or natural history (or the local area).*

  There is no evidence that the embankment is important in the course or pattern of cultural or natural history in NSW or the local area.

- *Criterion (b) an item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the local area).*

  There is no evidence that the embankment has any association with a person or group of persons of importance in the cultural or natural history of NSW or the local area other than as a general example (amongst many others) of previous mining activities within the Project Site.

- *Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).*

  There is no evidence that the embankment has any particular aesthetic or technical/engineering characteristics of significance.

- *Criterion (d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons (or the local area).*

  There is no evidence that the embankment is associated with any particular community or cultural group, including the Chinese community identified by ASR (2010b) as undertaking small scale mining within the Project Site.

- *Criterion (e) an item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the local area).*

  There is no evidence that the embankment has potential to yield information that would contribute to the understanding of the cultural or natural heritage of NSW or the local area.

- *Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the local area).*

  The embankment does not possess uncommon, rare or endangered aspects of the cultural or natural history of NSW or the local area.

- *Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or the local area).*

  The embankment is not considered important in demonstrating principal characteristics of any class of cultural or natural places or environments of NSW or the local area.

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. The proposed leaching plant would be constructed within the footprint of the approved plant. In addition, the proposed Eastern Waste Rock Emplacement would be constructed in cleared land and the operation of the new maximum harvestable rights dam would not pose a bushfire hazard.

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 result in a significant reduction in the total number of heavy vehicles that would access the Project Site as a result of the removal of the requirement to transport concentrate off site. As a result, the Proposed Modification would result in a significant reduction in traffic and transportation-related impacts. Further reductions in heavy vehicle traffic on public roads are unlikely to be achievable as alternative transportation modes such as rail are not available or feasible. Notwithstanding this, the Proponent would develop a code of conduct or similar for heavy vehicle operators regularly accessing the Project Site.

Furthermore, the Proponent does not propose to reduce the quantum of its contribution under the existing Voluntary Planning Agreement with Palerang Council, including that component that was originally intended to compensate for the approved heavy vehicle movements.

4.10 AIR QUALITY AND ENERGY

4.10.1 Introduction

An *Air Quality and Greenhouse Gas Assessment* was undertaken by PAEHolmes (PAEHolmes, 2010) to support the original development application as it was then understood.

As the result of the Proposed Modification, Pacific Environment Limited (PEL), a company that has amalgamated with PAEHolmes since 2010, were engaged to review the results of the previously completed 2010 assessment and determine the applicability of these results to the Proposed Modification. The following subsections consider the potential impacts resulting from the Proposed Modification and any management measures proposed to be maintained and/or implemented. A copy of PEL's letter report is provided in full as **Appendix 12** and is referred to hereafter as PEL (2015).

4.10.2 Existing Environment

4.10.2.1 Introduction

The Proponent has implemented an air quality monitoring program in the vicinity of the Project Site for:

- deposited dust – since July 2012 via a series of five depositional dust gauges; and
- suspended particulates measured as PM_{10} – since 2013 via a high volume air sampler (HVAS).

The locations of the current monitoring stations within and surrounding the Project Site are shown on **Figure 18**.

4.10.2.2 Meteorology

PEL (2015) state that the prevailing wind directions and wind speeds assessed from the on-site weather station in PAEHolmes (2010) are consistent with the dataset used within PEL (2015).

4.10.2.3 Existing Deposited Dust Levels

Deposited dust information has been collected monthly from the five deposited dust gauges displayed on **Figure 18** since July 2010 with the results to October 2014 presented in **Table 27**. The results highlight that deposited dust levels are well below the identified criterion of 4g/m^2/month averaged over each year.

