

Dubbo Zirconia Project

Water Management Plan This page has intentionally been left blank



Dubbo Zirconia Project

Water Management Plan

TABLE OF REVISIONS

Number	Date	Prepared By	Approved by	Comments
1	1/9/2015	A. Irwin (RWC)		For Stage 1 - Construction
1.1	1.1 18/12/15 L. Clear (RWC) 2.0 22/3/2016 A. Irwin (RWC) 2.1 26/8/2016 A. Irwin (RWC)		M. Sutherland (AZL)	To incorporate advice and comments provided by the EPA.
2.0			M. Sutherland (AZL)	Submitted for Secretary's approval on issue of EPL 20702
2.1			N. Earner (AZL	Resubmitted for Secretary's approval
2.1	6/10/2016	A. Irwin (RWC)	C. Preshaw (DPE)	Approved following minor revisions - refer to Appendix 4



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FOREWORD

This Water Management Plan ("the Plan") for the Dubbo Zirconia Project (DZP) has been prepared by R.W. Corkery & Co. Pty. Limited (RWC) on behalf of Australian Zirconia Limited (AZL), a subsidiary of Alkane Resources Ltd (Alkane). The DZP, approved as SSD-5251 by the NSW Planning Assessment Commission (PAC) on 28 May 2015, comprises a small scale open cut mine supplying ore containing rare metals (zirconium, niobium, hafnium and tantalum) and rare earth elements (REEs) to a processing plant near the village of Toongi, approximately 25km south of Dubbo. Waste residues produced by the processing operations will be managed in residue storage facilities, designed to contained and encapsulate these residues.

The DZP also includes the construction of a water pipeline between the processing plant and the Macquarie River, a pipeline to carry natural gas between Dubbo and the DZP Site, and the upgrades of the following linear infrastructure;

- Toongi Road;
- Obley Road; and
- the Toongi-Dubbo section of the currently disused Dubbo-Molong Rail Line.

Collectively, these are referred to as the DZP linear infrastructure.

In accordance with Condition 14 of Schedule 2 of SSD-5251, the Plan is prepared in a staged fashion.

- Stage 1: provides for management of water during construction on the DZP Site and linear infrastructure.
- Stage 2: provides for management of water following the commencement of mining operations (as defined by SSD-5251 as "the removal and emplacement of overburden and extraction, processing, handling, storage and transport of mineral ore / ore concentrate / refined ore products").

This document represents Stage 1 of the Plan.



Dubbo Zirconia Project Stage 1

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1. SCOPE

The Dubbo Zirconia Project (DZP) Water Management Plan ("the Plan") has been prepared to satisfy *Condition 30* of Schedule 3 (*Condition 3(30)*) of development consent SSD-5251 and to provide guidance on the management of water during the construction and operation of the DZP. It will be used by Australian Zirconia Limited (AZL) personnel as the first point of reference for surface water and groundwater related issues. The Plan forms part of the DZP Environmental Management System and sits under the overarching Environmental Management Strategy (EMS) for the DZP.

This plan synthesises the recommendations made during the preparation of an Environmental Impact Statement (EIS) for the DZP (RWC, 2013), and subsequent assessment and approval of SSD-5251. As far as possible, it has been prepared as a practical guide for the management of water.

As noted in the **Foreword**, the Plan will be prepared in stages to reflect the initial construction activities on the DZP Site (as defined by Mining Lease 1724) and linear infrastructure (Stage 1), and ongoing construction and operations following commencement of mining operations (Stage 2). This document represents Stage 1 of the Plan and includes the following emission generating activities (see **Figure 1**).

DZP Site Construction

- Site Entrance and Access Road.
- Site Administration Area.
- Processing Plant Area and ROM Pad.
- Laydown and Storage Area.
- Mine Haul Road.
- Liquid Residue Storage Facility (LRSF).
- Salt Encapsulation Cell 1 (SEC 1).
- Initial open cut development.
- Initial Waste Rock Emplacement (WRE) construction.
- Extraction of basalt from a small quarry (developed under separate development consent within the impact footprint of the WRE).

Linear Infrastructure Construction

- Macquarie River Water Pipeline and pump station.
- Natural Gas Pipeline.
- Toongi Road Upgrade (including Wambangalang Creek Crossing).
- Obley Road Upgrade (including Hyandra and Twelve Mile Creek Crossings).

As this version of the Plan only considers the construction activities of Stage 1, some sections of the Plan remain to be completed and include the reference:

To be included in Stage 2 of the Plan prior to commencement of mining operations

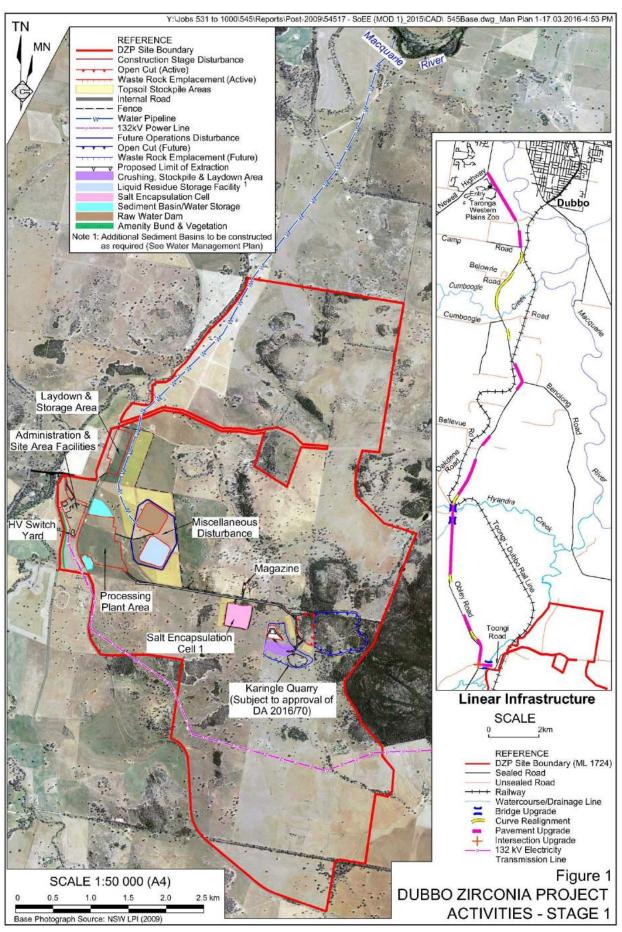


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R.W. CORKERY & CO. PTY. LIMITED

Stage 2 of the Plan will be submitted prior to the commencement of mining operations, as defined by SSD-5251 as:

"the removal and emplacement of overburden and extraction, processing, handling, storage and transport of mineral ore / ore concentrate / refined ore products".

2. CONSULTATION

2.1 GOVERNMENT CONSULTATION

Condition 23(a) of Schedule 3 of SSD-5251 requires the NSW Environment Protection Authority (EPA) be consulted in the preparation of the Plan. Following from recommendations provided by the EPA to the NSW Department of Planning & Environment (DPE) on 21 November 2013 and 20 January 2014, which provided advice on emission limits, water monitoring, compliance assessment and reporting (refer to Section 3.2), a meeting between AZL (Mr Mike Sutherland, General Manager) and the EPA (Mr Bradley Tanswell, Acting Head Far West Operations) was held on 29 May 2015. The objective of this meeting, also attended by RWC (Mr Alex Irwin, Senior Environmental Consultant), was to confirm the EPA's requirements for a *Water Management Plan*, discuss the staged preparation of the Plan and the application for Environmental Protection Licence (EPL) generally.

At the 29 May 2015 meeting, it was confirmed that:

- A Water Management Plan, including a Site Water Balance, a Surface Water Management Plan and a Groundwater Management Plan, is required to support an application for EPL.
- The EPA would consider a Water Management Plan restricted to the construction activities of the DZP Site and associated infrastructure as part of an application for an EPL for Scheduled Development Work.

On 11 December 2015, the EPA provided advice and comments on a draft WMP, which have been incorporated into this revision of the WMP.

Department of Primary Industries – Water

On 10 July 2015, an invitation to provide input into the content of a Water Management Plan was emailed to the NSW Office of Water (now Department of Primary Industries – Water) (DPI Water). DPI Water responded on 3 August 2015, supporting the conditional requirements of Conditions 26 to 30 (of Schedule 3) and 2 to 4 (of Schedule 5) of SSD-5251(refer to **Table 1** and **Appendix 1**) and the staged preparation of the Plan.

DPI Water also recommended the following be considered, with respect to the proposed construction of the upgraded road crossings over Wambangalang, Hyandra and Twelve Mile Creeks, in the preparation of the Plan.

- The use of box culverts for the Twelve Mile Creek crossing is supported, however, it is recommended that the invert level of the culverts be at the existing bed level to maintain hydrologic functioning.
- The three steel pipes of the temporary road realignment for the Wambangalang Creek crossing be removed on completion and the creek channel and bed rehabilitated.

- Erosion protection measures for bed and bank stability upstream and downstream of culverts and around bridge abutments, preferably in the form of geotextile and appropriately sized rock rip rap, is recommended.
- Works are undertaken in accordance with "Guidelines for In-stream Works on Waterfront Land" (NOW, 2012).
- A comprehensive flood impact and channel/floodplain stability assessment should be prepared in support of the proposed crossing designs and associated road infrastructure¹.

Department of Primary Industries – Office of Agricultural Sustainability and Food Security

On 10 July 2015, an invitation to provide input into management of DZP operations was emailed to the Department of Primary Industries – Office of Agricultural Sustainability and Food Security (DPI OASFS).

The request was acknowledged, however, no feedback or recommendations were subsequently received.

Dubbo City Council

On 7 July 2015, AZL (Mr Mike Sutherland and Mr Nic Earner, Chief Operations Officer) met with representatives of Dubbo City Council ("Council") to discuss progress and likely scheduling of tasks associated with the DZP. At this meeting, AZL sought feedback from Council with respect to the management of the linear infrastructure construction works to be undertaken on Council infrastructure, with the objective of ensuring that management effectively addressed issues both generally and specifically with respect to water management.

Council requested that the Front End Engineering Design (FEED) drawings of road upgrades and infrastructure prepared by Hatch be forwarded to Steve Clayton at Council for consideration and comment. No further comments or recommendations provided by Council.

2.2 COMMUNITY CONSULTATION

A Community Consultative Community (CCC) was established in November 2015 and provides a forum for open discussion between AZL, the community, Council and other stakeholders on issues directly relating to the mine's operations, environmental performance and community relations, and to keep the community informed on these matters.

The representatives of the CCC comprise an independent chair, AZL representative(s), community, Council and Aboriginal community representatives. The contact details of the CCC representatives are published (with the permission of each) on Alkane's website such that each may be contacted to present concerns of others in the community. The CCC meets quarterly and provides an opportunity for issues of concern related to management of air quality to be raised and solutions identified and discussed.

¹ It is noted that the Surface Water Impact Assessment which accompanied the EIS (SEEC, 2013) included an assessment of flooding on the DZP Site and at each of the three Obley Road creek crossing where an upgrade of the crossing is proposed. The management of water during construction, with consideration of these flood levels is included as part of Erosion and Sediment Control Plans for the relevant features of the DZP Site and linear infrastructure (to be appended on preparation and prior to commencement of activities).





AZL will continue to publish a community newsletter that will inform the local community of relevant developments which may impact on the local hydrological and hydrogeological environment. AZL has and will continue to operate an open door policy to those wishing to raise and discuss issues of concern.

3. LEGAL AND OTHER REGULATORY REQUIREMENTS

3.1 DEVELOPMENT CONSENT SSD-5251

The DZP is State Significant Development and was assessed with an Environmental Impact Statement (RWC, 2013) in accordance with Schedule 2, Part 3 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

Development Consent SSD-5251 was granted by the NSW Planning Assessment Commission (PAC) on 28 May 2015, with *Condition 30* (of Schedule 3) requiring the preparation of a Water Management Plan. More general requirements for the preparation of management plans is provided by *Condition 3* of Schedule 5. **Table 1** identifies the conditional requirements of both conditions and identified where in the Plan individual requirements have been addressed.

Condition			
Schedule 3			
30. The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This plan must:	nt		
 (a) be prepared in consultation with the EPA, NOW and DPI, and be submitted to the Secretary for approval prior to carrying out any development under this consent, unle the Secretary agrees otherwise; 	Secretary for approval prior to carrying out any development under this consent, unless		
(b) in addition to the standard requirements for management plans (see condition 3 of schedule 5), include a:			
(i) Site Water Balance that:			
includes details of:			
 sources and security of water supply, including contingency planning for future reporting periods; 	7.2		
 water use and management on site, including water use priorities during periods of restricted water supply; 	7.3 & 7.4		
 water transfers to/from the site and discharges; and 	7.5		
 reporting procedures, including the preparation of a site water balance for each calendar year; and 	7.6		
 investigates and implements all reasonable and feasible measures to minimi water use on site; 	se 7.7		

 Table 1

 Conditional Requirements of SSD-5251 for a Water Management Plan



Page 1 of 3

Table 1 (Cont'd) Conditional Requirements of SSD-5251 for a Water Management Plan

Condition			Section	
Schedule 3	· · · ·	-		
(ii)	Sι	urface Water Management Plan, that includes:		
	•	detailed baseline data on surface water flows and quality in the watercourses that could potentially be affected by the development;	8.2	
	٠	a detailed description of the water management system on site, including the:		
		 clean water diversion systems; 	8.3.1 & 8.4	
		 erosion and sediment controls (for the mine and associated linear infrastructure); 	8.4 & App. 3	
		 mine water management systems, including Waste Residue Structures, Salt Encapsulation Cells and ore processing facility; and 	8.3	
		 clean water storages; 	8.3 & 8.4	
	•	detailed plans, including design objectives and performance criteria, for the:		
		 design, construction and management of the Macquarie River water pumping station; 	8.5.1	
		 design, construction and management of the Waste Residue Storage Facilities and the Salt Encapsulation Cells; 	8.5.2	
		 design, construction and management of mine water storages and process water dams; 	8.5.3	
		\circ design and management of the final void; and	8.5.4	
		 control of any potential water pollution from the rehabilitated areas of the site; 	8.5.5	
	•	performance criteria for the following, including trigger levels for investigating any potentially adverse impacts associated with the development, including the:		
		 mine water management system; 	8.7.2	
		 surface water flows and quality, including channel stability, stream and riparian vegetation health; and 	8.7.3 & 8.7.8	
		 basic landholder water rights for downstream landowners in the 'undefined Macquarie River Catchment'; 	8.7.7	
	•	a program to monitor and report on:		
		 the effectiveness of the mine water management system, including the Waste Residue Facilities, Salt Encapsulation Cells and associated pipelines between water management structures; 		
		 surface water supplies for adjacent landowners; 	8.6	
		\circ the operation of the Macquarie River water pumping station; and		
		 surface water flows and quality, including channel stability, stream and riparian vegetation health; and 		
	•	a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the development; and	8.7	

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Table 1 (Cont'd) Conditional Requirements of SSD-5251 for a Water Management Plan

Condition					
Schedule 3 (Cont'd)					
	(iii) Groundwater Management Plan, which includes:				
	 detailed baseline data on groundwater levels and quality in the region, and privately-owned groundwater bores, that could be affected by the development; 	9.2			
	 groundwater performance criteria, including trigger levels for investigating any potentially adverse groundwater impacts; 	9.4			
	 a program to monitor and report on: 				
	 groundwater inflows to the open cut pit, if relevant; 				
	 the seepage/leachate from mine water storages, Waste Residue Storage Facilities and mine voids; 				
	 the impacts of the development on: 	9.5			
	 regional and local (including alluvial) aquifers; 				
	 groundwater supply of potentially affected landowners; and 				
	 base flows to Wambangalang Creek; and 				
	 a plan to respond to any exceedances of the groundwater performance criteria, and mitigate and/or offset any adverse groundwater impacts of the development. 	9.6			
Schedu	le 5				
	Applicant shall ensure that the management plans required under this consent are ared in accordance with any relevant guidelines, and include:				
(a)	detailed baseline data;	8.2 & 9.2			
(b)	a description of:				
	 the relevant statutory requirements (including any relevant approval, licence or lease conditions); 	3			
	 any relevant limits or performance measures/criteria; 				
	 the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures; 	6, 8.5 & 9.3			
(c)	a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	8.3, 8.4 & 9.3			
(d)	a program to monitor and report on the:				
	 impacts and environmental performance of the development; 	8.6 & 9.5			
	 effectiveness of any management measures (see c above); 	0.0 & 9.5			
(e)	a contingency plan to manage any unpredicted impacts and their consequences;	8.7 & 9.6			
(f)	a program to investigate and implement ways to improve the environmental performance of the development over time;	17			
(g)	a protocol for managing and reporting any:				
	incidents;	12			
	complaints;	17			
	 non-compliances with statutory requirements; and 	12.2 &			
	exceedances of the impact assessment criteria and/or performance criteria; and	12.3			
(h)	a protocol for periodic review of the plan.	17			



Appendix 1 includes a copy of the 'relevant conditions' for which the Plan provides measures to ensure compliance, namely *Conditions 26* to *29* (of Schedule 3), along with reference to the relevant section of the Plan.

3.2 ENVIRONMENT PROTECTION LICENCE (POEO ACT)

This version of the Plan supports an application for an Environment Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997* (POEO Act). In lieu of conditional requirement of an EPL, the following recommendations of the NSW Environment Protection Authority (EPA) to the DPE prior to the issue of SSD-5251 ("the EPA Recommendations"), reflecting the requirements of the EPA in issuing a licence, have been considered and addressed in this Plan.

The proponent must establish water quality trigger values appropriate to the monitoring location, including:

- a) refine the salinity and salinity species trigger values for surface water monitoring based on the source sub-catchment so that significant changes in salinity due to mining operations can be detected in each sub-catchment. Trigger values for determining change should be based on detectable change away from the range of salinity values that are present in a sub-catchment prior to mining commencing. Site specific trigger values should be developed in accordance with ANZECC (2000) methodology, e.g. using appropriate reference sites and monitoring as defined in the ANZECC guidelines.
- b) at all relevant monitoring locations, more clearly define the trigger values for "salinity species" currently described in the monitoring program.
- c) describe any proposed flocculent to be used in sediment basin(s) that discharge to the environment and demonstrate that flocculants selected have low toxicity (LC50 >100mg/L).

The Proponent must prepare and implement a Water Management Plan for the project to the satisfaction of the EPA. This plan must:

- a) be prepared in consultation with EPA and by a suitably qualified and experienced person(s).
- b) be submitted to the EPA's Regional Manager for approval prior to the commencement of activities.
- c) address construction, operation and post closure monitoring, management and response arrangements.
- d) include:
 - a Site Water Balance.
 - a Water Reuse Management Plan.
 - an Erosion and Sediment Control Plan.
 - a Residue Storage Facility Management Plan.
 - a Surface Water Monitoring Program.



- a Groundwater Monitoring Program.
- a Surface and Ground Water Response Plan to respond to issues identified by the Surface and Groundwater monitoring programs.

Specific reference is made to the requirement that all plans be reviewed to ensure adequate separation of clean, dirty and contaminated water.

Appendix 2 includes the content requirements provided by the EPA Recommendations for each of the separate plans referenced by (d) above, including the relevant section of the Plan where this information is presented.

4. OBJECTIVES AND OUTCOMES

Table 2 details the objectives and outcomes with respect to water management of the DZP.

	Page 1 of					
OBJECTIVES			KEY PERFORMANCE OUTCOMES			
(a)	To ensure compliance with the performance measures of SSD-5251, criteria of Environmental Protection Licence criteria and reasonable community expectations.	(i)	Compliance with all relevant criteria and reasonable community expectations, as determined in consultation with the relevant government agencies.			
(b)	To ensure sufficient water is available during all phases of the life of the DZP for environmental and operation purposes.	(ii)	Dust deposition monitoring (refer to <i>Air Quality Management Plan</i> , RWC 2015) confirms sufficient water available and used for dust suppression purposes.			
		(iii)	Sufficient water is available processing operations.			
		(iv)	No uncontrolled discharges from pollution control dams (unless in accordance with design specifications).			
(c)	To reduce the water requirement of the DZP as far as practically possible.	(v)	Water minimisation strategies such as re-use, reduction in disturbed areas requiring ongoing dust suppression and use of additives to water used in dust suppression.			
(d)	To ensure that appropriate sediment and erosion control measures are implemented and maintained.	(vi)	All water management structures constructed and maintained in accordance with Landcom (2004), DECC (2008) and the <i>Erosion and Sediment Control</i> <i>Plans</i> appended to the Plan (prior to commencement of activities).			
(e)	To ensure that appropriate chemical and hydrocarbon management is implemented and maintained.	(vii)	All chemicals and hydrocarbons stored and used in accordance with manufactures' instructions, Material Data Safety Sheet requirements and Australian Standards.			
		(viii)	No polluting discharge to receiving land and/or waters.			

Table 2Objectives and Outcomes



Table 2 (Cont'd) Objectives and Outcomes

			Page 2 of
OBJECTIVES		KEY F	PERFORMANCE OUTCOMES
(f)	To ensure that the permeability of the floor and embankment of Residue Storage Facilities and Salt Encapsulation Cells complies with the requirements of SSD-5251.	(ix)	No contaminated seepage from the Residue Storage Facilities and Salt Encapsulation Cells.
(g)	To ensure that water within the DZP Site is used in an efficient and environmentally responsible manner.	(x)	Capture of water on the DZP Site does not exceed the maximum harvestable right for the land.
		(xi)	Pipelines carrying saline or contaminated water or residues are fitted with suitable leak detection systems.
		(xii)	Nominated freeboard maintained within the Residue Storage Facilities.
		(xiii)	No uncontrolled discharges from pollution control dams (unless in accordance with design specifications).
		(xiv)	Discharges of water achieve the nominated quality criteria.
(h)	To ensure that runoff to surface or leachate to sub-surface from the waste rock emplacement is not saline, acidic or otherwise contaminated.	(xv)	Potentially acid forming materials are identified and encapsulated.
		(xvi)	All runoff from waste rock with potentially elevated concentration of radionuclides is captured and no discharged.
(i)	To ensure appropriate flood mitigation measures are in place.	(xvii)	Infrastructure is constructed to prevent ingress of floor waters, or discharge of internal runoff, up to a 1 in 100 ARI event.
(j)	To ensure that aquatic and riparian ecosystems are not adversely effected by the DZP.	(xviii)	Channel stability of receiving waters is maintained or improved.
		(xix)	Monitoring at sites downstream of the DZP Site confirms no degradation of water quality criteria or aquatic ecological indicators.
(k)	To ensure that an appropriate surface water and groundwater monitoring program is implemented throughout the life of the Project.	(xx)	Water monitoring programs are sufficiently robust to detect any adverse water quality or quantity impacts associated with the DZP to allow appropriate adaptive management measures to be implemented.
(I)	To ensure that appropriate contingency and emergency management plans are in place and regularly reviewed.	(xxi)	Contingency and emergency management plans are prepared for all relevant contingencies and regularly reviewed and upgraded.
(m)	To implement an appropriate incident reporting program, if required.	(xxii)	A Pollution Incident Response Management Plan is prepared and has been tested.
(n)	To ensure that all relevant water- related information is made available in a timely and accessible manner.	(xxiii)	Monitoring information is published on the AZL website in accordance with <i>Requirements for</i> <i>Publishing Pollution Monitoring Data</i> (EPA, 2013) (or guideline document which supersedes this).



5. LOCAL SETTING

5.1 METEOROLOGY

The climatic conditions of the DZP Site are presented in *Section 4.1.3* of RWC (2013). A summary of the climatic conditions is presented in this subsection.

Temperature and Humidity

January is typically the warmest month of the year with a mean daily maximum temperature of 33.4°C and mean daily minimum temperature of 18.2°C. The coolest month of the year is typically July with the lowest mean daily maximum temperature of 15.4°C and minimum mean minimum temperature of 3.1°C.

The highest humidity is experienced in June, and the least humid month is December.

Rainfall

On average, 647.3mm of rain is recorded each year, with that rainfall spread relatively evenly throughout the year. January is typically the wettest month (66.4mm) and September is the driest month (42.7mm).

Wind Speed and Direction

Wind distribution patterns at the DZP Site are dominated by winds from the south-southwest in autumn, winter and spring, with northeasterly winds dominating in summer. **Figure 2** presents the wind roses from 2008, selected as a year representative of the prevailing annual conditions of the local setting.

5.2 LOCAL LAND OWNERSHIP AND CATCHMENTS

The land ownership within and surrounding the DZP Site is presented in Figure 3.

AZL owns 12 homesteads and cottages within and surrounding the DZP Site (R1, R2, R3A, R3B, R48, R49A, R49B, R51, R54, R55, R56 (derelict) and R58). Only R3A, R3B and R51 are within the DZP Site. All residences within the village of Toongi are either owned, or under contract for purchase by AZL.

The closest residential receivers to the DZP Site, not owned by or under contract to AZL, are the four houses on smaller lifestyle blocks to the west of Obley Road (approximately 600m to 1000m from the entrance to the DZP Site). Other notable receivers surrounding the DZP Site include the Toongi Hall (R12), approximately 600m to the southwest of the DZP Site entrance and 800m west of the processing plant, "Glen Idol" Homestead (R4) approximately 1 000m from the open cut, the cottage of "Cockleshell Corner" (R7B) approximately 2 400m from the processing plant and the Wambangalang Environmental Education Centre (R13), approximately 4.8km to the southwest of the processing plant.

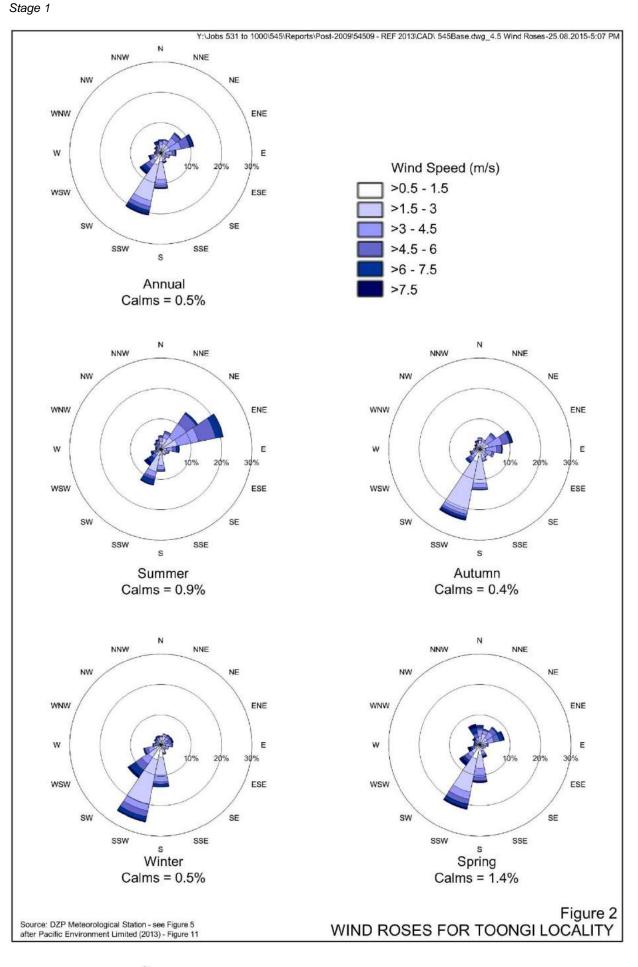
The direct impacts of the DZP would be limited to the catchments of Cockabroo Creek, Wambangalang Creek, the Little River and the Macquarie River (**Figure 6**).



