



Environmental Assessment for Modification to Dendrobium Area 3

**Final Report
November 2007**



CARDNO FORBES RIGBY PTY LTD

**Environmental Assessment for
Modification to Dendrobium Area 3**

Report 002 Rev 0

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Table of Contents

Environmental Assessment Report

Attachments

- A. SUBSIDENCE PREDICTIONS AND IMPACT ASSESSMENTS ON NATURAL FEATURES AND SURFACE INFRASTRUCTURE (MINE SUBSIDENCE ENGINEERING CONSULTANTS)**
- B. SURFACE WATER QUALITY AND HYDROLOGY IMPACT ASSESSMENT (ECOENGINEERS)**
- C. LANDSCAPE IMPACT ASSESSMENT AND MONITORING SITE OPTIMISATION (CARDNO FORBES RIGBY)**
- D. SPECIES IMPACT STATEMENT (BIOSIS RESEARCH)**
- E. ASSESSMENT OF MINE SUBSIDENCE IMPACTS ON AQUATIC HABITAT AND BIOTA (THE ECOLOGY LAB)**
- F. HYDROGEOLOGY IMPACT ASSESSMENT (GHD)**
- G. ARCHAEOLOGICAL AND CULTURAL HERITAGE ASSESSMENT AND MANAGEMENT PLAN (BIOSIS RESEARCH)**
- H. RISK ASSESSMENT DOCUMENTATION (AXYS CONSULTING)**
- I. STAKEHOLDER CONSULTATION DOCUMENTATION**

TABLE OF CONTENTS

| | <i>Page</i> |
|-----------------|--|
| <u>1</u> | <u>INTRODUCTION</u> 17 |
| 1.1 | BACKGROUND 17 |
| 1.2 | THE APPLICANT 17 |
| 1.3 | APPLICATION AREA 18 |
| 1.4 | MODIFICATION OF LONGWALL FOOTPRINT IN AREA 3 18 |
| 1.4.1 | Mine Planning to Avoid Major Impacts 18 |
| 1.4.2 | Proposed Modified Footprint 19 |
| 1.5 | APPROVALS SOUGHT 21 |
| 1.5.1 | Additional Approval Required 22 |
| 1.6 | DIRECTOR GENERAL'S REQUIREMENTS 22 |
| 1.7 | ENVIRONMENTAL ASSESSMENT STUDY TEAM 25 |
| 1.8 | STRUCTURE OF THIS REPORT 25 |
| <u>2</u> | <u>JUSTIFICATION FOR THE PROJECT</u> 26 |
| 2.1 | INTRODUCTION 26 |
| 2.2 | NEED FOR A MODIFIED AREA 3 FOOTPRINT 26 |
| 2.3 | LONGWALL LAYOUT OPTIMISATION PROCESS 28 |
| 2.4 | ALTERNATIVE OPTIONS CONSIDERED 29 |
| 2.5 | INTER-RELATIONSHIP BETWEEN THE PROPOSED MODIFICATION AND EXISTING/APPROVED MINING OPERATIONS 39 |
| 2.6 | BENEFITS OF THE PROPOSED DEVELOPMENT 39 |
| <u>3</u> | <u>RELEVANT STATUTORY PROVISIONS</u> 41 |
| 3.1 | INTRODUCTION 41 |
| 3.2 | COMMONWEALTH LEGISLATION 41 |
| 3.2.1 | Environmental Protection and Biodiversity Conservation Act 1999 41 |
| 3.3 | STATE LEGISLATION 41 |
| 3.3.1 | Environmental Planning and Assessment Act 1979 41 |
| 3.3.2 | Mining Act 1992 41 |
| 3.3.3 | Threatened Species Conservation Act 1995 41 |
| 3.3.4 | The National Parks and Wildlife Act 1974 42 |
| 3.3.5 | Coal Mines Health and Safety Regulation 2006 42 |