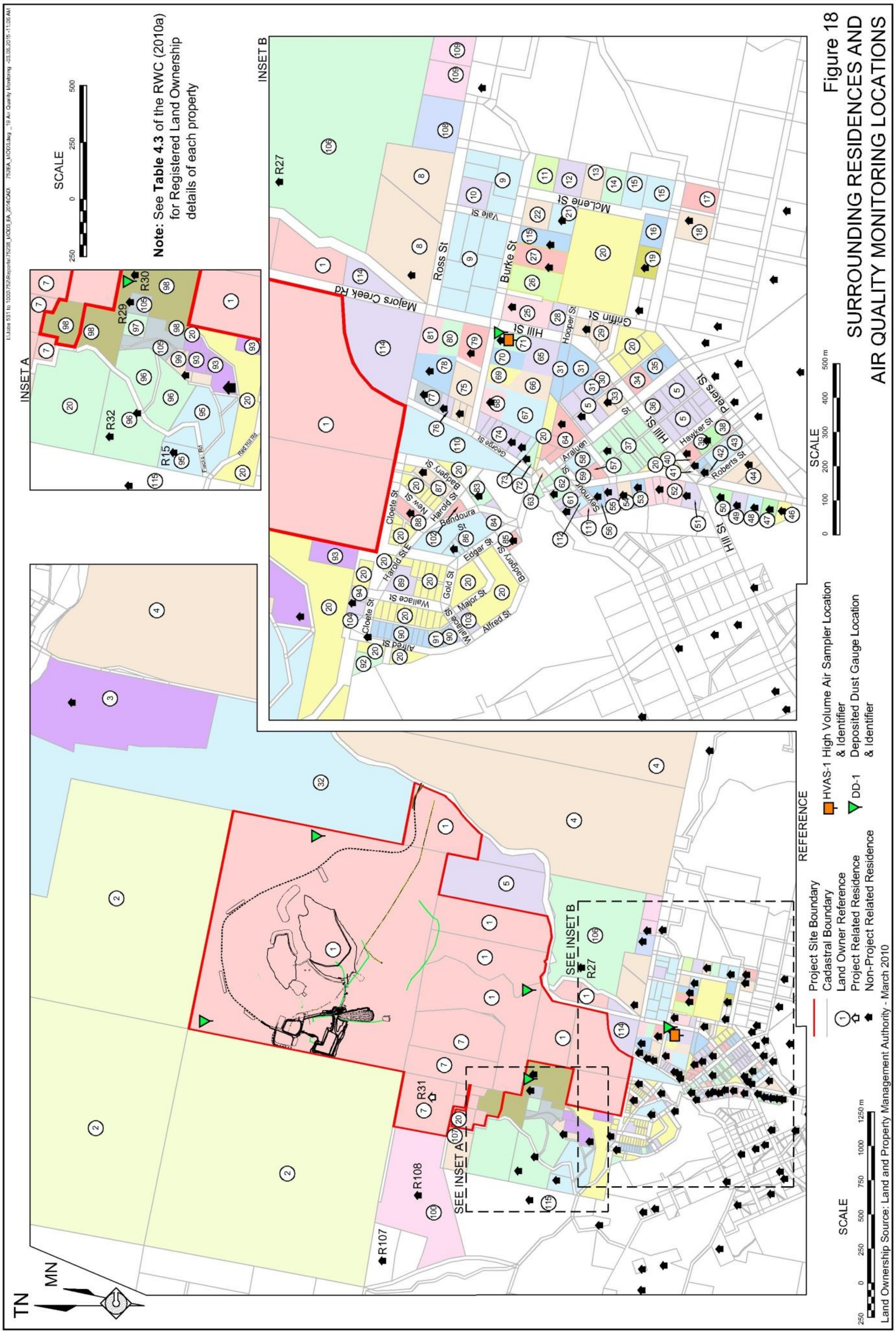


Figure 18
SURROUNDING RESIDENCES AND
AIR QUALITY MONITORING LOCATIONS
REFERENCE
Project Site Boundary
Cadastral Boundary
Land Owner Reference
Project Related Residence
Non-Project Related Residence
HVAS-1 High Volume Air Sampler Location & Identifier
DD-1 Deposited Dust Gauge Location & Identifier
Land Ownership Source: Land and Property Management Authority - March 2010
