



TABLE OF CONTENTS

TABLE OF CONTENTS

EXECUTIVE SUMMARY	ES-1		ES5.5 Rehabilitation and Mine Closure	ES-25
ES1 BACKGROUND	ES-1		ES6 CONCLUSION	ES-26
ES2 APPROVAL PROCESS	ES-1		INTRODUCTION	1-1
ES2.1 New South Wales	ES-1	1	1.1 PROJECT OVERVIEW	1-1
ES2.2 Commonwealth	ES-1		1.1.1 Purpose of this Report	1-1
ES2.3 Determination	ES-5		1.1.2 Background	1-1
ES3 THE PROJECT	ES-5		1.1.3 Project Objectives	1-6
ES3.1 Existing Approved Dendrobium Mine	ES-5		1.1.4 Project Summary	1-6
ES3.2 Project Summary	ES-6		1.1.5 Site Location and Tenure	1-7
ES3.3 Interaction with BlueScope Steelworks	ES-7		1.1.6 Applicant	1-7
ES3.4 Interaction with Port Kembla Coal Terminal	ES-12		1.1.7 Interaction with the Approved Dendrobium Mine	1-7
ES3.5 Interaction with Bulli Seam Operations	ES-12		1.1.8 Interaction with the Approved Bulli Seam Operations	1-10
ES3.6 Project Construction	ES-12		1.1.9 Interaction with BlueScope Steelworks	1-14
ES3.7 Mining Operations	ES-12		1.1.10 Interaction with Port Kembla Coal Terminal	1-14
ES3.8 ROM Coal Transport	ES-16		1.2 POTENTIAL CUMULATIVE INTERACTIONS WITH OTHER PROJECTS	1-14
ES3.9 Coal Processing and Product Coal Transport	ES-17		1.3 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS	1-17
ES3.10 Coal Wash Management	ES-17		1.4 PROJECT CONSULTANTS	1-17
ES3.11 Water Management	ES-17		1.5 DOCUMENT STRUCTURE	1-20
ES3.12 Infrastructure and Services	ES-17		2 DESCRIPTION OF THE APPROVED OPERATIONS	2-1
ES3.13 Workforce	ES-18	2	2.1 HISTORY OF MINING IN THE VICINITY OF THE PROJECT	2-1
ES4 CONSULTATION	ES-18		2.2 DENDROBIUM MINE	2-4
ES4.1 Government Agencies and Infrastructure Owners	ES-18		2.2.1 Underground Mining Operations	2-4
ES4.2 Public Consultation	ES-18		2.2.2 Surface Facilities	2-4
ES5 KEY ENVIRONMENTAL ASSESSMENT ISSUES AND PROJECT MITIGATION	ES-18		2.2.3 ROM Coal Transport, Stockpiling and Processing	2-10
ES5.1 Environmental Specialist Studies	ES-18		2.2.4 Product Coal Handling and Transportation	2-10
ES5.2 Key Engagement Outcomes and Associated Project Design	ES-19		2.2.5 Coal Wash Management	2-10
ES5.3 Key Project Outcomes	ES-21		2.2.6 Approval History	2-10
ES5.4 Strategic Context	ES-24		2.2.7 Environmental Monitoring and Management	2-12

TABLE OF CONTENTS (CONTINUED)

	2.2.8	ROM Coal Production in the Absence of the Project	2-12		3.5.4	Underground Mine Access and Materials Handling	3-19
	2.3	CORDEAUX COLLIERY	2-19		3.5.5	Major Underground Equipment	3-19
	2.3.1	Cordeaux Pit Top	2-19		3.5.6	Mine Ventilation Systems	3-19
	2.3.2	Approval History	2-19		3.5.7	Gas Management and Abatement	3-23
	2.3.3	Environmental Monitoring and Management	2-19		3.5.8	Water Management Systems	3-24
	2.4	BULLI SEAM OPERATIONS	2-19		3.6	ROM COAL TRANSPORT AND PROCESSING	3-24
3	PROJECT DESCRIPTION		3-1		3.6.1	ROM Coal Sizing, Stockpiling and Transport	3-24
	3.1	COAL RESOURCE, GEOLOGICAL FEATURES AND EXPLORATION ACTIVITIES	3-1		3.6.2	Dendrobium Coal Preparation Plant	3-24
	3.2	PROJECT GENERAL ARRANGEMENT	3-5		3.7	PRODUCT COAL HANDLING AND TRANSPORTATION	3-25
	3.3	PROJECT SCHEDULE	3-5		3.8	COAL WASH MANAGEMENT	3-25
	3.4	PROJECT CONSTRUCTION AND OTHER DEVELOPMENT ACTIVITIES	3-5		3.8.1	Coal Wash Production	3-25
	3.4.1	Development of Access and Supporting Infrastructure for Underground Mining Areas	3-9		3.8.2	Coal Wash Physical and Chemical Characteristics	3-25
	3.4.2	Underground Mining Machinery Replacement and Upgrades	3-9		3.8.3	Beneficial Use of Coal Wash	3-26
	3.4.3	Mine Ventilation Infrastructure	3-9		3.8.4	West Cliff Coal Wash Emplacement	3-26
	3.4.4	Gas Management and Abatement Infrastructure	3-10		3.9	WATER MANAGEMENT	3-29
	3.4.5	Dendrobium Pit Top	3-10		3.9.1	Underground Operations	3-29
	3.4.6	Cordeaux Pit Top	3-10		3.9.2	Dendrobium Pit Top	3-29
	3.4.7	Kemira Valley Rail Line	3-13		3.9.3	Kemira Valley Coal Loading Facility	3-29
	3.4.8	Dendrobium CPP	3-13		3.9.4	Cordeaux Pit Top	3-31
	3.4.9	Water Management System Upgrades	3-13		3.9.5	Ventilation Shafts	3-31
	3.4.10	Other Surface Facilities and Supporting Infrastructure Upgrades	3-13		3.9.6	Dendrobium CPP	3-31
	3.5	UNDERGROUND MINING OPERATIONS	3-16		3.10	INFRASTRUCTURE AND SERVICES	3-31
	3.5.1	Mining Method	3-16		3.10.1	Surface Facilities	3-32
	3.5.2	Project Mining Domain Constraints	3-16		3.10.2	Access Roads and Haul Roads	3-32
	3.5.3	Project Longwall Design Constraints	3-16		3.10.3	Energy and Electricity Supply and Distribution	3-32
					3.10.4	Surface Services	3-32
					3.10.5	Site Security and Communications	3-33
					3.10.6	Water Supply and Use	3-33