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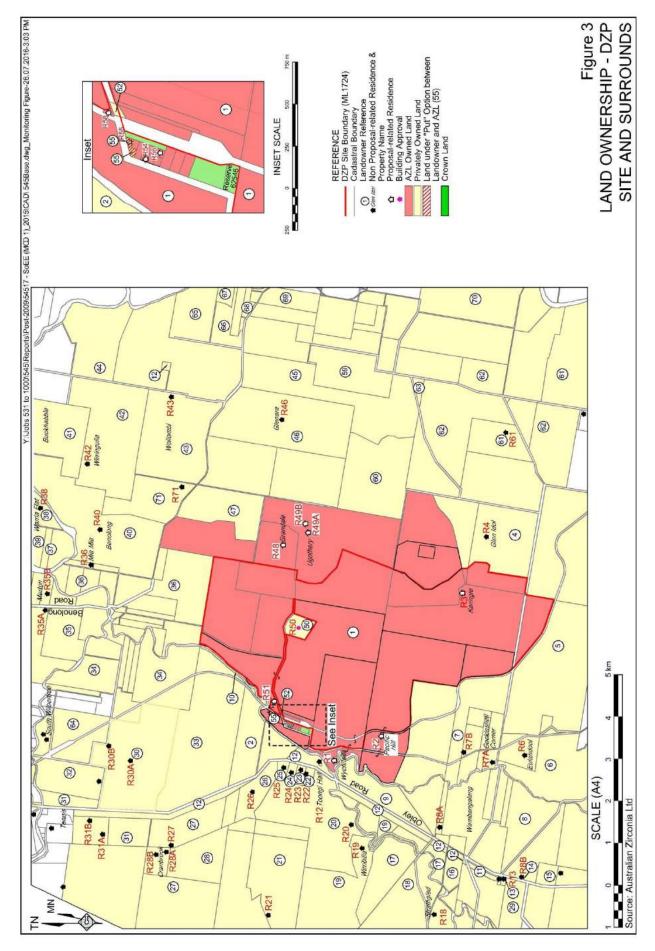
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6. WATER QUALITY DISCHARGE CRITERIA LIMITS

6.1 INTRODUCTION

As the DZP Site traverses three catchments, the objective for the establishment of water quality discharge criteria is to ensure that the criteria reflect water quality which naturally occurs in each.

Site-specific trigger values (SSTV) would be established to determine baseline water quality data for the catchment surrounding the DZP Site. As these would be dependent on water sampling and analysis, preliminary water quality criteria would be used until SSTVs are established. The preliminary water quality criteria is based on either ANZECC (2000) trigger values for aquatic ecosystem protection (95%)² or collated data collected from local waterways in 2002 and 2012.

The SSTVs would be established in conjunction with a Pollution Reduction Program for the DZP operations. The following subsections present a summary of the preliminary water quality criteria that would be implemented, and a description of how the SSTVs would be established.

6.2 PRELIMINARY WATER QUALITY CRITERIA

Table 3 presents the preliminary water quality criteria for water discharged from the DZP Site. Where the criteria would apply only to discharges from areas exposed to waste rock, processing reagents, or residues, a brief summary is included in this subsection.

Thorium

A value of 0.2µg/L would be used as a preliminary water quality criterion for thorium for catchments that do not contain stockpiled ore or waste rock. For catchments containing ore or waste rock, the preliminary water quality criterion would be less than or equal to the thorium concentration of a monitoring point not influenced by runoff from the DZP within the same catchment.

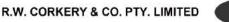
Uranium

A value of 0.5µg/L would be used as a preliminary water quality criterion for uranium for catchments that do not contain stockpiled ore or waste rock. For catchments containing ore or waste rock, the preliminary water quality criterion would be less than or equal to the uranium concentration of a monitoring point not influenced by runoff from the DZP within the same catchment.

Rare Earth Elements

As rare earth elements would only potentially occur within catchments containing stockpiled ore or waste rock, and no excavation of ore or waste rock would occur during the construction phase, preliminary water criteria are not required for rare earth elements.

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² The protection level percentage signifies the percentage of species expected to be protected, i.e. 95%.

Freiminary Water Quanty Criteria						
Parameter	Criteria	Justification				
General						
рН	<6.5 or >8.0	ANZECC (2000) – Lowland River of Southeast Australia				
TSS	<50mg/L					
Oil & Grease	10mg/L	EPA requirement				
Catchment Specific ¹						
Electrical conductivity	2 200µS/cm	ANZECC (2000) – Lowland River of Southeast Australia				
Dissolved Oxygen	<85% or >110%	ANZECC (2000) – Lowland River of Southeast Australia				
Total Phosphorus	20µg/L					
Total Nitrogen	250µg/L	ANZECC (2000) – Lowland River of Southeast Australia				
Aluminium	55µg/L					
Arsenic (as Arsenic III)	24µg/L					
Zinc	8µg/L					
Copper	1.4µg/L					
Lead	3.4µg/L	ANZECC (2000) – 95% Aquatic Ecosystem Protection				
Silver	0.05µg/L	Level				
Nickel	11µg/L					
Boron	370µg/L					
Manganese	1 900µg/L					
Cadmium	0.2µg/L					
Uranium	0.5µg/L	Comparison to background analysis				
Thorium	0.2µg/L	US EPA				
Radioactivity						
Radionuclides (Gross Alpha)	0.5Bq/L					
Radionuclides (Gross Beta)		Australian Drinking Water Guidelines (NHMRC, 2011)				
Note 1: Criteria for Wambangalang Creek, Cockabroo Creek and Macquarie River (undefined) catchments to be updated following monitoring results of construction phase						
Source: Modified after SEEC (2013) – Tables 9 to 12						

Table 3				
Preliminary Water Quality Criteria				

6.3 SITE-SPECIFIC TRIGGER VALUES

6.3.1 Development of Site-Specific Trigger Values

The SSTVs would be developed in consultation with the EPA and NSW Health, and would be established based on both the collection of baseline data from receiving water catchments and a Direct Toxicity Assessment (DTA). AZL would establish SSTVs to replace the preliminary water quality criteria presented in Section 6.2, and for all pollutants during controlled discharge that are determined to have a non-trivial risk of harm to human health or the environment.

The collection of baseline data would be conducted in accordance with the ANZECC (2000) methodology for selecting reference sites and for deriving site specific trigger values. SSTVs would be based on samples collected from potentially impacted catchments surrounding the DZP Site. A DTA would be used to verify the SSTVs, and ensure that there would be no toxicity impacts from chemical combinations that site discharges do not significantly increase the load of pollutants discharged where background levels of potential pollutants are elevated compared to environmental criteria.



6.3.2 Dilution

Discharge from catchments containing ore or waste rock would only occur under 1 in 100, 72 hour ARI conditions. Under such conditions, there would be significant flooding within the local setting, and the large volume of water would provide natural dilution for any thorium, uranium or rare earth element in discharged water. As a result, an analysis of near-field (initial) dilution available under various rainfall conditions would be used to justify variable SSTVs for controlled discharges.

7. SITE WATER BALANCE

7.1 INTRODUCTION

The Water Balance identifies the following (in satisfaction of Condition 3(30)(b)(ii)).

- Sources of water and security of water supply, including contingency planning for future reporting.
- Water use and management on site, including water use priorities during periods of restricted water supply.
- Water transfers to/from the DZP Site and discharges.
- Reporting procedures, including the preparation of a Site Water Balance for each calendar year.
- Reasonable and feasible measures to minimise water use on site.

Figure 4 presents, schematically, the primary sources, uses and losses of water for the DZP.

7.2 SOURCES OF WATER

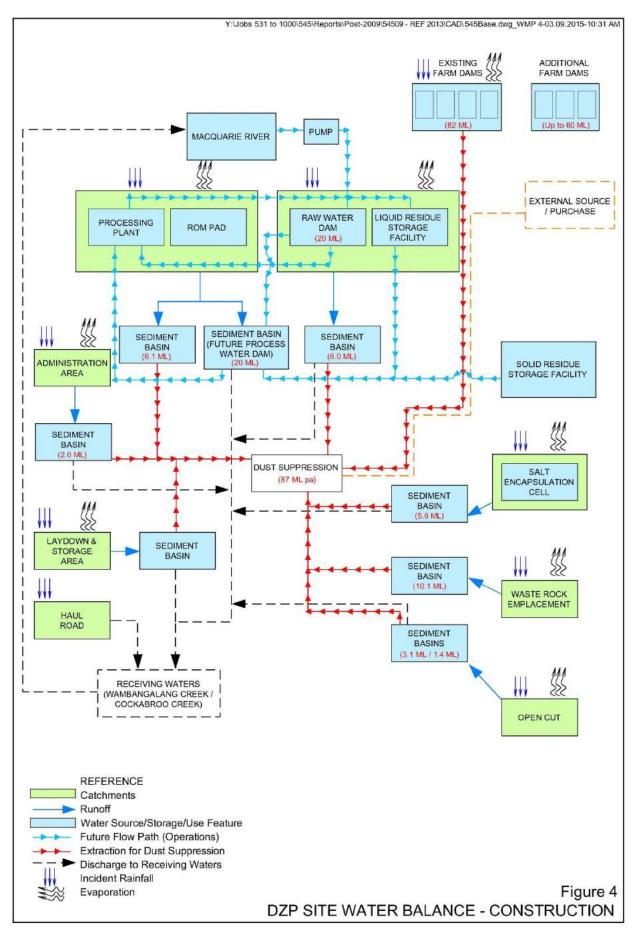
Water required for use within and surrounding the DZP Site would be sourced from the following sources.

- On-site surface water harvesting. The harvestable rights capacity for the land held by AZL is approximately 223ML (refer to Section 7.3.1.1).
- Macquarie River (high security licences). The Applicant has sourced 812ML of high security water.
- Macquarie River (general security licences). The Applicant currently holds a WAL for 750ML of general security water. Over 10 000ML of general security water is traded each year.
- Groundwater (Upper Macquarie River alluvial aquifer). The Applicant holds a zero allocation WAL and will prove up a water supply on "Sweet Water" in due course. Pump testing and a determination by DPI-Water will determine the allowable offtake. Water will be purchased from the same zone to add to the AZL owned WAL.



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 Groundwater (Lachlan Fold Belt Fractured Rock Aquifer / Upper Macquarie River alluvial aquifer). Various groundwater bores with stock and domestic use entitlement occur on the AZL landholding. This water will be used to supply residences and livestock on this land, however, will not be used for commercial or industrial purpose.

7.3 WATER USE AND MANAGEMENT

7.3.1 Stage 1 – Construction

7.3.1.1 Water Requirements

Water use during Stage 1 of the DZP will be restricted to that required for:

- dust suppression; and
- drinking and ablutions water for the construction workforce.

Dust Suppression

The estimated demand for dust suppression is taken as 50% the difference between the pan evaporation rate and the daily rainfall rate (576mm/year) and multiplied by the combined surface areas to be treated (SEEC, 2013).

During construction, the maximum disturbed area requiring the application of water (see **Figure 1**) will be 15ha. Hence, the annual dust suppression requirement is equivalent to $0.576 \text{ m} \times 150\ 000 \text{ m}^2 = 86\ 400 \text{ m}^3$, i.e. 86.4ML. Until the Macquarie River Water Pipeline is established, this water will be sourced preferentially from existing and additional dams on the properties of the DZP Site owned by AZL. Section 53 of the Water Management Act 2000 permits landholders to harvest and use a portion of the total runoff from their land without requiring a licence. This is referred to as the maximum harvestable right capacity for the property. Provided the dams or basins are either "off-line" from natural watercourses or are positioned on first or second-order streams only, a property's harvestable right permits construction of dams up to the harvestable right capacity without the requirement for further approvals. Water captured within harvestable rights dams may be used for any purpose, including mining-related purposes. The harvestable right multiplier for the DZP is 0.065ML/ha³. AZL owns 3 452ha, however, the area used in calculation excludes areas which would become isolated from the larger catchment, i.e. retain all incident rainfall, during construction (Salt Encapsulation Cell 1, Raw Water Dam and Liquid Residue Storage Facility) is reduced by 20ha (to 3 430ha). Therefore, the permissible harvestable right is $0.065 \times 3.430 = 223$ ML.

There are 64 existing farm dams within this land with a total estimated volume of approximately 82ML. In addition, nine sediment basins are to be constructed with a combined capacity of 79.3ML (see **Figure 5** and **Table 4**) allowing for a further 61.7ML of water storages to be built on the DZP Site. Given the water balance modelling of SEEC (2013) indicated that a combined 12ML storage of three sediment basins for the Administration Area, Processing Plant and ROM Pad Area, and Laydown and Storage Area would supply up to 151ML⁴, the DZP Site will have more than sufficient water availability to supply dust suppression requirements.

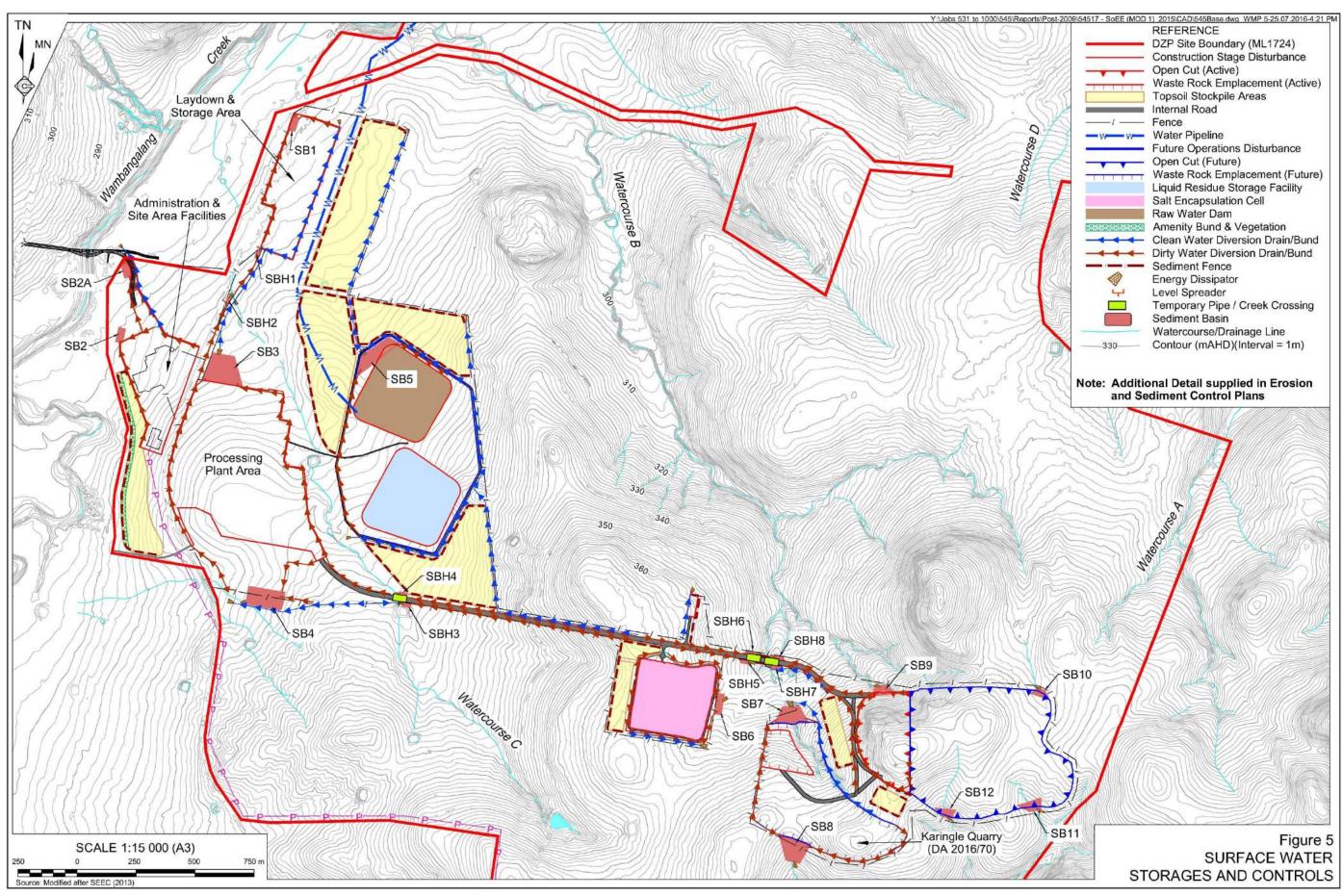
⁴ SEEC (2013) modelled 42MLpa for dust suppression and 109MLpa for processing.





³ http://www.farmdamscalculator.dnr.nsw.gov.au/cgi-bin/ws_postcode.epl

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Drinking and Ablutions Water

Based on an average requirement of 5L/day per employee, the average annual demand for drinking and ablutions water (assuming an average construction workforce of 250) will be 0.5ML.

Until a water treatment plant is established, this water will be sourced from external sources, i.e. purchased and transferred to the Site by truck.

7.3.1.2 Water Capture, Storage and Management

Noting that maximum harvestable right (MHR) represents approximately 10% of the available runoff from a portion of land, and the MHR of the DZP Site is significantly in excess of water use requirement, it is not anticipated that there will be a deficit of water. Furthermore, additional water storages will be progressively constructed on the DZP Site. As these are constructed the overall water storage capacity of the DZP Site will be increased further. The individual storages and minimum capacities are identified in **Table 4**.

Storage	Function			
SB 1	Settlement of runoff from the Laydown and Storage Area under construction.			
SB 2	Settlement of runoff from the Administration Area under construction.			
SB 2A	Settlement of runoff from the Site Entrance and Access Road under construction.			
SB 3 (& future process water	Initially constructed and operated to provide for settlement of runoff from the northern Processing Area under construction.	20.2ML ⁴		
storage)	On completion of construction, the dam will be lined and operated for the recycling of process water to supplement the DZP Process Water Dam.			
SB 4	Settlement of sediment containing runoff the southern Processing Area and ROM Pad under construction.			
SB 5	Settlement runoff from the Raw Water Dam and LRSF under construction.			
SB 6	Settlement of runoff from the initial construction footprint of Salt Encapsulation Cell 1.			
SB 7	Settlement of sediment containing runoff from the construction footprint of WRE within the Wambangalang Creek catchment.	11.8ML ³		
SB 8	To provide for the capture and settlement of sediment containing runoff from the construction footprint of the Karingle Quarry (operated under DA D2016-70) and future placement of waste rock within the WRE.			
SB 9	Settlement of runoff from the initial open cut development.			
Raw Water Dam	To accept water extracted under licences from either the Macquarie River or Macquarie alluvial aquifer.			
Existing Farm Dams of the DZP Site	For watering of stock retained on the DZP Site and adjoining lands and supplementary supply of water for dust suppression.			
Additional Dams (Harvestable Right)	For capture and supply of water for dust suppression.			
Note 1: Modifications to the location and capacity of the sediment basins to follow preparation of an Erosion and Sediment Control Plan(s) for the DZP Site				
by Note 3, i.e.	by Note 3, i.e. the 5-day 90 th percentile rainfall event for the locality (39.9mm)			
Note 3: Provides for at least the 1 in 100 ARI time of concentration (t _c) event (for containment of contact water) Note 4: Exceeds the 5-day 90 th percentile rainfall event requirements to provide supplementary storage of recycled privater				
Source: Modified after SEEC (2013) – Table 4 / SEEC (2016) – Table 4				

Table 4Water Storage Capacity1



Further detail is provided in the Erosion and Sediment Control Plan (ESCP) prepared for the Site Establishment (Construction) Phase of the DZP by Strategic Environmental and Engineering Consultants (SEEC). The management practices to be implemented as part of the ESCP are described in Section 8.3, with a complete copy of the ESCP provided as **Appendix 3**.

7.3.1.3 Water Availability Contingencies

The volume of water retained within the sediment basins, farm dams and other storages of the DZP Site will be reviewed at least monthly and in the event the volume available is restricted to less than 1 month supply (8ML), the following management strategies will be implemented.

- Areas of active disturbance will be reduced, thereby reducing the requirement rate at which water requires application. The requirement for water application will be further reduced by stabilisation of these areas, e.g. through establishment of grass, chemical soil stabilisers, rolled erosion control product or other means.
- Supplementary water will be obtained from sources off the DZP Site, e.g. Macquarie River water extracted under the existing allocation of AZL, and delivered to the DZP Site for use.
- Additional dust suppressant additives may be sourced and used to reduce the application rate of water.

7.3.2 Stage 2 – Operations

To be included in Stage 2 of the Plan prior to commencement of mining operations

7.4 WATER USE PRIORITIES

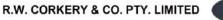
Table 5 presents the anticipated water demand and sources of supply, in priority order, for the Construction stage of the DZP.

7.5 WATER TRANSFERS AND DISCHARGES

7.5.1 Stage 1 – Construction

7.5.1.1 Transfer of Water

The movement of water on the DZP Site during the construction phase will be primarily by surface runoff with clean water diverted around construction areas and runoff from the construction areas (dirty water) diverted to sediment basins designed and constructed to store runoff generated by a 5-day 95th percentile rainfall event (see Section 8.4).





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Priority	Demand	Volume	Source (In Priority Order)
1	Dust	Variable, depending on	1. Water captured within sediment basins.
	prevai conditi Based area o	area exposed and prevailing weather conditions. Based on maximum area of disturbance, estimated at 86.4ML/yr.	 Water captured within existing farm dams (as part of harvestable right).
			 Water captured within additional dams constructed in accordance with harvestable right of the properties of the DZP Site.
			Following construction of the Macquarie River Water Pipeline and Raw Water Dam.
			4. Macquarie River water.
			5. Macquarie River alluvial aquifer.
2	Drinking and Ablutions Up to 0.5ML/yr.	Up to 0.5ML/yr.	 Import from external sources (until internal water capture and treatment options available).
			2. Rainwater capture.
		Following construction of the Macquarie River Water Pipeline and Raw Water Dam.	
			 Treatment of Macquarie River or alluvial aquifer water discharged to Raw Water Dam.

Table 5Demands for Water – Construction

Mobile pumps will be operated to transfer water accumulated in the sediment basins to water carts for application to disturbed areas (for dust suppression), between storages via HDPE pipelines or to receiving waters by discharge. During the construction stage, the transfer of water between storages will be principally to **SB 3** and **SB 4**, which will be constructed well in excess of storage requirements (for water settlement and sediment storage generated by the 90th percentile 5-day depth of 35.6mm) and provide for a central repository of water from which water carts/trucks may draw water.

In the event the accumulated water within a sediment basin reduces the available storage capacity below that required for a 5-day 90th percentile rainfall event, transfer of water will be undertaken within 5 days of the conclusion of the rainfall event causing runoff (i.e. >5mm in 24hrs).

Prior to the placement of waste rock to the WRE commencing, a pipeline will be installed to allow transfer of water accumulated within **SB 7** to the LRSF or Process Water Dam. The pipeline will be a permanent feature and placed within the table drain of the internal roads between the WRE and LRSF or Process Water Pond. A diesel powered pump capable of transferring at least 100kL/hour will be installed (at **SB 7**) to pump water during or immediately following heavy rainfall to ensure no overflow during or following rainfall up to a 1 in 100 ARI event. The pump will be operated manually in response to accumulation of water within **SB 7**.

On construction of the Macquarie River Water Pipeline, water will be pumped from the Macquarie River or groundwater bore field to be developed on the "Sweetwater" property (see **Figure 1**) to the Raw Water Dam.

7.5.1.2 Discharge of Water

Each sediment basin will be constructed to allow for discharge under rainfall conditions exceeding the design rainfall event (5-day 90th percentile rainfall event for **SBs 1**, **2**, **5**, **6** and **9** and 1 in 100 ARI t_c event for **SBs 3**, **4**, **7** and **8**) (see **Figure 5**). The water quality criteria of **Table 3** will not apply under conditions exceeding these design rainfall events.



Controlled discharge to receiving waters, as described in Section 7.5.1.1, will only be undertaken on satisfaction of the General Water Quality Criteria (for runoff from general disturbance areas) or General and Catchment Specific Water Quality Criteria (for runoff exposed to ore, waste rock, processing reagents or residues). Controlled discharge will only be undertaken from the sediment basins approved as discharge points by the EPL for the DZP.

In the event a flocculent is required to reduce the suspended sediment of the water (to <50mg/L), AZL will ensure that the active agent is of low toxicity (LC_{50} >100mg/L). The details of any flocculent used will be provided to the EPA for approval prior to use and appended to this Plan (*none appended to this version*).

7.5.2 Stage 2 – Operations

To be included in Stage 2 of the Plan prior to commencement of mining operations

7.6 REPORTING

All water usage will be recorded, either automatically by flow meter attached to pumps, or manually by recording the number of water cart fills, calculation of flow rate x period of flow, or other means. At the end of each annual reporting period (initial anniversary date being 28 May 2016), the total volume of water used during the period will be calculated and reported.

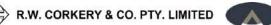
The recorded water usage will be used to review and update the water balance as necessary. In particular, the necessity for construction of additional water storages, in accordance with the maximum harvestable right for the properties, will be identified and planned for the following reporting period

7.7 CONTINUAL IMPROVEMENT

As nominated by Objective (c) in **Table 2**, AZL will continue to investigate measures to reduce the water requirement of the DZP. AZL will continue to:

- review of technologies available for retaining, re-using or recycling the water for processing operations, e.g. implementation of reverse osmosis plants, use of forced evaporation prior to discharge of liquid residues;
- identify and assess the applicability of water additives which may reduce the rate of application of water for dust suppression; and
- review construction and mining plans which reduce the areas of disturbance on the DZP Site, thereby reducing the requirement for active dust suppression.

In light of possible reductions in water requirements based on the above, and recorded water usage as nominated in Section 7.6, AZL will review the water balance each year. This review will include a discussion on specific water reduction measures considered and whether or not these were or will be implemented. A summary of the review undertaken and outcomes will be included in the Annual Review completed for the DZP in accordance with *Condition 5(4)* of SSD-5251.





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8. SURFACE WATER MANAGEMENT PLAN

8.1 INTRODUCTION

This Surface Water Management Plan has been prepared in satisfaction of *Condition* 3(30)(b)(ii) and provides the following detail on surface water management.

- Baseline data on surface water flows and quality in the watercourses that could potentially be affected by the DZP.
- A detailed description of the surface water management system on site.
- Design objectives and performance criteria for the design and construction of the Macquarie River pumping station, Waste Residue Storage Facilities, Salt Encapsulation Cells, mine water storages, process water dams and the final void.
- Performance criteria, including trigger levels, for the mine water management system, surface water flows and quality, and basic landholder water rights for downstream landowners in the undefined Macquarie River Catchment.
- A program to monitor and report on the effectiveness of the mine water management system, surface water supplies for adjacent landowners, the operation of the Macquarie River pumping station, and surface water flows and quality.
- A plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts.

8.2 BASELINE DATA

8.2.1 Drainage

The DZP Site is located in the upper section of the Macquarie River Catchment which in turn is located within the wider Macquarie-Bogan Catchment. The Macquarie-Bogan Catchment comprises an area of approximately 74 800km², and merges with the Darling River near Brewarrina in western NSW. Key water management issues within the catchment include water sharing and water use, reductions in flow and associated adverse impacts on the Ramsar-listed Macquarie Marches (located in the lower reaches of the catchment) and salinity. **Figure 6** identifies the catchments affected by the DZP.

Wambangalang, Paddys and Meadows Creeks Catchments

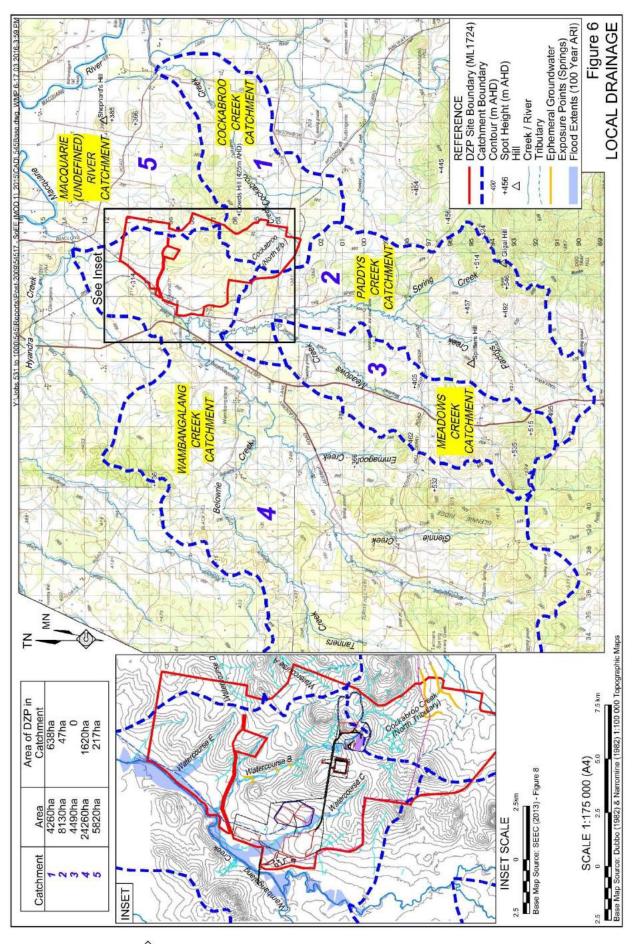
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The Wambangalang Creek catchment (Catchment 4 on **Figure 6**), including the catchments of Meadows and Paddys Creeks, drains north-northeast before joining the Macquarie River approximately 7km north of the DZP Site. The catchment drains an area of approximately 345km² or approximately 0.5% of the Macquarie River catchment. The DZP Site is located in the lower section of the catchment.



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Cockabroo Creek Catchment

The Cockabroo Creek Catchment (Catchment 1 on **Figure 6**) drains to the east before joining the Little River approximately 4km east of the DZP Site. This small catchment of 4 260ha drains surface flows off a local high point, namely Dowds Hill, with an elevation of 425m AHD.