Note: See Table 4.3 of the RWC (2010a) for Registered Land Ownership details of each property
SCALE
INSET A
INSET B
SEE INSET A
SEE INSET B
TN
MN
R27
R29
R30
R31
R32
R15
R107
R108
Majors Creek Rd
Ross St
Burke St
Vale St
McLerie St
Hill St
Hooper St
Griffin St
George St
Araluen St
Hawker St
Peters St
Roberts St
Cloete St
Bagdery St
Harold St
New St
Bendoura St
Edgar St
Wallace St
Gold St
Major St
Alfred St

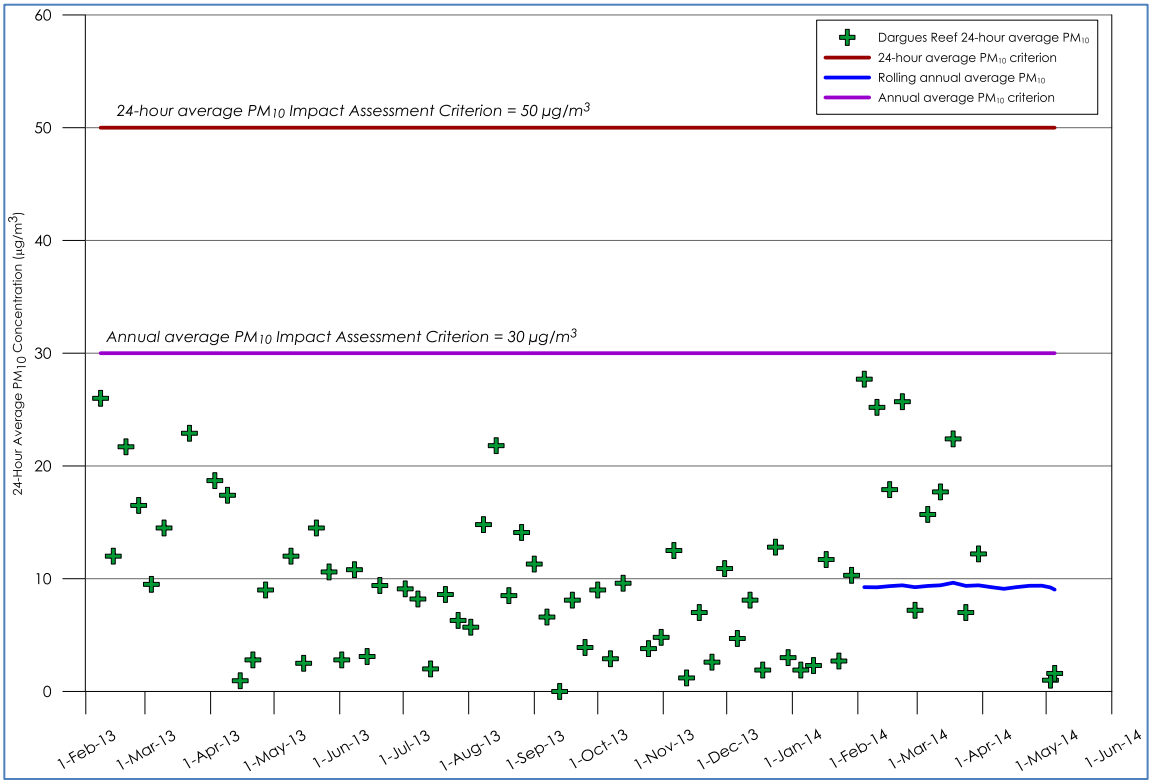
Table 27
Dust Deposition Monitoring Data (g/m^2/month)

