



# BULLI SEAM OPERATIONS

# TABLE OF CONTENTS

## TABLE OF CONTENTS

|       |   |      |        |   |      |
|-------|---|------|--------|---|------|
| 1     | INTRODUCTION  | 1-1  | 2.6    | ROM COAL RECLAIM AND WASHING  | 2-33 |
| 1.1   | PROJECT OVERVIEW  | 1-1  | 2.6.1  | Coal Sizing and Screening Circuit                                     | 2-33 |
| 1.1.1 | Purpose of this Report  | 1-1  | 2.6.2  | Coal Preparation Plant  | 2-33 |
| 1.1.2 | Background  | 1-1  | 2.7    | PRODUCT COAL STOCKPILING, RECLAIM AND TRANSPORT                       | 2-34 |
| 1.1.3 | Project Summary   | 1-1  | 2.8    | COAL WASH MANAGEMENT  | 2-34 |
| 1.1.4 | Site Location and Tenure  | 1-4  | 2.8.1  | Coal Wash Production  | 2-34 |
| 1.1.5 | Proponent   | 1-7  | 2.8.2  | Coal Wash Physical Characteristics                                    | 2-34 |
| 1.2   | ENVIRONMENTAL ASSESSMENT REQUIREMENTS                               | 1-7  | 2.8.3  | West Cliff Coal Wash Emplacement                                      | 2-34 |
| 1.3   | SOUTHERN COALFIELD INQUIRY AND PANEL REPORT RECOMMENDATIONS         | 1-7  | 2.8.4  | Underground Emplacement Pilot Trial                                   | 2-38 |
| 1.4   | PROJECT CONSULTANTS   | 1-7  | 2.8.5  | Ongoing Consideration of Alternative Coal Wash Management Options     | 2-38 |
| 1.5   | STRUCTURE OF THIS DOCUMENT  | 1-9  | 2.9    | REHABILITATION ACTIVITIES AND REMEDIATION WORKS                       | 2-38 |
| 2     | PROJECT DESCRIPTION   | 2-1  | 2.10   | WATER MANAGEMENT  | 2-39 |
| 2.1   | EXISTING MINING OPERATIONS  | 2-1  | 2.10.1 | Existing Water Management System                                      | 2-39 |
| 2.1.1 | Underground Mining Operations                                       | 2-1  | 2.10.2 | Project Water Management System                                       | 2-42 |
| 2.1.2 | Pit Tops and Supporting Infrastructure                              | 2-7  | 2.10.3 | Stage 4 Coal Wash Emplacement   | 2-42 |
| 2.1.3 | ROM Coal Transport, Reclaim and Washing                             | 2-9  | 2.11   | INFRASTRUCTURE AND SERVICES   | 2-42 |
| 2.1.4 | Product Coal Stockpiling and Road Transport                         | 2-9  | 2.11.1 | Administration Buildings, Bathhouse, Workshops and Surface Facilities | 2-42 |