TABLE OF CONTENTS (CONTINUED)

3.11	WASTE MANAGEMENT	3-34	4.3.3	Approvals and Authorisations that are not required for State Significant Development	4-6
3.11.1	General Waste	3-34	4.3.4	Other Approvals and Legislation that must be Applied Consistently for State Significant Development	4-6
3.11.2	Sewage and Effluent	3-34	4.3.5	Environmental Impact Statement Requirements for State Significant Development	4-6
3.12	MANAGEMENT OF DANGEROUS GOODS	3-34	4.3.6	Documents to Accompany Development Application	4-7
3.12.1	Transport	3-34	4.3.7	Public Notification of the Development Application	4-7
3.12.2	Hydrocarbon Storage	3-34	4.3.8	Division 7.1 Development Contributions	4-8
3.12.3	Explosives Storage	3-36	4.4	ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT, 1999	4-8
3.12.4	Other Substances	3-36	4.4.1	Environmental Record of the Proponent	4-9
3.13	REHABILITATION AND REMEDIATION ACTIVITIES	3-36	4.5	OTHER APPLICABLE STATUTORY APPROVALS AND LEGISLATION	4-10
3.13.1	Subsidence Monitoring and Remediation	3-36	4.5.1	Relevant NSW Legislation	4-11
3.13.2	Decommissioning and Rehabilitation of Surface Facilities	3-36	4.5.2	Relevant Commonwealth Legislation	4-14
3.13.3	Coal Wash Emplacement Rehabilitation	3-36	4.6	ENVIRONMENTAL PLANNING INSTRUMENTS	4-15
3.14	WORKFORCE	3-37	4.6.1	State Environmental Planning Policies	4-15
3.14.1	Construction and Development	3-37	4.6.2	Local Environmental Plans	4-15
3.14.2	Operations	3-37	5	ENGAGEMENT	5-1
3.15	INTERACTION WITH DEVELOPMENT CONSENT DA 60-03-2001	3-37	5.1	ENGAGEMENT APPROACH	5-1
4	STRATEGIC AND STATUTORY CONTEXT	4-1	5.2	ENVIRONMENTAL IMPACT STATEMENT CONSULTATION	5-1
4.1	STRATEGIC PLANNING DOCUMENTS	4-1	5.2.1	State Government Agencies	5-1
4.1.1	Strategic Statement on NSW Coal	4-1	5.2.2	Local Government Agencies	5-7
4.1.2	Illawarra-Shoalhaven Regional Plan	4-2	5.2.3	Federal Government Agencies	5-8
4.1.3	Other Strategic Planning Documents	4-2			
4.2	EXISTING APPROVALS AND REGULATORY CONTROLS	4-3			
4.3	ENVIRONMENTAL PLANNING AND ASSESSMENT ACT, 1979	4-4			
4.3.1	Permissibility and Requirement for Development Consent	4-4			
4.3.2	Application of Division 4.7 of Part 4 (State Significant Development) of the Environmental Planning and Assessment Act, 1979	4-5			

TABLE OF CONTENTS (CONTINUED)