Gauge	July – December 2012	2013	January – October 2014
DD-1	1.8	1.9[1]	1.6
DD-2	0.6	1.1	0.9[2]
DD-3	1.1	1.5[1]	0.5[1]
DD-4	1.3[1]	0.5[1]	1.0[1]
DD-5	0.7	0.9[2]	0.7[2]
Note: 1 Excludes some monthly samples that were contaminated by biological matter Note: 2 Excludes some monthly samples contaminated with high proportion of combustible material not related to mining operations			
Source: PEL (2015) – Modified after Table 2.2			

It is also important to note that the measured annual average deposited dust levels is significantly lower than the assumed 2.4g/m^2/month background levels assessed in PAEHolmes (2010).

4.10.2.4 Existing Particulate Matter Concentrations

Suspended particulate matter (PM_{10}) concentrations have been monitored at the Project Site since February 2013, with 24-hour average concentrations of PM_{10} collected every sixth day from the HVAS. **Figure 19** provides a graphical representation of the collected data.



Source: PEL (2015) – Figure 3.1

Figure 19
HVAS PM_{10} CONCENTRATIONS

The results indicate that there have been no measured concentrations above the EPA 24-hour average PM_{10} criterion of 50µg/m^3 with the maximum recorded concentration being 27.7µg/m^3 recorded on 4 February 2014.

Further, the rolling annual average of the HVAS PM_{10} is significantly lower than the assessment criterion of 30µg/m^3, with the average of all data calculated at 9.9µg/m^3. It should be noted that the background levels assessed in PAEHolmes (2010) conservatively assumed an annual average PM_{10} concentration of 21µg/m^3.

4.10.3 Management and Mitigation Measures

All management and mitigation measures identified in RWC (2010a) and the approved *Air Quality and Greenhouse Gas Management Plan for the Dargues Reef Gold Mine – Revision 2* (approved by the then by Department of Planning and Infrastructure on 30 January 2013) would continue to be implemented.

The *Air Quality and Greenhouse Gas Management Plan* would be updated to reflect the minor legislative changes and background information as a result of this Proposed Modification.

4.10.4 Assessment of Impacts

4.10.4.1 Particulate Emissions

The only component of the Proposed Modification that has the potential to increase dust emissions from the Project is the addition of the Eastern Waste Rock Emplacement, resulting in an increased disturbance footprint of approximately 6 ha.

PEL (2015) identified that as a result of the inclusion of the Eastern Waste Rock Emplacement, the total emissions compared with the approved activities would increase by 6.7%. PEL (2015) concludes as a result that this would be an insignificant increase in deposited dust and particulate emissions.

Further to the above, the transportation of waste rock to the Tailings Storage Facility and Eastern Waste Rock Emplacement would reduce the return distance travelled from 6.7km, ultimately reducing air quality emissions from the transportation of waste rock from both a dust lift-off and transport-related diesel emissions (i.e. greenhouse gas emissions).

In conclusion, noting that the assumed existing background dust deposition levels and annual average PM_{10} concentrations utilised in PAEHolmes (2010) were significantly higher than the actual Project Site based monitoring results and the minor changes in total emissions, it is concluded that the Proposed Modification has limited potential to result in increased air quality-related impacts.

4.10.4.2 Non-particulate Emissions

The Proponent notes that RWC (2010a) includes a description of the approved gold room operations. Those operations would remain largely unchanged, with the exception of the addition of an electro winning circuit. The Proponent has previously committed to installing a scrubber on the exhaust ventilation system within the gold room and would ensure that all

emissions would comply with the requirements for Group 6 non-ferrous metal facilities identified in Schedule 3 of Protection of the Environment Operations Clean Air, Regulation 2010. As a result, PEL (2015) have determined that the cumulative impacts associated with the Proposed Modification would be negligible.