| 2.1.5 | Coal Wash Management  | 2-9  | 2.11.2 | Access Roads and Haul Roads   | 2-42 |
| 2.1.6 | Electricity Supply and Distribution                                 | 2-9  | 2.11.3 | Electricity Supply and Distribution                                   | 2-42 |
| 2.1.7 | Historical Mining Areas   | 2-10 | 2.11.4 | Service Boreholes   | 2-43 |
| 2.2   | COAL RESOURCE, MAJOR GEOLOGICAL FEATURES AND EXPLORATION ACTIVITIES | 2-10 | 2.11.5 | Site Security and Communications                                      | 2-43 |
| 2.3   | PROJECT GENERAL ARRANGEMENT   | 2-14 | 2.11.6 | Potable Water   | 2-43 |
| 2.4   | PROJECT CONSTRUCTION/ DEVELOPMENT ACTIVITIES                        | 2-19 | 2.12   | WASTE MANAGEMENT  | 2-43 |
| 2.4.1 | Longwall Mining Machinery Upgrades                                  | 2-19 | 2.12.1 | Sewage Treatment and Effluent Disposal                                | 2-44 |
| 2.4.2 | Materials Handling and Transport System Upgrades                    | 2-19 | 2.12.2 | Recyclable and Non-Recyclable General Domestic Wastes                 | 2-44 |
| 2.4.3 | West Cliff Washery Reliability Improvement Project                  | 2-19 | 2.12.3 | Other Waste Types   | 2-44 |
| 2.4.4 | Surface Facilities and Supporting Infrastructure Upgrades           | 2-20 | 2.13   | MANAGEMENT OF DANGEROUS GOODS   | 2-44 |
| 2.5   | UNDERGROUND MINING OPERATIONS                                       | 2-20 | 2.14   | WORKFORCE   | 2-45 |
| 2.5.1 | Indicative Mine Schedule  | 2-20 | 3      | CONSULTATION AND COMMUNITY INITIATIVES                                | 3-1  |
| 2.5.2 | Coal Mining and Subsidence Effects                                  | 2-23 | 3.1    | ENVIRONMENTAL ASSESSMENT CONSULTATION                                 | 3-1  |
| 2.5.3 | Underground Mine Access, Development Works and ROM Coal Handling    | 2-29 | 3.1.1  | Objectives  | 3-1  |
| 2.5.4 | Major Underground Equipment   | 2-30 | 3.1.2  | State Government Agencies   | 3-1  |
| 2.5.5 | Coal Seam Gas Management  | 2-30 | 3.1.3  | Local Government Agencies   | 3-5  |
| 2.5.6 | Ventilation Systems   | 2-32 | 3.1.4  | Federal Government Agencies   | 3-6  |
| 2.5.7 | Mine Dewatering   | 2-33 | 3.1.5  | Infrastructure Owners/Service Providers                               | 3-7  |
|       |   |      | 3.1.6  | Public Consultation   | 3-9  |

