Appendix 2

Surface Water Assessment

(Total No. of pages including blank pages = 68)

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Dargues Gold Mine

Surface Water Assessment

Prepared by

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May 2015

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Surface Water Assessment

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CONTENTS

Page

1. INTRODUCTION....2-9

2. PROPOSED MODIFICATION....2-9

3. CHANGES TO LOCAL SURFACE WATER CATCHMENTS....2-11

3.1 EASTERN WASTE ROCK EMPLACEMENT....2-11

3.2 ADDITIONAL PROPERTY AVAILABLE....2-12

3.3 AMENDED TAILINGS STORAGE FACILITY....2-12

4. SURFACE WATER HARVESTING....2-12

4.1 AMENDED HARVESTABLE RIGHTS PROGRAM....2-12

4.1.1 Increase in the Harvestable Right Capacity....2-12

4.1.2 Removal of Two Harvestable Right Dams....2-13

4.2 REVISED MODELLING – MAJORS CREEK RETURN FLOW....2-13

4.2.1 Rainfall Data....2-13

4.2.2 Model Setup and Calibration....2-14

4.2.3 Results of Modelling....2-15

5. STORMWATER MANAGEMENT....2-15

5.1 STORMWATER FLOW....2-15

5.2 EROSION AND SEDIMENT CONTROL....2-16

5.2.1 Introduction....2-16

5.2.2 Eastern Waste Rock Emplacement....2-16

5.2.3 Emplacement Access Road....2-16

5.2.4 Amended Tailings Storage Facility....2-17

6. CONCLUSION....2-17

7. REFERENCES....2-18

ANNEXURES

Annexure 1 Erosion and Sediment Control Plan Eastern Waste Rock Emplacement....2-19

Annexure 2 Erosion and Sediment Control Plan Spring Creek Crossing....2-37

Annexure 3 Erosion and Sediment Control Plan Tailings Storage Facility....2-57

FIGURES

Figure 1 – Proposed Project Site Layout....2-10

TABLES

Table 1 - Revised Harvestable Rights Dam Capacities....2-13

Table 2 – Results of Water Balance Modelling....2-15

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1. INTRODUCTION

Strategic Environmental & Engineering Consulting (SEEC) Pty Ltd has been commissioned by R.W. Corkery and Co Pty Limited (RWC) on behalf of the Proponent, Unity Mining Ltd, to prepare this Surface Water Assessment. It accompanies a modification to MP10_0054 under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Dargues Reef Gold Mine, near Majors Creek, NSW.

2. PROPOSED MODIFICATION

The Dargues Gold Mine (the Project) is owned and operated by Unity Mining Limited. Project Approval MP10_0054 was granted by the Land and Environment Court on 7 February 2012, with subsequent modifications granted on:

- 12 July 2012 (MOD1) to permit the use of paste fill; and
- 24 October 2013 (MOD2) to regularise the layout following minor changes during the detailed design phase of the Project.

Construction of the Project commenced on 11 February 2013 and the Project was placed into care and maintenance in late 2013 pending finalisation of project finance and optimisation of the mining operation.

As a result of the studies undertaken to optimise the mining operation, a modification to MP10_0054 is to be sought to permit the following as displayed on **Figure 1**.

- An amendment to the Project Site to accommodate the recently purchased “Slings” property.
- A minor increase to the total resource to be extracted and associated extension of the life of the mine.
- Construction and use of the Eastern Waste Rock Emplacement.
- Construction and use of a vehicle crossing over Spring Creek to permit direct access between the box cut and the Tailings Storage Facility and proposed Western Waste Rock Emplacement.
- Final processing of gold concentrate on site to produce gold doré or unrefined gold bars using a conventional carbon-in-leach (CIL) processing plant.
- Construction of an enlarged Tailings Storage Facility (from 12ha to 16ha) to permit storage of additional tailings that would be produced as a result of the additional ore to be processed and the on-site final processing of gold concentrate.
- A range of minor adjustments to the conditions of MP10_0054 to further clarify the intent of the conditions.

As it relates to surface water, the study area for the surface water assessment focuses on the construction of:

- the Eastern Waste Rock Emplacement Area;