4.10.5 Monitoring

As the predicted air quality impacts associated with the Project are broadly in line with those associated with the approved Project, no changes to the existing monitoring program outlined in the *Air Quality and Greenhouse Gas Management Plan* are proposed. However, this document would be updated to reflect the minor changes associated with the Proposed Modification, including commitment to monitor emissions from the Gold Room ventilation system.

4.11 VISUAL AMENITY

4.11.1 Introduction

An assessment of visual amenity was undertaken as part of RWC (2010a). This subsection presents an update of that previous assessment.

4.11.2 Existing Environment

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.

4.11.3 Impact Assessment

Figure 20 presents an updated series of representative sections from the previously assessed vantage points, with the focus of **Figure 20** being on the Eastern Waste Rock Emplacement.

Given the location of the proposed Eastern Waste Rock Emplacement and Tailings Storage Facility located in valleys, the distance from the proposed additional disturbance areas and visual setting of the Project Site, the additional impacts would be negligible, if indeed they can be viewed at all.

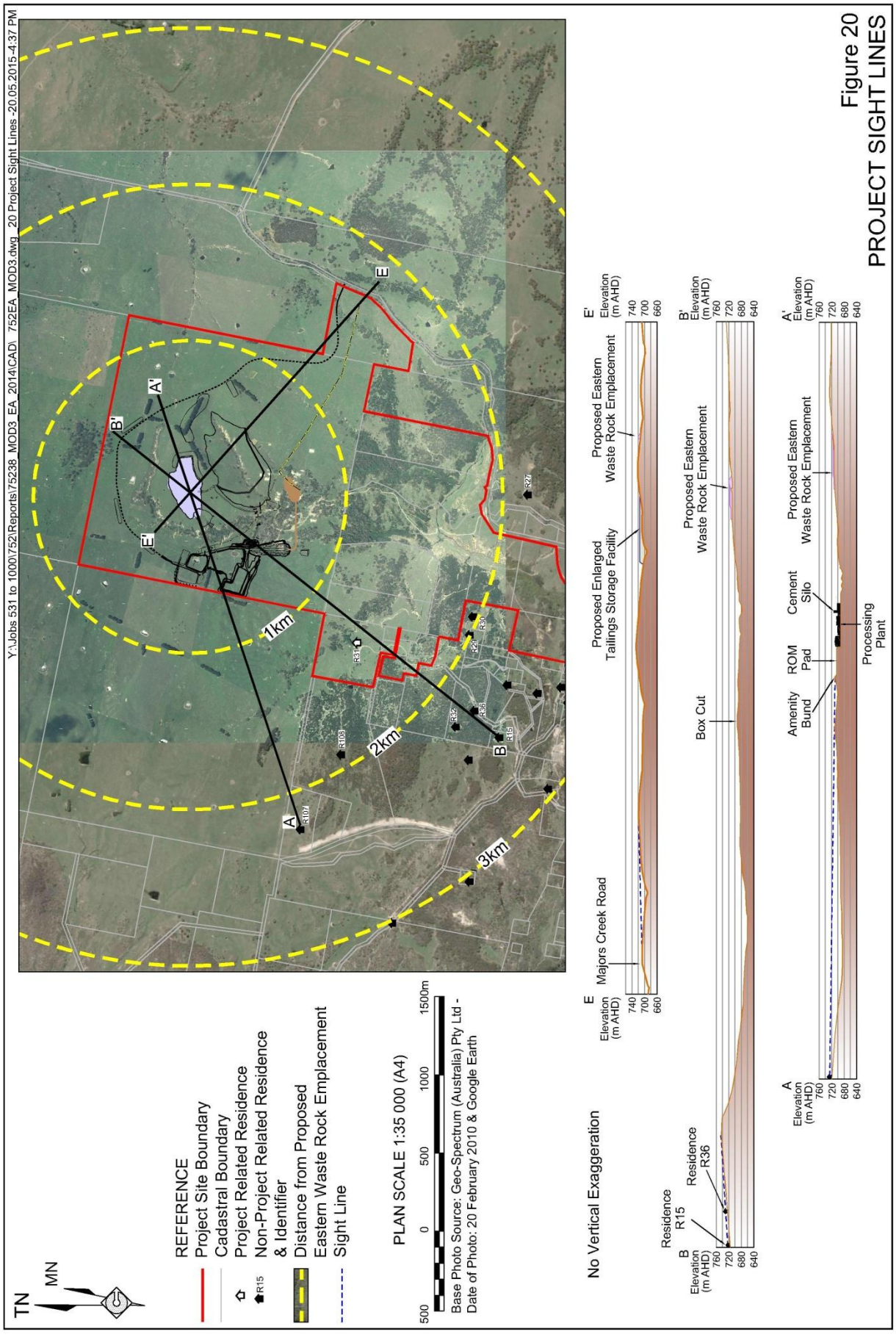


Figure 20
PROJECT SIGHT LINES

The re-routing of vehicles transporting waste rock to the Eastern Waste Rock Emplacement and the Tailings Storage Facility via the dedicated access road would limit the frequency of vehicle movements on the Site Access Road, providing an improvement in the overall visual amenity.

4.12 SOIL AND LAND CAPABILITY

4.12.1 Introduction

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. The following subsections present an assessment of soil-related impacts as a result of the Proposed Modification.

4.12.2 Existing Environment

The Eastern Waste Rock Emplacement would disturb approximately 5.1ha and 0.7ha of the Braidwood Soil Landscape and the Brushy Hill Soil Landscape respectively. **Table 28** provides a description of each of the soils within each of these soil landscape units.

Table 28
Typical Soil Profiles

Layer	Depth range	Description