**TABLE OF CONTENTS (Continued)**

|        |   |      |        |  |       |
|--------|---|------|--------|--|-------|
| 3.1.7  | Southern Coalfield Inquiry  | 3-13 | 5.4    | SUBSIDENCE   | 5-45  |
| 3.1.8  | Choice Modelling  | 3-13 | 5.4.1  | Prediction Methodology   | 5-45  |
| 3.2    | COMMUNITY INITIATIVES AND INVOLVEMENT                                       | 3-14 | 5.4.2  | Maximum Systematic Subsidence Predictions                                  | 5-45  |
| 3.2.1  | Appin Area Community Working Group  | 3-14 | 5.4.3  | Non-Systematic Subsidence Predictions                                      | 5-46  |
| 3.2.2  | Dendrobium Community Consultative Committee                                 | 3-14 | 5.4.4  | Subsidence Impact Assessment for Key Natural and Man-Made Surface Features | 5-46  |
| 3.2.3  | Website and Community Call Line   | 3-14 | 5.4.5  | Mitigation Measures, Management and Monitoring                             | 5-51  |
| 3.2.4  | Appin Community Office and Douglas Park Community Hall Displays             | 3-15 | 5.5    | GROUNDWATER  | 5-58  |
| 3.2.5  | Community Perception Surveys  | 3-15 | 5.5.1  | Existing Environment   | 5-58  |
| 3.2.6  | Community Partnerships Program and Dendrobium Community Enhancement Program | 3-15 | 5.5.2  | Potential Impacts  | 5-63  |
| 3.2.7  | Sponsorships and Community Initiatives                                      | 3-16 | 5.5.3  | Mitigation Measures, Management and Monitoring                             | 5-64  |
| 3.2.8  | Media   | 3-17 | 5.6    | SURFACE WATER  | 5-67  |
| 3.2.9  | Community Newsletters, Fact Sheets and Publications                         | 3-17 | 5.6.1  | Existing Environment   | 5-67  |
| 3.2.10 | Local Suppliers   | 3-17 | 5.6.2  | Potential Impacts  | 5-75  |
| 5.6.3  | Mitigation Measures, Management and Monitoring                              | 5-79 | 5.7    | AQUATIC ECOLOGY  | 5-82  |
| 4      | FRAMEWORK OF ENVIRONMENTAL ASSESSMENT                                       | 4-1  | 5.7.1  | Existing Environment   | 5-82  |
| 4.1    | SOUTHERN COALFIELD INQUIRY  | 4-1  | 5.7.2  | Potential Impacts  | 5-84  |
| 4.2    | METROPOLITAN COAL PROJECT PLANNING ASSESSMENT COMMISSION REPORT             | 4-1  | 5.7.3  | Mitigation Measures, Management and Monitoring                             | 5-90  |
| 4.2.1  | Risk Management Zones for Significant Natural Features                      | 4-2  | 5.7.4  | Compensatory Measures and Ecological Initiatives                           | 5-91  |
| 4.2.2  | Risk Framework  | 4-2  | 5.8    | TERRESTRIAL FLORA  | 5-91  |
| 4.2.3  | Assessment of Significance and Acceptability of Environmental Consequences  | 4-3  | 5.8.1  | Existing Environment   | 5-91  |
| 4.2.4  | Subsidence  | 4-3  | 5.8.2  | Potential Impacts  | 5-104 |
| 4.2.5  | Groundwater   | 4-4  | 5.8.3  | Mitigation Measures, Management and Monitoring                             | 5-110 |
| 4.2.6  | Vegetation  | 4-5  | 5.8.4  | Compensatory Measures and Ecological Initiatives                           | 5-113 |
| 4.2.7  | Economic and Social Impacts   | 4-6  | 5.9    | TERRESTRIAL FAUNA  | 5-114 |
| 5      | ENVIRONMENTAL ASSESSMENT  | 5-1  | 5.9.1  | Existing Environment   | 5-114 |
| 5.1    | ENVIRONMENTAL RISK ASSESSMENT   | 5-1  | 5.9.2  | Potential Impacts  | 5-117 |
| 5.2    | RISK ASSESSMENTS FOR SIGNIFICANT FEATURES                                   | 5-1  | 5.9.3  | Mitigation Measures, Management and Monitoring                             | 5-124 |
| 5.2.1  | Stream Risk Assessment  | 5-2  | 5.9.4  | Compensatory Measures and Ecological Initiatives                           | 5-127 |
| 5.2.2  | Upland Swamp Risk Assessment  | 5-15 | 5.10   | ABORIGINAL HERITAGE  | 5-127 |
| 5.2.3  | Aboriginal Heritage Site Risk Assessment                                    | 5-24 | 5.10.1 | Existing Environment   | 5-127 |
| 5.2.4  | Major Cliff Line Risk Assessment  | 5-27 | 5.10.2 | Potential Impacts  | 5-140 |
| 5.3    | LAND RESOURCES, CLIMATE AND BUSHFIRE REGIME                                 | 5-31 | 5.10.3 | Mitigation Measures, Management and Monitoring                             | 5-143 |
| 5.3.1  | Existing Environment  | 5-31 | 5.11   | NON-ABORIGINAL HERITAGE  | 5-145 |
| 5.3.2  | Potential Impacts   | 5-41 | 5.11.1 | Existing Environment   | 5-145 |
| 5.3.3  | Mitigation Measures, Management and Monitoring                              | 5-43 | 5.11.2 | Potential Impacts  | 5-145 |
|        |   |      | 5.11.3 | Mitigation Measures, Management and Monitoring                             | 5-149 |