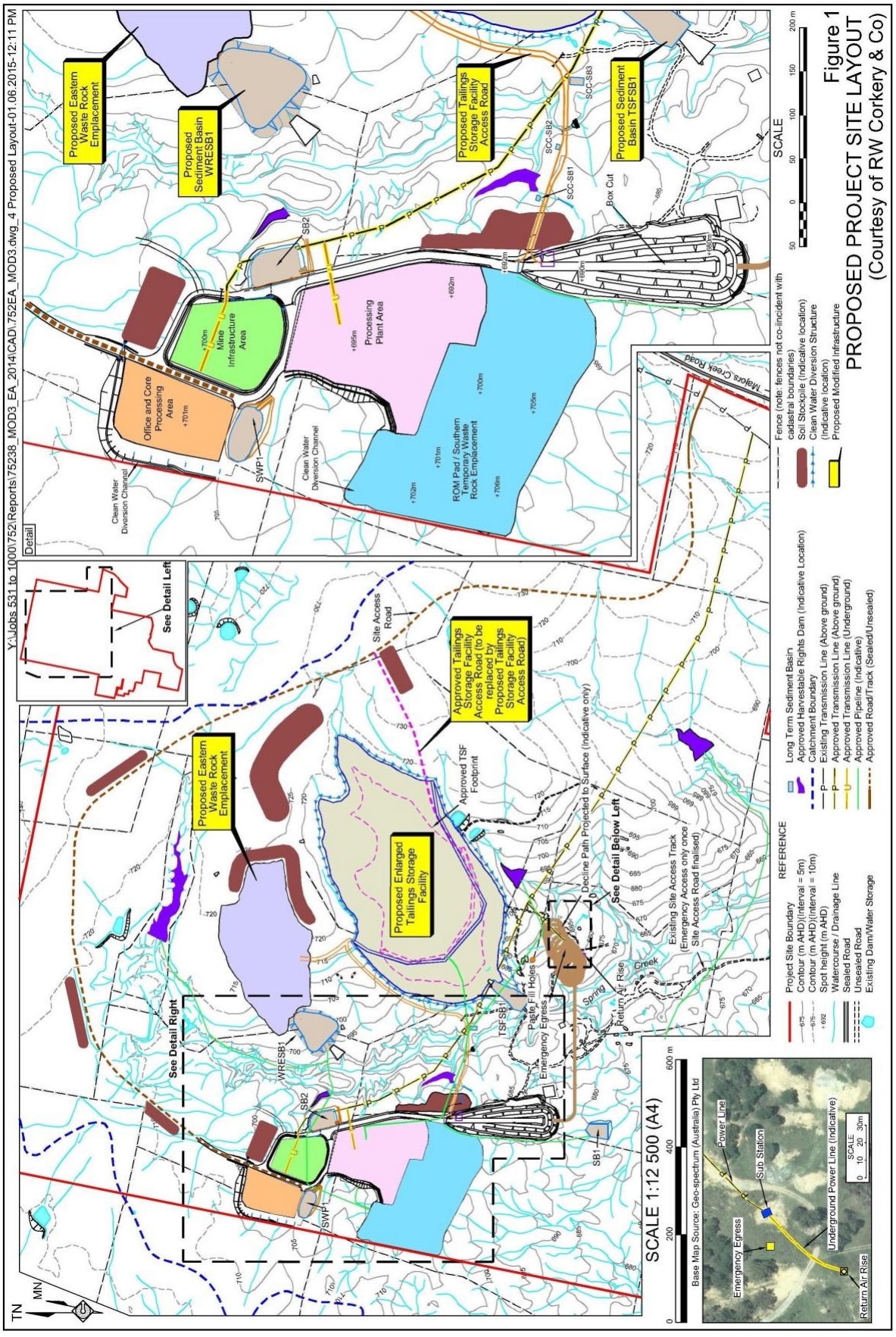

Figure 1 – Proposed Project Site Layout

- a haul road directly from the box cut, across Spring Creek to the Tailings Storage Facility and the new Eastern Waste Rock Emplacement.
- The amended Tailings Storage Facility

The study area of this assessment is limited to these structures. Site-specific Erosion and Sediment Control Plans for the proposed Eastern Waste Rock Emplacement, Spring Creek Crossing and the Tailings Storage Facility have also been compiled by SEEC and are presented as annexures to this report, referred to as SEEC (2015a), SEEC (2015b) and SEEC (2015c) respectively. It is envisaged that SEEC (2015a), SEEC (2015b) and SEEC (2015c) would be revised and updated if required prior to any construction/operational activities occurring in those areas.

3. CHANGES TO LOCAL SURFACE WATER CATCHMENTS

3.1 EASTERN WASTE ROCK EMPLACEMENT

The Eastern Waste Rock Emplacement would be constructed as a valley-fill emplacement to the east of Spring Creek. The valley contains a first order stream which drains in a general west and southwest direction prior to joining Spring Creek (**Figure 1**). The eastern extremity of the catchment is approximately bound by the mine access road. Soil removed from the footprint of the Eastern Waste Rock Emplacement would be placed on the upper eastern side of the Eastern Waste Rock Emplacement itself. Clean water diversion drains would be installed upslope of the soil stockpiles to divert flows from the upstream catchment (approximately 1ha) around the Eastern Waste Rock Emplacement Area.

In the approved Project Site layout, the valley was to contain a small harvestable right dam (HRD-E). It was to be approximately 3ML in volume, have a surface area of approximately 2,800m^2 and a catchment of 10.3ha. The dam was to supply a portion of the compensatory base flow to Spring Creek (as identified in Table 2.10 of the 2010 *Environmental Assessment (RWC, 2010a)*) but, given its small size (2.2% of the total harvestable right), the limited portion is deemed to be minimal. As a result of the construction and operation of the proposed Eastern Waste Rock Emplacement, HRD-E would not be constructed. It will be replaced with a proportional increase in the remaining HR dams.

Runoff from the Eastern Waste Rock Emplacement would continue to drain to Spring Creek via the southwest extremity of the existing first-order stream. Therefore, the catchment's area would remain essentially unchanged. However, during construction and operation of the WRE, the volumetric runoff coefficient would, in places, temporarily increase to approximately 79% (based upon calculations outlined within Landcom, 2004) from 15% (the estimated coefficient for the existing vegetated catchment). Following the rehabilitation of the Eastern Waste Rock Emplacement, the volumetric runoff coefficient for the catchment would return to approximately 15%.