Braidwood Soil Landscape		
1	0 – 150mm	Topsoil. Dark brown, weakly pedal loam. No coarse fragments.
2	150 – 350mm	Topsoil. Greyish-brown, weakly pedal sandy loam to sandy clay loam. No coarse fragments.
3	350 – 800mm	Subsoil. Yellowish-brown, moderately to strongly pedal sandy clay. No coarse fragments.
4	800 – 1 400mm+	Subsoil. Mottled yellow/grey/brown moderately to strongly pedal clayey sand. Evidence of weathering rock with increasing depth. 5 to 10% coarse fragments, increasing with depth.
Brushy Hill Soil Landscape		
1	0 – 110mm	Topsoil. Dark brown, weakly pedal loam. No coarse fragments.
2	110 – 300mm	Topsoil. Mid-brown, weakly pedal sandy loam. No coarse fragments.
3	300 – 650mm	Subsoil. Yellowish-brown, mottled, moderately pedal sandy clay. <5% coarse fragments.
4	650 – 1 100mm+	Subsoil. Greyish-yellow-brown, gritty clayey sand. Massive to weakly pedal. >5% coarse fragments as weathering granite. Layer continues to at least 1,500mm in some areas.

Source: RWC (2010a) – Table 4.48

Any topsoil located within the minor areas of disturbance (i.e. the proposed Tailings Storage Facility Access Road) 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 in accordance with the management measures outlined in Section 4.12.3. As a result of this, soils related to the proposed Tailings Storage Facility Access Road are not discussed further.

4.12.3 Management and Mitigation Measures

All management and mitigation measures identified in RWC (2010a) would continue to be implemented. No additional measures are required to manage the disturbance associated with the Proposed Modification.

4.12.4 Assessment of Impacts

The Proposed Modification would result in disturbance of an additional approximately 6ha for the Eastern Waste Rock Emplacement. Based on the soil stripping depths identified in Table 2.2 of RWC (2010a), approximately 20 000m^3 of soil would be stripped during construction of the emplacement, with the indicative location of the soil stockpile shown on **Figure 4**.

The Proposed Modification, whilst resulting in a slightly larger disturbance area, 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 include the following.