**TABLE OF CONTENTS (Continued)**

|        |  |       |       |  |      |
|--------|--|-------|-------|--|------|
| 5.12   | NOISE  | 5-153 | 6.3   | TEMPORARY SURFACE DISTURBANCE AREAS  | 6-7  |
| 5.12.1 | Background   | 5-153 | 6.4   | MINE SUBSIDENCE IMPACTS  | 6-7  |
| 5.12.2 | Existing Environment                                 | 5-154 | 6.4.1 | Streams  | 6-7  |
| 5.12.3 | Applicable Noise and Vibration Criteria              | 5-155 | 6.4.2 | Swamps   | 6-9  |
| 5.12.4 | Potential Impacts                                    | 5-160 | 6.4.3 | Other Natural Surface Features   | 6-11 |
| 5.12.5 | Mitigation Measures, Management and Monitoring       | 5-165 | 6.5   | LEASE RELINQUISHMENT   | 6-11 |
| 5.13   | AIR QUALITY  | 5-167 | 7     | PLANNING FRAMEWORK AND PROJECT JUSTIFICATION   | 7-1  |
| 5.13.1 | Background   | 5-167 | 7.1   | MAJOR PROJECTS   | 7-1  |
| 5.13.2 | Existing Environment                                 | 5-168 | 7.1.1 | Application of Other Provisions of the Environmental Planning and Assessment Act, 1979 | 7-2  |
| 5.13.3 | Potential Impacts                                    | 5-170 | 7.1.2 | Approvals and Legislation that do not Apply to Approved Part 3A Projects               | 7-2  |
| 5.13.4 | Mitigation Measures, Management and Monitoring       | 5-171 | 7.1.3 | Approvals and Legislation that must be Applied Consistently for Part 3A Projects       | 7-2  |
| 5.14   | GREENHOUSE GAS EMISSIONS                             | 5-172 | 7.2   | ENVIRONMENTAL PLANNING INSTRUMENTS   | 7-3  |
| 5.14.1 | Framework for Assessment                             | 5-172 | 7.2.1 | State Environmental Planning Policies  | 7-3  |
| 5.14.2 | Greenhouse Gas Assessment                            | 5-176 | 7.2.2 | Illawarra Regional Environmental Plan No 1   | 7-9  |
| 5.14.3 | Mitigation Measures, Management and Monitoring       | 5-179 | 7.2.3 | Greater Metropolitan Regional Environmental Plan No 2—Georges River Catchment          | 7-13 |
| 5.15   | ROAD TRANSPORT                                       | 5-180 | 7.2.4 | Drinking Water Catchments Regional Environmental Plan No. 1                            | 7-17 |
| 5.15.1 | Existing Environment                                 | 5-180 | 7.2.5 | Sydney Regional Environmental Plan No 20 - Hawkesbury-Nepean River (No 2 - 1997)       | 7-18 |
| 5.15.2 | Potential Impacts                                    | 5-184 | 7.2.6 | Local Environmental Plans  | 7-24 |
| 5.15.3 | Mitigation Measures, Management and Monitoring       | 5-188 | 7.2.7 | Section 94 Contribution Plans  | 7-24 |
| 5.16   | REGIONAL AND NSW ECONOMIES                           | 5-189 | 7.2.8 | Subregional Planning   | 7-24 |
| 5.16.1 | Existing Environment                                 | 5-189 | 7.3   | OTHER APPLICABLE STATUTORY APPROVALS   | 7-26 |
| 5.16.2 | Potential Impacts                                    | 5-190 | 7.3.1 | NSW Approvals  | 7-26 |
| 5.16.3 | Mitigation Measures and Management                   | 5-191 | 7.3.2 | Commonwealth Approvals   | 7-30 |
| 5.17   | EMPLOYMENT, POPULATION AND COMMUNITY INFRASTRUCTURE  | 5-191 | 7.4   | EPBC – ASSESSMENT OF MATTERS OF NATIONAL SIGNIFICANCE                                  | 7-31 |
| 5.17.1 | Existing Environment                                 | 5-191 | 7.5   | DHARAWAL STATE CONSERVATION AREA   | 7-31 |
| 5.17.2 | Potential Impacts                                    | 5-195 | 7.6   | ALTERNATIVES CONSIDERED  | 7-33 |
| 5.17.3 | Mitigation Measures and Management                   | 5-196 | 7.6.1 | Mining Method  | 7-33 |
| 5.18   | HAZARD AND RISK                                      | 5-197 | 7.6.2 | Longwall Width   | 7-33 |
| 5.18.1 | Hazard Identification and Risk Assessment            | 5-197 | 7.6.3 | Environmental Impact Reduction Alternatives  | 7-34 |
| 5.18.2 | Mitigation Measures and Management                   | 5-197 | 7.6.4 | Coal Transport   | 7-35 |
| 5.19   | VISUAL CHARACTER                                     | 5-198 | 7.6.5 | Coal Wash Production   | 7-37 |
| 5.19.1 | Existing Environment                                 | 5-198 | 7.6.6 | Coal Wash Disposal   | 7-37 |
| 5.19.2 | Potential Impacts                                    | 5-200 |       |  |      |
| 5.19.3 | Mitigation Measures and Management                   | 5-208 |       |  |      |
| 6      | REHABILITATION AND MINE CLOSURE                      | 6-1   |       |  |      |
| 6.1    | MINE CLOSURE PLANS FOR PIT TOP AREAS AND SHAFT SITES | 6-1   |       |  |      |
| 6.1.1  | Pit Top Areas  | 6-1   |       |  |      |
| 6.1.2  | Shaft Sites  | 6-3   |       |  |      |
| 6.2    | WEST CLIFF STAGE 4 COAL WASH EMPLACEMENT             | 6-5   |       |  |      |