The peak flow coefficient of runoff (C_{10}) would increase from 0.5 (Pilgrim, ed., 1987) for natural lands to 0.9 on disturbed and compacted surfaces (Landcom, 2004). However, following the rehabilitation of the Eastern Waste Rock Emplacement, the peak flow runoff coefficient for the catchment would return to approximately 0.5.

The proposed management of stormwater flows during the construction and operational stages in which the volumetric and peak flow runoff coefficients are increased are discussed in Section 5.

3.2 ADDITIONAL PROPERTY AVAILABLE

The Proponent has recently purchased a new property to the southwest of the Mine Site known as "The Slings", (see Figure 2 of *Environmental Assessment*). The land within this property that is included within the Project Site includes Lots 1 and 2 in DP 136801,

The additional land now included within the Project Site contains a third-order stream that drains southeast to join Majors Creek, approximately 400m upstream of the junction between Spring Creek and Majors Creek. The majority of the land is cleared for agricultural purposes but remnant native vegetation exists along much of the stream's banks. There are no proposed changes to these lands.

3.3 AMENDED TAILINGS STORAGE FACILITY

The amended footprint of the Tailings Storage Facility is approximately 16ha, 4ha larger than that described in the original 2010 *Environmental Assessment.* This area would ultimately be quarantined from the local catchments, but the change to overall surface runoff volume from that described in the 2010 *Environmental Assessment* would be minimal.

As a result of the Tailings Storage Facility's larger footprint, Harvestable Right Dam HRD-F would not be constructed. It was to be 3.1ML and will be replaced with a proportional increase in the remaining HR dams.

4. SURFACE WATER HARVESTING

4.1 AMENDED HARVESTABLE RIGHTS PROGRAM

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

4.1.1 Increase in the Harvestable Right Capacity

The Proponent has purchased the "Slings" property and incorporated that land within the Project Site. The additional land associated with the "Slings" property has increased the Proponent's landholdings from approximately 396ha to 452ha. However, as described in the 2010 *Environmental Assessment,* the area of the Tailings Storage Facility (16ha) is removed from that calculation leaving 436 ha. 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).

4.1.2 Removal of Two Harvestable Right 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 1 presents the proposed volumes of the remaining, approved, harvestable rights dams. **Figure 1** presents their locations.

Table 1 - 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	0 (deleted)
HRD-F	0 (deleted)
HRD-G	2.8
HRD-H	11
Total	13.8
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 (2010). Section 4.2 of this document provides water balance for that program in light of the revised harvestable rights dams.

4.2 REVISED MODELLING – MAJORS CREEK RETURN FLOW

4.2.1 Rainfall Data

The closest Bureau of Meteorology's rainfall station is at Majors Creek (7061) (<3 km). Daily rainfall data is sourced from September 1970 to June 2012. The completeness of data for that period is reasonably good (particularly since 1988) but it was necessary to make adjustments to it as follows:

- June 1971 was compiled with data from the Bureau's rainfall station at Braidwood (Station number 69010). This station is jointly (with station 70191, Tallanganda) the next nearest station to the site and has very good data.

- Data was missing from May 1986 to May 1988 inclusive. This period was simply removed from the model as it is too long to consider replacing it with data from elsewhere.
- October and December 1975 were compiled with data from the Bureau's rainfall station at Braidwood (Station number 69010).
- December 1976 was compiled with data from the Bureau's rainfall station at Braidwood (Station number 69010).
- February 1980 was compiled with data from the Bureau's rainfall station at Braidwood (Station number 69010).
- October to December 1980 was compiled with data from the Bureau's rainfall station at Braidwood (Station number 69010).
- If data was missing for minor time periods (1-10 days), it was replaced with a zero.

The approximate percentage of replaced data was 2% (8 months in 40 years plus occasional days) and so the data set is considered highly representative of the site. During this period the average rainfall was 933.8mm/year.

4.2.2 Model Setup and Calibration

The same water balance method used within RWC (2010a) has been used to determine the capacity for the revised harvestable right dams to provide the compensatory base flow to Spring Creek. The water balance uses a daily model developed by SEEC called RATES. RATES uses daily rainfall data from the Bureau of Meteorology and allows for modifications to runoff/infiltration characteristics and daily water demand. The only demand placed on the dams is to constantly return 2.5L/s to Majors Creek over the life of the mine.

Other key modelling calibrations include:

- Initial rainfall loss of 5mm per day to account for surface wetting and initial soaking.
- Ongoing rainfall loss of 85% to account for infiltration and groundwater recharge. This is conservatively calibrated based on the characteristics of the soils as detailed in the Soils Assessment, also by SEEC.
- Average daily pan evaporation data from the Bureau's Braidwood Wallace Street station. Evaporation is drawn as a daily loss from the proposed harvestable right dams assuming eight dams with a total volume of 37ML, average depth of 3m, and total dam surface area of 1.23ha. No shading or covering of dams is assumed.
- An assumption that water from the harvestable right dams is only used to supply a constant demand of 2.5L/s water to Majors Creek
- An assumption that water is drawn from the harvestable right dams before any water is drawn from an alternative source (e.g. the historic workings).