5.2.4	Infrastructure Owners and Service Providers	5-8	6.6	SURFACE WATER	6-38
5.2.5	Other Resource Companies	5-9	6.6.1	Methodology	6-38
5.2.6	Public Consultation	5-10	6.6.2	Existing Environment	6-38
5.3	COMMUNITY INITIATIVES AND INVOLVEMENT	5-12	6.6.3	Assessment	6-44
5.3.1	Community Relations	5-12	6.6.4	Mitigation Measures and Monitoring	6-53
5.3.2	Dendrobium Community Consultative Committee	5-12	6.6.5	Adaptive Management	6-55
5.3.3	Website and Community Call Line	5-13	6.7	AQUATIC ECOLOGY	6-55
5.3.4	Sponsorships and Community Initiatives	5-13	6.7.1	Methodology	6-55
5.3.5	Public Reporting	5-13	6.7.2	Existing Environment	6-56
5.3.6	Contractors and Suppliers	5-14	6.7.3	Assessment	6-59
6	ENVIRONMENTAL ASSESSMENT	6-1	6.7.4	Mitigation Measures	6-60
6.1	ENVIRONMENTAL RISK ASSESSMENT	6-1	6.7.5	Adaptive Management	6-60
6.2	CLIMATE AND TOPOGRAPHY	6-1	6.8	UPLAND SWAMPS	6-60
6.2.1	Existing Environment	6-1	6.8.1	Methodology	6-61
6.2.2	Assessment	6-5	6.8.2	Background	6-61
6.3	SUBSIDENCE	6-5	6.8.3	Existing Environment	6-64
6.3.1	Description of Subsidence Effects, Impacts and Consequences	6-5	6.8.4	Assessment	6-67
6.3.2	Subsidence Impacts Observed at the Existing Dendrobium Mine	6-7	6.8.5	Mitigation Measures	6-69
6.3.3	Assessment	6-7	6.8.6	Adaptive Management	6-69
6.3.4	Mitigation Measures	6-11	6.9	TERRESTRIAL ECOLOGY AND PROJECT BIODIVERSITY OFFSET STRATEGY	6-69
6.3.5	Adaptive Management	6-15	6.9.1	Methodology	6-69
6.4	LAND RESOURCES AND LAND USES	6-15	6.9.2	Existing Environment	6-70
6.4.1	Existing Environment	6-15	6.9.3	Assessment	6-75
6.4.2	Assessment	6-17	6.9.4	Avoidance/Mitigation Measures	6-78
6.4.3	Mitigation Measures	6-18	6.9.5	Adaptive Management	6-79
6.5	GROUNDWATER	6-19	6.9.6	Project Biodiversity Offset Strategy	6-79
6.5.1	Methodology	6-19	6.10	ABORIGINAL HERITAGE	6-82
6.5.2	Existing Environment	6-19	6.10.1	Methodology	6-82
6.5.3	Assessment	6-25	6.10.2	Existing Environment	6-82
6.5.4	Licensing, Mitigation Measures and Monitoring	6-34	6.10.3	Assessment	6-87
6.5.5	Adaptive Management	6-37	6.10.4	Mitigation Measures	6-88
			6.10.5	Adaptive Management	6-88
			6.11	NON-ABORIGINAL HERITAGE	6-89
			6.11.1	Methodology	6-89
			6.11.2	Existing Environment	6-89
			6.11.3	Assessment	6-90
			6.11.4	Mitigation Measures	6-93
			6.11.5	Adaptive Management	6-93
			6.12	ROAD TRANSPORT	6-93

TABLE OF CONTENTS (CONTINUED)

6.12.1	Methodology	6-93	6.18.2	Existing Environment	6-129
6.12.2	Existing Environment	6-94	6.18.3	Assessment	6-132
6.12.3	Assessment	6-98	6.18.4	Mitigation Measures	6-138
6.12.4	Mitigation Measures	6-102	6.19	ECONOMIC EFFECTS	6-139
6.12.5	Adaptive Management	6-102	6.19.1	Methodology	6-139
6.13	OPERATIONAL AND CONSTRUCTION NOISE	6-102	6.19.2	Existing Environment	6-141
6.13.1	Methodology	6-102	6.19.3	Assessment	6-141
6.13.2	Background	6-103	6.19.4	Mitigation Measures	6-143
6.13.3	Existing Environment	6-105	6.20	SOCIAL AND COMMUNITY INFRASTRUCTURE	6-143
6.13.4	Applicable Criteria	6-105	6.20.1	Methodology	6-143
6.13.5	Assessment	6-110	6.20.2	Existing Environment	6-143
6.13.6	Mitigation Measures	6-114	6.20.3	Assessment	6-144
6.13.7	Adaptive Management	6-114	6.20.4	Mitigation Measures	6-147
6.14	RAIL TRANSPORT NOISE	6-115	6.20.5	Adaptive Management	6-148
6.14.1	Methodology	6-115	6.21	GREENHOUSE GAS EMISSIONS	6-148
6.14.2	Background	6-115	6.21.1	Methodology	6-148
6.14.3	Existing Environment	6-116	6.21.2	Quantitative Assessment of Potential Greenhouse Gas Emissions	6-148
6.14.4	Assessment	6-116	6.21.3	Australian Greenhouse Gas Emissions Reduction Targets	6-151
6.14.5	Mitigation Measures	6-117	6.21.4	Project Greenhouse Gas Mitigation Measures	6-151
6.14.6	Adaptive Management	6-118	6.21.5	Adaptive Management	6-152
6.15	ROAD TRANSPORT NOISE	6-118	6.22	HAZARD AND RISK	6-152
6.15.1	Methodology	6-118	6.22.1	Methodology	6-152
6.15.2	Existing Environment	6-118	6.22.2	Hazard Identification and Risk Management	6-152
6.15.3	Assessment	6-118	6.22.3	Hazard Prevention and Mitigation Measures	6-154
6.15.4	Mitigation Measures	6-119	7	REHABILITATION AND MINE CLOSURE	7-1
6.16	BLASTING	6-119	7.1	REHABILITATION AT THE APPROVED OPERATIONS	7-1
6.16.1	Methodology	6-119	7.1.1	Rehabilitation Objectives	7-1
6.16.2	Existing Environment	6-120	7.1.2	Dendrobium Mine	7-2
6.16.3	Assessment	6-120	7.1.3	Cordeaux Colliery	7-2
6.16.4	Mitigation Measures	6-121	7.1.4	West Cliff Coal Wash Emplacement	7-2
6.17	AIR QUALITY	6-121			
6.17.1	Methodology	6-121			
6.17.2	Applicable Criteria	6-122			
6.17.3	Existing Environment	6-123			
6.17.4	Assessment	6-125			
6.17.5	Mitigation Measures	6-128			
6.17.6	Adaptive Management	6-128			
6.18	VISUAL CHARACTER	6-128			
6.18.1	Methodology	6-128			

TABLE OF CONTENTS (CONTINUED)