**TABLE OF CONTENTS (Continued)**

|     |       |  |       |
|-----|-------|--|-------|
|     | 7.6.7 | Pit Top Locations/<br>Endeavour Project  | 7-38  |
|     | 7.6.8 | Surface Goaf Gas<br>Drainage   | 7-38  |
| 7.7 |       | <b>ECOLOGICALLY SUSTAINABLE<br/>DEVELOPMENT<br/>CONSIDERATIONS</b>   | 7-39  |
|     | 7.7.1 | Consideration of the<br>Consistency of the Project<br>with the Objects of the<br>EP&A Act                      | 7-45  |
| 7.8 |       | <b>PROJECT JUSTIFICATION</b>   | 7-46  |
|     | 7.8.1 | Consistency with the Findings<br>and Recommendations of<br>the Southern Coalfield<br>Panel Report              | 7-46  |
|     | 7.8.2 | Consideration of Potential<br>Environmental Impacts,<br>Mitigation Measures and<br>Environmental<br>Management | 7-46  |
|     | 7.8.3 | Consideration of Potential<br>Socio-Economic Benefits  | 7-46  |
| 8   |       | <b>STATEMENT OF COMMITMENTS</b>  | SOC-1 |
| 9   |       | <b>REFERENCES</b>  | 9-1   |
| 10  |       | <b>ABBREVIATIONS, ACRONYMS AND<br/>GLOSSARY</b>  | 10-1  |
|     | 10.1  | <b>ABBREVIATIONS AND<br/>ACRONYMS</b>  | 10-1  |
|     | 10.2  | <b>GLOSSARY</b>  | 10-5  |

**LIST OF TABLES**

|            |  |
|------------|--|
| Table 1-1  | Project Summary  |
| Table 1-2  | Existing Mining and Exploration<br>Tenements   |
| Table 1-3  | Director-General's Environmental<br>Assessment Requirements – Reference<br>Summary                       |
| Table 2-1  | Existing Surface Mobile Equipment Fleet  |
| Table 2-2  | Indicative Mine Schedule   |
| Table 2-3  | Indicative Coal Wash Production Schedule   |
| Table 2-4  | Typical Size Fraction and Moisture<br>Content of Coal Wash from the West Cliff<br>Washery                |
| Table 2-5  | Other Wastes Likely to be Generated by<br>the Project  |
| Table 2-6  | Initial Development and Operational<br>Workforce   |
| Table 5-1  | Key Potential Environmental Issues   |
| Table 5-2  | Summary of Preferred Risk Management<br>Options - Streams  |
| Table 5-3  | Summary of Preferred Risk Management<br>Options – Swamps   |
| Table 5-4  | Summary of Archaeological Significance<br>for Aboriginal Heritage Sites                                  |
| Table 5-5  | Soil Landscapes of the Project Area  |
| Table 5-6  | Bureau of Meteorology Monitoring Station<br>Locations and Recording Periods                              |
| Table 5-7  | Relevant Meteorological Information  |
| Table 5-8  | Maximum Predicted Total Systematic<br>Subsidence, Tilts and Curvatures for the<br>EA Base Plan Longwalls |
| Table 5-9  | Residential Dwellings within the Study<br>Area   |
| Table 5-10 | Residential Dwellings Repair Categories  |
| Table 5-11 | Summary of Water Quality Data at<br>Shallow Groundwater Monitoring Sites<br>(January 1998 to March 2008) |
| Table 5-12 | Proposed Groundwater Monitoring<br>Programme   |
| Table 5-13 | O'Hares Creek and Stokes Creek Stream<br>Flow Characteristics (1978 to 1987)                             |
| Table 5-14 | Summary of Regional Surface Water<br>Quality Monitoring  |
| Table 5-15 | Aquatic Ecology Sampling Locations   |
| Table 5-16 | Vegetation Communities Identified in the<br>Study Area   |
| Table 5-17 | Threatened Flora Species Recorded<br>during Baseline Flora Surveys                                       |
| Table 5-18 | Endangered Ecological Communities<br>Known to Occur in the Study Area                                    |