Macquarie River (Undefined) Catchment

The Macquarie River (Undefined) Catchment (Catchment 5 on **Figure 6**), an area of approximately 5 820ha, flows via several ephemeral channels directly into the Macquarie River, approximately 7km to the north of the DZP Site.

8.2.2 Groundwater-Surface Water Interaction

It has been confirmed that ephemeral springs occur within the DZP Site, generally at the break point of steeper slopes where the surface is intermittently incised by a rising groundwater table following rainfall events (EES, 2013). Such springs are known to occur on Cockabroo Creek (North Tributary), Watercourse B and Watercourse A, feeding several of the farm dams (see **Figure 6**).

Sub-surface groundwater flows are towards the local creeks, with Paddys Creek to the west listed as having a "high potential for groundwater interaction" by the Groundwater Dependent Ecosystem Map published by the Bureau of Meteorology (BOM, 2012). Groundwater interaction refers to a surface water system that is "reliant on surface expression of groundwater". Wambangalang Creek to the north of Obley Road and Cockabroo Creek to the north of Eulandool Road, are both identified by as having a "moderate potential for groundwater interaction" (BOM, 2012).

Flood Regimes

Under extreme rainfall conditions, flood waters will rise from Wambangalang Creek and encroach upon the DZP Site (see **Figure 6**). The design of the Processing Plant and Administration Area infrastructure takes into account the pre-development flood conditions.

Flood waters also rise above the existing road level of Toongi and Obley Roads at Wambangalang Creek, Hyandra Creek and Twelve Mile Creek (under 1 in 5 ARI rainfall conditions).

8.2.3 Water Quality

The ambient (background) surface water quality within and surrounding the DZP Site are described in detail in *Section 4.5* of the EIS (RWC, 2013). In summary, the ambient surface water quality is influenced as follows.

- Significant surface water salinity (electrical conductivities between 1 830µS/cm and 3 800µS/cm) is present in the lower sections of Watercourses B and C and Wambangalang Creek (Catchment 4 of Figure 6). This is typical of the Toongi Catchment which has surface water salinity between 2 000 to 3 000µS/cm, and as high as 6 000µS/cm, commonly recorded (SEEC, 2013). By contrast, the upper reaches of the Cockabroo Creek Catchment (Catchment 1 of Figure 6) recorded low salinity values (electrical conductivities between 95µS/cm and 330µS/cm).
- pH levels between 6.82 to 8.66.
- Turbidity levels between 2.6NTU and 100 NTU.



- Nitrogen and phosphorus levels elevated above ANZECC (2000) criteria.
- Uranium concentration of 13µg/L (which approaches the Australian Drinking Water Guidelines limit of 17µg/L, NHMRC, 2011). Thorium was not present in detectable concentration.

The Plan provides for ongoing water quality monitoring which will provide more targeted baseline data for the individual catchments of the DZP Site (refer to Figure 6).

8.3 SURFACE WATER MANAGEMENT SYSTEM

8.3.1 **Best Management Practices**

The soils of the DZP Site are moderately erodible and generally either fine grained or significantly dispersive (SSM, 2013). Areas of bare soil are therefore potential sources of erosion and subsequent sedimentation unless they are managed correctly.

The management of erosion and sedimentation for the DZP Site and linear infrastructure is provided by a Erosion and Sediment Control Plans(ESCP), prepared by Strategic Environmental and Engineering Consults (SEEC)in accordance with the requirements of Landcom (2004), DECC (2008a) and DECC (2008d), for the Site Establishment (Construction) Phase. The ESCP is provided as **Appendix 3** to the Plan.

The Surface Water Management System has also been designed to manage:

- runoff from ore or waste rock, and which may be contaminated with radionuclides, metals, metalloids or other chemical pollutants ('contact water'); and
- runoff contaminated by chemical reagents, hydrocarbons or processing residues ('contaminated water').

While tailored to the specific water requirements and pollution hazards of individual components, the implementation of the following Best Management Practices (BMPs) will be common to the DZP Site and linear infrastructure construction sites.

- Water from upslope of DZP disturbance ('clean water') will be diverted away from active works areas in accordance with an ESCP for that component area of the DZP.
- Runoff from disturbed areas ('dirty water') will be minimised by:
 - only disturbing land when works are required;
 - delineating no-go areas; i.e. controlling access to only those areas that would be worked: and
 - effectively and promptly stabilising ground that has reached its final design form or land that would not be re-worked within 20 days;
- All dirty water will be directed to appropriately designed sediment basins and either used for processing operations, dust suppression or, following testing to verify the quality of the water is acceptable, discharged to receiving waters.
- Ancillary or secondary measures, to reduce the potential for erosion and sedimentation will be implemented including:
 - reducing slope lengths on disturbed surfaces to control soil loss; _





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- using sediment fence or similar sediment traps where necessary; and
- using a series of "wet-type" sediment basins and actively managing them to the requirements of Landcom (2004) and DECC (2008d).

The specific locations of sediment fences, sediment basins and other secondary control measures are presented in individual ESCPs.

- Any runoff from ore or waste rock, i.e. 'contact water', will be captured within structures designed to be nil discharge.
- All areas where reagents, processing-related chemicals or residues are contained, i.e. containing contaminated water, are operated for nil discharge.
- Inspect all surface water control structures at least monthly and following any rainfall event of more than 10mm in 24-hours to ensure their adequacy, and identify where remedial action is required.
- Ensure that all potentially salt or chemical-laden water, i.e. contaminated water, is retained within the DZP Site and is used for processing operations or is pumped to the LRSF.
- Ensure that all roads within the DZP Site are constructed in accordance with DECC (2008b).
- Ensure that the capacity of existing and proposed water storages to be constructed under the Applicant's harvestable rights does not exceed 223ML.
- Ensure that all areas of proposed disturbance, with the exception of the proposed open cut, are progressively rehabilitated and that surface water control structures are removed once the rehabilitated areas have achieved a 70% cover.

The design specifications and information on construction or installation, maintenance and management of these BMPs are provide<u>d</u> in the ESCP for the Site Establishment (Construction) Phase of the DZP (see **Appendix 3**). Sections 8.3.2 to 8.3.10 consider the critical features of surface water management for the individual components of the DZP Site (critical features of which are identified on **Figure 5**).

8.3.2 DZP Site Administration Area

The DZP Administration Area will generate potentially sediment-laden water during construction. This area would be drained to **SB 2** and **SB 2A** with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see **Table 3**) via engineered outlets.

8.3.3 Laydown and Storage Area

During construction, the Laydown and Storage Area will generate potentially sediment-laden water. This area would be drained to **SB1** with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see **Table 3**) via engineered outlets.

Following construction, the individual storage areas will constructed and managed in accordance with AS 1940. Each will be bunded, with the capacity of bunded area sufficient for at least 110% of the largest container to be stored. Areas beyond the bunded storage areas, will drain to the retained SB 2. Should a spill of reagents occur outside the bunded bays, the outlet to **SB 1** would be closed and any accumulated water collected and transferred to the LRSF.



Further detail on the management of water within this area following construction will be included in Stage 2 of the Plan prior to commencement of mining operations.

8.3.4 Processing Plant Area (and ROM Pad)

During construction, the Processing Plant Area will generate potentially sediment-laden water. This will drain either to the south to **SB 4** or north to **SB 3**, with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see Table 3) via engineered outlets. Both sediment basins have been designed and will be constructed to provide storage for runoff far in excess of the 5-day 90th percentile runoff requirement as they will be converted to nil discharge storage dams for the operating stage of the DZP.

Following construction, the Processing Plant Area will include a mixture of sealed and bunded areas, including the processing plant itself, reagent and chemical storage areas, roads and unsealed hardstand areas. SB 3 will be raised, lined and converted from to the DZP Processing Water Pond from which water will be drawn for processing. All bunded areas will collect potentially-contaminated runoff in a sump for return to the relevant component of the processing operation or neutralised (as required) and pumped to the LRSF.

While considered unlikely by SEEC (2013), detectable levels of some rare earth elements and radionuclides could be entrained in any sediment suspended within runoff from the ROM Pad once ore is stockpiled. As a result, SB 4 has been designed to contain runoff generated by a 100 ARI rainfall event storm volume (3ML) by a factor of two. A pump(s) capable of 30kL/hour will be installed and pump water to the LRSF in the event of heavy rainfall resulting in the capacity of the storage being reduced below 3ML.

Further detail on the management of water within this area following construction will be included in Stage 2 of the Plan prior to commencement of mining operations.

8.3.5 Haul Road

The haul road will be constructed to the standards identified in DECC (2008a) and will drain runoff to a series of small sediment basins (denoted by SBH in the ESCP - see Appendix 3) which will settle water before being transferred to the larger water storages of the SB3 or SB4 or discharging via engineered outlets to vegetated pasture.

The construction of the haul road, and other internal roads, includes several sections with very limited contributing catchments. These sections of the haul road will generate far less than 200t/ha/year of sediment which Landcom (2004) nominates as the threshold for the use of sediment basins. Sediment fencing, installed in accordance with Standard Drawing 6-8 of Landcom (2004), will be used downslope of the construction zone for these catchments.

8.3.6 **Open Cut**

Initial disturbance to within the open cut will be free draining and could produce potentially sediment-laden water. This area will be initially drained to SB9 with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see Table 3) via engineered outlets.

Further detail on management, including progressive ground disturbance and sediment basin construction, will be provided in the Stage 2 Water Management Plan.





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8.3.7 Waste Rock Emplacement

Runoff from the WRE will contain sediments with detectable concentration of metals, rare earths and radionuclides which will drain initially to **SB7** (and later **SB8** as the WRE is developed to the south). In light of the small possibility of runoff containing elevated concentrations of metals (above the General Water Quality Criteria of **Table 3**) or detectable levels of some rare earth elements and radionuclides within the sediment suspended (SEEC, 2013), the storage capacity of these sediment basins have been designed to exceed the 100year t_c storm volume (5ML) by a factor of two.

To prevent a large accumulation of such material, which could be subject to re-mobilisation, sediment will periodically (every three months) be removed and placed within SEC 1 or the Solid Reside Storage Facility (SRSF) when constructed.

A pump capable of transferring at least 100kL/hour will be installed to pump trapped water to one of the LRSF as soon as practicable after in-flow commences.

Further detail on management, including the construction of a second sediment basin within the Cockabroo Creek Catchment, will be provided in the Stage 2 Water Management Plan.

8.3.8 Solid Residue Storage Facility

There will be no disturbance associated with the SRSF during the Construction Stage of the DZP. The detail on water management will be provided in the Stage 2 Water Management Plan.

8.3.9 Liquid Residue Storage Facility and Raw Water Dam

During the construction of the LRSF and Raw Water Dam, rainfall would be diverted around the exposed surfaces through the construction of diversion banks (in accordance with Landcom, 2004 and DECC, 2008d). Incident rainfall on the exposed surfaces during construction will be diverted to **SB 5** with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see **Table 3**) via engineered outlets.

On completion and revegetation of the embankments of the LRSF and Raw Water Dam, the sediment basins will be decommissioned.

8.3.10 Salt Encapsulation Cells

During the construction of Salt Encapsulation Cell (SEC) 1, rainfall would be diverted around the exposed surfaces through the construction of diversion banks (in accordance with Landcom, 2004 and DECC, 2008d). Incident rainfall on the exposed surfaces during construction will be diverted to **SB 6** with discharge of excess stormwater to Wambangalang Creek, subject to achievement of General Water Quality Criteria (see **Table 3**) via engineered outlets.

On completion and revegetation of the embankments of SEC 1, the sediment basins will be decommissioned.

Further detail on the management of water within SEC 1 will be included in Stage 2 of the Plan prior to commencement of mining operations.



EROSION AND SEDIMENT CONTROL 8.4

8.4.1 **DZP Site**

Figure 5 identifies the locations of critical erosion and sediment controls on the DZP Site. **Appendix 3** provides an ESCP prepared by SEEC which nominates the design specifications, construction / installation procedures and maintenance requirements of these controls.

8.4.2 Linear Infrastructure

Appendix 3 provides the ESCP for prepared by SEEC for the construction works associated with the Obley Road upgrade. The civil engineering company awarded the contract to complete road upgrade works will be required to review and either operated in accordance with the ESCP as prepared (see Appendix 3) or prepare an alternative ESCP to the satisfaction of the road authority.

Prior to the commencement of other works on the linear infrastructure, an ESCP will be completed, reviewed by the relevant Manager and/or site supervisor and appended to the Plan. The ESCP will be supplied to the DPE for review and approval prior to the commencement of works.

8.5 DESIGN OBJECTIVES AND PERFORMANCE CRITERIA

8.5.1 Macquarie River Water Pumping Station

The design objectives of the Macquarie River pumping station are as follows.

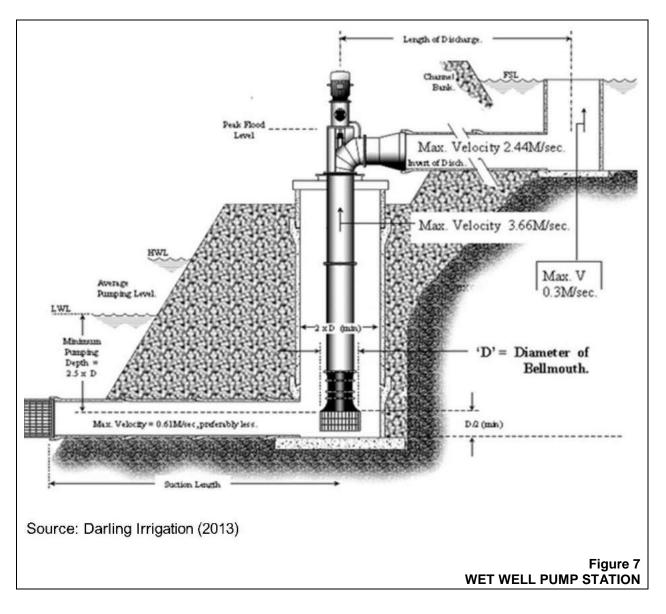
- Efficient point of uptake.
- High reliability and a strong contingency in the case of equipment failure.
- Ease of maintenance and efficient operating costs.
- Environmental controls to minimise potential impact on fish and other aquatic biota.
- Minimal sound and visual emissions for local landholders and recreational river users.
- Minimised power demand and cost effectiveness.

The critical design features of the Macquarie River pumping station are as follows (see also Figure 7).

- River water inlets at an elevation representing the lowest water level recorded in the past 20 years.
- Use of a low-suction velocity fish diversion screen, specifically designed to protect fish and other aquatic life.
- Installation of a wet well, of 1 200mm in diameter, drawing water from the inlets • via a horizontal suction line of 600mm.







- Construction and installation of the wet wells requires a temporary dam within the Macquarie River channel (~5m x 10m) for an auger to operate to bore a horizontal hole for the installation of an intake pipe. From the top of the bank, a void to intersect the horizontal pipeline would be excavated within which the wet wells and pumps would be placed. The intake or 'bell mouth' of the vertical suction line within the wet well will be fitted with a fish diversion screen.
- Pump motors placed approximately 11.5m above the low water level elevation of the inlet valve, i.e. above the 1 in 100 year flood level.
- A small enclosure (5m x 6m with as removable roof), constructed over a concrete foundation slab, to attenuate the noise of the surface motors driving the pumps.

Further information, including information regarding the performance criteria for the Macquarie River pumping station systems will be presented in a future version of the Plan prior to commencement of Stage 2.



8.5.2 Mine Water Storages and Process Water Dams

The design objectives and performance criteria for mine water storages and process water dams are as follows.

Sediment Basins

Table 4 provides the design capacities to be provided by these structures, i.e. sufficient water settlement and sediment storage to accommodate a 5-day 90th percentile rainfall event.

Additional design objectives and performance criteria for these structures are provided in the Erosion and Sediment Control Plan (see Appendix 3).

Containment Basin

Table 4 provides the design capacities to be provided by these structures, i.e. sufficient water storage to accommodate the 1 in 100 ARI time of concentration (t_c) event for the respective catchment.

These structures will be constructed with an effective permeability of 1 x 10⁻⁹m/s over 900mm or less.

These structures will be equipped with pumps to transfer accumulated water to the Process Water Dam or LRSF. These pumps will have capability to pump at the following rates.

- 100kL/hr from SB4.
- 100kL/hr from SB7.
- 50kL/hr from SB8. •

Additional design objectives and performance criteria for these structures are provided in the Erosion and Sediment Control Plan (see Appendix 3).

Process Water Dam

Table 4 provides the design capacity to be provided by this structure, i.e. sufficient water storage to accommodate the 1 in 100 ARI time of concentration (t_c) event for this catchment during construction.

On completion of construction, this dam will be lined with HDPE to prevent seepage to the underlying ground.

Waste Residue Storage Facilities and Salt Encapsulation Cells 8.5.3

To be included in Stage 2 of the Plan prior to commencement of mining operations

8.5.4 **Final Void**

To be included in Stage 2 of the Plan prior to commencement of mining operations





8.5.5 Rehabilitated Lands – Pollution

Sources of pollution from rehabilitated areas of the DZP Site are as follows.

- Elevated suspended sediment within runoff from final landform.
- Saline leachate from completed residue and salt storage facilities and encapsulation cells.
- Elevated metal and/or radionuclide concentration in contact water runoff or leachate from completed residue and salt storage facilities and encapsulation cells.

Section 2.17.2 of RWC (2013), along with Sections 4.3 and 6 of the Mining Operations Plan (MOP) for the DZP (RWC, 2015), present the specific objectives, performance measures and criteria for the rehabilitation of lands within the DZP Site.

8.6 SURFACE WATER MONITORING PROGRAM

8.6.1 Objectives

A surface water monitoring program will be undertaken throughout and following the life of the DZP to achieve the following objectives.

- Establish baseline patterns and volumes of water flow in local drainage lines.
- Establish baseline water quality in the catchments potentially impacted by the DZP.
- Assess water quantities and flow volumes in local drainage lines during and after mining operations.
- Assess water quality in local drainage lines during and after mining operations.
- Assess availability of water (as basic landholder rights) to surrounding landowners.
- Assess the effects of water extraction from the Macquarie River on the local riparian and aquatic environment.
- Assess the effects of the DZP on the local riparian and aquatic environment.
- Confirm the effectiveness of the surface water management measures described in Section 8.3, 8.4 and ESCPs (as completed).
- Review water requirements of the DZP and modify the water balance accordingly.



8.6.2 Monitoring Locations and Frequency

8.6.2.1 Water Management System

During the Construction Stage of the DZP, the performance of the mine water management system will be assessed based on two key parameters.

- 1. Prevention of erosion and sedimentation resulting in excessive erosion and/or discharge of unacceptable quality to receiving waters.
- 2. Ensuring sufficient water is available for the suppression of dust.

The monitoring and maintenance of erosion and sediment controls is provided in the various ESCPs prepared for the DZP Site and linear infrastructure.

Monitoring of water use and availability for dust suppression is discussed in Section 8.6.2.3.

8.6.2.2 Water Quality and Flow

Monitoring of water quality and flow would be undertaken at the following locations for the following purposes (see **Figure 8**).

- SW1 to SW9 and SW19 monitoring of water quality and flow in surrounding creeks and watercourses. This monitoring will be undertaken during the construction stage to establish baseline information, and continue once mining and processing commences to identify and quantify possible impacts.
- SW10 to SW12, SW14, SW15 and SW18 monitoring of water quality within sediment basins prior to discharge. This monitoring will confirm that water accumulated within a sediment basin does not exceed the nominated criteria for TSS, pH and TPH.
- SW13, SW16 and SW17- monitoring of water quality within containment basins for the capture and storage of contact water runoff. This monitoring will be undertaken in the event a discharge to receiving waters from these basins is proposed to confirm that the water accumulated within a sediment basin does not exceed all nominated criteria of **Table 3**.

Additional monitoring points, monitoring of water quality in drainage lines down slope of residue / salt storage facilities to determine if there is any leakage issues associated with those facilities, will be included in Stage 2 of the Plan prior to commencement of mining operations.

The surface water monitoring locations presented on **Figure 8** are further described in **Table 6**.

8.6.2.1 Water Use

Prior to the construction of the Macquarie River Water Pipeline, the use of water on the DZP Site and linear infrastructure construction sites will be monitored 'manually' by counts on water cart / truck usage. That is, records of water loads used will be recorded daily and usage calculated through multiplication of truck loads vs truck capacity.

On construction of the Macquarie River Water Pipeline, but prior to commencement of processing, a flow meter will be placed on the pump to record volumes extracted and transferred to the Raw Water Pond (on construction).



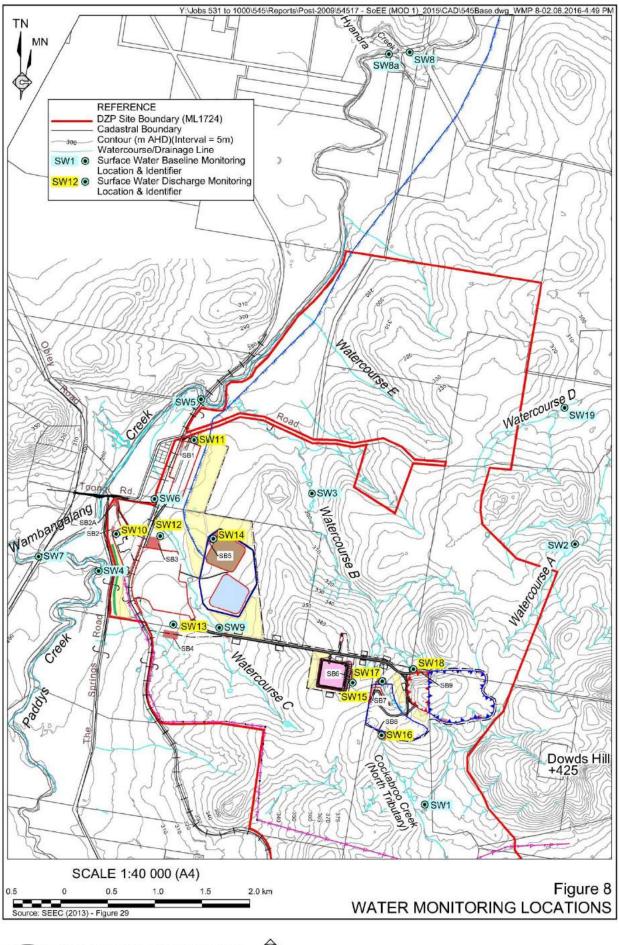


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Identifier	Location		Monitoring	
Identifier	Location	Northing ¹	Easting ¹	(Quality / Flow)
SW1	Cockabroo Creek (North Tributary) on "Glen Idol"	652553	6405721	Quality / Flow ²
SW2	Watercourse A within Catchment 1 on "Ugothery"	654144	6408480	Quality / Flow
SW3	Watercourse B on the DZP Site on "Ugothery"	651361	6409016	Quality / Flow ²
SW4	Paddys Creek, via The Springs Road	649103	6408194	Quality / Flow
SW5	Wambangalang Creek at the Toongi Rail Bridge	650186	6410013	Quality / Flow
SW6	Watercourse C at culvert crossing of Rail Line	649696	6408959	Quality / Flow ^{2,3}
SW7	Wambangalang Creek at confluence of Paddys Creek	648468	6408349	Quality / Flow
SW8	Wambangalang Creek (downstream of confluence with Hyandra Creek)	652394	6413689	Quality / Flow
SW8a	Wambangalang Creek (upstream of confluence with Hyandra Creek)	652176	6413668	Quality / Flow
SW9	Watercourse C on "Whychitella"	650380	6407595	Quality / Flow ²
SW10	Sediment Basin 2	649291	6408588	Quality
SW11	Sediment Basin 1	650115	6409583	Quality
SW12	Sediment Basin 3	649758	6408566	Quality
SW13	Containment Basin 4	649894	6407629	Quality
SW14	Sediment Basin 5	652096	6406456	Quality
SW15	Sediment Basin 6	652104	6407028	Quality
SW16	Containment Basin 8	652435	6407157	Quality
SW17	Containment Basin 7	650115	6409583	Quality
SW18	Sediment Basin 9	649758	6408566	Quality
SW19	Watercourse D within Catchment 1 on "Grandale"	654033	6409923	Quality / Flow
Note 2: Wh	um = MGA (Zone 55) en not flowing, water sampled from standing water within dam flow - stranding water ' in the water monitoring database.	on the watercou	rse. The sample	would be identified a

Table 6 Water Quality and Flow Monitoring Locations

Note 3: Flow is regulated by farm dams and so only reported as Yes / No

On commencement of processing operations, AZL will also monitor the extraction of water from the Raw Water Dam to the processing plant as well as the return of water from the processing plant, LRSF and other components of the DZP to review water reuse and recycling against objectives. The detail on this monitoring, as well as the objectives and performance criteria for water reuse and recycling will be will be presented in a future version of the Plan prior to commencement of Stage 2 (mining and processing).

8.6.2.2 Water Availability (Basic Landholder Rights)

Sites for monitoring possible impacts on water availability, and frequency, will be subject to requests from surrounding landowners.

8.6.2.3 Water Extraction (Macquarie River Pump Station)

On construction of the Macquarie River Pump Station, a riparian zone monitoring point will be established (see Figure 8).





Monitoring by a qualified ecologist will be undertaken at least annually.

8.6.3 Monitoring Methods

8.6.3.1 Water Management System

Monitoring of the overall water management system is described in the respective ESCPs for the DZP Site and linear infrastructure.

8.6.3.2 Water Quality and Flow

8.6.3.2.1 Monitoring Parameters and Frequency

Table 7 identifies the parameters measured at each monitoring site and the frequency of monitoring.

Sections 8.6.3.2.2 and 8.6.3.2.3 outline the monitoring methodology for water quality and flow respectively.

8.6.3.2.2 Water Quality

The procedures water sampling and analysis generally follow those presented in the *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (DEC, 2004).

Page 1 of 2				
Ref	Parameters	Frequency	Comment	
Baseline Watercourse Monitoring				
	pH, TSS, TPH, EC	Quarterly (when flowing) ¹	Following commencement of mining and processing	
	Major anions and cations		operations (Stage 2), monitoring will; continue, however, analyses will now consider possible	
SW1 to SW9, SW19	Metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Zn)	6-monthly	changes in baseline conditions, or trends over time. Note 1: The creeks and drainage lines of the local setting	
	Radionuclides (U & Th)	6-monthly	are ephemeral and will be sampled when flowing.	
	Flow	Quarterly	This may include opportunistic sampling outside of quarterly schedule.	
		Pre-Discharge M	onitoring	
SW10 to SW12, SW14, SW15 & SW18	pH, TSS, TPH, EC	Prior to Discharge	If a discharge is likely to be required, monitoring will be undertaken to compliance with EPL discharge criteria.	
	pH, TSS, TPH, EC	Prior to Discharge		
	Major anions and cations			
SW13, SW16 & SW17	Metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se, Zn)		Monitoring only required if discharge to receiving waters is proposed.	
	U & Th			
	Radionuclides			
	Discharge (Volume) Monitoring			
SW-10 to SW- 18	Volume	On Discharge		

Table 7 Water Quality and Flow Monitoring Parameters and Frequency



Table 7 (Cont'd) Water Quality and Flow Monitoring Parameters and Frequency

			Page 2 of 2
Ref	Parameters	Frequency	Comment
Impact Assessment Monitoring ¹			
	pH, TSS, TPH, EC		
	Major anions and cations	Quarterly (when flowing)	Monitoring only required following commencement
TBC	Metals (Al, As, Cd, Cr, Cu,		of placement of residues or salts to the respective structures.
	Fe, Pb, Hg, Ni, Se, Zn)		Monitoring only required when consistent flow
	U & Th		observed.
	Radionuclides		
ote 1: To b	e included in Stage 2 of the Plan pr	ior to commenceme	nt of mining operations

Monitoring Equipment

The following equipment is used for the collection of surface water samples.

- Chain of custody form and water monitoring sheet.
- Pre-treated and labelled sample containers as per Table 8.
- Marker pen and ink pen.
- Esky (with ice or chilled briquettes).
- Camera.
- Spares kit, including;
 - spare sampling bottles; and
 - marker pen/ink pen.