7.2	REHABILITATION OF THE PROJECT	7-4		7.5.2	Rehabilitation Trials	7-27
7.2.1	General Rehabilitation and Mine Closure Criteria	7-4		7.6	POTENTIAL BARRIERS AND LIMITATIONS TO EFFECTIVE REMEDIATION	7-27
7.2.2	Post-mining Land Use and Conceptual Final Landform	7-6		7.7	MINE CLOSURE PLAN	7-27
7.2.3	Rehabilitation Domains and Conceptual Objectives	7-7	8	7.8	LEASE RELINQUISHMENT	7-29
7.2.4	Biodiversity Offset Strategy	7-7			SUMMARY OF MITIGATION MEASURES	8-1
7.2.5	Key Rehabilitation Performance Measures and Completion Criteria	7-7		8.1	PROJECT ENVIRONMENTAL MANAGEMENT	8-1
7.3	GENERAL REHABILITATION PRACTICES AND MEASURES	7-16		8.2	KEY SPECIFIC ENVIRONMENTAL MITIGATION MEASURES AND MONITORING	8-1
7.3.1	Vegetation Clearing Measures	7-16		8.2.1	Subsidence	8-3
7.3.2	Soil Stripping and Handling Measures	7-16		8.2.2	Land Resources and Land Uses	8-5
7.3.3	Geotechnical Stability	7-17		8.2.3	Groundwater	8-6
7.3.4	Decommissioning of Surface Infrastructure	7-17		8.2.4	Surface Water	8-8
7.3.5	Selection of Native Plant Species for Revegetation	7-18		8.2.5	Biodiversity	8-10
7.3.6	Remediation of Subsidence Impacts on Streams	7-18		8.2.6	Aboriginal Heritage	8-12
7.3.7	Remediation of Subsidence Impacts on Upland Swamps	7-23		8.2.7	Non-Aboriginal Heritage	8-13
7.3.8	Remediation of Subsidence Impacts on Other Natural Features	7-24		8.2.8	Road Transport	8-13
7.3.9	Erosion and Sediment Control Measures	7-24		8.2.9	Noise and Blasting	8-14
7.3.10	Land Contamination Measures	7-25		8.2.10	Air Quality	8-15
7.3.11	Weeds and Pest Control	7-25		8.2.11	Visual Character	8-15
7.3.12	Bushfire Management	7-25		8.2.12	Socio-Economic	8-16
7.3.13	Post-closure Maintenance	7-25		8.2.13	Greenhouse Gas	8-16
7.4	MINING OPERATIONS PLAN	7-25		8.2.14	Hazard and Risk	8-17
7.5	MONITORING AND TRIALS	7-25		8.2.15	Rehabilitation and Mine Closure	8-18
7.5.1	Rehabilitation Monitoring	7-25		8.3	ADAPTIVE MANAGEMENT	8-19
				8.3.1	Subsidence	8-19
				8.3.2	Groundwater and Surface Water	8-19
				8.3.3	Biodiversity	8-19
				8.3.4	Aboriginal Heritage	8-20
				8.3.5	Non-Aboriginal Heritage	8-20
				8.3.6	Road Transport	8-20
				8.3.7	Noise and Blasting	8-20
				8.3.8	Air Quality	8-20
				8.3.9	Socio-Economic	8-21
				8.3.10	Greenhouse Gas	8-21
				8.3.11	Rehabilitation and Mine Closure	8-21

TABLE OF CONTENTS (CONTINUED)

8.4	REPORTING	8-21	9.3.3	Evaluation Under Section 4.15(1) of the Environmental Planning and Assessment Act, 1979	9-17
8.4.1	Incident Reporting	8-21	9.3.4	Potential Implications of Climate Change	9-17
8.4.2	Annual Review	8-21	9.3.5	Ecologically Sustainable Development Considerations	9-18
8.4.3	Development Consent Requirements	8-22	9.3.6	Neutral or Beneficial Effect on Water Quality	9-24
8.4.4	Independent Environmental Auditing	8-22	9.3.7	Other Policies and Strategic Objectives	9-26
8.4.5	Other Reporting	8-22	9.4	EVALUATION OF KEY IMPACTS AND BENEFITS	9-26
8.5	INDEPENDENT EXPERT PANEL FOR MINING IN THE CATCHMENT – INITIAL REPORT	8-22	9.4.1	Key Potential Impacts	9-26
8-21			9.4.2	Key Potential Benefits	9-27
9	EVALUATION AND CONCLUSION	9-1	9.4.3	Strategic Context	9-31
9.1	SUITABILITY OF THE SITE	9-1	9.4.4	Consideration of the Consequences of Not Carrying Out the Project	9-32
9.1.1	Existing Mining Tenements	9-1	9.5	CONCLUSION	9-32
9.1.2	Existing Surface and Underground Mine Infrastructure	9-1	10	REFERENCES	10-1
9.1.3	Proximity to BlueScope Steelworks	9-2	11	ABBREVIATIONS, ACRONYMS AND GLOSSARY	11-1
9.1.4	Access to Port Infrastructure	9-3	11.1	ABBREVIATIONS AND ACRONYMS	11-1
9.1.5	Drinking Water Catchments	9-3	11.2	GLOSSARY	11-5
9.2	KEY ENGAGEMENT OUTCOMES AND ASSOCIATED PROJECT DESIGN	9-4			
9.2.1	Mine Subsidence-Related Impacts	9-4			
9.2.2	Surface Facilities Related Impacts	9-10			
9.2.3	Socio-Economic Impacts	9-14			
9.3	STATUTORY REQUIREMENTS AND PLANNING/POLICY OBJECTIVES	9-15			
9.3.1	Consideration of the Project against the Objects of the Environmental Planning and Assessment Act, 1979	9-15			
9.3.2	Consideration of the Project against the Objects of the Environment Protection and Biodiversity Conservation Act, 1999	9-16			