4.2.3 Results of Modelling

Key results from RATES modelling are contained in **Table 2**. These results show over the 40-year modelling period the harvestable right dams would have been able to supply a constant demand for 2.5L/s to Majors Creek 93% of the time. The shortfall would need to be supplied from an alternative source such groundwater sourced from the historic workings. The results show in the worst year the dams would have been dry for 74 days. During such dry periods supply would revert to an alternative source (i.e. the historic workings).

Table 2 – 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 7% 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.)

The actual probability that water would need to be drawn from the historic workings to supply the return of water to Majors Creek is low as the:

- modelling is inherently conservative, assuming a constant rate of flow to Majors Creek of 2.5L/s. The actual rate of flow returned to Majors Creek would be commensurate with the anticipated loss from the system and this peaks at 2.5L/s;
- the mine's life is short (approximately five years) and so the risk that an extremely dry year coincides with the maximum demand from the harvestable right dams is very low.

5. STORMWATER MANAGEMENT

5.1 STORMWATER FLOW

Section 3.1 identified that peak and volumetric runoff coefficients would rise in the catchment of the Eastern Waste Rock Emplacement. This would result in an increase in the overall volume of stormwater entering Spring Creek and could, without management, result in an increase in the rate at which stormwater is conveyed to Spring Creek. However, peak flow calculations show neither would be problematic as the sediment basin is sufficiently large to contain all flood waters up to the 3 hour 100-year ARI storm and, beyond that, any overflow would be at a rate less than pre-existing conditions. This assumes the sediment basin is managed correctly (i.e. trapped water is treated and released within 10 days of a rainfall event which caused inflow) and the basin is empty before the storm event. Should a storm event occur when the basin is partly full (say 50%) calculations show no overflow would occur up to the 30 minute 100 year ARI storm event and, beyond that, any overflow would be at a rate less than pre-existing conditions.

5.2 EROSION AND SEDIMENT CONTROL

5.2.1 Introduction

The following information summarises the erosion and sediment control components to be undertaken during the construction and operation of the Eastern Waste Rock Emplacement, Spring Creek Crossing and the amended Tailings Storage Facility. Erosion and Sediment Control Plans for each are presented in **Annexures 1 to 3** respectively.

5.2.2 Eastern Waste Rock Emplacement

The Eastern Waste Rock Emplacement and its associated soil stockpiles would ultimately have a footprint of approximately 6ha (see **Figure 1**). However, the emplacement would be built in three stages (three lifts) and to limit the potential of disturbance for each stage the footprint of the emplacement would be pegged out and marked to ensure ground-disturbing activities are limited in extent and confined to approved areas. The Proponent would install the following prior to commencement of any ground disturbing works.

- Clean water diversions (including their stabilised outlets) upslope of the proposed stockpile area.
- Dirty water diversions down slope of the proposed emplacement stage.
- A sediment basin to collect and temporarily store sediment-laden water for settling and treatment (as required) prior to discharge to Spring Creek. The sediment basin would be sized to accommodate the ten-day, 95th percentile rainfall depth (110.4mm[2]). It would have a stabilised spillway designed for the 100-year ARI time of concentration storm flow. As the basin would be operational for all three stages of the Eastern Waste Rock Emplacement it would be designed for the ultimate catchment, although at no time would all that area be disturbed at once.

Other best-management practices for erosion and sediment control would also be implemented. These, and relevant calculations, are detailed in the Erosion and Sediment Control Plans presented in SEEC (2015a) (**Annexure 1**).

5.2.3 Emplacement Access Road

During the construction of the proposed haul road that would connect the Tailings Storage Facility to the Eastern Waste Rock Emplacement (a length of approximately 150m), all disturbed lands would drain to two sediment basins sized for the 5 day 85th percentile rainfall depth (42.4mm[3]). Following construction of the road, water would still drain to the sediment basins but the sediment basins would now operate as water quality ponds (i.e. they would not need active treatment (flocculation) and would not have to be emptied after rainfall events.

Other best-management practices for erosion and sediment control would also be implemented. These, and relevant calculations, are detailed in the Erosion and Sediment Control Plans presented in SEEC (2015b) (**Annexure 2**).

[2] Calculated from daily rainfall data from the BOM's Weather Station at Majors Creek (Station 70061), 01/09/1970 to 30/06/2012 adjusted for completeness.
[3] Calculated from daily rainfall data from the BOM's Weather Station at Majors Creek (Station 70061), 01/09/1970 to 30/06/2012 adjusted for completeness. Note this is conservatively larger than that adopted in the 2010 Environmental Assessment.

5.2.4 Amended Tailings Storage Facility

The Tailings Storage Facility would ultimately have a footprint of 16ha (see **Figure 1**). However, the facility would be built in stages (lifts) and to limit the potential of disturbance, the footprint for each stage would be pegged out and marked to ensure ground-disturbing activities are limited in extent and confined to approved areas. The Proponent would install the following prior to commencement of any ground disturbing works.

- Clean water diversions (including their stabilised outlets).
- Dirty water diversions down slope of the proposed stage.
- A series of sediment basins to collect and temporarily store sediment-laden water for settling and treatment (as required) prior to discharge to Spring Creek. The sediment basins would be sized to accommodate the five-day, 85th percentile rainfall depth (42.4mm). The basin adjoining Spring Creek would have a stabilised spillway designed for the 100-year ARI time of concentration storm flow.