Table 8 Water Sample Containers

Parameter	Label Colour ¹	Container Type (Preservative)
pH, TSS, EC, Major anions and cations	Green	1 x 500mL Plastic Bottle per sample location.
Metals (Al, As, Cd, Cr, Cu, Fe, Pb, Hg, Ni, Se and Zn)	Red	1 x 60mL Nitric Preserved Plastic Bottle per sample location.
ТРН	Purple	1 x 250mL wide mouth glass jar containing sodium bisulphate.
Radionuclides (Gross alpha & beta Analysis)	Green	1L Plastic Bottle (unpreserved) per sample location.
Note 1: Applies to ALS-supplied bottles		

A minimum of 20 sets of sampling bottles (i.e. sufficient for two rounds of sampling) should be retained on site. The contracted laboratory will arrange for a new supply to be delivered.



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Sampling Procedure

The following procedures apply to surface water sampling.

1. Clearly label each sample bottle **before sampling**, as follows.

Site:	Dubbo Zirconia Project, Toongi
Sampling Location	e.g. SW3
Sample Number:	SW3-001
Date:	15/10/2015
Time:	7:00am
Sampled by:	John Smith

- 2. Remove lid of a green bottle and rinse the bottle with at least 500mL of water from the sample area. Ensure rinsed water is tipped away from the sampling area.
- 3. Fill the green bottle and use it to carefully fill each of the other bottles ensuring not to spill the preservative contained within the other bottles, or mix the lids between bottles. Tighten the sample bottle lids and keep the samples cool until sample dispatch.
- 4. Refill the green bottle to capacity, gently squeezing the bottle's sides while placing the lid on the bottle to minimise the volume of air left in the bottle. Tighten the sample bottle lid and keep the sample cool till sample despatch.
- 5. Prior to leaving each monitoring site, photograph the site and record data on stream flow, water colour or any other relevant matter, on the water monitoring sheet and chain of custody form.

Collected water samples should be stored within the esky with ice bricks and delivered to a NATA accredited laboratory for analysis as soon as possible.

8.6.3.2.3 Water Flow

Record of flow is monitored to provide an indication of the overall volume of water moving within the respective catchments. The measurement for determining flow when sampling for water quality will be qualitative and modified from the Velocity-Area Method of Part 3 of Australian Standard (AS) 3778-2009: Measurement of water flow in open channels (SA, 2009).

The flow will be recorded as either:

- high: rapid movement of water flowing at, or over the defined channel;
- medium: moderate movement of water covering >50% of the defined channel;
- low: slow movement of water covering >50% of the defined channel; or
- none: no movement of water.

A photo will be taken on each occasion for comparison to previous flows.

8.6.3.3 Discharge Volume

Flow meters will be installed on pumps where practical. When a flow meter is not available, a quantitative method will be used to calculate discharge.



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For controlled discharges, i.e. using a pump, the period over which discharge occurs will be multiplied by the approximate flow rate of the pump (expressed in L/s).

For uncontrolled events, i.e. following rainfall events exceeding the design specifications of the respective basin, a back calculation method will be used. The total rainfall during the period will be obtained from the DZP weather station and total volume of runoff calculated using the equation below.

 $V = 10 x C_v x A x R_{x-day, y-\%ile} (m^3)$

Where:

- 10 = a unit conversion factor
- C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period
- $R_{x-day, y-\%ile}$ = the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events, e.g. 5-day, 90th percentile.
- A = total catchment area (ha)

The discharge volume will be calculated as the difference between the available storage capacity and the total volume of runoff within the catchment.

8.6.3.4 Water Use

Prior to the construction of the Macquarie River Water Pipeline, the use of water on the DZP Site and linear infrastructure construction sites will be monitored 'manually' by counts on water cart / truck usage. That is, records of water loads used will be recorded daily and usage calculated through multiplication of truck loads vs truck capacity.

On construction of the Macquarie River Water Pipeline, but prior to commencement of processing, a flow meter will be placed on the pump to record volumes extracted and transferred to the Raw Water Pond (on construction).

8.6.3.5 Landholder Water Rights

To be included in Stage 2 of the Plan prior to commencement of mining operations

8.6.3.6 Water Extraction (Macquarie River Pump Station)

To be included in Stage 2 of the Plan prior to commencement of mining operations

8.7 SURFACE WATER RESPONSE PLAN

8.7.1 Introduction

This section identifies the triggers for further action or response that will apply to the management of surface water of the DZP, and actions and responses that will be implemented in the event that the identified triggers are exceeded. The triggers, actions and responses are considered with respect to:

- water management system generally;
- water discharges;





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- water quality monitoring;
- flow monitoring;
- water use;
- water availability; and
- aquatic environment.

8.7.2 Water Management System

The triggers and actions / responses to be implemented in response to these triggers are presented for the Water Management System in **Table 9**.

8.7.3 Water Discharge

The triggers and actions / responses to be implemented in response to these triggers are presented for the water discharge in **Table 10**.

Trigger	Action / Response
Erosion or Sediment Control Structure Identified during Routine Inspection to be not performing as designed.	Environmental or supervising manager advised of issue.
	 Remedial maintenance works scheduled as soon as practically possible.
	 If issues identified again, a certified (or appropriately qualified) practitioner or erosion and sediment control to be commissioned to provide recommendations for further improvements.
Erosion and sedimentation identified beyond nominated	 Identify flow paths within the relevant catchment and install upslope diversions where possible.
construction areas.	 Complete remedial earthworks, e.g. cross-ripping, scarification, over eroding surface.
	 Install additional downslope (secondary) sedimentation controls, e.g. sediment fencing.
	 Sow grass, to establish a cover (C-) factor of 0.6 within 20 days, or apply alternative stabilisation technique.
Overflow or breach of water	Environmental or supervising manager advised of issue.
diversion or containment structures	• Further flow of water to or through these structures redirected.
Structures	Remedial works completed to repair the breach.
	 Capacity calculations to be reviewed and capacity increased as required.
	 Procedures for inspection of capacity of structures to be reviewed and additional training provided as required.
Hydrocarbon or chemical reagent spill to water containing or management structure.	 Refer to procedures provide in the Pollution Incident Response Management Plan (PIRMP).

 Table 9

 Trigger Action Response Plan – Water Management System



Table 10
Trigger Action Response Plan – Water Discharge

Trigger	Action / Response	
Water quality exceeds the General Water Quality Criteria or Catchment Specific Water Quality Criteria (of Table 3) as defined by the EPL.	• Arrange for further check sampling to be undertaken to confirm the initial monitoring result.	
	 Investigate method for correcting non-compliant result, e.g. flocculent for TSS, neutralising agent for pH. Commission specialist consultant as required. 	
	 Contact the EPA and others, as required, in accordance with the PIRMP and Section 13. 	

8.7.4 Impact Assessment Water Quality Monitoring

The triggers and actions / responses to be implemented in response to these triggers are presented for Impact Assessment Water Quality Monitoring in Table 11.

As there will be no treatment of ore, importation of chemical reagents of placement of residues during the period covered by the Plan, the trigger of **Table 11** is not expected.

Trigger	Action / Response
Water quality exceeds the Catchment Specific Water Quality Criteria (of Table 3) as defined by the EPL.	• Arrange for further check sampling to be undertaken to confirm the initial monitoring result.
	 Undertake supplementary sampling and monitoring at analogue location to confirm the result represents a 'pollution' incident.
	 If supplementary monitoring confirms analogous result, i.e. pollution incident, commence investigation to establish source of pollutant.
	 Repair or remediate source / location of pollution, or cease discharge of residues or salts to this area.
	• Contact the EPA and others, as required, in accordance with the PIRMP and Section 13.

Table 11 Trigger Action Response Plan – Impact Assessment Water Quality Monitoring

8.7.5 Flow Monitoring

The triggers and actions / responses to be implemented in response to these triggers are presented for Impact Assessment Flow Monitoring in Table 12.

8.7.6 Water Use

During the construction stage, the volume of water require by the DZP will be relatively small and as noted in Section 7, easily provided for through surface water harvesting. Triggers and actions during the construction stage covered by the Plan will be more focussed on establishing more accurate records of water requirements for dust suppression.





Trigger	Action / Response
Flows reduced by 50% from equivalent sampling period of previous year.	Review meteorological data to determine whether flow reduction a result of meteorological conditions.
	 If rainfall records do not explain reduction, undertaken investigation of the waterways between the DZP Site and the monitoring site to identify any explanation for flow reduction, e.g. natural damming, extraction by other water user.
	 If no alternative explanation available, prepare a report identifying water collection from the relevant catchment. Engage a suitably qualified consultant as necessary.
	 If the investigation identifies the reduced flow is a direct result of water collected and used on the DZP Site, switch water sourcing to another catchment.
	 If alternative water sourcing not available, consult with DPI Water re: provision of compensatory flows.

Table 12 Trigger Action Response Plan – Flow Monitoring

The triggers and actions / responses to be implemented in response to these triggers are presented for Water Use in **Table 13**.

Table 13Trigger Action Response Plan – Water Use

Trigger	Action / Response
Water use exceeds anticipated water use of the Water Balance (Section 7) by >25%.	 Confirm additional water can still be obtained from identified sources. Update the DZP water balance to account for revised water requirement.

Additional triggers and actions associated with the main water use of the DZP, ore processing, will be provided in the next version of the Plan for Stage 2 operations.

8.7.7 Water Availability – Basic Landowner Rights

AZL is the principal landowner of the local setting with impacted catchments primarily affecting land owned by AZL. Further, assessment of impact on the volume of surface runoff within these catchments (SEEC, 2013) has confirmed that the reduction in available flow to the Wambangalang Creek and Cockabroo Creek catchments (see **Figure 6**) will not exceed 5%.

Within the Undefined Macquarie River catchment (see **Figure 6**), the reduction in flow may be greater (up to 20%) and there could be some effect on the harvestable right of landowners to the north of the DZP Site within this catchment.

The triggers and actions / responses to be implemented in response to these triggers are presented for Water Availability (for the purpose of basic landowner rights) in **Table 14**.



Trigger	Action / Response
Complaint by local landowner as to reduced water availability. Request by local landowner to investigate reduced water availability.	 Review operations and management of water structures within the relevant catchment.
	 If no potential for impact, advise the landowner and no further action required.
	• If additional water infrastructure has been constructed upstream of land owner, or existing dams are used as source of water for dust suppression, compile a report comparing the volume of water sourced from the catchment against the expected runoff from the catchment.
Proportion of water sourced from catchment > 25% of total	 Switch water sourcing to an alternative catchment if practical and provide compensatory water supply to fill landowner dam(s).
expected runoff.	 If not practical to switch source of water, negotiate agreement to provide compensatory supply to the landowner for as long as water to be sourced from catchment upstream of his/her land.

Table 14 Trigger Action Response Plan – Water Availability

As there will be no construction or other development within this catchment, the triggers of **Table 14** are not expected.

9. GROUNDWATER MANAGEMENT PLAN

9.1 INTRODUCTION

This Groundwater Management Plan has been prepared for Stage 1 of the DZP and includes the following in satisfaction of Conditions 3(30)(b)(iii) of SSD-5251.

• Detailed baseline data on groundwater levels, quality and bores that could be affected by the DZP.

As the construction activities covered by Stage 1 of the Plan will not impact directly on groundwater, nor introduce contaminants which could impact on local groundwater quality, the following will be included in future versions of the Plan.

- Groundwater performance criteria, including trigger levels.
- A groundwater monitoring program.
- A plan to respond to any exceedances of the groundwater performance criteria, and mitigate and/or offset any adverse groundwater impacts of the development.

9.2 BASELINE DATA

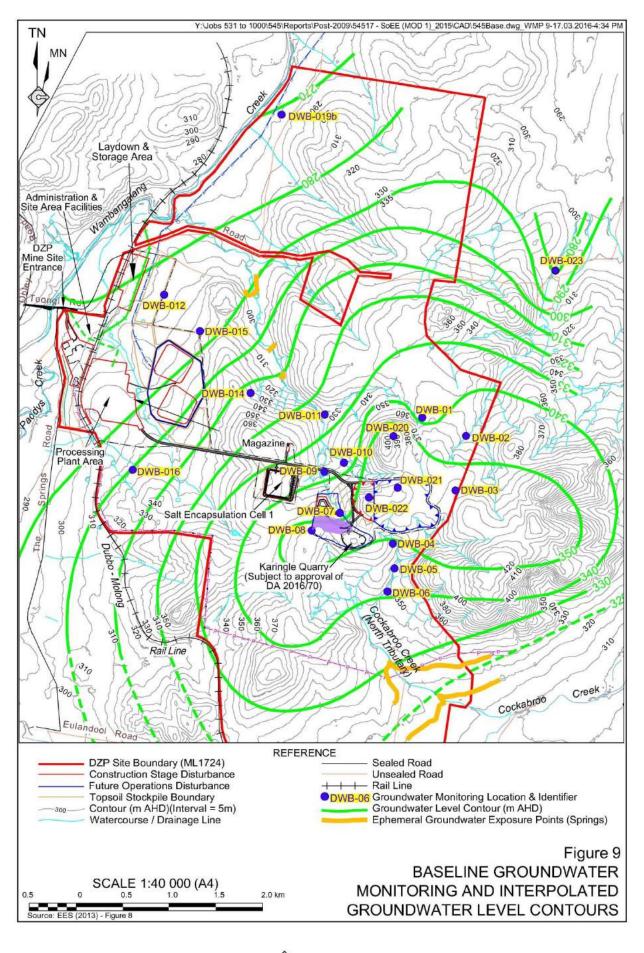
9.2.1 Introduction

Figure 9 identifies the groundwater bores of the DZP Site, monitored in 2002 (Golder, 2002) and 2013 (EES, 2013) to establish baseline conditions.



WATER MANAGEMENT PLAN Report 545/19f

Stage 1



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9.2.2 Groundwater Aquifers

Two connected groundwater systems occur in the Toongi catchment, namely, a consolidated fractured rock system and an unconsolidated sedimentary system consisting mostly of alluvium (with minor colluviums and aeolian deposits).

• Fractured Rock System.

The fractured rock groundwater system is unconfined near the top of the aquifer (water-table surface) but confined at depth, resulting in variations in flow paths (local, intermediate or regional flow systems) (EES, 2013). Groundwater flow is controlled by fractures with preferential flow through formations with a relatively high density of open interconnected fractures. Recharge mechanisms to the fractured rock system have been identified where trachyte intrusions outcrop at the top of the catchment. Some local recharge is expected (and observed) along the alluvial valleys, either as direct rainfall recharge or recharge from the creeks during periods of flow. These systems have been interpreted to be relatively saline due to longer time periods for geochemical interaction with the aquifer matrix (Smithson, 2001).

• Alluvium System.

The alluvium system overlies the fractured rock system (Smithson, 2001) and displays thicknesses ranging from 3.5m below ground level to 43.5m. The alluvium system, being unconsolidated and relatively shallow and fresh, generally corresponds rapidly to recharge via rainfall. As such, groundwater flows from the topographic high points of the Jurassic trachyte intrusions of the DZP Site and Dowds Hill to the southeast towards the local creek systems of Wambangalang and Paddys to the west, Cockabroo to the south and the Macquarie River tributaries to the north.

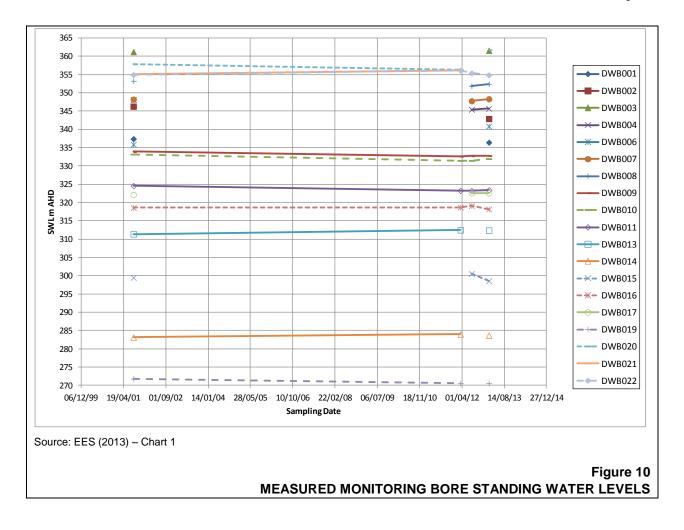
9.2.3 Groundwater Levels and Gradient

Groundwater monitoring programs described in Golder (2002) and EES (2013) illustrates some minor variation in local standing water levels (SWL) which are likely to correspond with rainfall (recharge conditions) (see **Figure 10**). Notably, monitoring in 2001 followed a period of average rainfall whereas monitoring in 2012/2013 followed a period of above average rainfall following an extended drought period (2001 to 2009). On the basis of the preceding rainfall conditions, it is considered that the groundwater levels recorded reflect SWLs at their more elevated levels.

Figure 9 displays the indicative existing groundwater level contours (for 2013) based on interpolation of the SWLs and consideration of such factors as topography and geology.







9.2.4 Groundwater Quality

Groundwater has been collected and analysed for the following analytes.

- pH, electrical conductivity (EC), dissolved oxygen (DO) and Total Dissolved Solids (TDS).
- Major Ions (Na, Ca, Mg, K, NH4, Cl, SO4 and F).
- Nutrients (HCO3, NO3 and PO4).

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- Trace Elements (Sb, As, Ba, B, Cu, Cd, Cr, Fe, Mn, Mo, Ni, Pb, U and Zn).
- Concentrations of uranium and thorium of up to 81µg/L.
- Gross alpha and beta radioactivity <0.2Bq/L.

The results of the analysis resulted in the groundwater being described as of generally good quality water with neutral pH ranges, low concentrations of most dissolved metals and being defined overall as fresh to slightly brackish but identified as not suitable for human consumption (drinking water). Generally the salinity (EC) of the groundwater increases within the fractured rock aquifer the further from the recharge zone. A reduction in salinity is then observed within the alluvium aquifer, presumably in response to direct recharge of fresh water into this aquifer.



9.2.5 Groundwater Availability and Use

Eleven registered bores exist within the DZP Site (see Figure 9) with groundwater yields generally low (<1L/sec). The identified water-bearing zones were found to be within unconsolidated alluvium and colluvial sediments in the lower to mid catchments and likely fracturing of basement rocks in the upper catchment areas. There are also several unregistered bores within the village of Toongi that intercept shallow groundwater within the alluvium system and are used for a mixture of stock and domestic purposes but there are no known large scale groundwater users within a 10km radius of the DZP Site.

As the groundwater quality is not suitable for human consumption, groundwater within the DZP Site is used primarily to support stock watering.

9.3 **GROUNDWATER MANAGEMENT SYSTEM**

To be included in Stage 2 of the Plan prior to commencement of mining operations

9.4 PERFORMANCE CRITERIA AND TRIGGERS

To be included in Stage 2 of the Plan prior to commencement of mining operations

9.5 GROUNDWATER MONITORING PROGRAM

To be included in Stage 2 of the Plan prior to commencement of mining operations

9.6 GROUNDWATER RESPONSE PLAN

To be included in Stage 2 of the Plan prior to commencement of mining operations

10. WATER REUSE MANAGEMENT PLAN

To be included in Stage 2 of the Plan prior to commencement of mining operations

RESIDUE STORAGE FACILITY MANAGEMENT 11. PLAN

To be included in Stage 2 of the Plan prior to commencement of mining operations





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12. COMPLAINTS HANDLING AND RESPONSE

In order to receive, record and respond to any complaints in a timely manner, the Company has established the following.

- Telephone via a 24-hour, 7 day per week Community Information Line.
- A dedicated email address (<u>dzp@alkane.com.au</u>).
- Registration of complaint portal on the Company web site (<u>www.alkane.com.au</u>).

Section 10.1 of the DZP Environmental Management Strategy describes the complaints handling procedure and Section 10.2 of the DZP Environmental Management Strategy the approach to dispute resolution.

Notification of a complaint will be based on whether it classifies as an incident or not (see Section 13).

13. INCIDENT MANAGEMENT, NOTIFICATION AND REPORTING

13.1 INCIDENT IDENTIFICATION

SSD-5251 defines an incident as "a set of circumstances that:

- causes or threatens to cause material harm to the environment; and/or
- breaches or exceeds the limits or performance measures/criteria."

In accordance with the definition provided by Section 147 of the POEO Act, harm to the environment is deemed to be material if:

- (i) it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial; or
- (ii) it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding \$10,000 (or such other amount as is prescribed by the regulations); and
- (iii) loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.

An incident which is causes of threatens to cause material harm to the environment (and may or may not result in an exceedance of water quality criteria) is referred to as a **Pollution Incident**.

An incident which is only as a result of an exceedance of water quality criterion, is referred to as a **Non-compliance Incident**.



INCIDENT MANAGEMENT AND NOTIFICATION 13.2

13.2.1 **Pollution Incident**

Management (including notification) of a pollution incident is to be undertaken in accordance with Section 6 of the DZP Pollution Incident Response Management Plan.

13.2.2 **Non-Compliance Incident**

On identification of a non-compliance against water quality criteria, which may follow receipt of a complaint, the Mine Manager will be notified and an investigation into the source of the noncompliant or complaint causing discharge or event commenced.

An investigation into the cause of the non-compliance will be undertaken involving the personnel involved, supervisory personnel, relevant Manager and/or Environment Manager. On completion of the investigation, the Mine Manager, Environment and Community Manager or delegate will implement one or more of the corrective measures identified in the Surface or Groundwater Response Plans (see Sections 8.7 and 9.6 respectively).

At the earliest opportunity⁵ following the completion of the investigation, a report will be prepared and submitted to the DPE and EPA summarising the investigation and proposed corrective and preventative measures.

If the incident was identified following receipt of complaint, the complainant will be provided with a report confirming the incident, source or cause of the incident, actions taken and ongoing management to prevent subsequent incident at the earliest opportunity (see also Section 10).

13.3 **INCIDENT REPORTING**

Pollution incidents will be reported in accordance with the Section 6.5 of the DZP Pollution Incident Response Management Plan.

In addition to the reports prepared for notification purposes (see Section 13.2), a short report documenting any non-compliance incident, actions taken and results of the corrective actions will be compiled by the Environment Manager, Environmental Superintendent or equivalent position. This report will be provided to the regulatory authorities and/or complainant at the earliest opportunity.

A summary of all incidents, including dates of occurrence, corrective measures taken and success of these measures will be compiled and reported in the Annual Environmental Management Report to the DPE and Annual Return to the EPA.

Unless justification is provided at the time, earliest opportunity refers to the end of the next business day (from completion of investigation) and within 7 days of the incident.





14. PUBLICATION OF MONITORING INFORMATION, NOTIFICATIONS AND REPORTING

AZL will include all water monitoring reports as appendices to the Annual Environmental Management Report. That document, once approved by the relevant government agencies, would be published on the Company's website.

In accordance with the requirements of Section 66(6) of the *Protection of the Environment Operations Act 1997*, AZL will make any of the monitoring data that relates to pollution available on AZLs website within 14 days of obtaining the data. In addition, AZL will provide a copy of obtained data (the value of each individual monitoring sample) free of charge to a member of the public when requested. The data will be published in a format that includes raw data values, is comprehensible by the general public and also includes all accompanying necessary information. These requirements are presented in detail in *Requirements for Publishing Pollution Monitoring Data" (EPA, 2013).*

15. PLAN IMPLEMENTATION

15.1 ROLES AND RESPONSIBILITIES

Table 15 outlines the roles and responsibilities of personnel with reference to management of water.

Role	Responsibilities
Chief Operations Officer	Ensure adequate resources are available to enable implementation of the Plan.
General Manager NSW	Ensure community notifications and negotiations are undertaken as nominated in the Plan and in a timely manner.
The Manager (Construction Operations)	Ensure construction personnel are aware of, and follow the relevant ESCP for the DZP Site of linear infrastructure construction zone.
	Ensure construction is undertaken in accordance with the controls nominated in the Water Management System.
	Inform the Environment and Community Manager of breaches of dams, drains or sediment basins reported by personnel.
	Initiate investigations of complaints as received from public or regulator.
Environment and Community Manager	Ensure the implementation of this Plan (including all ESCPs).
	Ensure all monitoring is undertaken, including aquatic environment monitoring by specialist consultant.
	Review water quality, flow and use monitoring results, and enter into environmental database.
	Review and revise water quality criteria in response to collection of baseline monitoring data.
	Respond to reports from the Manager of breaches of dams, drains or sediment basins.
	Inform and enforce the Trigger Action Response process of the Plan.
	Assist the Manager in investigations of a recorded incident.

Table 15 Roles and Responsibilities



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Table 15 (Cont'd) Roles and Responsibilities

	Page 2 of 2
Role	Responsibilities
Environment and Community Manager (Cont'd)	Prepare a report to regulatory authorities or neighbours following a recorded incident.
	Ensure employees are competent through training and awareness programs.
Maintenance Manager	Ensure all equipment used during construction is in good working order.
Mobile Equipment Operators	Do not operate equipment in No-Go zones identified by ESCPs.
	Construct drains, dams and other water management structures in accordance with provide design specifications.
	Report any breaches of dams, drains or sediment basins, or signs of excessive erosion, to immediate supervisor, the Manager or Environment and Community Manager.
	Follow all instructions provided by the Manager or Environment and Community Manager.
All Personnel	Follow any instructions provided by the Environment and Community Manager or Manager.
	Do not access areas other than by defined roads or access tracks.
	Do not enter flood waters.

15.2 COMPETENCE TRAINING AND AWARENESS

Prior to commencement of work on the DZP Site or specific off-site construction sites, personnel and subcontractors will undertake a DZP Induction. The induction will address occupational health and safety, quality, and environmental issues. *Section 6.3.2* of the DZP *Environmental Management Strategy* describes the overall content of induction to be undertaken. After completing the induction workers will sign a statement of attendance and records of this are kept in the site office.

AZL and contract personnel will also be provided with environmental awareness training. As discussed in *Section 6.3.3* of the DZP *Environmental Management Strategy*, training will be targeted to specific to activities or locations depending on the potential for environmental impact. The training will be prepared and delivered by the Environment Manager (or equivalent position) or delegate, with specific training relevant to air quality management to include the following.

- Incident identification and reporting.
- Water Management Plan obligations and requirements.
- Erosion and Sediment Control, obligations and responsibilities.
- Pollution incident response..





15.3 REVIEW

In accordance with Condition 5, of Schedule 5, of SSD-5251, the Plan will be reviewed and if necessary advised within 3 months of:

- a) the submission of an Annual Review of operations in accordance with Condition 4, of Schedule 5, of SSD-5251 (to be completed by 30 September each year);
- b) any notifiable incident related to water management;
- c) any internal or external audits undertaken of the DZP; and/or
- d) any significant modifications to operations that may influence water management.

These reviews will consider monitoring data, complaints and management measures allowing for water quality triggers and limits to be updated as the DZP progresses from Stage 1 to Stage 2.

These reviews will ensure the adequacy of the Plan and allow for opportunities of adaptive management and continual improvement.



16. **REFERENCES**

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- R.W. Corkery & Co. Pty Limited (RWC) (2013). *Environmental Impact Statement for the Dubbo Zirconia Project*. Prepared for Australian Zirconia Ltd.
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- Strategic Environmental and Engineering Consultants (SEEC) (2013). Surface Water Assessment for the Dubbo Zirconia Project. Volume 1, Part 4 of the Specialist Consultant Studies Compendium.
- Strategic Environmental and Engineering Consultants (SEEC) (2016). Erosion and Sediment Control Plan (Site Establishment Phase) for the Dubbo Zirconia Project.
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Appendix 1

Water-related Conditions of SSD-5251

Schedule 3, Conditions 26 to 30 Schedule 5, Condition 3

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Dubbo Zirconia Project Stage 1

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WATER

Water Supply

- 26. The Applicant shall
 - ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale
 of mining operations to match its available water supply; and
 - (b) prioritise the use of water for environmental management over mining operations where a reduction in water use is required under this condition.

Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain necessary water licences for the development.

Compensatory Water Supply

27. The Applicant shall provide a compensatory water supply to the owner of privately-owned land with riparian frontage within the 'undefined Macquarie River catchment' as identified within the EIS, whose basic landholder water rights (as defined in the *Water Management Act 2000*) are adversely and directly impacted as a result of the development. This supply must be provided in consultation with NOW, and to the satisfaction of the Secretary.

The compensatory water supply measures must provide an alternative long term supply of water that is equivalent to the loss attributable to the development. Equivalent water supply should be provided (at least on an interim basis) as soon as practicable from the loss being identified, unless otherwise agreed with the landowner.

If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

If the Applicant is unable to provide an alternative long term supply of water, then the Applicant shall provide alternative compensation to the satisfaction of the Secretary.

Note: The Water Management Plan (see condition 30) is required to include trigger levels for investigating potentially adverse impacts on basic landholder water rights.

Water Discharges

 The Applicant shall ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the development in any EPL.