LIST OF TABLES

Table ES-1	Summary Comparison of the Approved Dendrobium Mine and the Project
Table ES-2	Key Potential Impacts and Associated Project Outcomes – Underground Mine Extensions
Table ES-3	Key Potential Impacts and Associated Project Outcomes – Surface Facilities
Table ES-4	Summary of Key Potential Benefits of the Project and Associated Project Outcomes
Table 1-1	Summary Comparison of the Approved Dendrobium Mine and the Project
Table 1-2	Interaction of Existing and Proposed Approvals

TABLE OF CONTENTS (CONTINUED)

Table 1-3	Secretary's Environmental Assessment Requirements – Reference Summary	Table 6-6	Existing Water Licensing Summary for the Dendrobium Mine
Table 1-4	Content Requirements of an EIS – Clause 7 of Schedule 2 of the EP&A Regulation	Table 6-7	Estimated Licensing Requirements for the Project
Table 2-1	Historical Start and Finish Dates for Dendrobium Mine Longwalls to Date	Table 6-8	Stream Characteristics – Areas 5 and 6
Table 2-2	Summary of the Current Environmental Monitoring Regime at the Dendrobium Mine	Table 6-9	Key Stream Features
Table 3-1	Characteristics of the Target Coal Seams in the Project Area	Table 6-10	Proposed Water Quality Improvement Works
Table 3-2	Coal Resources within Project and Approved Mine Plans (Financial Year 2018)	Table 6-11	Threatened Ecological Community Upland Swamps within Project Underground Mining Area
Table 3-3	Summary of Key Project Characteristics	Table 6-12	Threatened Ecological Community Upland Swamp Ecosystem Credit Requirements
Table 3-4	Summary of Constraints Incorporated into the Project Longwall Mining Layout	Table 6-13	Ecosystem Credit Requirements – Surface Disturbance
Table 3-5	Indicative Mining Schedule	Table 6-14	Species Credit Requirements – Surface Disturbance and Subsidence
Table 3-6	Indicative Production Schedule of Coal Wash to be Emplaced at the West Cliff Coal Wash Emplacement and/or Available to be Supplied for Beneficial Re-use	Table 6-15	Offset Requirements and Strategy Options
Table 3-7	Waste Streams Likely to be Generated by the Project	Table 6-16	Summary of Aboriginal Heritage Consultation Undertaken for the Project
Table 5-1	Consultation Summary – NSW Department of Planning and Environment	Table 6-17	Aboriginal Heritage Sites within Project Underground Mining Areas
Table 5-2	Consultation Summary – NSW Office of Environment and Heritage	Table 6-18	Identified Heritage Items in the Project Area
Table 5-3	Consultation Summary – NSW Environmental Protection Authority	Table 6-19	Average Daily Traffic Movements on Haulage Routes and Local Roads
Table 5-4	Consultation Summary – WaterNSW	Table 6-20	Traffic Growth Rate (2015-2016)
Table 6-1	Bureau of Meteorology Monitoring Station Locations and Recording Periods	Table 6-21	Relevant Intersection Performance – Surveyed Traffic Flows (March 2017)
Table 6-2	Relevant Meteorological Information	Table 6-22	Predicted Average Weekday Traffic Movements on the Local Road Network
Table 6-3	Predicted Conventional Subsidence Effects for the Project Underground Mining Areas	Table 6-23	Relative Scale of Various Noise Sources
Table 6-4	Summary of Typical Southern Coalfield Permo-Triassic Stratigraphic Sequence	Table 6-24	Rating Background Level Values Derived from Noise Monitoring
Table 6-5	Dendrobium Mine Groundwater Inflows	Table 6-25	NPfI Project-specific Intrusiveness Criteria
		Table 6-24	NPfI Project-specific Amenity Criteria
		Table 6-27	NPfI Project-specific Trigger Levels (PSTL)
		Table 6-28	Characterisation of Noise Impacts and Potential Treatments

TABLE OF CONTENTS (CONTINUED)

Table 6-29	Dendrobium Pit Top Summary of Potential Operational Noise Exceedances at Privately-owned Receivers under Adverse Meteorological Conditions	Table 8-3	Independent Expert Panel for Mining in the Catchment - Major Recommendations
Table 6-30	Non-network Rail Noise Assessment Criteria Adopted	Table 9-1	Climate Change Projections for East Coast South sub-cluster, Eastern Australia – Percentage Change in Rainfall
Table 6-31	Minimum Setback Distance from the Kemira Valley Rail Line for Rural and Suburban Receivers in Accordance with the RING	Table 9-2	Climate Change Projections for the Illawarra, Metropolitan Sydney and South East and Tablelands Regions – Percentage Change in Rainfall
Table 6-32	NSW Road Noise Policy Criteria for Residential Land Uses	Table 9-3	Water Quality Improvement Works
Table 6-33	Blasting Assessment Criteria	Table 9-4	Key Potential Impacts and Associated Project Outcomes – Water Supply
Table 6-34	Air Quality Assessment Criteria for Concentrations of Suspended Particulate Matter	Table 9-5	Key Potential Impacts and Associated Project Outcomes – Biodiversity and Aboriginal Heritage Values
Table 6-35	Air Quality Assessment Criteria for Concentrations of Oxides of Nitrogen	Table 9-6	Key Potential Impacts and Associated Project Outcomes – Amenity
Table 6-36	Measured Annual Average PM ₁₀ and PM _{2.5} Concentrations (µg/m ³)	Table 9-7	Key Potential Impacts and Associated Project Outcomes – Indirect Impacts
Table 6-37	Adopted Background Values for Cumulative Assessment		
Table 6-38	Visual Impact Matrix		
Table 6-39	Visual Sensitivity Levels		
Table 6-40	Project Visual Impact Levels		
Table 6-41	Summary of Social Impact Assessment Stakeholder Engagement and Consultation		
Table 7-1	Rehabilitation Status of the Cordeaux Colliery		
Table 7-2	Primary and Secondary Domains		
Table 7-3	Rehabilitation Phases and Objectives		
Table 7-4	Provisional Target Revegetation Communities		
Table 7-5	Mitigation and Remediation Strategies for Subsidence Impacts on Swamps Associated with Surface and Bedrock Fracturing and Dilation		
Table 7-6	Identification of Potential Key Barriers and Limitations to Effective Rehabilitation and Management Strategies		
Table 8-1	Summary of Project Management, Mitigation, Monitoring and Reporting		
Table 8-2	Proposed Water Quality Improvement Works		