| | | |
|----------|---|-----------|
| 3.3.6 | NSW Dams Safety Committee | 42 |
| 3.3.7 | Protection of the Environment Operations Act 1997 | 43 |
| 3.3.8 | Fisheries Management Act 1994 | 43 |
| 3.3.9 | Sydney Water Catchment Management Act 1998 | 43 |
| 3.4 | ENVIRONMENTAL PLANNING POLICIES | 44 |
| 3.4.1 | SEPP (Major Project) 2005 | 44 |
| 3.4.2 | SEPP (Mining, Petroleum Production and Extractive Industries) 2007 | 44 |
| 3.4.3 | SEPP 44 Koala Habitat | 44 |
| 3.4.4 | Sydney Drinking Water Catchment REP | 44 |
| 3.4.5 | Wollongong and Wingecarribee Local Environmental Plans | 45 |
| 4 | <u>IDENTIFICATION OF KEY ISSUES</u> | 47 |
| 5 | <u>SUBSIDENCE</u> | 48 |
| 5.1 | SURFACE FEATURES | 48 |
| 5.2 | MAXIMUM SUBSIDENCE PREDICTIONS | 49 |
| 5.2.1 | Area 3A | 49 |
| 5.2.2 | Areas 3B and 3C | 50 |
| 5.3 | IMPACT ASSESSMENT ON NATURAL FEATURES AND SURFACE INFRASTRUCTURE | 50 |
| 5.3.1 | Cordeaux River | 50 |
| 5.3.2 | Wongawilli and Sandy Creeks | 51 |
| 5.3.3 | Donalds Castle Creek | 61 |
| 5.3.4 | Drainage Lines | 62 |
| 5.3.5 | Ground Water Resources | 64 |
| 5.3.6 | Cliffs | 64 |
| 5.3.7 | The Rock Outcrops | 66 |
| 5.3.8 | Steep Slopes | 67 |
| 5.3.9 | Upland Swamps | 68 |
| 5.3.10 | The Abandoned Maldon-Dombarton Railway Corridor | 73 |
| 5.3.11 | Fire Trails and Four Wheel Drive Tracks | 74 |
| 5.3.12 | Bridges | 75 |
| 5.3.13 | 330kV Transmission Line | 77 |
| 5.3.14 | 33kV Powerline | 79 |
| 5.3.15 | Lake Cordeaux and Lake Avon | 81 |
| 5.3.16 | Cordeaux Dam and Upper Cordeaux No. 2 Dam | 83 |
| 5.3.17 | Exploration Bore Holes | 85 |
| 5.3.18 | Archaeological Sites | 86 |
| 5.3.19 | Survey Control Marks | 87 |

| | | |
|----------|---|------------|
| 5.4 | REMEDIATION MEASURES | 88 |
| 5.4.1 | Ground Monitoring | 89 |
| 6 | <u>SURFACE WATER QUALITY AND HYDROLOGY</u> | 90 |
| 6.1 | SURFACE HYDROLOGY ASSESSMENT | 90 |
| 6.2 | SUBSIDENCE INDUCED EROSION ISSUES | 91 |
| 6.3 | STREAM BED FRACTURING EFFECTS | 91 |
| 6.4 | FERRUGINOUS SPRINGS | 92 |
| 6.5 | SWAMPS | 93 |
| 6.6 | WATER QUALITY IMPACTS ON WATER SUPPLY RESERVOIRS | 94 |
| 6.7 | MITIGATION MEASURES | 95 |
| 6.7.1 | Mitigation of Acid and Heavy Metals Generation | 95 |
| 6.7.2 | Mitigation Measures for Ferruginous Springs | 96 |
| 6.7.3 | Mitigation Measures for Swamp Impacts | 96 |
| 6.8 | HYDROLOGY AND WATER QUALITY MONITORING PLAN | 97 |
| 6.8.1 | Compensatory Measures | 97 |
| 7 | <u>GROUND WATER AND HYDROGEOLOGY</u> | 98 |
| 7.1 | EXISTING GEOLOGICAL AND HYDROGEOLOGIC SETTING | 98 |
| 7.2 | HYDROGEOLOGY IMPACT ASSESSMENT | 100 |
| 7.3 | IMPACT ASSESSMENT ON NEAR-SURFACE HYDROLOGY AND POTENTIAL LOSS OF CATCHMENT YIELD | 101 |
| 7.4 | IMPACT ASSESSMENT ON POTENTIAL WATER LOSS FROM CORDEAUX RESERVOIR | 101 |
| 7.5 | ESTIMATE OF GOUNDWATER INGRESS TO THE WORKINGS | 103 |
| 7.6 | MITIGATION AND MONITORING | 103 |
| 8 | <u>TERRESTRIAL FLORA AND FAUNA</u> | 104 |
| 8.1 | ASSESSMENT METHODOLOGY | 104 |
| 8.2 | THREATENED PLANTS | 104 |
| 8.3 | THREATENED ANIMALS | 105 |
| 8.4 | ENDANGERED POPULATIONS AND ENDANGERED ECOLOGICAL COMMUNITIES | 106 |
| 8.5 | MITIGATION MEASURES | 106 |
| 8.5.1 | Long Term Management Strategies | 119 |