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Water Management Performance Measures

29. The Applicant shall comply with the performance measures in Table 8 to the satisfaction of the Secretary.

Table 8: Water management performance measures

Feature	Performance Measure
Water Management – General	Minimise the use of clean water on site. Minimise the need for make-up water from external supplies.
Construction and operation of infrastructure	 Design, install and maintain all infrastructure within 40 m of watercourses to: minimise the impact on watercourse water quality, hydrology and function; minimise the impact on the habitat of aquatic species, populations or communities, consistent with the <i>Guidelines for fish habitat conservation and management – Chapter 4</i> (DPI 2013), or its latest version; ensure pipelines across perennial watercourses are installed by directional drilling (under-boring) or attached to rail or road bridge crossings; and be in accordance with NOW's <i>Guidelines for Controlled Activities on Waterfront Land</i> (2012), or the latest version(s).
Macquarie River Pumping Station	 Design, construct and operate the water intake structure to prevent to the greatest extent practicable the entrapment and/or extraction of aquatic fauna species including juvenile fish and larvae.
Mine Water Management System - General	 Design, install and/or maintain mine water storage infrastructure to prevent the discharge of mine water off-site (this does not apply to sediment control structures that can be designed to discharge in accordance with an EPL). On-site storages are suitably designed, installed and/or maintained to minimise permeability. Maintain adequate freeboard at all times to minimise the risk of discharge to surface waters.
Waste Residue Storage Facilities and Salt Encapsulation Cells	 Nil discharge from site. Design, construct and maintain: in accordance with the recommendations of the NSW Dam Safety Committee; to be stable over the long term and under all expected loading conditions; in accordance with the standards set out in the <i>Environmental Guidelines</i> – Management of Tailings Storage Facilities (VIC DPI, 2006); and to be lined with HDPE liners or equivalent that complies with a minimum permeability standard of < 1 x 10³ m/s in accordance with the <i>NSW Environmental Guidelines for Solid Waste Landfills</i> (EPA, 1996), unless otherwise agreed with the EPA; and to ensure the Solid Residue Storage Facility and Salt Encapsulation Cells are double-lined and include an adequate leak detection system. Ensure that at all times a freeboard of at least 600 mm (or 1000 mm for liquid residue storage facility) or a freeboard capable of accommodating a 1 in 100 year ARI, 72 hour rainfall event (or 1 in 10,000 year for the liquid residue storage facility) without overtopping, whichever is greater.
Waste Rock Emplacement	 Design, install and maintain the emplacement to encapsulate and prevent: migration of potentially acid forming material, and saline and sodic material; and and/or manage long term saline groundwater seepage.
Clean water diversion & storage infrastructure	 Design, install and maintain the clean water diversion system to capture and convey the 100 year ARI flood around the perimeter of the site. Maximise as far as reasonable and feasible the diversion of clean water around disturbed areas on site.
Flood mitigation measures	 Design, install and maintain flood mitigation measures ensuring that the Processing Plant, Administration areas, Waste Residue Storage Facilities, Salt Encapsulation Cells and Waste Rock Emplacement are appropriately protected from flooding up to the 1 in 100 ARI. Residual impacts downstream must be managed in an appropriate manner.
Sediment control structures	 Design, install and maintain erosion and sediment controls generally in accordance with Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries.
Chemical and hydrocarbon storage	 Chemical and hydrocarbon products to be stored in covered, impervious bunded areas in accordance with the relevant Australian Standards.

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Feature	Performance Measure
Aquatic and riparian ecosystem	 Maintain or improve baseline channel stability. Develop site-specific in-stream water quality objectives in accordance with ANZECC 2000 and Using the ANZECC Guidelines and Water Quality Objectives in NSW procedures (DECC 2006), or its latest version

Water Management Plan

- 30. The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary. This plan must:
 - be prepared in consultation with the EPA, NOW and DPI, and be submitted to the Secretary for (a) approval prior to carrying out any development under this consent, unless the Secretary agrees otherwise:
 - (b) in addition to the standard requirements for management plans (see condition 3 of schedule 5), include a:
 - (i) Site Water Balance that:
 - includes details of:
 - sources and security of water supply, including contingency planning for future reporting periods:
 - o water use and management on site, including water use priorities during periods of restricted water supply;
 water transfers to/from the site and discharges; and

 - o reporting procedures, including the preparation of a site water balance for each calendar vear: and
 - · investigates and implements all reasonable and feasible measures to minimise water use on site:
 - (ii) Surface Water Management Plan, that includes:
 - · detailed baseline data on surface water flows and quality in the watercourses that could potentially be affected by the development;
 - · a detailed description of the water management system on site, including the:
 - clean water diversion systems;
 - erosion and sediment controls (for the mine and associated linear infrastructure);
 - o mine water management systems, including Waste Residue Storage Facilities, Salt Encapsulation Cells, Waste Rock Emplacement and ore processing facility; and
 - clean water storages;
 - · detailed plans, including design objectives and performance criteria, for the:
 - design, construction and management of the Macquarie River water pumping station; o design, construction and management of the Waste Residue Storage Facilities and the
 - Salt Encapsulation Cells;
 - design, construction and management of mine water storages and process water dams;
 - o design and management of the final void; and
 - o control of any potential water pollution from the rehabilitated areas of the site;
 - · performance criteria for the following, including trigger levels for investigating any potentially adverse impacts associated with the development, including the:
 - mine water management system;
 - o surface water flows and quality, including channel stability, stream and riparian vegetation health: and
 - o basic landholder water rights for downstream landowners in the 'undefined Macquarie River catchment':
 - a program to monitor and report on:
 - o the effectiveness of the mine water management system, including the Waste Residue Storage Facilities, Salt Encapsulation Cells and associated pipelines between water management structures;
 - o surface water supplies for adjacent landowners;
 - the operation of the Macquarie River water pumping station; and
 - o surface water flows and quality, including channel stability, stream and riparian vegetation health: and
 - a plan to respond to any exceedances of the performance criteria, and mitigate and/or offset any adverse surface water impacts of the development; and

(iii) Groundwater Management Plan, which includes:

- · detailed baseline data on groundwater levels and quality in the region, and privately-owned groundwater bores, that could be affected by the development;
- · groundwater performance criteria, including trigger levels for investigating any potentially adverse groundwater impacts;
- a program to monitor and report on:
 - groundwater inflows to the open cut pit, if relevant;

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- o the seepage/leachate from mine water storages, Waste Residue Storage Facilities and mine voids;
- o the impacts of the development on:
 - regional and local (including alluvial) aquifers;
 - groundwater supply of potentially affected landowners; and
 base flows to Wambangalang Creek; and
- · a plan to respond to any exceedances of the groundwater performance criteria, and mitigate and/or offset any adverse groundwater impacts of the development.

SCHEDULE 5

ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING

ENVIRONMENTAL MANAGEMENT

Environmental Management Strategy

- The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
 - be submitted to the Secretary for approval prior to the commencement of an activity associated with the development;
 - (b) provide the strategic framework for environmental management of the development;
 - (c) identify the statutory approvals that apply to the development;
 - (d) describe the role, responsibility, authority and accountability of all key personnel involved in the environmental management of the development;
 - (e) describe the procedures that would be implemented to:
 - keep the local community and relevant agencies informed about the operation and environmental
 performance of the development;
 - · receive, handle, respond to, and record complaints;
 - · resolve any disputes that may arise during the course of the development;
 - respond to any non-compliance;
 - · respond to emergencies; and
 - (f) include:
 - copies of any strategies, plans and programs approved under the conditions of this consent; and
 - a clear plan depicting all the monitoring required to be carried out under the conditions of this consent.

Adaptive Management

 The Applicant shall assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:

- take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
- (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
- (c) implement remediation measures as directed by the Secretary,
- to the satisfaction of the Secretary.

Management Plan Requirements

- The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:
 - (a) detailed baseline data;
 - (b) a description of:
 - the relevant statutory requirements (including any relevant approval, licence or lease conditions);
 - · any relevant limits or performance measures/criteria;
 - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;
 - a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
 - (d) a program to monitor and report on the:
 - impacts and environmental performance of the development;
 - effectiveness of any management measures (see c above);
 - (e) a contingency plan to manage any unpredicted impacts and their consequences;
 - a program to investigate and implement ways to improve the environmental performance of the development over time;
 - (g) a protocol for managing and reporting any:
 - incidents;
 - complaints;
 - · non-compliances with statutory requirements; and
 - exceedances of the impact assessment criteria and/or performance criteria; and
 - (h) a protocol for periodic review of the plan.

NSW Government

Department of Planning and Environment

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Appendix 2

Water-related Conditions of Environment Protection Licence

(Total No. of pages including blank pages = 6)









L1 Pollution of waters

L1.1 Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.

4 Operating Conditions

O1 Activities must be carried out in a competent manner

- O1.1 Licensed activities must be carried out in a competent manner.
 - This includes:

 a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and

b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.

O4 Other operating conditions

O4.1 Bunding Requirements

All above ground storage facilities containing flammable and combustable liquids must be bunded in accordance with Australian Standard AS 1940-2004.

O4.2 All Toxic Chemicals must be stored in accordance with the requirements of AS/NZS4452- The Storage and Handling of Toxic Substances.

O4.3 Stormwater/Sediment -Construction Phase

A stormwater management scheme must be prepared for all aspects of the construction phase of the development and must be implemented. Implementation of the scheme must mitigate the impacts of stormwater runoff from and within the premises during the construction. The scheme should be consistent with the Stormwater Management Plan for the catchment. Where a Stormwater Management Plan has not yet been prepared the scheme should be consistent with the guidance contained in Managing Urban Stormwater: Control Handbook (available from the EPA).

5 Monitoring and Recording Conditions

M1 Monitoring records

- M1.1 The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.
- M1.2 All records required to be kept by this licence must be:

a) in a legible form, or in a form that can readily be reduced to a legible form;

b) kept for at least 4 years after the monitoring or event to which they relate took place; and

c) produced in a legible form to any authorised officer of the EPA who asks to see them.

- M1.3 The following records must be kept in respect of any samples required to be collected for the purposes of this licence:
 - a) the date(s) on which the sample was taken;
 - b) the time(s) at which the sample was collected;
 - c) the point at which the sample was taken; and
 - d) the name of the person who collected the sample.

M3 Recording of pollution complaints

- M3.1 The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.
- M3.2 The record must include details of the following:
 a) the date and time of the complaint;
 b) the method by which the complaint was made;
 c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
 d) the nature of the complaint;
 e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and

f) if no action was taken by the licensee, the reasons why no action was taken.

- M3.3 The record of a complaint must be kept for at least 4 years after the complaint was made.
- M3.4 The record must be produced to any authorised officer of the EPA who asks to see them.

M4 Telephone complaints line

- M4.1 The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.
- M4.2 The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.
- M4.3 The preceding two conditions do not apply until the date of the issue of this licence.

R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

R2 Notification of environmental harm

- R2.1 Notifications must be made by telephoning the Environment Line service on 131 555.
- Note: The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act.
- R2.2 The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.

G2 Signage

G2.1 The location of each Monitoring and Discharge point must be clearly marked by signs that indicate the point identification number used in this licence and be located as close as practical to the point.

Appendix 3

Erosion and Sediment Control Plan (Site Establishment Phase)

Prepared by



(Total No. of pages including blank pages = 16)



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A3-2



GENERAL EROSION AND SEDIMENT CONTROL REQUIREMENTS

EROSION AND SEDIMENT CONTROL INSTRUCTIONS

The details shown within this Erosion and Sediment Control Plan (ESCP) are for construction stage erosion and sediment control only and do not cover operational erosion and sediment control requirements and management measures.

This ESCP has been prepared in accordance with the "Blue Book" - Managing Urban Stormwater (Landcom, 2004) and "Blue Book Volume 2E - Mines and Quarries".

INSTRUCTIONS

All erosion and sediment controls for each stage/section of works must be installed and functioning prior to undertaking any soil 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 a minimum.

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

Waterway Crossings - Obley Road and Toongi Road

For waterway crossing instructions and staging requirements refer to the details provided on Drawings 15000196 P01 ESCP201 - 206

Mine Site Works

Before commencement of stripping and earthworks for each stage/component of works, the site is to be secured and the following erosion and sediment control measures installed in sequential order 1 to 11. Items 12 to 18 are to be undertaken progressively as required throughout all stages of works (Refer to the Monitoring and Maintenance notes).

- 1. Barrier fencing or suitable administrative controls are to 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 'Access Control' notes.
- 2. Establish sediment fencing in the locations shown on Drawings 15000196 P01 ESCP101-103 (where relevant) and following Standard Drawing SD 6-8 (Refer to the 'Sediment Fencing' notes).
- 3. Establish a site office, toilet and parking area (alternatively existing amenities can be used if suitable).
- 4. Establish stockpile sites for the relevant stage/componenet of works within the designated locations shown on Drawings 15000196 P01 ESCP101-103 and in accordance with the requirements on Standard Drawing SD 4-1 and the 'Stockpiling' notes.
- 5. Temporary waterway crossings are to be installed in accordance with Standard Drawing 5–1.
- 6. Prior to stripping topsoil, gypsum is to be spread evenly over the ground surface at a rate of 5 tonnes/ha (Refer to the 'Soil Treatment and Stabilisation' notes).
- 7. For haul road works, pipe/culverts are to be installed as part of the early works for each section prior to commencing broad scale soil stripping or earthworks within that catchment. Install the pipe/culvert in accordance with Detail 1 on Drawing 15000196 P01 ESCP004.
- 8. Clean water diversion drains are to be formed and stabilised (sizing and lining to future detail). Energy dissipaters are to be installed at the outlets (specifications to future detail).
- 9. 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 for general sediment basin requirements and to

Table 4 for sediment basin sizing specifications. Spillway sizing to future detail).

- 10. Dirty water diversion drains are to be formed and stabilised (sizing and lining to future detail). Energy dissipaters are to be installed at the outlets (specifications to future detail).
- 11. Main earthworks for the relevant stage/component can now commence. 12. Stockpile topsoil and subsoil separately and in accordance with the
- requirements on Standard Drawing SD 4–1 and the 'Stockpiling' notes. 13. Slope lengths across disturbed lands to be maintained at the required
- intervals during all rainfall events (Refer to the 'Slope Lengths' notes).
- 14. Dust suppression to be carried out when required (Refer to the 'Dust Suppression' notes).
- 15. Treatment of dirty water is to be carried out as necessary in accordance with the 'Dirty Water Treatment and Discharge Requirements' notes.
- 16. Monitoring, maintenance and inspections are to be carried out regularly as required, in accordance with the 'Monitoring and Maintenance and Inspection' notes.
- 17. 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).
- 18. Final soil treatment and stabilisation is to be completed in accordance with the 'Soil Treatment and Stabilisation' notes and Table 1.

ACCESS CONTROL

- Barrier fencing or suitable administrative controls are to be used to • delineate the work extent.
- Install barrier fencing around the edge of the works boundary or establish site instructions or protocols to manage disturbance limits. Limit work extent to 2–5m from the edge of the construction агеа.
- 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. Examples are outlined in Table 2.

STOCKPILING

The approved potential stockpile locations are shown on Drawings 15000196 P01 ESCP101-103 for the Mine site. Suggested locations of the temporary stockpiles for the waterway crossing works are shown on Drawings 15000196 P01 ESCP201-206. All stockpiles must be located within these approved areas. All stockpile sites 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:

- Limit stockpiling works to essential areas only (i.e. the stockpile locations shown are potential stockpile sites only and all areas may not be required).
- Stockpiling operations should be staged such that stockpiles are

- 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 20m of a drainage reserve/creek or concentrated flow).

 - height.
 - Where possible the stockpiles within the main site works should be formed/shaped to form a continuous landform (i.e. without mounds and dips) to provide more suitable conditions for future land use. The working face of the stockpile should be battered down to no steeper than 2:1 (H:V). However, where possible stockpile batter faces within the main site works should be further reduced to 4:1 (H:V) or flatter to provide more suitable conditions for future land
 - USP.

 - 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.

SEDIMENT FENCING

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- Install sediment fences in the locations shown on Drawings 15000196 P01 ESCP101 to 103 and 15000196 P01 ESCP201-206. Install all sediment fencing in accordance with Standard Drawing SD 6-8
- 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).

SEDIMENT BASINS

requirements.

- The required sediment basin sizes and details are shown in Table 4. Basins denoted SB are main Mine Site sediment basins and basins denoted SBH are haul road sediment basins. Sediment basins are to be constructed in accordance with Standard Drawing SD 6-4 and engineering and geotechical
- specifications/design.
- Where possible sediment basins are to achieve at least 3:1 length:width from their inlet(s) to their
- Gypsum is to be shallow ripped into the basin internal walls at a rate of 5 tonnes/ha during basin construction.

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- being progressively stabilised as formations progress.
- All stockpiles must have upslope clean water diversions installed wherever potential run-on water is likely.
- Mulched vegetation, topsoil and subsoil (if applicable) are to be stockpiled separately.
- Stockpiles should be constructed to no more than 2 meters in

- Stockpiles are to be trimmed and immediately sown with permanent
- Stabilisation can be achieved by seeding and spraying stockpiles with Vital P47, hydromulching, covering with jute matting or geotextile (or equivalent).
- Sediment fences must be firmly trenched into the ground for their
- The details and requirements shown below are for construction stage sediment basins only and do not address operational stage sediment basin management

spillway. If this is not achieved through the natural shape of the basin, a baffle is to be included.

GENERAL EROSION AND SEDIMENT CONTROL REQUIREMENTS CONTINUED

- Standard construction stage 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 (sizing to future detail). Sediment basins taking potentially contaminated surface flows (i.e. ROM and WRE basins designed to take potentially contaminated runoff for the 100yr ARI peak flow) are to be built to incorporate a primary outlet (weir overflow/spillway) sized to have a capacity to pass the PMF event (sizing to future detail).
- An energy dissipater is to be incorporated into the outlet of each spillway overflow. Dissipaters are 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 and to future engineering design detail.
- 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.
- The sediment basins taking potentially contaminated surface flows (i.e. ROM (SB4) and WRE (SB7 & SB8) basins) will all have diesel pumping systems installed to pump water to one of the nearby storage facilities. Pumping water would commence almost immediately after inflow. The pumps and basin storage capacities have been sized as one system capable of containing the peak 100yr ARI storm event. Basin sizes are shown within Table 4. Minimum required pump sizes are as follows:
 - ROM (SB4) basin = 100kL/hr ...
 - ... WRE (SB7) basin = 100kL/hr
 - ... WRE (SB8) basin = 50 kL/hr
- 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 or an alternative water storage device for later use, it cannot be discharged from the tanker or water storage 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 guality limits (Table 3) and discharged within 5-days or less following a rainfall event.
- Flow or rainfall activated flocculant/coagulant dosing at the . sediment basin inlet/s is preferred.
- Sediment basin forebays are to be constructed and maintained at all inlets into all sediment basins to facilitate cleaning out accumulated sediments from basins.
- 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 within sediment basins or within the general works area (e.g. excavations, pits, 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 discharge.

- . If the water is to be used 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. These are to be identified and approed on the Mine EPL.
- Flow or rainfall activated flocculant/coagulant dosing at the • sediment basin inlet/s is preferred. If manual treatment is carried out, the flocculating/coagulating agent is to be spread evenly over the entire pond surface for maximum effect.

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 (e.g. dustex, dustguard or Vital Stonewall) is available 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.
- 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 (as denoted by C-factors outlined in Table 1) 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 (details to be provided within future desian).
- 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).

SLOPE LENGTHS

...

Ensure slope lengths are maintained at the maximum intervals as specified below across all disturbed lands during any rainfall event: ... 300m for the main site establishment areas; 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.

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MONITORING, MAINTENANCE AND INSPECTIONS

- •
- recorded.

- be re-entrained in runoff.
- - а

 - b. С.
 - control is achieved. d.
 - e.
 - limited to:

b.

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- С.

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

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

Waste receptacles are to be emptied as necessary. Disposal of waste must be in a manner approved by the site superintendent. 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. A log of inspections must be maintained, paying particular attention to:

Removal of spilled soils or other materials from near creeks/drainage lines.

Ensuring barrier fencing is maintained and exclusion zones are being observed by all workers and contractors.

Constructing additional erosion and/or sediment control works as might become necessary to ensure the desired water

Maintaining erosion and sediment control measures in a functioning condition for the duration of the excavation works. 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

Planting additional stabilising vegetation or wind breaks. Stabilising soils with mulches or alternative soil binders. Taking steps to minimise any concentrated stormwater flows.

BACKGROUND AND CALCULATIONS

RUSLE: A = SOIL LOSS (tonnes/ha/yr) = R.K.LS.P.C.

THE AVERAGE ANNUAL SOIL LOSS CALCULATIONS WERE UNDERTAKEN USING THE "BLUE BOOK" – MANAGING URBAN STORMWATER (LANDCOM, 2004)

R-FACTOR	1,360 (MANAGING URBAN STORMWATER, LANDCOM, 2004)					
K-FACTOR	0.04 SOILS ARE TYPE D (DISPERSIBLE)					
LS-FACTOR	VARIES FOR EACH CATCHMENT					
P-FACTOR	1.3 – DEFAULT ASSUMED					
C-FACTOR	1 – DEFAULT ASSUMED					
CATCHMENT AREA	VARIES FOR EACH CATCHMENT					
ESTIMATED SOIL LOSS	> 200 tonnes/yr					
THE "BLUE BOOK" REQUIRES THE INSTALLATION OF A SEDIMENT BASIN ON THE SITE I THE SOIL LOSS > 200 tonnes/yr.						

THE SOIL LOSS FOR THIS SITE IS > 200 tonnes/yr, THEREFORE SEDIMENT BASIN/S ARE

REQUIRED.

SOIL DATA HAS BEEN SOURCED FROM THE ORIGINAL SURFACE WATER ASSESSMENT PREPARED FOR THE DUBBO ZIRCONIA PROJECT BY SEEC, 2013.

ADOPTED VALUES FOR SEDIMENT BASIN AND DRAINAGE CALCULATIONS:

- 5-day, 90th%'ile rainfall depth = 39.9mm (Temporary sediment basins for site establishment/construction stage)
- ROM and WRE basins have been designed for the 100yr ARI time of concentration (tc) event.
- Sediment volumes are sized for an average of 6 months worth of soil loss.
- All basins are designed assuming 100% disturbed catchment area excluding WRE and Extraction Pit basins (SB7 SB12) which have been designed assuming 50% disturbed catchment area.
- 2yr, 6hr ARI event = 7.39mm/hr
- Cv = 0.9 (compacted and impervious surfaces)
- Cv = 0.64 (general disturbance un-compacted)

TAE	TABLE 3					
STORMWATER DISCHARGE/RELEASE LIMITS						
CHARACTERISTIC	LIMIT					
рH	6.5-8.0					
Total suspended solids (mg/L)	50 (Maximum)					
Turbidity (NTU)	An approved correlated NTU value which corresponds to <50mg/L TSS					
Hydrocarbons (visual oils and greases)	Nil					

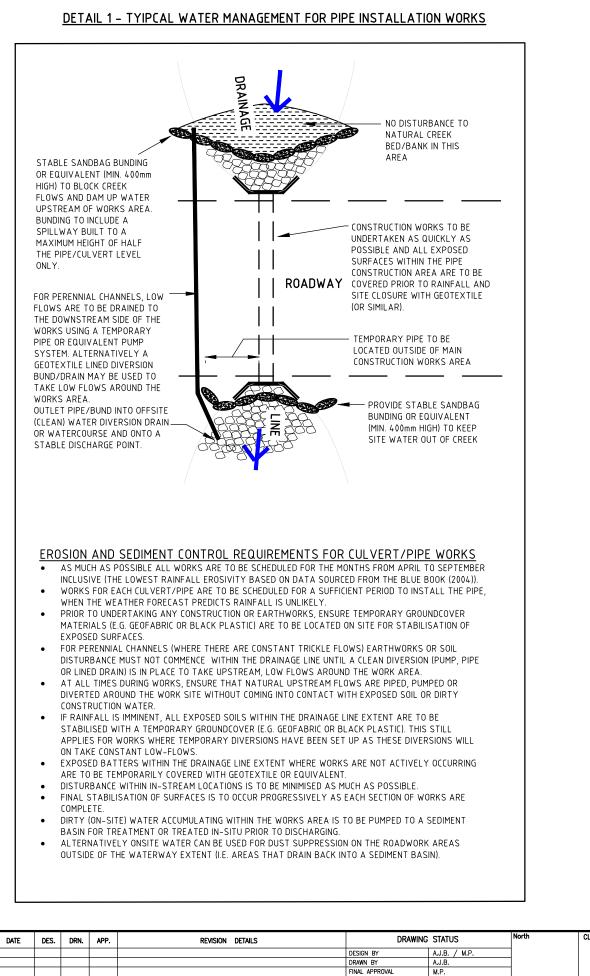
TABLE 1 MA	XIMUM ACCEPT	ABLE C-FACTORS AT NOMINATED TIMES	TABL	E 2 LIMITATIONS	TO ACCESS DURING CONSTRUCTION		
LANDS	MAXIMUM C-FACTOR	REMARKS	LAND USE	LIMITATION	REMARKS		
Waterways and other areas subjected to concentrated flows (e.g. table drains), post construction and during operation	0.05	Applies after ten working days from completion of formation and before they are allowed to carry any concentrated flows. Flows will be limited to those shown in Table 5.2 of Landcom (2004). Foot and vehicular traffic will be prohibited in these areas. Maximum C-factor of 0.05 equals 70% ground cover	Construction areas	Limited to 5 (preferably 2) metres from the edge of any essential construction activity as shown on the engineering plans	All site workers should clearly recognise these areas that, where appropriate, are identified with barrier fencing (upslope) and sediment fencing (downslope) or similar materials.		
Stockpiles and batters, post construction	0.10	Applies after ten working days from completion of formation. Maximum C-factor of 0.10 equals 60% ground cover	Access corridors	Limited to a maximum width of 5 metres	The site manager will determine and mark the location of these zones on site. They can vary in position so as to best conserve existing vegetation and protect downstream areas while being		
All lands, including waterways and stockpiles during	0.15	Applies after 20 working days of inactivity, even though works might continue later. Maximum C-factor of 0.15			considerate of the needs of efficient works activities. All site workers will clearly recognise these boundaries		
construction and operation		equals 50% ground cover	Remaining lands,	Entry prohibited except	Thinning of growth might be necessary, for example, for fire		
All lands post construction 0.05 Applies after 60 working days of completion of works. Maximum C-factor of 0.05 equals 70% ground cover		including revegetation areas	for essential management works	reduction or weed removal			