LIST OF FIGURES

Figure ES-1	Regional Location Inclusive of Historical Mine Workings
Figure ES-2	General Arrangement of the Approved Dendrobium Mine
Figure ES-3	Project General Arrangement – Underground Mining Areas
Figure ES-4	Materials Handling Spatial Relationship
Figure ES-5	Material Handling Schematic Flowsheet
Figure ES-6	Longwall Mining Method – Conceptual Cross Section and Plan
Figure ES-7	Key Management Features – Areas 5 and 6
Figure 1-1a	Regional Location
Figure 1-1b	Regional Location Inclusive of Historical Mine Workings
Figure 1-2	General Arrangement of the Approved Dendrobium Mine
Figure 1-3	General Arrangement of the Project
Figure 1-4	Relevant Land Tenure
Figure 1-5	Approved Dendrobium Mine
Figure 1-6	Interaction of Existing and Proposed Approvals

TABLE OF CONTENTS (CONTINUED)

Figure 1-7	Other Mining Operations and Major Developments in the Vicinity of the Project	Figure 3-9	Project General Arrangement – Underground Mine Areas
Figure 2-1	Previous Mine Workings	Figure 3-10a	Materials Handling Spatial Relationship
Figure 2-2	Longwall Mining Method – Conceptual Cross Section and Plan	Figure 3-10b	Material Handling Schematic Flowsheet
Figure 2-3	Approved Dendrobium Mine Underground Mining Layout	Figure 3-11	General Arrangement of West Cliff Coal Wash Emplacement
Figure 2-4	General Arrangement of Dendrobium Pit Top	Figure 3-12	Project Water Management Schematic
Figure 2-5	General Arrangement of Dendrobium Shafts	Figure 6-1	Key Built Features Located in the Project Extent of Longwall Mining and Surrounds
Figure 2-6	General Arrangement of Kemira Valley Coal Loading Facility	Figure 6-2	Groundwater Monitoring Locations
Figure 2-7	General Arrangement of Dendrobium Coal Preparation Plant	Figure 6-3	Groundwater Model Extent and Mesh
Figure 2-8	Overview of the Dendrobium Mine Environmental Management Strategy General Arrangement of West Cliff Coal Wash Emplacement	Figure 6-4	Groundwater Model Boundary Conditions
Figure 2-9a	Environmental Monitoring Sites Dendrobium Pit Top and Kemira Valley Coal Loading Facility	Figure 6-5	Variation in Inferred Height of Fracturing Estimated using the Tammetta Equation
Figure 2-9b	Environmental Monitoring Sites West Cliff Coal Wash Emplacement	Figure 6-6	Regional Surface Water Catchments
Figure 2-9c	Environmental Monitoring Sites Underground Mining Area	Figure 6-7	Surface Water Catchments – Project Area
Figure 2-10	Surface Facilities at the Cordeaux Colliery	Figure 6-8	Surface Water Monitoring Locations
Figure 2-11	General Arrangement of Cordeaux Pit Top	Figure 6-9	Project Mining Constraints for Named Watercourses, Key Stream Features and Water Supply Infrastructure
Figure 2-12	General Arrangement of the West Cliff Coal Wash Emplacement	Figure 6-10	Aquatic Ecology Baseline Survey Sites and Key Fish Habitat Mapping
Figure 3-1	Indicative Stratigraphic Section – Project Area	Figure 6-11	Regionally Mapped Swamps
Figure 3-2	Known and Inferred Geological Features in the Vicinity of Project Underground Mining Areas	Figure 6-12	Upland Swamps in the Vicinity of the Approved Mine Areas 2, 3A and 3B
Figure 3-3	General Arrangement of the Project	Figure 6-13	Upland Swamps in the Vicinity of the Project Underground Mining Area
Figure 3-4	Indicative Project Schedule	Figure 6-14	Vegetation Mapping
Figure 3-5	Project General Arrangement – Dendrobium Pit Top	Figure 6-15	Threatened Flora
Figure 3-6	Project General Arrangement – Cordeaux Pit Top	Figure 6-16	Threatened Fauna
Figure 3-7	Project General Arrangement – Kemira Valley Coal Loading Facility	Figure 6-17	Historic Heritage Items – Dendrobium Pit Top
Figure 3-8	Project General Arrangement – Dendrobium Coal Preparation Plant	Figure 6-18	Historic Heritage Items – Project Underground Mining Area
		Figure 6-19	Local Road Network and Traffic Survey Locations
		Figure 6-20	Noise Monitoring Locations
		Figure 6-21	Representative Noise Receivers
		Figure 6-22	Air Quality Monitoring Locations