Other best-management practices for erosion and sediment control would also be implemented. These, and relevant calculations, are detailed in the Erosion and Sediment Control Plans presented in SEEC (2015c) (**Annexure 3**).

6. CONCLUSION

In conclusion, the proposed Eastern Waste Rock Emplacement and the amended Tailings Storage facility could be built without adversely impacting the existing environment and without significantly altering the impacts outlined within RWC 2010a. In addition, their construction would not adversely affect the ability of the harvestable right dams to supply compensatory flow to Spring Creek.

7. REFERENCES

DECC (2008). Managing Urban Stormwater. Soils and Construction. Volume 2e; Mines and Quarries. NSW Department of Environment and Climate Change.

Landcom (2004). Managing Urban Stormwater. Soils and Construction Volume 1. Landcom, Sydney.

Pilgrim, DH, (ed). Australian Rainfall & Runoff – A Guide to Flood Estimation, Institution of Engineers, Australia, Barton, ACT, 1987.

RWC (2010a). The *Environmental Assessment* dated September 2010. R. W. Corkery and Company.

RWC (2010b). Response to Submissions Dated 2010. R. W. Corkery and Company.

SEEC (2015a). Erosion and Sediment Control Plan. Dargues Gold Project. Eastern Waste Rock Emplacement. 13000046-P03-ESCP01 to ESCP08 REV01.

SEEC (2015b). Erosion and Sediment Control Plan. Dargues Gold Project. Spring Creek Crossing. 13000046-P02-ESCP01 to ESCP09 REV02.

SEEC (2015c). Erosion and Sediment Control Plan. Dargues Gold Project. Tailings Storage Facility. 13000046-P04-ESCP01 to ESCP05 REV00.

Annexure 1

Erosion and Sediment Control Plan Eastern Waste Rock Emplacement

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GENERAL EROSION AND SEDIMENT CONTROL REQUIREMENTS

EROSION AND SEDIMENT CONTROL STAGING REQUIREMENTS
All erosion and sediment controls for each stage/section of works must be installed and functioning prior to undertaking any stripping or earthworks for that particular stage. The site supervisor or environmental manager is to ensure this. Stripping and earthworks necessary to implement the required erosion and sediment controls is permitted but is to be kept to an absolute minimum.

Erosion and sediment control locations, details and sizes to be confirmed onsite during construction with detailed survey. Controls may need to be varied to suit site conditions.

Haul Road Works
Before commencement of stripping and earthworks, the site is to be secured and the following erosion and sediment control measures installed in order except for Items 10 to 16 which are to be undertaken progressively as required throughout all stages of works (Refer to the Monitoring and Maintenance notes):

1. Barrier fencing should be installed around the edge of the construction boundary to restrict access and in any additional locations as necessary to minimise unnecessary disturbance. Refer to the 'Barrier Fencing' notes below.
2. Establish sediment fencing in the locations shown and following Standard Drawing SD 6-8 (Refer to the 'Sediment Fencing' notes below).
3. Establish a site office, toilet and parking area (alternatively existing amenities can be used).
4. Temporary waterway crossings are to be installed in accordance with Standard Drawing 5-1.
5. Prior to stripping topsoil, gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha to be stripped up with the topsoil (Refer to the 'Soil Treatment and Stabilisation' notes).
6. The permanent pipe/culvert is to be installed as early works prior to commencing soil stripping or earthworks on any other areas. Install the pipe/culvert in accordance with Detail 3 on Drawing 13000046_P03_ESCP04.
7. Clean water diversion drains are to be formed and stabilised (Refer to Table 5 and Detail 1 for all sizing and lining specifications). Energy dissipaters are to be installed at the outlets (Refer to Detail 2).
8. Sediment basins are to be constructed including their outlet spillways and energy dissipaters (Refer to Standard Drawing SD 6-4 and the 'Sediment Basin' notes below for construction details and Table 4 for sizing and lining specifications).
9. Dirty water diversion drains are to be formed and stabilised (Refer to Table 5 for all sizing and lining specifications). Energy dissipaters are to be installed at the outlets (Refer to Detail 2). (Refer to Drawing 13000046_P03_ESCP05 for locations and to Standard Drawing SD 5-4 for construction details).
10. Main earthworks can now commence. Stockpile topsoil and subsoil separately and in accordance with the requirements on Standard Drawing SD 4-1 and the 'Stockpiling' notes below.
11. Slope lengths across disturbed lands to be maintained at the required intervals during all rainfall events (Refer to the 'Slope Lengths' notes).
12. Dust suppression to be carried out when required (Refer to the 'Dust Suppression' notes).
13. Treatment of dirty water is to be carried out as necessary in accordance with the 'Dirty Water Treatment and Discharge Requirements' notes.
14. Monitoring, maintenance and auditing is to be carried out regularly as required, in accordance with the 'Monitoring and Maintenance' notes and the 'Self Auditing Program' notes.
15. Undertake progressive stabilisation of lands (including soil treatment) as final earthworks and road works are complete in each area (rather than waiting until the completion of works).
16. Final soil treatment and stabilisation is to be completed in accordance with the 'Soil Treatment and Stabilisation' notes and Table 1.