## TABLE OF CONTENTS (Continued)

### LIST OF TABLES (Continued)

|            |  |
|------------|--|
| Table 5-19 | Native Terrestrial Fauna Species   |
| Table 5-20 | Threatened Terrestrial Fauna Species Recorded during Baseline Fauna Surveys  |
| Table 5-21 | Summary of Previous and Project Aboriginal Heritage Consultation/Surveys   |
| Table 5-22 | Known Aboriginal Heritage Sites within the Project Area and Surrounds  |
| Table 5-23 | Archaeological Significance of Aboriginal Heritage Sites within the Project Area and Surrounds                               |
| Table 5-24 | Risk Based Impact Assessment of Potential Subsidence Impacts on Aboriginal Heritage Sites                                    |
| Table 5-25 | Identified Heritage Items in the Project Area  |
| Table 5-26 | Potential Impacts on Major Infrastructure with Heritage Value  |
| Table 5-27 | Preliminary Management and Mitigation Measures for Higher Heritage Significance Buildings                                    |
| Table 5-28 | Relative Scale of Various Noise Sources  |
| Table 5-29 | RBL Values Adopted for Noise Assessment  |
| Table 5-30 | Project Specific Intrusiveness Criteria  |
| Table 5-31 | INP Amenity Criteria   |
| Table 5-32 | Blasting Assessment Criteria   |
| Table 5-33 | Applicable Road Traffic Noise Goals  |
| Table 5-34 | Predicted Number of Receivers in the Existing/Approved and Project Intrusive Noise Affectation and Noise Management Zones    |
| Table 5-35 | Air Quality Standards/Assessment Criteria for Concentrations of Suspended Particulate Matter                                 |
| Table 5-36 | Odour Assessment Criteria  |
| Table 5-37 | Measured Annual Average Dust Deposition ( $\text{g}/\text{m}^2/\text{month}$ )   |
| Table 5-38 | Measured Annual Average $\text{PM}_{10}$ Concentrations  |
| Table 5-39 | Average Weekday Traffic Movements on Haulage Routes and Local Roads  |
| Table 5-40 | Relevant Intersection Performance – Surveyed Traffic Flows (April 2009)  |
| Table 5-41 | Predicted Average Weekday Traffic Movements on Haulage Routes and Local Roads  |
| Table 5-42 | Contributions to Employment Gross Regional Product and Output by Industry Sector – Regional and NSW Economies (2005 to 2006) |
| Table 5-43 | Observed and Predicted Population Growth Rate – Illawarra, Outer South-Western Sydney and NSW                                |

### LIST OF TABLES (Continued)

|             |   |
|-------------|---|
| Table 5-44  | Distribution of the Illawarra and Outer South-Western Sydney Population by Age Group            |
| Table 5-45  | Unemployment in the Illawarra and Outer South-Western Sydney Regions                            |
| Table 5-46  | Housing Stock in the Illawarra and Outer South-Western Sydney Regions (Occupied Dwellings Only) |
| Table 5-47  | Short Stay Accommodation in the Illawarra and Outer South-Western Sydney Regions                |
| Table 5-48  | Education Enrolments in the Illawarra and Outer South-Western Sydney Regions                    |
| Table 5-49  | Existing Modification and Public Accessibility to Key Watercourses within the Study Area        |
| Table 5-50  | Visual Impact Matrix  |
| Table 5-51  | Visual Sensitivity Levels   |
| Table 5-52  | Summary of Visual Assessment for the West Cliff Coal Wash Emplacement                           |
| Table 6-1   | Summary of Proposed Stream Remediation Techniques   |
| Table 7-1   | Summary of Project Environmental Impact Reduction Alternatives                                  |
| Table 7-2   | Summary of Project Research, Offset and Compensatory Measures                                   |
| Table SOC-1 | Summary of Project Management, Monitoring and Reporting   |
| Table SOC-2 | Summary of Project Research, Offset and Compensatory Measures                                   |