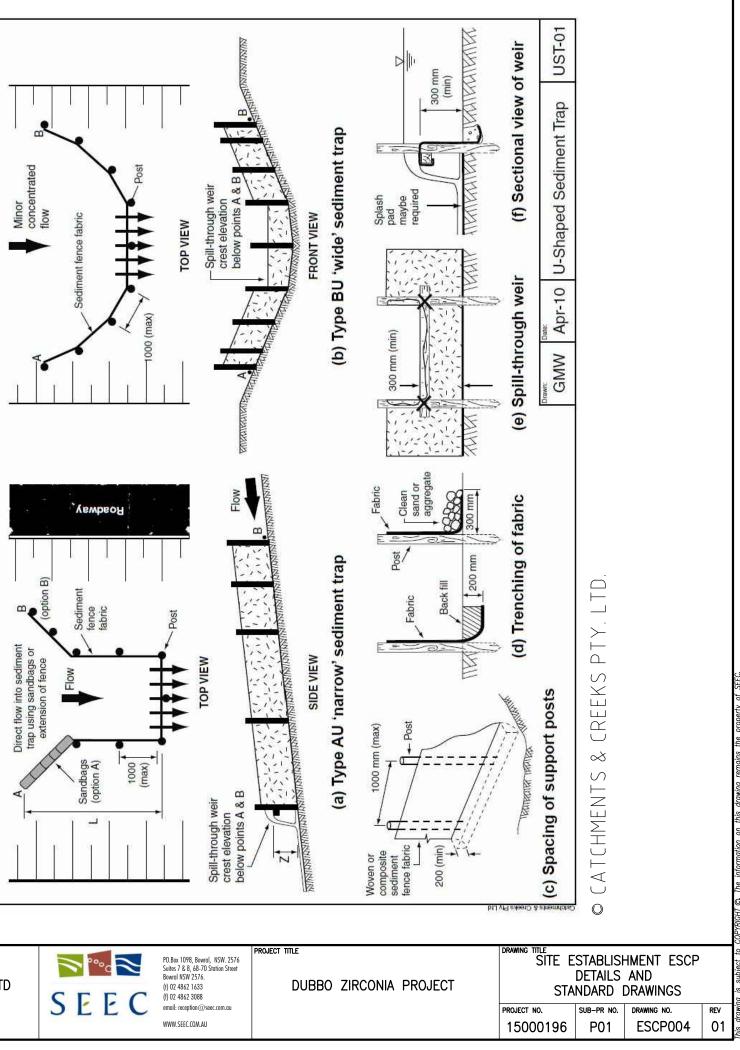
TABLE 4 – SEDIMENT BASIN SIZING DETAILS

Basin	Sediment Storage	Settling Volume	Total Basin Volume	Basin	Sediment Storage	Settling Volume	Total Basin Volume
Dasin	Volume (m ³)	(m ³)	(m³)	Dashi	Volume (m ³)	(m³)	(m³)
SB1	207	3993	4200	SBH1	3	144	147
SB2	690	3602	4292	SBH2	4	251	255
SB2A	10	575	585	SBH3	15	395	410
SB3	2469	17704	20173	SBH4	15	395	410
SB4 (ROM)	306	7641	7947	SBH5	13	359	372
SB5	2144	10929	13073	SBH6	8	215	223
SB6	1137	3269	4406	SBH7	35	790	825
SB7 (WRE)	880	10916	11796	SBH8	14	323	337
SB8 (WRE)	428	5031	5459				
SB9	3702	3473	7175				
SB10		To future detail					
SB11		To future detail					
SB12		To future detail					
- Sediment basi - Sediment basi geotechnically s	in spillway sizing and li ins and their spillways itable and set out in ac	ning specifications to are to be constructed codance with Blue Bo	ns denoted SBH are har to be determined with in accordance with eng ok Standard Drawing SI ed in accordance with e	nin future design gineering and ge D 6-4.	n prior to construction. otechnical specificatio	ons to be structurally	
- Sediment basi - Sediment basi geotechnically s - Permanemt ba geotechnically s - Gypsum is to	in spillway sizing and li ins and their spillways itable and set out in ac asins and their spillway itable. be shallow ripped into	ning specifications to are to be constructed codance with Blue Bo /s are to be constructo the basin walls at a re	to be determined with in accordance with eng lok Standard Drawing SI ed in accordance with e ate of 5 tonnes/ha durin	nin future design gineering and ge D 6-4. Ingineering and ng basin constru	n prior to construction. eotechnical specificatio geotechnical specificat ction.	ons to be structurally	
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- Sediment basi - Sediment basi geotechnically s - Permanemt ba geotechnically s - Gypsum is to - Gypsum is to - Ensure the tot - Ensure suitabl	in spillway sizing and li ins and their spillways itable and set out in ac asins and their spillway itable. be shallow ripped into ial basin volumes are p e access is provided in arker is to be installed	ning specifications to are to be constructed codance with Blue Bo ys are to be constructo the basin walls at a ra the spillway walls at rovided within the av to the sediment basin	to be determined with in accordance with eng ok Standard Drawing SI ed in accordance with e ate of 5 tonnes/ha durin a rate of 10 tonnes/ha railable basin capacity b	nin future design gineering and ge D 6-4. angineering and ng basin constru during basin cor below the spillw , sediment remo	n prior to construction. eotechnical specification geotechnical specification ction. istruction. iay level. aval and maintenance.	ons to be structurally	ly sound and
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						DRAWN BY	A.J.B.				Bowral NSW 2576.		
						FINAL APPROVAL	M.P.		AUSTRALIAN ZIRCONIA LTD		(t) 02 4862 1633	DUBBO 2	ZIRCON
						SCALE:	N/A			CFFC	(f) 02 4862 3088		
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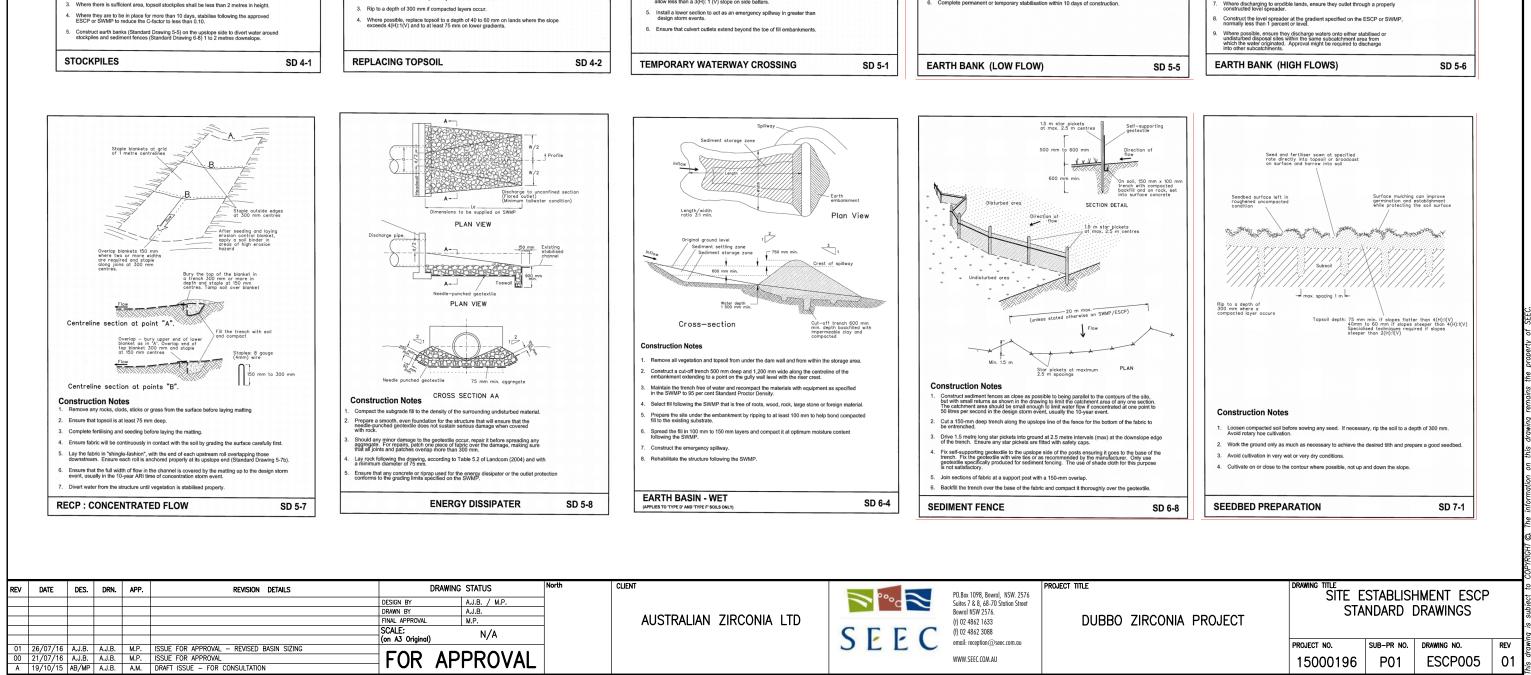
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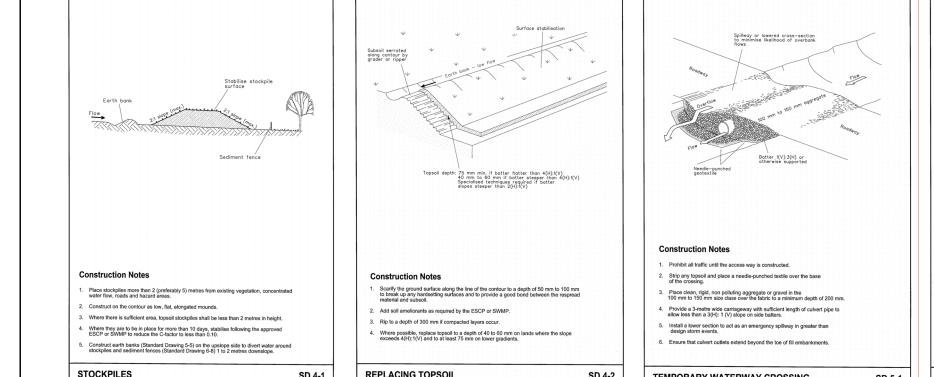


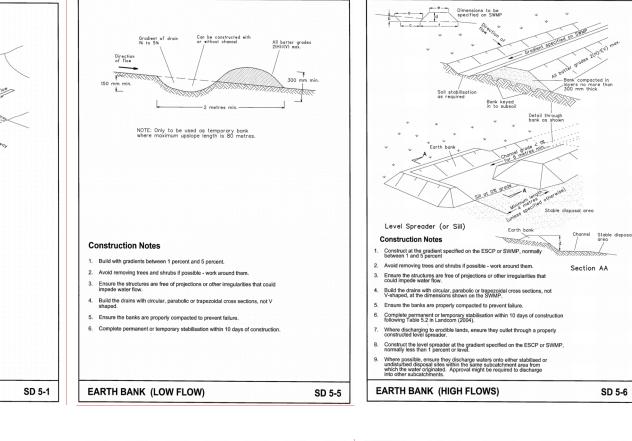
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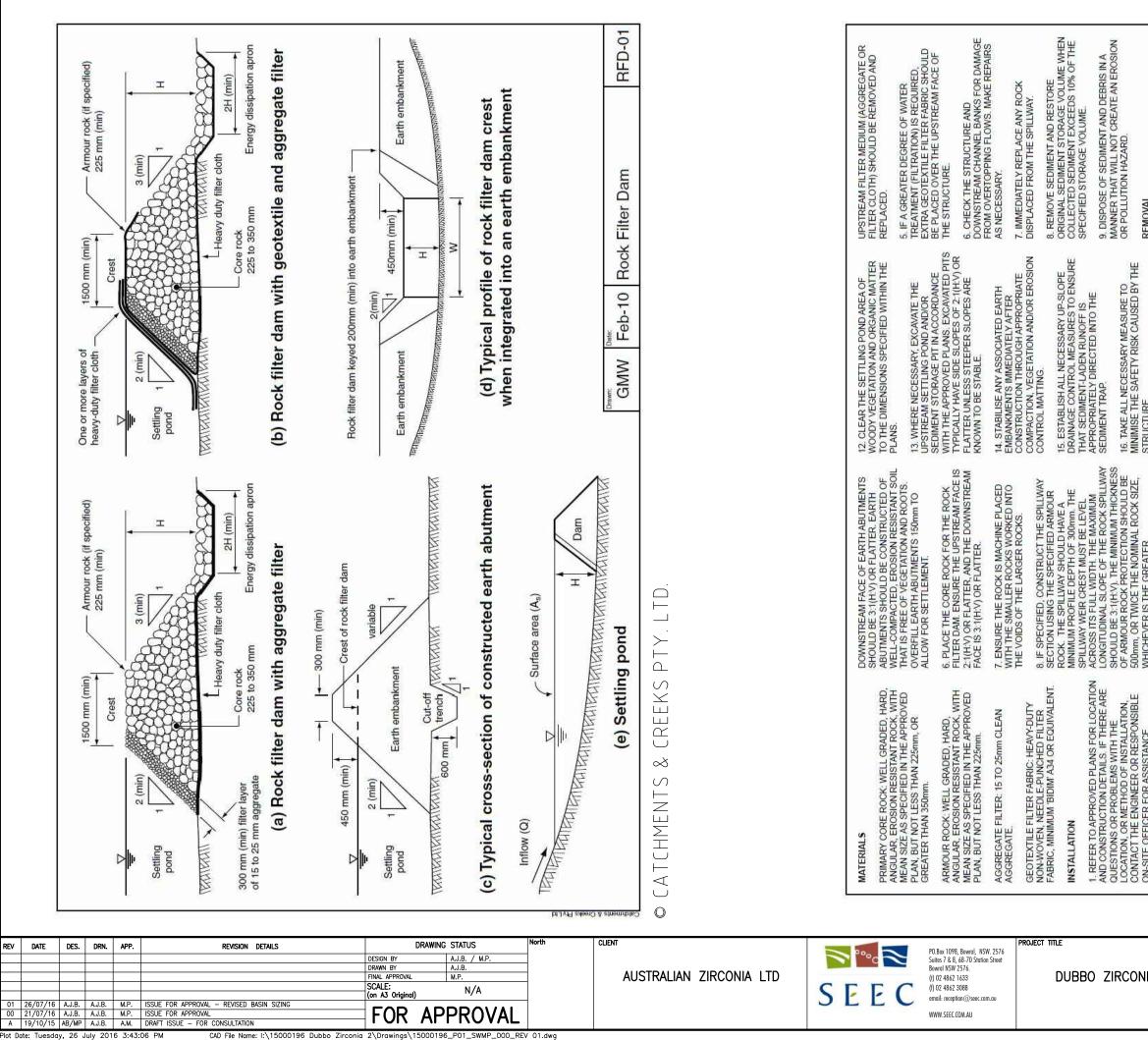


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						DRAWN BY	A.J.B.					Bowral NSW 2576.	
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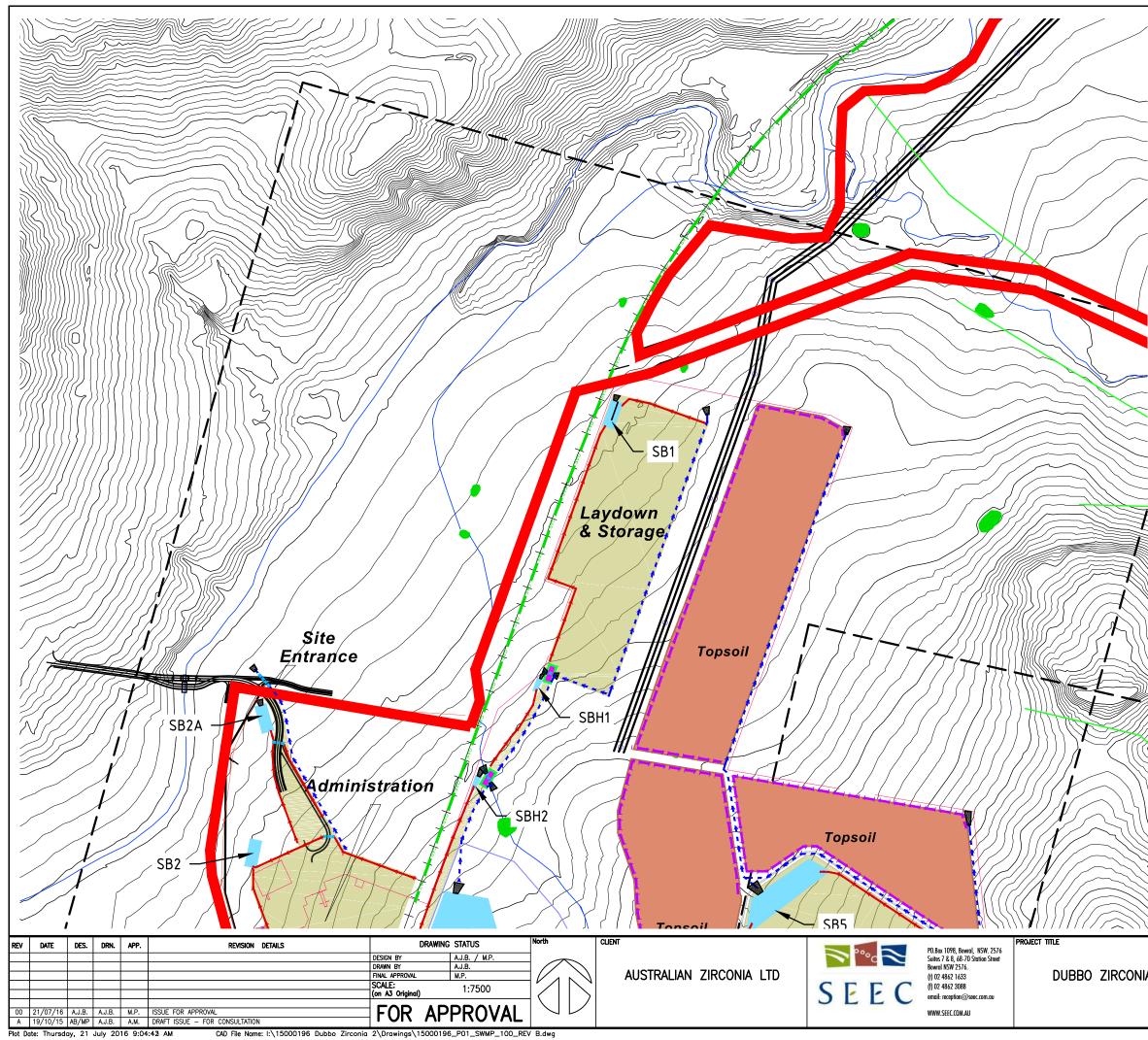




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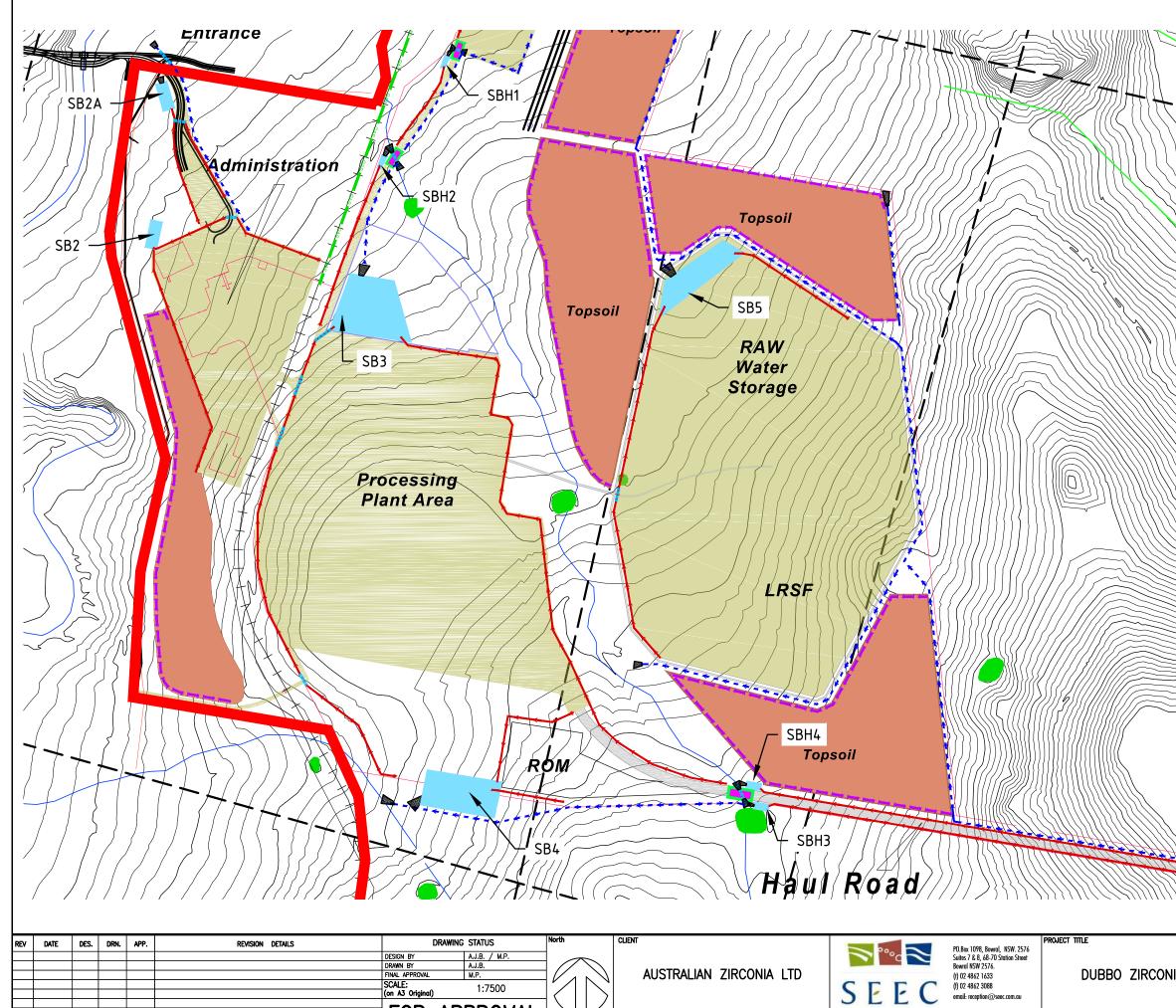


PROJEC		MOLECTO TT TT I O MALAL HOU TH TT TO HOLT O	A BUTTANATOT		I
T	2. CLEAR THE FOUNDAND AREA OF THE ROCK FILTER DAM OF WOODY VEGETATION AND ORGANIC MATTER. DELAY CLEARING THE UP-SLOPE POND AREA UNTIL THE DAM IS FORMED AND IS ABLE TO ACT AS A SUITABLE SEDIMENT TRAP, OTHERWISE AN ALTERNATIVE TEMPORARY DOWNSTREAM SEDIMENT TRAP MAY BE REQUIRED DURING CONSTRUCTION OF THE ROCK FILTER DAM.	9. ENSURE THE SPILLWAY OUTLET SECTION EXTENDS DOWNSTREAM PAST THE TOE OF THE FORMED EMBANKMENT UNTIL STABLE CONDITIONS ARE REACHED, OR A DISTANCE EQUAL TO THE HEIGHT OF THE DAM, WHICHEVER IS THE CREATER. THE EDGES OF THE SURROUNDING GROUND. THE SURROUNDING GROUND.	MAINTENANCE 1. CHECK ALL ROCK FILTER DAMS AFTER EACH RUNOFF EVENT AND MAKE REPAIRS IMMEDIATELY. 2. INSPECT ALL ROCK AND EARTH EMBANKMENTS FOR UNDERCUTTING OR UNDESIRABLE SEEPAGE FLOWS.		EA HAS RIALS NN NN BE PRIOR
	 IF SPECIFIED ON THE PLANS, EXCAVATE A CUT-OFF TRENCH ALONG THE CENTRE-LINE OF THE DAM AND EARTH ABUTMENTS (IF ANY). 4. COVER THE FOUNDATION AREA AND CUT-OFF TRENCH WITH HEAV-DUTY FILTER CUT-OFF TRENCH WITH HEAV-DUTY FILTER CUT-OFF TRENCH WITH HEAV-DUTY FILTER 	TO. INSTALL THE SPECIFIED FILLER (AGGREGATE AND/OR FILTER CLOTH) ON THE UPSTREAM FACE OF THE ROCK FILTER DAM. 11. IF FILTER CLOTH IS USED, THEN: () EXTEND THE FABRIC OVER THE CREST OF THE ROCK FILTER DAM INTO THE SPILLWAY CHITE-	3. IDEALLY, ROCK FILTER DAMS SHOULD DISCHARGE (FROM FULL) OVER NO LESS THAN 8 HOURS. IF DRAINAGE IS TOO RAPID. THEN ADDITIONAL FILTER AGGREGATE MAYBE REQUIRED TO ACHIEVE OPTIMUM HYDRAULIC PERFORMANCE.	IO THE UPAMS REMOVATE UNSPOSE OF SEDIMENT AND WATER IN A MANNER THAT WILL NOT CREATE AN EROSION OR POLLUTION HAZARD. SE 3 BRING THE DISTURBED AREA TO A PROPER GRADE, THEN SMOOTH, COMPACT AND STABILISE AND/COE DISTIGED AREA DO INDED	HAT LLUTION ROPER
STABLISH NDARD SUB-PR NO. P01	MINIMUM OF 600mm.	(ii) CONSIDER THE PLACEMENT OF SEVERAL (ii) CONSIDER THE PLACEMENT OF SEVERAL LAYERS OF OVERLAPPING FABRIC, THUS ALLOWING EACH LAYER TO BE REMOVED INDIVIDUALLY ONCE THE FABRIC BECOMES	4. IF FLOW THROUGH THE STRUCTURE IS REDUCED TO AN UNACCEPTABLE LEVEL, THE		
HMENT DRAWIN drawing n ESCF	BUTMENT (IF ANY), ALL CUT AND FILL SLOPES SHOULD BE 2:1(H:V) OR FLATTER. THE	BLOCKED WITH SEDIMENT.	GMW Apr-10 F	Apr-10 Rock Filter Dam	RFD-02
10.	© CATCHMENTS & CREEKS PTY. LTC	S PTY. LTD.			
rev 01					



<u>LEGEN</u>	ID
*******	STORMWATER PIPE/CULVERT (SIZING TO FUTURE DETAIL (MIN. 450Ø RCP)
→ - —	CLEAN WATER DIVERSION DRAIN/BUND
→	DIRTY WATER DIVERSION DRAIN/BUND
	SEDIMENT FENCE (SD 6-8)
	MINE SITE BOUNDARY
	HAUL ROAD
<u> </u>	EXISTING RAIL LINE
	EXISTING CREEK
	ENERGY DISSIPATER (SD 5-8)
	PIPE/WATERWAY CROSSING (SD 5-1)
	SEDIMENT BASIN (SD 6-4)
	STOCKPILE LOCATIONS (SD 4-1)
-	EXISTING DAM

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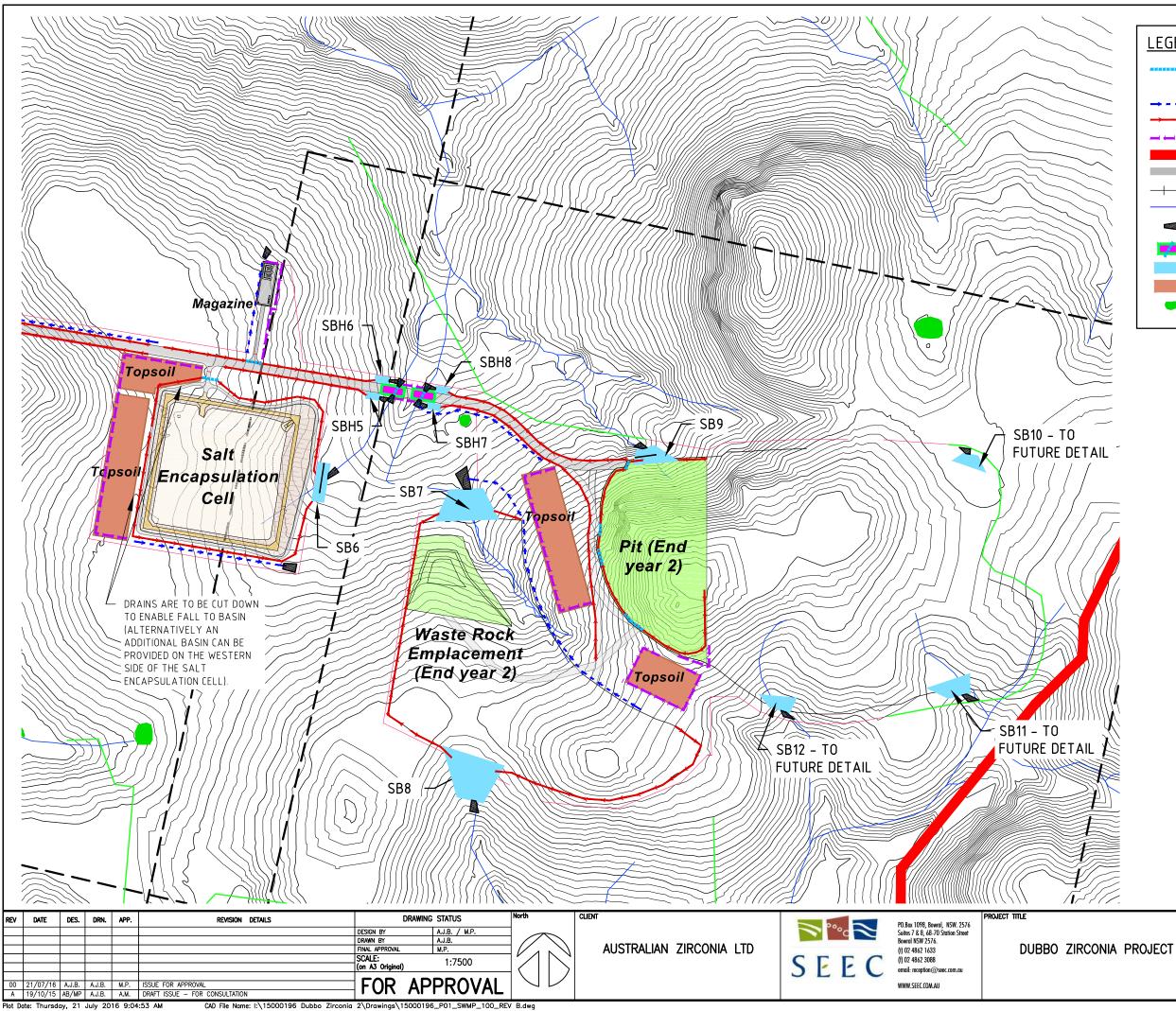
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	SEDIMENT FENCE (SD 6-8)									
	MINE SITE BOUNDARY									
	HAUL ROAD									
	EXISTING RAIL LINE									
	EXISTING CREEK									
	ENERGY DISSIPATER (SD 5-8)									
	PIPE/WATERWAY CROSSING (SD 5-1)									
	SEDIMENT BASIN (SD 6-4)									
	STOCKPILE LOCATIONS (SD 4-1)									
-	EXISTING DAM									