Rock Emplacement Area – Site Preparation
Before commencement of stripping and earthworks, the site is to be secured and the following erosion and sediment control measures installed in order except for Items 11 to 18 which are to be undertaken progressively as required throughout all stages of works (Refer to the Monitoring and Maintenance notes):

1. Establish a site office, toilet and parking area (alternatively existing amenities can be used).
2. Barrier fencing should be installed around the edge of the construction boundaries to restrict access and in any additional locations as necessary to minimise unnecessary disturbance. Refer to the 'Barrier Fencing' notes below. Delineate only those lands to be disturbed for the upcoming stage of waste rock emplacement.
3. Establish sediment fencing in the locations shown and following Standard Drawing SD 6-8 (Refer to the 'Sediment Fencing' notes below).
4. Prior to stripping topsoil, gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha to be stripped up with the topsoil (Refer to the 'Soil Treatment and Stabilisation' notes).
5. Clean water diversion drains are to be formed and stabilised (Refer to Table 5 and Detail 1 for all sizing and lining specifications). Energy dissipaters are to be installed at the outlets (Refer to Detail 2).
6. Site specific erosion and sediment controls are to be installed for the construction of WRESB1 (to be provided within site specific progressive ESCP – to future detail). The sediment basin is to be constructed including its outlet spillway and energy dissipater (Refer to Table 4 for sizing details and to engineering & geotechnical design & construction specifications for construction details).
7. Dirty water diversion drains are to be formed and stabilised (Refer to Table 5 for all sizing and lining specifications). Energy dissipaters are to be installed at the outlets (Refer to Detail 2). (Refer to Drawing 13000046_P03_ESCP06 for locations and to Standard Drawing SD 5-4 for construction details). The temporary waterway crossing within DD2-B is to be installed in conjunction with the construction of this drain and in accordance with Standard Drawing 5-1.
8. Establish the stockpile area within the location specified and following Standard Drawing SD 4-1 (Refer to the 'Stockpiling' notes below).
9. Main earthworks can now commence in stages – refer to the 'Waste Rock Placement' Staging notes and Drawing 13000046_P03_ESCP06. Stockpile topsoil and subsoil separately and in accordance with the requirements on Standard Drawing SD 4-1 and the 'Stockpiling' notes below.
10. Disturbed lands that grade more than 6% must be temporarily stabilised with soil binder (e.g. Vital Stonewall) or other suitable product if rain is forecast (more than 50% chance of more than 5mm), even if they are to be re-worked. To reduce the need for temporary stabilisation, minimise disturbed areas as much as possible by only removing grass and stripping soils for each stage of the rock emplacement.
11. Slope lengths across disturbed lands to be maintained at the required intervals during all rainfall events (Refer to the 'Slope Lengths' notes).
12. Dust suppression to be carried out when required (Refer to the 'Dust Suppression' notes).
13. Treatment of dirty water is to be carried out as necessary in accordance with the 'Dirty Water Treatment and Discharge Requirements' notes.
14. Monitoring, maintenance and auditing is to be carried out regularly as required, in accordance with the 'Monitoring and Maintenance' notes and the 'Self Auditing Program' notes.
15. Undertake progressive stabilisation of lands (including soil treatment) as final earthworks are complete in each area (rather than waiting until the completion of works).
16. Final soil treatment and stabilisation is to be completed in accordance with the 'Soil Treatment and Stabilisation' notes and Table 1.

Waste Rock Placement

1. When the Waste Rock Emplacement Area is prepared, waste rock may be brought in.
2. The notes 2 to 16 under "Rock Emplacement Area – Site Preparation" generally apply.
3. Waste rock placement is to occur in 3 stages – refer to Drawing 13000046_P03_ESCP06 for staging footprints.
4. As waste rock is placed, grade the surface away from the embankment so that water does not drain down the embankment face.
5. To facilitate this, place a stabilised windrow of soil along the top of the embankment (Refer to Table 5 – DB for details). This should be in place for the duration of the works.
6. Place waste rock in manner that quickly reduces, and maintains, slope gradients to less than 6%. Disturbed lands that grade more than 6% must be stabilised with soil binder (e.g. Vital Stonewall) or other suitable product if rain is forecast (more than 50% chance of more than 5mm), even if they are to be re-worked.
7. Ensure all dirty water drains to the sediment basin.
8. Progressively stabilise the active embankment faces (batters) as the fill proceeds.
9. As Stage 1 is completed and Stage 2 begins, Stage 1 will begin rehabilitation; although stabilisation of the active embankment face is to be progressively undertaken – refer to Note 15.
10. As Stage 2 is completed and Stage 3 begins, Stage 2 will begin rehabilitation; although stabilisation of the active embankment face is to be progressively undertaken – refer to Note 15.
11. All access to the waste rock emplacement area must be confined within the designated footprint.

STOCKPILING
The stockpile location is shown on Drawings 13000046_P03_ESCP06 & ESCP07. Other locations may be possible, however, approval must be granted and appropriate erosion and sediment controls implemented.
They should also incorporate clearly defined access controls and comply with the regulations outlined below.