## TABLE OF CONTENTS (Continued)

### LIST OF FIGURES

|             |   |
|-------------|---|
| Figure 1-1  | Regional Location   |
| Figure 1-2  | Aerial Photograph of the Project Area and Surrounds                                       |
| Figure 2-1  | Project General Arrangement   |
| Figure 2-2  | General Arrangement of West Cliff Pit Top Area and Supporting Infrastructure              |
| Figure 2-3  | General Arrangement of Appin East Pit Top Area and Supporting Infrastructure              |
| Figure 2-4  | General Arrangement of Appin West Pit Top Area and Supporting Infrastructure              |
| Figure 2-5  | General Arrangement of Appin and North Cliff Shafts and Supporting Infrastructure         |
| Figure 2-6  | Stratigraphic Cross Section   |
| Figure 2-7  | Indicative Stratigraphic Section – Project Area   |
| Figure 2-8  | Project General Arrangement – West Cliff Area 5 and Appin Area 7                          |
| Figure 2-9  | Project General Arrangement – North Cliff   |
| Figure 2-10 | Project General Arrangement – Appin West (Area 9) and Appin Area 8                        |
| Figure 2-11 | Project General Arrangement – Appin Areas 2 and 3 Extended                                |
| Figure 2-12 | Materials Handling Schematic Flowsheet  |
| Figure 2-13 | West Cliff CPP Schematic Flowsheet  |
| Figure 2-14 | Longwall Mining Method – Conceptual Cross Section and Plan                                |
| Figure 2-15 | West Cliff Stage 4 Coal Wash Emplacement – Conceptual Cross Section and Plan              |
| Figure 2-16 | Project Water Management Schematic  |
| Figure 5-1  | Stream Risk Management Zones - West Cliff Area 5 and Appin Area 7                         |
| Figure 5-2  | Stream Risk Management Zones - North Cliff  |
| Figure 5-3  | Stream Risk Management Zones - Appin West (Area 9) and Appin Area 8                       |
| Figure 5-4  | Stream Risk Management Zones - Appin Areas 2 and 3 Extended                               |
| Figure 5-5  | Upland Swamps – North Cliff (North)   |
| Figure 5-6  | Upland Swamps – North Cliff (South)   |
| Figure 5-7  | Upland Swamps – Appin Areas 2 and 3 Extended  |
| Figure 5-8  | Mine Subsidence Districts in the Project Extent of the Longwall Mining Area and Surrounds |
| Figure 5-9  | DWE Registered Bores and ICHPL Piezometer Locations                                       |
| Figure 5-10 | Indicative Stratigraphic Section – Project Area   |