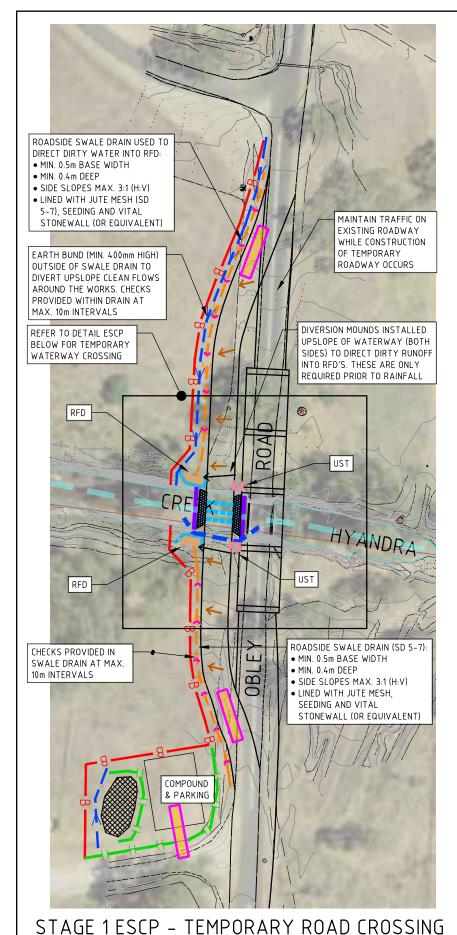
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→	DIRTY WATER DIVERSION DRAIN/BUND										
-	SEDIMENT FENCE (SD 6-8)										
	MINE SITE BOUNDARY										
	HAUL ROAD										
<u> </u>	EXISTING RAIL LINE										
	EXISTING CREEK										
	ENERGY DISSIPATER (SD 5-8)										
	PIPE/WATERWAY CROSSING (SD 5-1)										
	SEDIMENT BASIN (SD 6-4)										
	STOCKPILE LOCATIONS (SD 4-1)										
-	EXISTING DAM										



HYANDRA CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO THIS PLAN) STAGE 2 - BRIDGE CONSTRUCTION (REFER TO DRAWING ESCP202) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO DRAWING ESCP202)

GENERAL

- REFER TO DRAWINGS 15000196 P01 001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS. WHERE FEASIBLE WORKS ARE TO BE SCHEDULED FOR THE MONTHS FROM APRIL TO SEPTEMBER INCLUSIVE (THE LOWEST
- RAINFALL EROSIVITY BASED ON DATA SOURCED FROM THE BLUE BOOK (2004) RAINFALL DISTRIBUTION ZONE 9). PRIOR TO UNDERTAKING ANY WORKS ENSURE TEMPORARY GROUNDCOVER MATERIALS (E.G. GEOTEXTILE, BLACK PLASTIC OR
- SIMILAR) ARE LOCATED ONSITE FOR TEMPORARY STABILISATION OF EXPOSED SURFACES. AT ALL TIMES DURING THE WORKS NATURAL CREEK FLOWS MUST BE DIRECTED AROUND OR THROUGH THE WORK SITE WITHOUT COMING INTO CONTACT WITH EXPOSED SOILS. THIS CAN BE ACHIEVED VIA LINED DIVERSIONS, TEMPORARY PIPES, PUMPS OR
- THROUGH THE PIPE/CULVERT STORMWATER SYSTEM (REFER TO THE RELEVANT PLAN FOR DETAILS). ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED PRIOR TO RAINFALL OR HIGH FLOW EVENTS. THIS APPLIES AT ALL TIMES DURING THE WORKS EVEN IF WATERWAY FLOWS ARE DIVERTED AROUND THE WORKS VIA TEMPORARY PIPES/PUMPS OR DIVERSION CHANNELS AS THESE DIVERSIONS WILL NOT BE ABLE TO TAKE HIGH FLOW EVENTS.
- FINAL STABILISATION OF SURFACES IS TO OCCUR PROGRESSIVELY AS EACH SECTION OF WORKS IS COMPLETED.
- DIRTY WATER ACCUMULATING WITHIN THE WORK AREA IS TO BE TREATED AND TESTED TO COMPLY WITH THE WATER QUALITY DISCHARGE LIMITS PRIOR TO DISCHARGING INTO THE CREEK OR OFFSITE. REFER TO THE 'DIRTY WATER TREATMENT AND DISCHARGE REQUIREMENTS' NOTES.
- MONITORING, MAINTENANCE AND INSPECTIONS ARE TO BE CARRIED OUT REGULARLY AS REQUIRED, IN ACCORDANCE WITH THE 'SITE INSPECTION AND MONITORING' NOTES.

STAGE 1 – TEMPORARY ROAD CROSSING STAGING AND REQUIREMENTS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING. TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 15 TO 17 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS). STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO A MINIMIUM:

SET-UP

- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A SEALED PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND EXIT POINTS' NOTES.
- 3. ESTABLISH A TEMPORARY COMPOUND AND PARKING AREA (LOCATION SHOWN IS INDICATIVE ONLY.
- 4. STOCKPILE AREAS ARE TO BE ESTABLISHED IN LOCATIONS AS SHOWN OR AS SPECIFIED BY THE SITE MANAGER (INCLUDING UPSLOPE DIVERSIONS) AND IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES.
- 5. INSTALL CLEAN WATER DIVERSIONS INCLUDING LINING/STABILISATION.
- 6. INSTALL SEDIMENT FENCING AND ROCK FILTER DAMS (RED'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8 AND IECA SD RFD-01. REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES.

TEMPORARY WATERWAY CROSSING WORKS (REFER TO DETAIL ESCP)

- (THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE, AND WHERE FEASIBLE IN LESS THAN 5 DAYS) 7. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE COMPLETION OF THE TEMPORARY CROSSING
- INSTALLATION. AIM TO COMPLETE AS QUICKLY AS POSSIBLE. 8. AT ALL TIMES DURING THE WORKS IF RAINFALL IS IMMINENT ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE
- COVERED 9. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE WATERWAY AND INSTALL A PUMP/PIPE SYSTEM TO
- TAKE CREEK FLOWS AROUND THE WORKS. PUMP/PIPE DIVERSION TO BE OF SUFFICIENT CAPACITY TO CARRY CREEK BASE FLOWS. 10.0NCE CREEK FLOWS ARE DIVERTED. THE TEMPORARY CROSSING (PIPES AND ROAD DECK) IS TO BE INSTALLED ACROSS THE WATERWAY, USE CLEAN ROCK (TO ENGINEERING DETAIL).
- 11. SCOUR PROTECTION (TO ENGINEERING DETAIL) IS TO BE PROVIDED UP AND DOWNSTREAM OF THE TEMPORARY CROSSING AT THE INLETS AND OUTLETS AND AROUND THE HEADWALL AND ABUTMENTS
- 12.0NCE THE TEMPORARY CROSSING WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY TO DIRECT CREEK FLOWS INTO THE TEMPORARY CROSSING

TEMPORARY ROADWAY WORKS

'STABILISATION' NOTES AND TABLE 1.

- 13.CONSTRUCTION WORKS ON THE TEMPORARY ROADWAY CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS. 14.ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT DIRTY
- WATER INTO THE ROCK FILTER DAMS. CHECKS ARE TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN. 15.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES
- 16.SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS - REFER TO THE 'SLOPE LENGTHS' NOTES.
- 17.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED REFER TO THE 'DUST SUPPRESSION' NOTES. 18.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE
 - DETAIL ESCP TEMPORARY WATERWAY CROSSING

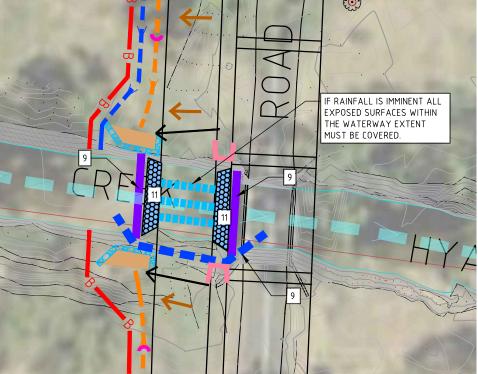
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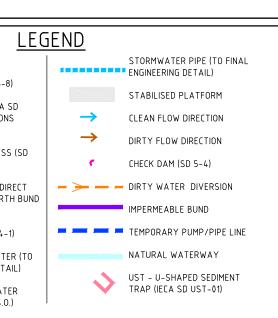
BARRIER FENCE SEDIMENT FENCE (SD 6-8) ROCK FILTER DAM (IECA SD RFD-01 & SPECIFICATIONS BFLOW) STABILISED SITE ACCESS (SD 6 - 14)DIVERSION MOUND TO DIRECT FLOWS (SANDBAG/EARTH BUND OR SIMILAR) STOCKPILE AREA (SD 4-1) ROCK ENERGY DISSIPATER (TO FINAL ENGINEERING DETAIL) STABILISED CLEAN WATER DIVERSION (SD 5-5 U.S.O.)

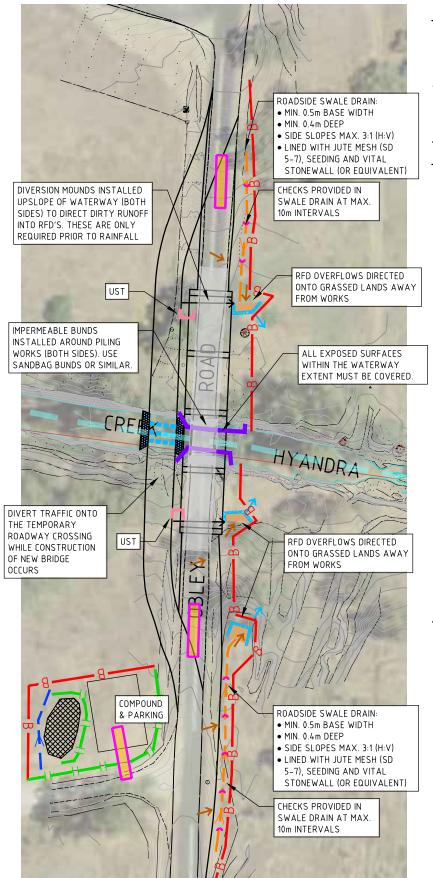
RFD SPECIFICATIONS

- SPECIFICATION: REFER TO SD RFD1 AND SD RFD2 • H: DEPTH TO WEIR = 0.4 M
- FREEBOARD = 0.45 M
- WIDTH OF GRAVEL FILTER (ACROSS FLOW) = 1.0 M
- SETTLING AREA BEHIND WALL = 7 M2
- THICKNESS OF 15-25 MM GRAVEL FILTER = 0.2 M
- BULK OF ROCK WALL TO BE GRADED 75 MM 225 MM HARD ROCK • CREST AND SPILLWAY ROCK = D50 = 225 MM, EXTEND SCOUR APRON ONTO NEAR LEVEL AND STABLE GROUND FOR MINIMUM 1.5 M OR TO WATERWAY. PERIODICALLY REMOVE AND REPLACE THE FILTER LAYER IF IT BECOMES CLOGGED.



STANDARD DRAWINGS AND TYPICAL NOTES ARE PROVIDED ON DRAWINGS 15000196 P01 ESCP000-006.





HYANDRA CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO DRAWING ESCP201) STAGE 2 - BRIDGE CONSTRUCTION (REFER TO THIS PLAN) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO THIS PLAN)

GENERAL

REFER TO DRAWINGS 15000196 P01 001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS. REFER TO THE GENERAL REQUIREMENTS ON DRAWING ESCP201

STAGE 2 – BRIDGE CONSTRUCTION STAGING AND

REQUIREMENTS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING, TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 11 TO 13 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS), STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO AN ABSOLUTE MINIMIUM:

SET-UP

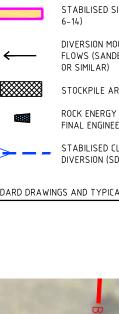
- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES.
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A SEALED PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND EXIT POINTS' NOTES
- 3. INSTALL SEDIMENT FENCING, TRAPS AND ROCK FILTER DAMS (RFD'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8, IECA SD UST-01 AND IECA SD RFD-01 - REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES.
- 4. INSTALL IMPERMEABLE BUNDS AROUND PILING WORKS AND COVER ANY EXPOSED/DISTURBED SURFACES WITHIN THE WATERWAY FXTENT

BRIDGE CONSTRUCTION WORKS

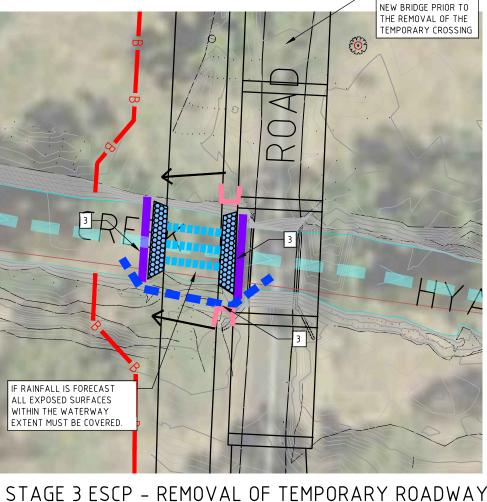
- 5. ONCE ALL OF THE ABOVE MEASURES ARE IN PLACE AND STABLE THE BRIDGE CONSTRUCTION WORKS CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS (INCLUDING ARMOURING AND SCOUR PROTECTION).
- 8. EXISTING ROAD PAVEMENTS ARE TO BE MAINTAINED FOR THE PILING PLATFORM AND BRIDGE WORKING AREA IN THE LOCATIONS SHOWN. IF THE EXISTING PAVEMENTS ARE DISTURBED OR CANNOT BE MAINTAINED ALL SURFACES IN THESE LOCATIONS ARE TO BE MAINTAINED STABLE USING CRUSHED ROCK, AGGREGATE OR SIMILAR. ALTERNATIVELY SURFACES CAN BE SPRAYED WITH A SOIL POLYMER (E.G. VITAL STONEWALL) PRIOR TO RAINFALL.
- 9. ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT DIRTY WATER INTO THE ROCK FILTER DAMS. CHECKS TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN.
- 10.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES. 11. SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS - REFER TO THE 'SLOPE LENGTHS' NOTES.
- 12.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED REFER TO THE 'DUST SUPPRESSION' NOTES.
- 13.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE 'STABILISATION' NOTES AND TABLE 1.

STAGE 3 – REMOVAL OF TEMPORARY ROADWAY CROSSING

- (THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE, AND WHERE FEASIBLE IN LESS THAN 5 DAYS) 1. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE REMOVAL OF THE TEMPORARY CROSSING AND COMPLETION OF STABILISATION WORKS AIM TO COMPLETE AS QUICKLY AS POSSIBLE
- 2. AT ALL TIMES DURING THE WORKS, IF RAINFALL IS IMMINENT ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED.
- 3. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE WATERWAY AND INSTALL A PUMP/PIPE SYSTEM TO TAKE CREEK FLOWS AROUND THE WORKS. PUMP/PIPE DIVERSION TO BE OF SUFFICIENT CAPACITY TO TAKE GENERAL CREEK FLOWS
- 4. ONCE CREEK FLOWS ARE DIVERTED AROUND THE WORKS, THE TEMPORARY CROSSING IS TO BE REMOVED AND
- REHABILITATION/STABILISATION WORKS UNDERTAKEN IN ACCORDANCE WITH ENGINEERING DETAIL. 5. ONCE THE TEMPORARY CROSSING REMOVAL AND REHABILITATION WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY



BFLOW)



CROSSING

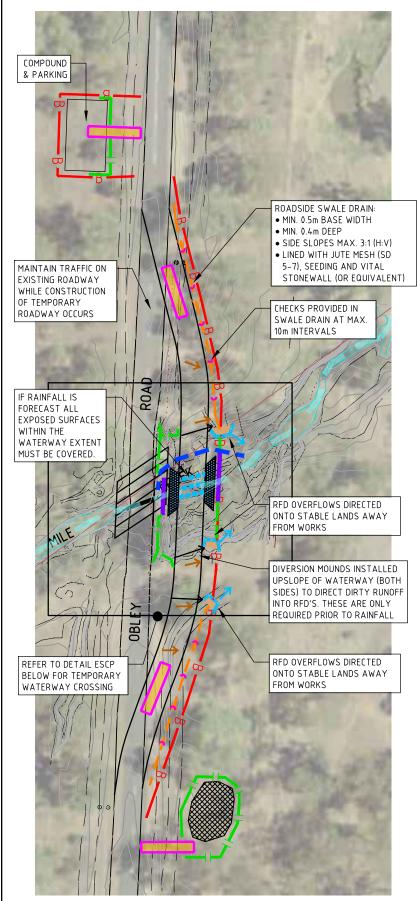
STAGE 2 ESCP - BRIDGE CONSTRUCTION

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STANDARD DRAWINGS AND TYPICAL NOTES ARE PROVIDED ON DRAWINGS 15000196 P01 ESCP000-006.

DIVERT TRAFFIC ONTO

LEGEND BARRIER FENCE STORMWATER PIPE (TO FINAL ENGINEERING DETAIL) SEDIMENT FENCE (SD 6-8) STABILISED PLATFORM ROCK FILTER DAM (IECA SD \rightarrow RFD-01 & SPECIFICATIONS CLEAN FLOW DIRECTION \rightarrow DIRTY FLOW DIRECTION STABILISED SITE ACCESS (SD CHECK DAM (SD 5-4) DIVERSION MOUND TO DIRECT 🗕 声 🗕 🗕 DIRTY WATER DIVERSION FLOWS (SANDBAG/EARTH BUND IMPERMEABLE BUND 💻 💻 τεμρώραρη ριμρ/ρίρει ίνε STOCKPILE AREA (SD 4-1) NATURAL WATERWAY ROCK ENERGY DISSIPATER (TO FINAL ENGINEERING DETAIL) UST - U-SHAPED SEDIMENT TRAP (IECA SD UST-01) STABILISED CLEAN WATER DIVERSION (SD 5-5 U.S.O.)



STAGE 1 ESCP - TEMPORARY ROAD CROSSING

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TWELVE MILE CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO THIS PLAN) STAGE 2 - CULVERT CONSTRUCTION (REFER TO DRAWING ESCP204) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO DRAWING ESCP204)

<u>GENERAL</u>

- REFER TO DRAWINGS 15000196_P01_001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS.
 WHERE FEASIBLE WORKS ARE TO BE SCHEDULED FOR THE MONTHS FROM APRIL TO SEPTEMBER INCLUSIVE (THE LOWEST
- RAINFALL EROSIVITY BASED ON DATA SOURCED FROM THE BLUE BOOK (2004) RAINFALL DISTRIBUTION ZONE 9). PRIOR TO UNDERTAKING ANY WORKS ENSURE TEMPORARY GROUNDCOVER MATERIALS (E.G. GEOTEXTILE, BLACK PLASTIC OR
- SIMILAR) ARE LOCATED ONSITE FOR TEMPORARY STABILISATION OF EXPOSED SURFACES. AT ALL TIMES DURING THE WORKS NATURAL CREEK FLOWS MUST BE DIRECTED AROUND OR THROUGH THE WORK SITE WITHOUT
- COMING INTO CONTACT WITH EXPOSED SOILS. THIS CAN BE ACHIEVED VIA LINED DIVERSIONS, TEMPORARY PIPES, PUMPS OR THROUGH THE PIPE/CULVERT STORMWATER SYSTEM (REFER TO THE RELEVANT PLAN FOR DETAILS).
- ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED PRIOR TO RAINFALL OR HIGH FLOW EVENTS. THIS
 APPLIES AT ALL TIMES DURING THE WORKS EVEN IF WATERWAY FLOWS ARE DIVERTED AROUND THE WORKS VIA TEMPORARY
 PIPES/PUMPS AS THESE DIVERSIONS WILL NOT BE ABLE TO TAKE HIGH FLOW EVENTS.
- FINAL STABILISATION OF SURFACES IS TO OCCUR PROGRESSIVELY AS EACH SECTION OF WORKS IS COMPLETED.
- DIRTY WATER ACCUMULATING WITHIN THE WORK AREA IS TO BE TREATED AND TESTED TO COMPLY WITH THE WATER QUALITY DISCHARGE LIMITS PRIOR TO DISCHARGING INTO THE CREEK OR OFFSITE. REFER TO THE 'DIRTY WATER TREATMENT AND DISCHARGE REQUIREMENTS' NOTES.
- MONITORING, MAINTENANCE AND INSPECTIONS ARE TO BE CARRIED OUT REGULARLY AS REQUIRED, IN ACCORDANCE WITH THE 'SITE INSPECTION AND MONITORING' NOTES.

<u>STAGE 1 – TEMPORARY ROAD CROSSING STAGING AND</u> <u>REQUIREMENTS</u>

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING, TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 14 TO 16 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS). STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO A MINIMIUM:

SET-UP

- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES.
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A SEALED PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND EXIT POINTS' NOTES.
- 3. ESTABLISH A TEMPORARY COMPOUND AND PARKING AREA (LOCATION IDENTIFIED IS INDICATIVE ONLY).
- 4. STOCKPILE AREAS ARE TO BE ESTABLISHED IN LOCATIONS AS SHOWN OR AS SPECIFIED BY THE SITE MANAGER (INCLUDING UPSLOPE DIVERSIONS) AND IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES.
- 5. INSTALL SEDIMENT FENCING, TRAPS AND ROCK FILTER DAMS (RFD'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8, IECA SD UST-01 AND IECA SD RFD-01 - REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES.

TEMPORARY WATERWAY CROSSING WORKS (REFER TO DETAIL ESCP)

(THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE, AND WHERE FEASIBLE IN LESS THAN 5 DAYS) 6. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE COMPLETION OF THE TEMPORARY CROSSING

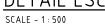
- 6. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE COMPLETION OF THE TEMPORARY CROSSIN INSTALLATION. AIM TO COMPLETE AS QUICKLY AS POSSIBLE.
- 7. AT ALL TIMES DURING THE WORKS IF RAINFALL IS IMMINENT ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED.
- 8. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE HIGH FLOW SECTION OF THE WATERWAY AND IF REQUIRED INSTALL AND OPERATE A PUMP/PIPE SYSTEM OF SUFFICIENT CAPACITY TO CARRY BASE CREEK FLOWS. PUMP/PIPE DIVERSION MAY NOT BE REQUIRED IF CREEK IS DRY OR WATER IS STAGNANT.
- 9. ONCE THE BUND AND DIVERSION SYSTEM IS SET UP, THE TEMPORARY CROSSING (PIPES AND ROAD DECK) IS TO BE INSTALLED ACROSS THE WATERWAY. USE CLEAN ROCK (TO ENGINEERING DETAIL).
- 10.SCOUR PROTECTION (TO ENGINEERING DETAIL) IS TO BE PROVIDED UP AND DOWNSTREAM OF THE TEMPORARY CROSSING AT THE INLETS AND OUTLETS AND AROUND THE HEADWALL AND ABUTMENTS.
- 11. ONCE THE TEMPORARY CROSSING WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM (IF INSTALLED) AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY TO DIRECT CREEK FLOWS INTO THE TEMPORARY CROSSING.

TEMPORARY ROADWAY WORKS

- 12.CONSTRUCTION WORKS ON THE TEMPORARY ROADWAY CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS. 13.ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT DIRTY WATER INTO THE ROCK FILTER DAMS. CHECKS ARE TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN.
- 14.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES.
- 15.SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS REFER TO THE 'SLOPE LENGTHS' NOTES.
- 16.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED REFER TO THE 'DUST SUPPRESSION' NOTES. 17.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN
- WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE 'STABILISATION' NOTES AND TABLE 1.

ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED.

IF RAINFALL IS FORECAST



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							DRAWN BY	A.J.B.				Bowral NSW 2576.	
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SPECIFICATION:

• H: DEPTH TO WEIR = 0.4 M

FREEBOARD = 0.45 M

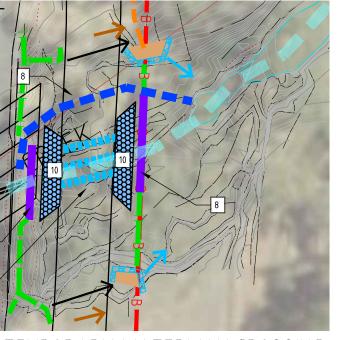
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NCE	STORMWATER PIPE (TO FINAL
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R DAM (IECA SD PECIFICATIONS	-> CLEAN FLOW DIRECTION
	DIRTY FLOW DIRECTION
SITE ACCESS (SD	CHECK DAM (SD 5-4)
YOUND TO DIRECT	🗕 ≽ 🗕 🗕 DIRTY WATER DIVERSION
	IMPERMEABLE BUND
AREA (SD 4-1)	TEMPORARY PUMP/PIPE LINE
5Y DISSIPATER (TO IEERING DETAIL)	NATURAL WATERWAY
CLEAN WATER SD 5-5 U.S.O.)	UST - U-SHAPED SEDIMENT TRAP (IECA SD UST-01)

STANDARD DRAWINGS AND TYPICAL NOTES ARE PROVIDED ON DRAWINGS 15000196_P01_ESCP000-006.

RFD SPECIFICATIONS

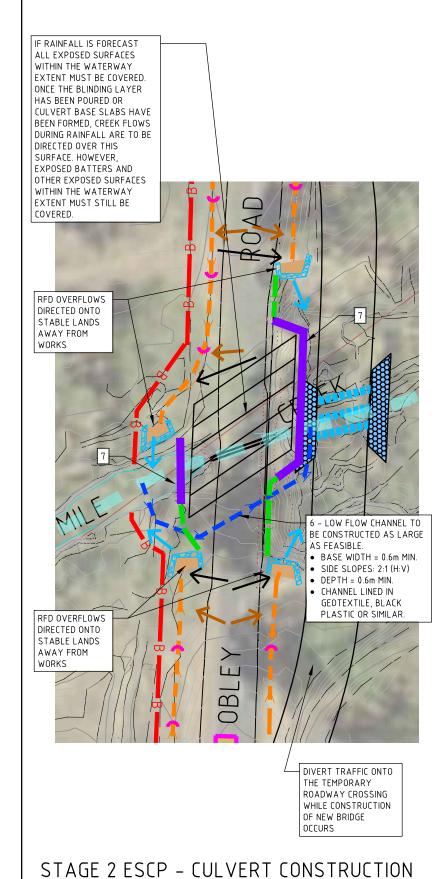
• REFER TO SD RFD1 AND SD RFD2

WIDTH OF GRAVEL FILTER (ACROSS FLOW) = 1.0 M
SETTLING AREA BEHIND WALL = 7 M2
THICKNESS OF 15-25 MM GRAVEL FILTER = 0.2 M
BULK OF ROCK WALL TO BE GRADED 75 MM - 225 MM HARD ROCK
CREST AND SPILLWAY ROCK = D50 = 225 MM, EXTEND SCOUR APRON ONTO NEAR LEVEL AND STABLE GROUND FOR MINIMUM 1.5 M OR TO WATERWAY.
PERIODICALLY REMOVE AND REPLACE THE FILTER LAYER IF IT BECOMES CLOGGED.



DETAIL ESCP - TEMPORARY WATERWAY CROSSING

CONIA PROJECT	TEMPOF		.E CREEK AD CROSSING STAGE 1	3
	PROJECT NO.	SUB-PR NO.	DRAWING NO.	REV
	15000196	P01	ESCP203	00



TWELVE MILE CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO DRAWING ESCP203) STAGE 2 - CULVERT CONSTRUCTION (REFER TO THIS PLAN) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO THIS PLAN)

GENERAL

- REFER TO DRAWINGS 15000196_P01_001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS
- REFER TO THE GENERAL REQUIREMENTS ON DRAWING ESCP203

STAGE 2 – CULVERT CONSTRUCTION STAGING AND REQUIREMENTS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING, TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 12 TO 14 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS). STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO AN ABSOLUTE MINIMIUM

SET-UP

- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES.
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND FXIT POINTS' NOTES.
- 3. INSTALL SEDIMENT FENCING, TRAPS AND ROCK FILTER DAMS (RFD'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8. IECA SD UST-01 AND IECA SD RFD-01 - REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES.