All stockpiles must be constructed and maintained in accordance with Standard Drawing SD 4-1 and the following regulations:

- All stockpiles must have sediment fencing installed around their bases as per Standard Drawing SD 4-1.
- Stockpiles are not to be positioned within a riparian zone (i.e. within 40m of a drainage reserve/creek).
- Mulched vegetation, topsoil and subsoil (if applicable) are to be stockpiled separately.
- Stockpiles are to be trimmed and immediately sown with permanent pasture species.
- Stockpiles are to be stabilised to achieve a C-factor of 0.1 within 10 days of formation. Stabilisation measures on stockpiles must be employed as per the requirements set out in Table 1.
- Stabilisation can be achieved by seeding and spraying stockpiles with Vital P47, hydromulching, covering with jute matting or geotextile (or equivalent).

REV	DATE	DES.	DRN.	APP.	REVISION DETAILS
01	19/05/15	A.J.B.	A.J.B.	M.P.	REVISED SEDIMENT BASIN DESIGN
00	21/01/15	A.J.B.	A.J.B.	M.P.	ISSUE FOR USE
A	19/11/14	A.J.B.	A.J.B.	M.P.	DRAFT ISSUE FOR CONSULTATION

DRAWING STATUS	
DESIGN BY	A.J.B.
DRAWN BY	A.J.B.
FINAL APPROVAL	M.P.
SCALE: (on A3 Original)	
FINAL	

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PROJECT TITLE: DARGUES GOLD PROJECT – EASTERN WASTE ROCK EMPLACEMENT

DRAWING TITLE: EROSION & SEDIMENT CONTROL GENERAL NOTES & REQUIREMENTS SHEET 1 OF 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
13000046	P03	ESCP01	01

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GENERAL EROSION AND SEDIMENT CONTROL REQUIREMENTS CONTINUED

- Stockpiles should be constructed to no more than 2 meters in height.
- The working face of the stockpile should be battered down to no steeper than 2:1 (H:V).

SEDIMENT FENCING

- Install sediment fences in the locations shown on Drawings 13000046_P03_ESCP05 to 07.
- Install all sediment fencing in accordance with Standard Drawing SD 6-8.
- Sediment fences must be firmly trenched into the ground for their entire length.
- Sediment fences must include small 'returns' (see Standard Drawing 6-8) to minimise the risk of water flowing along them rather than through them.
- Sediment fences are to be installed around the toe of all stockpiles (Refer to Standard Drawing SD 4-1).

BARRIER FENCING

- Barrier fencing is to be used to delineate the work extent.
- Install barrier fencing around the edge of the works boundary. Install 2-5m from the edge of the construction area.
- Barrier fencing can simply be made from tape wound around star pickets or stakes. Alternatively, sediment fence, flagging or chain wire fences can be used for this purpose if so desired. Existing site fences can also be used where it is present in the relevant locations.
- Barrier fencing is to be used at the discretion of the site manager to delineate other 'no go' areas to minimise unecessary disturbance.
- The soil erosion hazard on the site will be kept as low as practicable by minimising land disturbance. Some ways of doing this are outlined in Table 2.

SEDIMENT BASINS

- The required sediment basin sizes and details are shown in Table 4.
- Sediment basins are to be constructed in accordance with Standard Drawing SD 6-4 and engineering and geotechical specifications/design.
- Gypsum is to be shallow ripped into the basin internal walls at a rate of 5 tonnes/ha during basin construction.
- The sediment basins are to be built to incorporate a primary outlet (weir overflow/spillway) sized to have a capacity to pass the 100 year ARI peak flow. (Refer to Table 4 for sizing and details). SB1 spillway and outlet dissipater is to be designed and constructed in accordance with engineering and geotechnical specifications/design.
- An energy dissipater is to be incorporated into the outlet of the spillway overflow. Dissipater is to extend to watercourse or 100% vegetated lands. Construct with geotextile and rock size equivalent to the spillway overflow and in accordance with Standard Drawing SD 5-8.
- Gypsum is to be shallow ripped into the spillway surfaces and dissipater surface at the base of the spillway at a rate of 10 tonnes/ha prior to placing geotextile and rock.
- Water quality is to be tested prior to discharge to verify compliance with Table 3.
- Any release of water from the sediment basins must comply with the water quality requirements prior to being discharged from site (Refer to the 'Dirty Water Treatment and Discharge Requirements' below for further details).
- Note that, if sediment basin water is pumped into a tanker truck for later use, it cannot be discharged from the tanker offsite or into a creek/dam without first being tested and where necessary treated (Refer to the 'Dirty Water Treatment and Discharge Requirements' below for further details).
- The sediment basins must be effectively treated (where necessary), settled, tested to comply with the water quality limits (Table 3) and discharged within the following time frames following a rainfall event:
  - 5-days or less for temporary sediment basins SB2 and SB3;and
  - 10-days or less for operational sediment basin SB1
- Although not essential, it is recommended that flow or rainfall activated flocculant/coagulant dosing occurs at the SB1 sediment basin inlet/s for settling out dirty water.
- A sediment basin marker is to be installed within all sediment basins indicating the sediment volume level.
- Sediment is to be cleaned out (removed) from the sediment basins prior to it reaching this sediment volume level.