### LIST OF FIGURES (Continued)

|             |  |
|-------------|--|
| Figure 5-11 | Surface Water Flow Monitoring Locations, Stream Features and Pool Locations  |
| Figure 5-12 | Surface Water Quality Monitoring Locations   |
| Figure 5-13 | Vegetation Communities Legend  |
| Figure 5-14 | Vegetation Communities - West Cliff Area 5 and Appin Area 7  |
| Figure 5-15 | Vegetation Communities - North Cliff   |
| Figure 5-16 | Vegetation Communities - Appin West (Area 9) and Appin Area 8  |
| Figure 5-17 | Vegetation Communities - Appin Areas 2 and 3 Extended  |
| Figure 5-18 | Threatened Flora Species Recorded by Project Surveys   |
| Figure 5-19 | Threatened Flora Species Recorded by Project Surveys and Biosis Research (2007) – West Cliff Stage 4 Coal Wash Emplacement                   |
| Figure 5-20 | Threatened Fauna Species Recorded by Project Surveys   |
| Figure 5-21 | Threatened Fauna Species Recorded by Project Surveys - West Cliff Stage 4 Coal Wash Emplacement  |
| Figure 5-22 | Known Aboriginal Heritage Sites and Relevant Non-Aboriginal Heritage Items – West Cliff Area 5 and Appin Area 7                              |
| Figure 5-23 | Known Aboriginal Heritage Sites – North Cliff (North)  |
| Figure 5-24 | Known Aboriginal Heritage Sites – North Cliff (South)  |
| Figure 5-25 | Known Aboriginal Heritage Sites and Relevant Non-Aboriginal Heritage Items – Appin West (Area 9) and Appin Area 8                            |
| Figure 5-26 | Known Aboriginal Heritage Sites and Relevant Non-Aboriginal Heritage Items – Appin Areas 2 and 3 Extended                                    |
| Figure 5-27 | Haulage Routes, Vehicle Survey Locations and Intersection Survey Locations   |
| Figure 5-28 | Comparison Between Existing/Approved and Project Indicative 40dBA, 43dBA and 45dBA Noise $L_{Aeq}$ (15 minute) Contours (Night-Time) – Appin |
| Figure 5-29 | West Cliff Coal Wash Emplacement – Locations of Viewpoints 1 to 4  |
| Figure 7-1  | Relevant Local Government Environmental Planning Instruments   |

## TABLE OF CONTENTS (Continued)

### LIST OF PLATES

|           |  |
|-----------|--|
| Plate 5-1 | Cliff Lines along Douglas Park Drive   |
| Plate 5-2 | Viewpoint 1 - George Street, Appin   |
| Plate 5-3 | Viewpoint 2 - Appin Road South-east of Appin Township                                  |
| Plate 5-4 | Viewpoint 3 - Appin Road South of West Cliff Pit Top                                   |
| Plate 5-5 | Viewpoint 4 - Cataract Scout Park  |
| Plate 6-1 | Square Coir Logs for Knick Point Control   |
| Plate 6-2 | Small Coir Log Dams Constructed at Intervals along an Incised Swamp with Jute Wrapping |
| Plate 6-3 | Round Coir Logs Installed to Spread Water  |

### LIST OF CHARTS

|           |  |
|-----------|--|
| Chart 5-1 | Closure and Change in Erosion Risk Index |
|-----------|--|

### LIST OF ATTACHMENTS

|              |  |
|--------------|--|
| Attachment 1 | Director-General's Environmental Assessment Requirements     |
| Attachment 2 | Project Application Area and Real Property Descriptions      |
| Attachment 3 | Peer Review Letters  |
| Attachment 4 | Consultation Newsletters and Leaflets                        |
| Attachment 5 | Relevant Local Government Planning Instruments               |
| Attachment 6 | Dharawal State Conservation Area Memorandum of Understanding |

### LIST OF APPENDICES

|            |  |
|------------|--|
| Appendix A | Subsidence Assessment                    |
| Appendix B | Groundwater Assessment                   |
| Appendix C | Surface Water Assessment                 |
| Appendix D | Aquatic Ecology Assessment               |
| Appendix E | Terrestrial Flora Assessment             |
| Appendix F | Terrestrial Fauna Assessment             |
| Appendix G | Aboriginal Cultural Heritage Assessment  |
| Appendix H | Non-Aboriginal Heritage Assessment       |
| Appendix I | Noise Impact Assessment                  |
| Appendix J | Air Quality Impact Assessment            |
| Appendix K | Road Transport Assessment                |
| Appendix L | Socio-Economic Assessment                |
| Appendix M | Preliminary Hazard Analysis              |
| Appendix N | Environmental Risk Assessment            |
| Appendix O | Upland Swamp Risk Assessment             |
| Appendix P | Stream Risk Assessment                   |
| Appendix Q | Aboriginal Heritage Site Risk Assessment |
| Appendix R | Major Cliff Line Risk Assessment         |