- Employment of an additional 20 persons during both the construction and operational phase of the Project.
- Expenditure of an additional approximately $3 million per year in the local and regional economy.
- Very significantly reduced heavy vehicle traffic volumes on the public road network, including through Braidwood, with no associated reduction the Proponent's road maintenance contribution under its Voluntary Planning Agreement with Palerang Council.
- Improved operational efficiencies and therefor Project robustness, minimising the potential for disruptions during downturns in the commodity cycle and maximising benefits for the community and surrounding businesses.
- An extended life of the Project, meaning that the identified benefits would be available for a longer period.

As a result, the Proponent contends that the Proposed Modification would result in an overall net benefit change to the socio-economic benefit when compared with the approved Project.

The Proponent does, however, acknowledge the community's concern in relation to aspects of the Proposed Modification, in particular, the transportation, use and management of cyanide and the Proponent's previous commitment not to use cyanide within the Project Site. The Proponent has made every effort to inform and educate the community about the use and associated risks of cyanide and is confident that through the implementation of proven, well understood management measures, that the risks associated with the use of cyanide would be maintained at a level that is acceptable.

Finally, the Proponent also acknowledges that the Project commissioning phase has taken longer than originally anticipated and that this, together with the previously approved and currently proposed changes to the Project, has caused a degree of frustration and concern for the community. The Proponent however, notes that economic factors beyond its control have influenced the decision to place the Project into care and maintenance. During this period, the Proponent has continued to manage the site to the highest standard and ensured the community is well aware of the Project's status. In addition, the Proponent contends that it is important to ensure that the Project is as robust as practicable to limit the potential for future periods of care and maintenance.

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 notes that it has undertaken a robust public consultation process and has, to the best of its ability, attempted to communicate the details of the project and Proposed Modification, including through preparation of this document in plain English. The Proponent notes that despite these efforts, a range of community concerns remain. While some represent justifiable concerns about the Project and Proposed Modification, some are the result of incorrect information that has been circulated within the community. 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 K&C Brown, consulting engineers, and would be constructed and operated in accordance with the detailed management measures identified in SEEC (2015c). As a result, the Proponent contends that construction of the proposed crossing would not adversely impact on the aquatic ecology of Spring or Majors Creeks.

In addition, the Proponent would ensure that cyanide is managed in a manner that is consistent with industry best practice, statutory requirements and the principles and standards of practice of the Cyanide Code. As a result, the potential for adverse impacts associated with the transportation, use and disposal of cyanide would be reduced to the maximum extent practicable.

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 broad spectrum of the community, a range of 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 – revised noise modelling by Spectrum (2015) identifies that noise levels as a result of the Proposed Modification would remain below the relevant noise criterion at all times. However, minor increases in noise levels of between 1dB(A)

or 2dB(A) at four residences are anticipated during day-time construction operations and an increase of 1dB(A) is anticipated during operations, under temperature inversion conditions.

- Ecology – the Proposed Modification would not have a significant impact on any NSW *Threatened Species Conservation Act 1995* or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* listed species, population or community.
- Groundwater – Revised groundwater modelling indicated a minor increase in the maximum rate of groundwater inflow to the Mine from 9L/s to 10L/s to 10L/s to 12L/s as well as a minor increase in the maximum loss of base flow to Majors Creek from 2.1L/s to 2.5L/s. The zone of drawdown and rate of groundwater recovery are expected to be largely unchanged. In addition, the proposed storage, handling, use and disposal measures for cyanide and the proposed upgraded Tailings Storage Facility liner would ensure that the risk of groundwater contamination would be minimised to the greatest extent practicable.
- Surface water – The Proposed Modification would not result in adverse impacts on the surface water environment within and surrounding the Project Site for the following reasons.
  - Sediment and erosion control measures would be implemented in a manner that is consistent with Sediment and Erosion Control Plans prepared by specialist sediment and erosion control specialists, namely SEEC (2015c and 2015d).
  - The proposed storage, handling, use and disposal measures for cyanide would ensure that the risk of surface water contamination would be minimised to the greatest extent practicable.
- Aboriginal heritage – The Proposed Modification would result in the collection and reburial of artefacts from two Aboriginal heritage sites (Sites GT OS1 and GT OS2). Given the mitigation measures proposed to manage the collection and reburial the registration of these artefacts, and the ongoing management of identified and potential heritage items located at the Project Site, it is considered that impacts to Aboriginal cultural heritage would be acceptable.
- Traffic and transportation – the Proposed Modification would result in a substantial reduction in the number heavy vehicles that would travel through Braidwood and the communities along the transportation route.