TABLE OF CONTENTS (CONTINUED)

Figure 6-23	Potential Views to Proposed Ventilation Shaft Sites – Construction Infrastructure	Plate 6-1	Geological Cross-section through Areas 5 and 6
Figure 6-24	Potential Views to Proposed Ventilation Shaft Sites – Operational Infrastructure (Fans)	Plate 6-2	Licensed Discharge Point 5
Figure 6-25	Potential Views to Proposed Ventilation Shaft Sites – Operational Infrastructure (Vent Stacks)	Plate 6-3a	Sampling Site CR1
Figure 6-26	Local Economic Region	Plate 6-3b	Sampling Site CR2
Figure 6-27	Comparison of Project Economic Benefits Between Dapto-Port Kembla SA3, Greater Wollongong and NSW Economies	Plate 6-3c	Sampling Site AR1
Figure 7-1	West Cliff Coal Wash Emplacement Conceptual Final Rehabilitation and Regeneration	Plate 6-3d	Sampling Site AR2
Figure 7-2	Conceptual Cross Sections of the Rehabilitated Mine Landform of the West Cliff Stage 3 Coal Wash Emplacement	Plate 6-3e	Sampling Site DC1
Figure 7-3	Dendrobium Mine Conceptual Rehabilitation Domains	Plate 6-3f	Sampling Site DC2
Figure 7-4	Dendrobium Pit Top and Kemira Valley Coal Loading Facility Conceptual Rehabilitation Domains	Plate 6-4a	Swamp 15b - Nine Years after Undermining
Figure 7-5	Cordeaux Pit Top Conceptual Rehabilitation Domains	Plate 6-4b	Swamp 15b - Nine Years after Undermining
Figure 7-6	West Cliff Stage 3 Coal Wash Emplacement Conceptual Rehabilitation Domains	Plate 6-5a	Example of Coastal Upland Swamp Impacted by Surface Disturbance
		Plate 6-5b	Example of Coastal Upland Swamp Impacted by Surface Disturbance
		Plate 7-1	West Cliff Stage 1 Coal Wash Emplacement Area - 14 Years After Completion
		Plate 7-2	West Cliff Stage 2 Coal Wash Emplacement Area - Five Years After Completion
		Plate 7-3	Drilling into Bedrock to Form Grouting Holes
		Plate 7-4	Example of Rockbar Grouting Injection Undertaken in the Georges River
		Plate 7-5	Square Coir Logs for Knickpoint Control
		Plate 7-6	Coir Log Dams Constructed at Intervals with Wrapping of Fibre Matting
		Plate 7-7	Round Coir Logs Installed to Spread Water

LIST OF PLATES

Plate ES-1	Mt Kembla Memorial Pathway
Plate ES-2	Diverse Underground Workforce
Plate ES-3	Port Kembla Industrial Complex
Plate ES-4	Underground Facilities
Plate ES-5	Kemira Valley Coal Loading Facility
Plate ES-6	South32 Workforce
Plate ES-7	Workforce Underground
Plate ES-8	Nursery Producing Rehabilitation Plantings for South32
Plate ES-9	Mt Kembla Memorial Pathway
Plate 2-1	Dendrobium Nos 2 and 3 Shafts
Plate 2-2	Train Loading at the Kemira Valley Coal Loading Facility

LIST OF GRAPHS

Graph 6-1	Plot Showing the Ranges of Electrical Conductivity for Various Water Sources
-----------	------------------------------------------------------------------------------

TABLE OF CONTENTS (CONTINUED)

LIST OF MAPS

Map A	Key Stream Features – Area 5 Tributaries to the Avon River
Map B	Key Stream Features – Area 5 Tributaries to Avon Dam
Map C	Key Stream Features – Area 5 Tributaries to Donalds Castle Creek
Map D	Key Stream Features – Area 6 Tributaries to the Cordeaux River

Appendix I	Air Quality and Greenhouse Gas Assessment
Appendix J	Noise and Blasting Assessment
Appendix K	Social Impact Assessment
Appendix L	Economic Assessment
Appendix M	Environmental Risk Assessment
Appendix N	Preliminary Hazard Analysis
Appendix O	Land Contamination Assessment
Appendix P	Geological Structure Review (South32)

LIST OF ATTACHMENTS

Attachment 1	Secretary's Environmental Assessment Requirements
Attachment 2	Cross Reference to Assessment Requirements Relevant to the EPBC Act
Attachment 3	Development Application Area and Real Property Descriptions
Attachment 4	Land Ownership and Landholder Key
Attachment 5	Peer Review Letters
Attachment 6	Relevant Environmental Planning Instruments and Government Policies
Attachment 7	Aquifer Interference Policy Considerations and Water Licensing Addendum
Attachment 8	Capital Investment Value Estimate Report
Attachment 9	Community Information
Attachment 10	JORC Summary

LIST OF APPENDICES

Appendix A	Subsidence Assessment
Appendix B	Groundwater Assessment
Appendix C	Surface Water Assessment
Appendix D	Biodiversity Assessment Report and Biodiversity Offset Strategy
Appendix E	Aquatic Ecology Assessment
Appendix F	Aboriginal Cultural Heritage Assessment
Appendix G	Historical Heritage Assessment
Appendix H	Road Transport Assessment