CULVERT CONSTRUCTION WORKS

- 4. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE BLINDING LAYER OF THE CULVERT TO BE POURED. AIM TO COMPLETE AS QUICKLY AS POSSIBLE.
- 5. AT ALL TIMES DURING THE WORKS IF RAINFALL IS IMMINENT ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED.
- 6. CONSTRUCT AND LINE THE LOW FLOW CLEAN WATER DIVERSION CHANNEL AROUND THE CULVERT WORKS. 7. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE HIGH FLOW SECTION OF THE WATERWAY
- AND DIRECT CREEK FLOWS INTO THE CLEAN WATER DIVERSION CHANNEL TO TAKE LOW FLOWS AROUND THE WORKS. 8. ONCE CREEK FLOWS ARE DIVERTED AROUND THE WORKS, THE CULVERT WORKS CAN COMMENCE.
- 9. SCOUR PROTECTION (TO ENGINEERING DETAIL) IS TO BE PROVIDED UP AND DOWNSTREAM OF THE CULVERT CROSSING AT THE INLETS AND OUTLETS AND AROUND THE HEADWALL AND ABUTMENTS.
- 10.0NCE THE CULVERT WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY TO DIRECT CREEK FLOWS INTO THE NEWS CULVERTS.

ROAD CONSTRUCTION WORKS

- 11. CONSTRUCTION WORKS ON THE ROADWAY CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS. 12.ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT
- DIRTY WATER INTO THE ROCK FILTER DAMS. CHECKS TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN. 13.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES. 14.SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS - REFER TO THE 'SLOPE LENGTHS' NOTES.
- 15.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED (REFER TO THE 'DUST SUPPRESSION' NOTES. 16.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE 'STABILISATION' NOTES AND TABLE 1

STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING

- (THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE, AND WHERE FEASIBLE IN LESS THAN 5 DAYS) 1. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE REMOVAL OF THE TEMPORARY
- CROSSING AND COMPLETION OF STABILISATION WORKS. AIM TO COMPLETE AS QUICKLY AS POSSIBLE. 2. AT ALL TIMES DURING THE WORKS IF RAINFALL IS IMMINENT ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT
- MUST BE COVERED. 3. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE HIGH FLOW SECTION OF THE WATERWAY
- AND AND IF REQUIRED INSTALL AND OPERATE A PUMP/PIPE SYSTEM OF SUFFICIENT CAPACITY TO TAKE CREEK FLOWS AROUND THE WORKS. PUMP/PIPE DIVERSION MAY NOT BE REQUIRED IF CREEK IS DRY OR WATER IS STAGNANT. 4. ONCE THE DIVERSION SYSTEM IS SET UP, THE TEMPORARY CROSSING IS TO BE REMOVED AND
- REHABILITATION/STABILISATION WORKS UNDERTAKEN IN ACCORDANCE WITH ENGINEERING DETAIL
- 5. ONCE THE TEMPORARY CROSSING REMOVAL AND REHABILITATION WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY

CROSSING

DIVERT TRAFFIC OVER

NEW CULVERTS PRIOF

TO THE REMOVAL OF

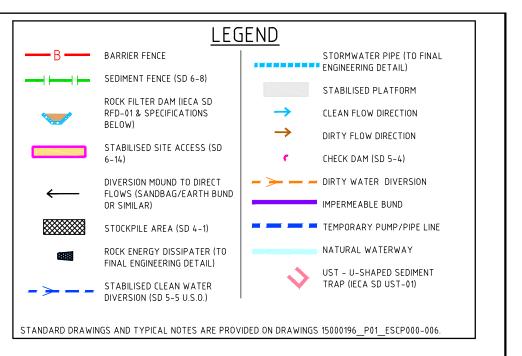
THE TEMPORARY

CROSSING

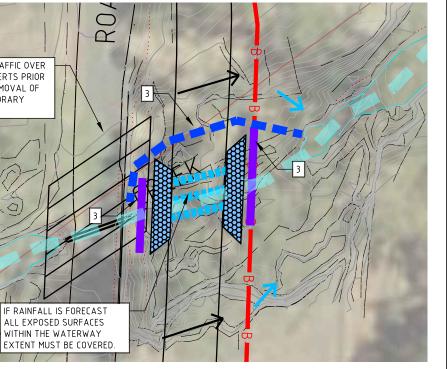
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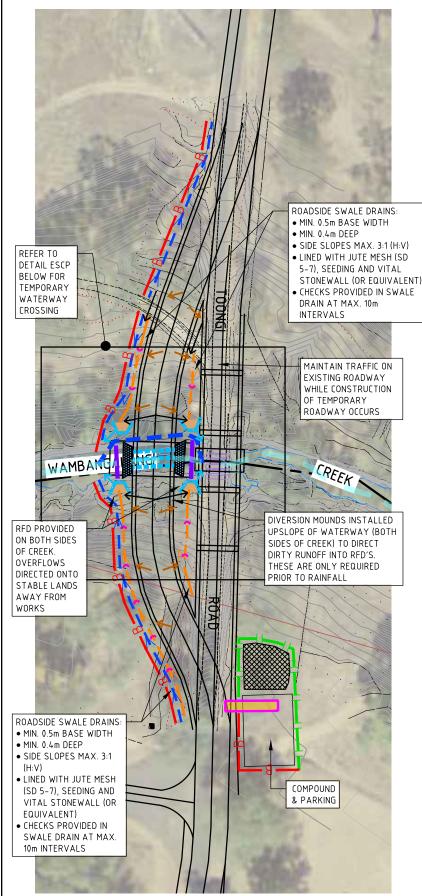
REV	DATE	DES.	DRN.	APP.	REVISION DETAILS	DRAWIN DESIGN BY	NG STATUS A.J.B. / M.P.	North	CLIENT	* *••	PO.Box 1098, Bowral, NSW. 2576 Suites 7 & 8, 68-70 Station Street	PROJECT TITLE	TWELVE MILE CREEK CULVERT CONSTRUCTION			
						DRAWN BY FINAL APPROVAL SCALE: (on A3 Original)	A.J.B. M.P. AS SHOWN		AUSTRALIAN ZIRCONIA LTD	SEEC	Bowral NSW 2576. (t) 02 4862 1633 (f) 02 4862 3088 email: recention@seec.com.au	DUBBO ZIRCONIA PROJECT	ESCP – S		GE 2 & 3	ing is su
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STAGE 3 ESCP - REMOVAL OF TEMPORARY ROADWAY



WAMBANGALANG CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO THIS PLAN) STAGE 2 - BRIDGE CONSTRUCTION (REFER TO DRAWING ESCP206) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO DRAWING ESCP206)

GENERAL

- REFER TO DRAWINGS 15000196 P01 001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS. WHERE FEASIBLE WORKS ARE TO BE SCHEDULED FOR THE MONTHS FROM APRIL TO SEPTEMBER INCLUSIVE (THE LOWEST
- RAINFALL EROSIVITY BASED ON DATA SOURCED FROM THE BLUE BOOK (2004) RAINFALL DISTRIBUTION ZONE 9). PRIOR TO UNDERTAKING ANY WORKS ENSURE TEMPORARY GROUNDCOVER MATERIALS (E.G. GEDTEXTILE, BLACK PLASTIC OR
- SIMILAR) ARE LOCATED ONSITE FOR TEMPORARY STABILISATION OF EXPOSED SURFACES. AT ALL TIMES DURING THE WORKS NATURAL CREEK FLOWS MUST BE DIRECTED AROUND OR THROUGH THE WORKS SITE WITHOUT COMING INTO CONTACT WITH EXPOSED SOILS. THIS CAN BE ACHIEVED VIA LINED DIVERSIONS, TEMPORARY PIPES, PUMPS OR
- THROUGH THE PIPE/CULVERT STORMWATER SYSTEM (REFER TO THE RELEVANT PLAN FOR DETAILS). ALL EXPOSED SURFACES WITHIN THE WATERWAY EXTENT MUST BE COVERED PRIOR TO RAINFALL OR HIGH FLOW EVENTS. THIS APPLIES AT ALL TIMES DURING THE WORKS EVEN IF WATERWAY FLOWS ARE DIVERTED AROUND THE WORK VIA TEMPORARY PIPES/PUMPS AS THESE DIVERSIONS WILL NOT BE ABLE TO TAKE HIGH FLOW EVENTS.
- FINAL STABILISATION OF SURFACES IS TO OCCUR PROGRESSIVELY AS EACH SECTION OF WORKS IS COMPLETED
- DIRTY WATER ACCUMULATING WITHIN THE WORK AREA IS TO BE TREATED AND TESTED TO COMPLY WITH THE WATER QUALITY DISCHARGE LIMITS PRIOR TO DISCHARGING INTO THE CREEK OR OFFSITE. REFER TO THE 'DIRTY WATER TREATMENT AND DISCHARGE REQUIREMENTS' NOTES.
- MONITORING, MAINTENANCE AND INSPECTIONS ARE TO BE CARRIED OUT REGULARLY AS REQUIRED, IN ACCORDANCE WITH THE 'SITE INSPECTION AND MONITORING' NOTES.

STAGE 1 - TEMPORARY ROAD CROSSING STAGING AND REQUIREMENTS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING. TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING FROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 14 TO 16 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS). STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO A MINIMIUM:

SET-UP

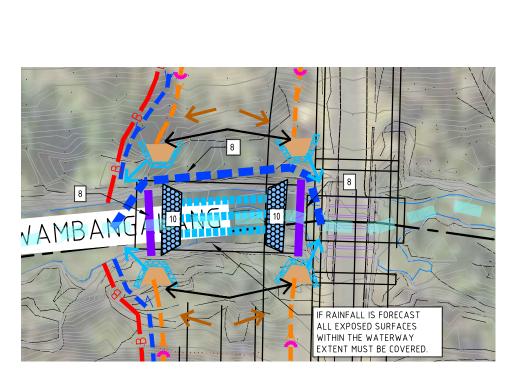
- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A SEALED PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND EXIT POINTS' NOTES.
- 3. ESTABLISH A TEMPORARY COMPOUND AND PARKING AREA (LOCATION IDENTIFIED IS INDICATIVE ONLY).
- 5. STOCKPILE AREAS ARE TO BE ESTABLISHED IN LOCATIONS AS SHOWN OR AS SPECIFIED BY THE SITE MANAGER (INCLUDING UPSLOPE DIVERSIONS) AND IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES.
- 5. INSTALL CLEAN WATER DIVERSIONS INCLUDING LINING/STABILISATION.
- 6. INSTALL SEDIMENT FENCING AND ROCK FILTER DAMS (RED'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8 AND IECA SD RFD-01 - REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES

TEMPORARY WATERWAY CROSSING WORKS (REFER TO DETAIL ESCP)

- (THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE, AND WHERE FEASIBLE IN LESS THAN 5 DAYS)
- 7. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE COMPLETION OF THE TEMPORARY CROSSING INSTALLATION. AIM TO COMPLETE AS QUICKLY AS POSSIBLE.
- 8. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE WATERWAY AND INSTALL A PUMP/PIPE SYSTEM TO TAKE CREEK FLOWS AROUND THE WORKS. PUMP/PIPE DIVERSION TO BE OF SUFFICIENT CAPACITY TO CARRY CREEK BASE FLOWS. 9. ONCE CREEK FLOWS ARE DIVERTED, THE TEMPORARY CROSSING (PIPES AND ROAD DECK) IS TO BE INSTALLED ACROSS THE WATERWAY. USE CLEAN ROCK (TO ENGINEERING DETAIL).
- 10.SCOUR PROTECTION (TO ENGINEERING DETAIL) IS TO BE PROVIDED UP AND DOWNSTREAM OF THE TEMPORARY CROSSING AT THE INLETS AND OUTLETS AND AROUND THE HEADWALL AND ABUTMENTS.
- 11. ONCE THE TEMPORARY CROSSING WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY TO DIRECT CREEK FLOWS INTO THE TEMPORARY CROSSING.

TEMPORARY ROADWAY WORKS

- 12.CONSTRUCTION WORKS ON THE TEMPORARY ROADWAY CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS. 13.ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT DIRTY WATER INTO THE ROCK FILTER DAMS. CHECKS ARE TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN.
- 14.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES. 15.SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS - REFER TO THE 'SLOPE LENGTHS' NOTES.
- 16.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED REFER TO THE 'DUST SUPPRESSION' NOTES.
- 17.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE 'STABILISATION' NOTES AND TABLE 1.



DETAIL	ESCP
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STAGE 1 ESCP - TEMPORARY ROAD CROSSING

SCALE - 1 - 1000

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					DRAWN BY A.J.B. FINAL APPROVAL M.P. SCALE: AS SLICIUM		AUSTRALIAN ZIRCONIA LTD	Sutes 7 & 8, 68-70 Station Street Bowrol NW 2576. () 02 4862 1633 () 02 4862 1633	DUBBO ZIRCONIA PROJECT	WAMBANGALONG CRE TEMPORARY ROAD CRO ESCP - STAGE 1			
				M.P. ISSUE FOR APPROVAL A.M. DRAFT ISSUE – FOR CONSULTATION	FOR APPROVAL			SEEC email: reception@seec.com.au WWW.SEEC.COM.AU		PROJECT NO. 15000196	sub-pr no. P01	drawing no. ESCP205	VEN 00 This drawin
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LEGEND BARRIER FENCE SEDIMENT FENCE (SD 6-8) ROCK FILTER DAM (IECA SD RFD-01 & SPECIFICATIONS BFLOW) STABILISED SITE ACCESS (SD 6 - 14DIVERSION MOUND TO DIRECT FLOWS (SANDBAG/EARTH BUND OR SIMILAR) STOCKPILE AREA (SD 4-1) ROCK ENERGY DISSIPATER (TO FINAL ENGINEERING DETAIL) STABILISED CLEAN WATER DIVERSION (SD 5-5 U.S.O.)

STANDARD DRAWINGS AND TYPICAL NOTES ARE PROVIDED ON DRAWINGS 15000196 P01 ESCP000-006.

- RFD SPECIFICATIONS SPECIFICATION: REFER TO SD RFD1 AND SD RFD2 • H: DEPTH TO WEIR = 0.4 M FREEBOARD = 0.45 M

- WIDTH OF GRAVEL FILTER (ACROSS FLOW) = 1.0 M • SETTLING AREA BEHIND WALL = 7 M2 THICKNESS OF 15-25 MM GRAVEL FILTER = 0.2 M • BULK OF ROCK WALL TO BE GRADED 75 MM - 225 MM HARD ROCK • CREST AND SPILLWAY ROCK = D50 = 225 MM, EXTEND SCOUR APRON ONTO NEAR LEVEL AND STABLE
- GROUND FOR MINIMUM 1.5 M OR TO WATERWAY.

- TEMPORARY WATERWAY CROSSING

PERIODICALLY REMOVE AND REPLACE THE FILTER LAYER IF IT BECOMES CLOGGED.

STORMWATER PIPE (TO FINAL

STABILISED PLATFORM

CLEAN FLOW DIRECTION

DIRTY FLOW DIRECTION

CHECK DAM (SD 5-4)

IMPERMEABLE BUND

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NATURAL WATERWAY

TRAP (IECA SD UST-01)

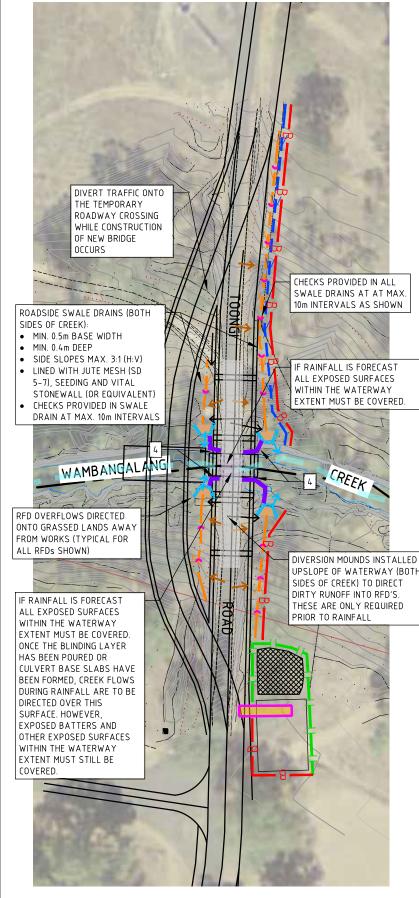
UST - U-SHAPED SEDIMENT

🗕 声 🗕 🗕 DIRTY WATER DIVERSION

ENGINEERING DETAIL)

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WAMBANGALANG CREEK CROSSING STAGING

STAGE 1 - TEMPORARY ROAD CROSSING (REFER TO DRAWING ESCP205) STAGE 2 - BRIDGE CONSTRUCTION (REFER TO THIS PLAN) STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING (REFER TO THIS PLAN)

GENERAL

REFER TO DRAWINGS 15000196 P01 001-006 FOR ALL STANDARD NOTES, REQUIREMENTS, TABLES AND STANDARD DETAILS. REFER TO THE GENERAL REQUIREMENTS ON DRAWING ESCP205

STAGE 2 - BRIDGE CONSTRUCTION STAGING AND

REQUIREMENTS

WORKS ARE TO BE STAGED IN THE FOLLOWING ORDER WITH THE RELEVANT EROSION AND SEDIMENT CONTROLS IMPLEMENTED PRIOR TO AND DURING EACH SECTION OF WORKS AS SPECIFIED.

BEFORE COMMENCEMENT OF CLEARING, TOPSOIL STRIPPING, EARTHWORKS OR ANY WORKS IN THE WATERWAY THE SITE IS TO BE SECURED AND THE FOLLOWING EROSION AND SEDIMENT CONTROL MEASURES INSTALLED IN ORDER (EXCEPT FOR ITEMS 11 TO 13 WHICH ARE TO BE UNDERTAKEN PROGRESSIVELY AS REQUIRED THROUGHOUT THE WORKS). STRIPPING AND EARTHWORKS NECESSARY TO INSTALL THE EROSION AND SEDIMENT CONTROLS ARE PERMITTED BUT MUST BE KEPT TO AN ABSOLUTE MINIMIUM:

SET-UP

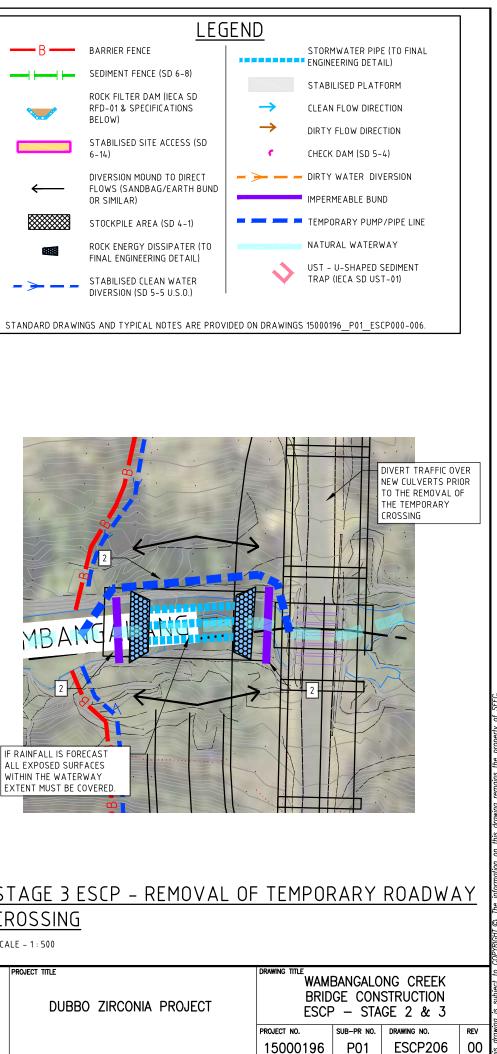
- 1. BARRIER FENCING (OR ALTERNATIVE MEASURES) MUST BE IN PLACE AROUND THE EDGE OF THE CONSTRUCTION BOUNDARY TO RESTRICT ACCESS AND IN ANY ADDITIONAL LOCATIONS AS REQUIRED TO MINIMISE UNNECESSARY DISTURBANCE - REFER TO THE 'ACCESS CONTROL' NOTES.
- 2. ESTABLISH STABILISED SITE ENTRY/EXIT POINTS (STANDARD DRAWING SD 6-14) IN THE LOCATIONS SHOWN AND ANYWHERE WHERE CONSTRUCTION VEHICLES EXIT A WORK AREA ONTO A PUBLIC ROAD - REFER TO THE 'SITE ENTRY AND EXIT POINTS' NOTES
- 3. INSTALL SEDIMENT FENCING, TRAPS AND ROCK FILTER DAMS (RFD'S) IN THE LOCATIONS AND SPECIFICATIONS SHOWN ON THIS PLAN AND FOLLOWING STANDARD DRAWING SD 6-8, IECA SD UST-01 AND IECA SD RFD-01 - REFER TO THE 'SEDIMENT FENCING' AND 'ROCK FILTER DAM' NOTES.
- 4. INSTALL IMPERMEABLE BUNDS AROUND PILING WORKS. USE SANDBAG BUNDS OR SIMILAR

BRIDGE CONSTRUCTION WORKS

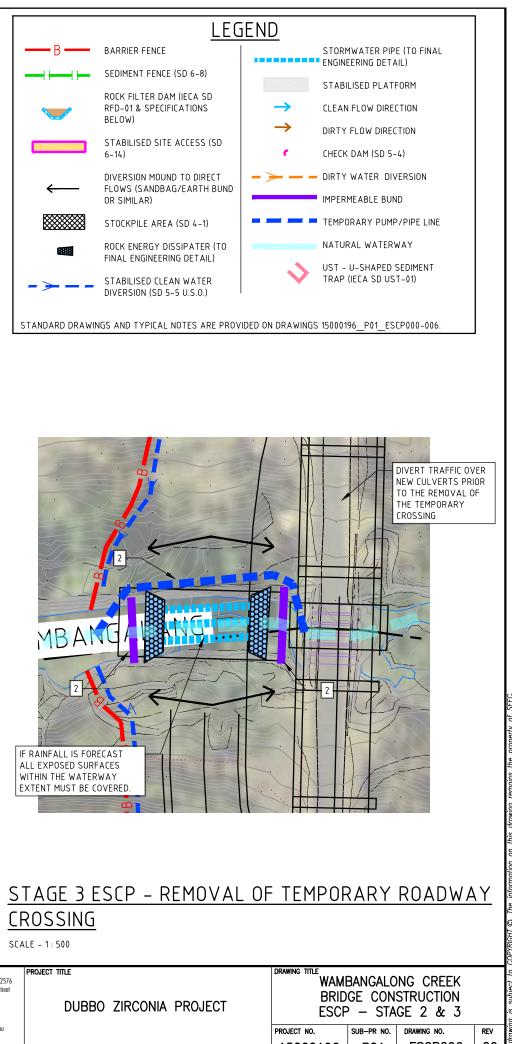
- 5. ONCE ALL OF THE ABOVE MEASURES ARE IN PLACE AND STABLE THE BRIDGE CONSTRUCTION WORKS CAN COMMENCE IN ACCORDANCE WITH THE ENGINEERING PLANS (INCLUDING ARMOURING AND SCOUR PROTECTION).
- 8. EXISTING ROAD PAVEMENTS ARE TO BE MAINTAINED FOR THE PILING PLATFORM AND BRIDGE WORKING AREA IN THE LOCATIONS SHOWN. IF THE EXISTING PAVEMENTS ARE DISTURBED OR CANNOT BE MAINTAINED ALL SURFACES IN THESE LOCATIONS ARE TO BE MAINTAINED STABLE USING CRUSHED ROCK, AGGREGATE OR SIMILAR. ALTERNATIVELY SURFACES CAN BE SPRAYED WITH A SOIL POLYMER (E.G. VITAL STONEWALL) PRIOR TO RAINFALL.
- 9. ROADSIDE SWALE DRAINS ARE TO BE INSTALLED PRIOR TO BULK STRIPPING AND EARTHWORKS AND USED TO DIRECT DIRTY WATER INTO THE ROCK FILTER DAMS. CHECKS TO BE INSTALLED WITHIN THE DRAINS AS PER THE PLAN.
- 10.TOPSOIL STRIPPING IS TO BE UNDERTAKEN IN ACCORDANCE WITH THE 'SOIL STRIPPING AND STOCKPILING' NOTES. 11. SLOPE LENGTHS ACROSS DISTURBED LANDS ARE TO BE MAINTAINED AT THE REQUIRED INTERVALS DURING ALL RAINFALL EVENTS - REFER TO THE 'SLOPE LENGTHS' NOTES.
- 12.DUST SUPPRESSION IS TO BE CARRIED OUT WHEN REQUIRED REFER TO THE 'DUST SUPPRESSION' NOTES. 13.UNDERTAKE PROGRESSIVE STABILISATION OF LANDS AS FINAL EARTHWORKS ARE COMPLETE IN EACH AREA (RATHER THAN
- WAITING UNTIL THE COMPLETION OF WORKS). FINAL STABILISATION IS TO BE COMPLETED IN ACCORDANCE WITH THE 'STABILISATION' NOTES AND TABLE 1.

STAGE 3 - REMOVAL OF TEMPORARY ROADWAY CROSSING

- (THESE WORKS SHOULD OCCUR AS QUICKLY AS POSSIBLE. AND WHERE FEASIBLE IN LESS THAN 5 DAYS)
- 1. SCHEDULE WORKS FOR A SUFFICIENT DRY PERIOD, LONG ENOUGH TO ENABLE THE REMOVAL OF THE TEMPORARY CROSSING AND COMPLETION OF STABILISATION WORKS. AIM TO COMPLETE AS QUICKLY AS POSSIBLE.
- 2. FORM TEMPORARY UP AND DOWNSTREAM IMPERMEABLE BUNDS WITHIN THE WATERWAY AND INSTALL A PUMP/PIPE SYSTEM TO TAKE CREEK FLOWS AROUND THE WORKS. PUMP/PIPE DIVERSION TO BE OF SUFFICIENT CAPACITY TO TAKE GENERAL CREEK FLOWS.
- 3. ONCE CREEK FLOWS ARE DIVERTED AROUND THE WORKS, THE TEMPORARY CROSSING IS TO BE REMOVED AND REHABILITATION/STABILISATION WORKS UNDERTAKEN IN ACCORDANCE WITH ENGINEERING DETAIL
- 4. ONCE THE TEMPORARY CROSSING REMOVAL AND REHABILITATION WORKS ARE COMPLETE REMOVE THE PUMP/PIPE DIVERSION SYSTEM AND REMOVE UP AND DOWNSTREAM IMPERMEABLE BUNDS FROM THE WATERWAY.



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EXPOSED SURF IIN THE WATER ENT MUST BE C	WAY	



STAGE 2 ESCP - CULVERT CONSTRUCTION

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							DRAWN BY	A.J.B.	$] \land \land$	$\mathbf{N}$			Bowral NSW 2576.			
							FINAL APPROVA	L M.P.	77 N	$\langle \rangle$	AUSTRALIAN ZIRCONIA LTD		(t) 02 4862 1633	DUBBO ZIRCONIA		
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# **Appendix 4**

# **Confirmation of Approval**

(Total No. of pages including blank pages = 2)











Planning Services **Resource Assessments** Contact: Phillipa Duncan 9274 6451 Tel: Email: phillipa.duncan@planning.nsw.gov.au

Mr Mike Sutherland General Manager NSW Alkane Resources PO Box 910 DUBBO NSW 2830

Dear Mr Sutherland

### Dubbo Zirconia Project (SSD-5251) **Environmental Management Plan**

I refer to an email dated 20 August 2016 sent by Alex Irwin of RW Corkery & Co Pty Limited on your behalf, seeking approval of the management plans required by conditions 8, 16, 23 and 30 of Schedule 3 and condition 1 of Schedule 5 of the project approval for the Dubbo Zirconia Project.

The Department has reviewed the final versions of the management plans and considers that they meet the requirements of the relevant conditions of approval.

Accordingly, please be advised that the Secretary has approved the following management plans:

- Environmental Management Strategy (Version 2.1 dated 6 October 2016); .
- Air Quality Management Plan (Version 1.2 dated 6 October 2016); .
- Noise Management Plan (Version 2.1 dated 6 October 2016); .
- Water Management Plan (Version 2.1 dated 6 October 2016); and .
- Blast Management Plan (Version 2.1 dated 6 October 2016).

I would appreciate if you could make the approved plans available on your website as soon as possible.

If you have any further enquiries about this matter, please contact Phillipa Duncan on the above contact details.

Yours sincerely

Reshand 12/10/16

Clay Preshaw A/Director **Resource Assessments** as nominee of the Secretary

cc: Alex Irwin of RW Corkery & Co Pty Limited

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R.W. CORKERY & CO. PTY. LIMITED