Finally, the residual impacts associated with 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

Importantly, the modified Project would provide several economic benefits to the local and regional socio-economic setting, including the following.

- Direct full-time employment for approximately 120 full-time equivalent positions, (an increase of 20 positions compared with the approved Project), during the site establishment and approximately 100 full-time equivalent positions (an increase of 20 positions compared with the approved Project) during the operational phase of the Project. These positions will be residential positions, with no allowance made for fly in-fly out drive in-drive out rosters.
- The Proposed Modification would result in personnel that would otherwise be employed at an off-site processing facility being employed within the Project Site, resulting in additional employment and economic benefits for the local community.
- 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.

Increased employment opportunities associated with the Project would have additional flow-on benefits including:

- the provision of new employment would provide an impetus to other local businesses;
- 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 Modified Project would 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 Modified Project would 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.

Importantly, the Proposed Modification would ensure that the Project is both economically robust and capable of being financially supported by domestic and international banks and investors. The ability to progress the successful financing, development and operation of the Project would ensure that the above socio-economic benefits would continue to flow to the surrounding community.

To illustrate the above, the Proponent undertook detailed financial modelling of the Project based on two scenarios, namely off-site processing of gold concentrate at the Proponent's mothballed Kangaroo Flat Gold Mine (as approved option) and on-site processing as described in this document (modified Project option). While the detail of that modelling remains confidential and market sensitive, the results may be summarised as follows.

- Ore tonnages, grades, recoveries, revenue and assumed gold price were the same for both scenarios.
- The modified project resulted in a net Project cash flow approximately $20 million greater than the approved Project.
- The modified Project resulted in a Net Present Value approximately $14 million greater than the approved Project.
- The modified Project resulted in an all in sustaining cost, namely the cost to complete the mining lifecycle from exploration to closure, approximately $76 per ounce less than the approved Project.

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.

An objective assessment of this impact on local amenity is difficult as what one person may consider as acceptable, may not be to another person (and vice versa). However, based on experience obtained from the assessment of similar mining developments, it is noted that the perceived impact of a project on local amenity is generally far greater than the actual impact. With respect to the Project, where all biophysical impacts are assessed as complying with nominated criteria or standards, it is considered unlikely for impacts on local amenity to be unacceptable to a reasonable person.

5.2.4 Consequences of not Proceeding with the Proposed Modification

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

- Forego the opportunity to finance and develop the Project, resulting in failure to fully extract the identified resource. Such an outcome would be contrary to the objective of Trade and Investment NSW and the Proponent to maximise resource recovery.
- Forego the opportunity to significantly reduce heavy vehicle movements to and from the Project Site, including the associated traffic and transportation impacts and unnecessary greenhouse gas emissions.
- Inability to adequately store the required volume of waste rock at the surface, introducing inefficiencies in the approved mining operation.
- Forego the opportunity to increase the efficiencies of the approved Project, resulting in a less robust Project.

Finally, the Proponent notes that in the current economic climate and in the absence of a suitable off-site processing facility, the approved Project is unlikely to be able to obtain funding in the absence of the Proposed Modification.

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.

ANZECC – Australian and New Zealand Environment and Conservation Council.

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.

^{o}C – 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.

paste 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.

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