22 July 2019

NSW Department of Planning, Industry and Environment
Level 22, 320 Pitt Street
SYDNEY NSW 2000

Illawarra Coal
South32
Innovation Campus
Enterprise 1 Bldg. Level 3 Squires Way
NORTH WOLLONGONG NSW 2500
PO Box 514
UNANDERRA NSW 2526
T +61 2 4286 3000
south32.net

Attention: Mike Young, Executive Director – Energy and Resources

Dear Mr Young,

**RE: DENDROBIUM MINE – PLAN FOR THE FUTURE: COAL FOR STEELMAKING (SSD 8194)
ENVIRONMENTAL IMPACT STATEMENT**

The enclosed Environmental Impact Statement for the Dendrobium Mine – Plan for the Future: Coal for Steelmaking (the Project) has been prepared for Illawarra Coal Holdings Pty Ltd, a wholly owned subsidiary of South32 Limited (South32), by Resource Strategies Pty Ltd.

The Project Environmental Impact Statement represents an accurate description of South32's development intentions and commitments in regard to environmental management and monitoring for the Project.

Yours sincerely

SOUTH32 LIMITED



Stephen Shaw
Project Director
Dendrobium Next Domain Project

Submission of Environmental Impact Statement (EIS)

prepared under the *Environmental Planning and Assessment Act 1979* (as amended)

EIS prepared by

name:	Joshua Hunt	James Steele
	Principal	Senior Environmental Manager
qualifications:	BE (Civil)	BE (Env)

address:	Resource Strategies Pty Ltd Post Office Box 1842, MILTON QLD 4064
----------	----------------------------------------------------------------------

in respect of	Dendrobium Mine – Plan for the Future: Coal for Steelmaking Project
---------------	---------------------------------------------------------------------

development application

applicant name:	Illawarra Coal Holdings Pty Ltd
applicant address:	108 St Georges Terrace, PERTH Western Australia 6000
land to be developed:	As described in Attachment 3 in the Main Report of the Environmental Impact Statement.
proposed development:	The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- longwall mining of the Wongawilli Seam in a new underground mining area (Area 6);
- development of underground roadways within the Bulli Seam, Wongawilli Seam and other strata required to access Project mining areas;
- use of existing underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Areas 5 and 6;
- development of surface infrastructure associated with mine ventilation and gas management and abatement, and other ancillary infrastructure;
- handling and processing of up to 5.2 million tonner per annum of run-of-mine (ROM) coal;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium Coal Preparation Plant (CPP) and Dendrobium Shafts with minor upgrades and extensions;
- use of the Cordeaux Pit Top for mining support activities;
- augmentation of mine access arrangements, including upgrades to, and the use of, the Cordeaux Pit Top;
- transport of sized ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- delivery of product coal from the Dendrobium CPP to the Port Kembla Steelworks for domestic use or to the Port Kembla Coal Terminal for transport to Liberty Primary Steel Whyalla Steelworks or export;
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill), for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and Stage 4 Coal Wash Emplacement;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure;
- controlled release of excess water in accordance with the conditions of Environmental Protection Licence 3241 and/or beneficial industrial re-use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

The Project is described in detail in the attached Environmental Impact Statement.

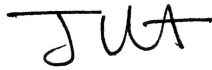
**Assessment of
environmental impact**

An Environmental Impact Statement is attached.

Declaration

I declare that the information contained in this Environmental Impact Statement, to the best of my knowledge and belief, is prepared in accordance with Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*, contains all available information that is relevant to the environmental assessment, and is neither false nor misleading.

Signature:



name:

JOSHUA HUNT

JAMES STEELE

date:

22 July 2019

22 July 2019

Key specialist studies for the Dendrobium Mine – Plan for the Future: Coal for Steelmaking Project have been prepared by the following consultants.

Subsidence Assessment

Dr James Barbato
BE (Civil)(Hons) PhD
Mine Subsidence Engineering Consultants

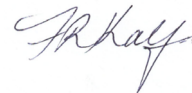


Groundwater Assessment and Peer Review

Mr Will Minchin
BE (Enviro)(Hons) MEngSci
HydroSimulations, Watershed HydroGeo



Dr Frans Kalf
BSc MappSc PhD
Kalf and Associates Pty Ltd



Surface Water Assessment and Peer Review

Mr Tony Marszalek
BE (Civil)(Hons) MEngSci
Hydro Engineering & Consulting Pty Ltd



Dr Camilla West
BSc (Environmental Science) (Hons) PhD



Emeritus Professor Thomas McMahon
BE (Agr) Dip Ed PhD DEng FTSE
The University of Melbourne



Biodiversity Assessment Report and Biodiversity Offset Strategy

Mr Luke Baker
BAppSc (Env Mgt)
Niche Environment and Heritage Pty Ltd



Mr Simon Tweed
BEnvSc (Hnrs)
Accredited BAM Assessor (No. BAAS17040)
Niche Environment and Heritage Pty Ltd



Aquatic Ecology Assessment

Mr Daniel Pygas
BSc (Marine Biology) (Hons)
Cardno (NSW/ACT) Pty Ltd



Aboriginal Cultural Heritage Assessment

Ms Renée Regal
BA (Hons)
Niche Environment and Heritage Pty Ltd



Noise and Blasting Assessment

Mr William Chan
BSc (Physics and Mathematics) M.A.A.S
Renzo Tonin & Associates



Economic Assessment

Mr George Michalas
BEc/LLB
Cadence Economics



Social Impact Assessment

Ms Dee Elliott
BA MSocPol
Elliott Whiteing Pty Ltd