DIRTY WATER TREATMENT AND DISCHARGE REQUIREMENTS

- Any water accumulating onsite within sediment basins or within the general works area (e.g. excavations, boxed out road sections, sediment traps, sumps or any other low point) must be considered as dirty water and is to be tested and treated as necessary to ensure it complies with the water quality requirements in Table 3 prior to being discharged from site.
- If the water is going to be used back on-site for construction or dust-suppression purposes and will drain back into the sediment capture system it will not require treatment to settle out suspended soilds.
- Dirty water treatment is to be achieved by using approved flocculants/coagulants only.
- Although not essential, it is recommended that flow or rainfall activated flocculant/coagulant dosing occurs at the SB1 sediment basin inlet/s for settling out dirty water. If manual treatment is carried out it is essential that the flocculating/coagulating agent is spread evenly over the entire pond surface for proper treatment of water.
- pH of discharge waters must be in the range of 6.5-8.5.

DUST SUPPRESSION

- Dust suppression should be carried out whenever necessary to minimise sediments becoming air borne due to wind erosion.
- Ensure a reliable water source and/or dust suppression management system (i.e. dustex, dustguard or Vital Stonewall) is available onsite prior to starting any construction works (including stripping and clearing works).

SOIL TREATMENT AND STABILISATION

- Prior to stripping topsoil, weeds are to be sprayed and gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha to be stripped up with the topsoil.
- Disturbed lands that grade more than 6% must be temporarily stabilised with soil binder or other suitable product if rain is forecast (more than 50% chance of more than 5mm), even if they are to be re-worked.
- Undertake progressive stabilisation of disturbed ground surfaces as they are completed rather than at the end of the works program (Refer to Table 1).
- Final stabilisation is to achieve the C-factors outlined in Table 1.
- Stabilisation of batters and general surfaces can be achieved by:
  1. Shallow ripping gypsum into the subgrade at a rate of 5 tonnes/ha and to a depth of 50-100mm to break up hardsetting surfaces.
  2. Placing treated topsoil over the ripped subgrade surface (see Standard Drawing SD 4-2 and SD 7-1 for instructions regarding topsoil replacement).
  3. Seeding, then placing placing locally sourced native mulch over the soil . Alternatively, topsoil can be placed then hydromulched (with seed) or seeded and sprayed with Vital P47 (or equivalent).
  4. Mulch, hydromulch or soil binders and additional seed might need re-application if adequate vegetation is not achieved.
- Appropriate seedbed preparation should be carried out when stabilising lands (See Standard Drawing SD 7-1).
- Diversion drains, bunds and table drains are to be stabilised as indicated in Tables 1 and 5.
- Stockpiles are to be stabilised as per the requirements of Table 1 and as shown in Standard Drawing SD 4-1.
- As surfaces are stabilised and permanent drainage measures are installed, temporary water management structures can be removed (e.g. diversion drains).

SELF AUDITING PROGRAM

- A self-auditing program must be initiated for the site. The site manager is to inspect the site at least weekly and after a rainfall event that causes runoff. They must maintain a log of inspections, paying particular attention to:
  a. Removal of spilled soils or other materials from near creeks/drainage lines.
  b. Ensuring barrier fencing is maintained and exclusion zones are being observed by all workers and contractors.
  c. Constructing additional erosion and/or sediment control works as might become necessary to ensure the desired water control is achieved.
  d. Maintaining erosion and sediment control measures in a functioning condition for the duration of the excavation works.
  e. Removal of trapped sediment and disposal to safe areas.
- Areas of localised soil erosion are to be identified and appropriate preventative measures implemented. These might include but are not limited to:
  a. Planting additional stabilising vegetation or wind breaks.
  b. Stabilising soils with mulches or alternative soil binders.
  c. Taking steps to minimise any concentrated stormwater flows.

SLOPE LENGTHS

- Ensure slope lengths are maintained at the maximum intervals as specified below across all disturbed lands during any rainfall event:
  - 200m for the waste rock emplacement area; and
  - 80m for the haul road construction works
- If necessary diversion bunds/drains, low flow earth banks (Standard Drawing SD 5-5) or sandbags/equivalent should be installed prior to any forecast rainfall event to achieve this.

MONITORING AND MAINTENANCE

- The site manager is to delineate an appropriate location for the site office or compound/s (or existing amenities can be used).
- A rain gauge is to be installed on site and daily rainfall is to be recorded .
- Safe storage areas for wastes, fuels and other hazardous materials are to be delineated at the discretion of the site manager.
- Storage locations for erosion control materials (e.g. jute matting) are to be delineated at the discretion of the site manager.
- Any waste materials (such as rocks and debris) are to be removed from any publically trafficked road surface as soon as possible.
- Any sediment accumulated in trapping devices is to be removed and deposited in a secure location where there is a low risk that it will be re-entrained in runoff.
- Waste receptacles are to be emptied as necessary. Disposal of waste must be in a manner approved by the site superintendent.

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DRAWING STATUS: DESIGN BY A.J.B. | DRAWN BY A.J.B. | FINAL APPROVAL M.P. | SCALE: (on A3 Original) | FINAL

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PROJECT TITLE: DARGUES GOLD PROJECT – EASTERN WASTE ROCK EMPLACEMENT

DRAWING TITLE: EROSION & SEDIMENT CONTROL GENERAL NOTES & REQUIREMENTS SHEET 2 OF 2

PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
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