| | | |
|-----------|---|------------|
| 8.5.2 | Compensatory Measures | 119 |
| 8.5.3 | Ongoing monitoring | 119 |
| 9 | <u>AQUATIC FLORA AND FAUNA</u> | 120 |
| 9.1 | EXISTING ENVIRONMENT | 120 |
| 9.1.1 | Aquatic Habitats | 120 |
| 9.1.2 | Aquatic Plants and Macroinvertebrate | 120 |
| 9.1.3 | Fish | 120 |
| 9.2 | IMPACT ASSESSMENT OF AQUATIC HABITAT | 121 |
| 9.2.1 | Wongawilli Creek Catchment | 121 |
| 9.2.2 | Sandy Creek Catchment | 123 |
| 9.2.3 | Donalds Castle Creek | 123 |
| 9.2.4 | Native Dog Creek | 124 |
| 9.3 | IMPACT ASSESSMENT OF SUBSIDENCE-INDUCED IMPACTS | 124 |
| 9.3.1 | Impacts on Aquatic Habitat | 124 |
| 9.3.2 | Impacts on Water Quality | 125 |
| 9.3.3 | Impacts on Aquatic Biota | 125 |
| 9.4 | THREATENED SPECIES / POPULATIONS AND ECOLOGICAL COMMUNITIES | 125 |
| 9.4.1 | Existing Environment | 125 |
| 9.4.2 | Impact Assessment | 126 |
| 9.5 | MITIGATION MEASURES | 127 |
| 9.5.1 | Aquatic Monitoring Plan | 127 |
| 9.5.2 | Management Measures | 127 |
| 9.5.3 | Compensatory Measures | 128 |
| 10 | <u>ARCHAEOLOGICAL AND CULTURAL HERITAGE</u> | 129 |
| 10.1 | OUTCOMES OF ARCHAEOLOGICAL SURVEY | 129 |
| 10.2 | IMPACT ASSESSMENT | 131 |
| 10.2.1 | Area 3A | 131 |
| 10.2.2 | Areas 3B and 3C | 134 |
| 10.3 | HISTORICAL ARCHAEOLOGICAL AND HERITAGE SITES | 136 |
| 10.3.1 | Timber Bridge DHS1 | 136 |
| 10.3.2 | Cordeaux Dam Heritage Curtilage | 136 |
| 10.4 | MITIGATION MEASURES | 136 |
| 11 | <u>AIR</u> | 137 |
| 12 | <u>NOISE</u> | 137 |

| | | |
|------------------|---|-------------------|
| <u>13</u> | <u>GREENHOUSE GAS</u> | <u>138</u> |
| 13.1 | INTRODUCTION | 138 |
| 13.2 | SCOPE OF EMISSIONS INVENTORY | 138 |
| 13.3 | METHODOLOGY | 141 |
| 13.3.1 | Estimation of ROM Coal Production from Area 3 | 141 |
| 13.3.2 | Estimation of Clean Coal & Coal Wash Production from Area 3 | 141 |
| 13.3.3 | Estimation of Fugitive Mining Emissions (Coal Seam Methane Gas) | 141 |
| 13.3.4 | Estimation of Emissions from Diesel Fuel Combustion | 142 |
| 13.3.5 | Emissions from Low Temperature Oxidation & Land Clearing Associated with Emplacement of Coal Wash | 142 |
| 13.3.6 | Emissions Associated with Electricity Consumption | 143 |
| 13.3.7 | Emissions Associated with Shipping of Product Coal to Customers | 144 |
| 13.3.8 | Final Use of Coal for Steel Manufacturing & Energy Generation | 145 |
| 13.4 | SOURCE DATA | 145 |
| 13.5 | EMISSIONS NOT INCLUDED IN ASSESSMENT | 146 |
| 13.6 | RESULTS | 147 |
| 13.7 | COMPARISON WITH GLOBAL AND NATIONAL EMISSIONS | 154 |
| 13.7.1 | National and Global Emissions Comparison | 154 |
| 13.7.2 | Relative Contribution of Project Global Coal Combustion GHG Emissions | 154 |
| 13.8 | IMPACT ASSESSMENT | 155 |
| 13.8.1 | Global and National Climate | 155 |
| 13.8.2 | Global and National Sea Level | 155 |
| 13.8.3 | NSW Impacts | 156 |
| 13.9 | ABATEMENT MEASURES | 157 |
| 13.9.1 | WestVAMP | 157 |
| 13.9.2 | Energy Developments Limited – Appin Power Station | 157 |
| 13.9.3 | Energy Savings Plans | 157 |
| <u>14</u> | <u>COMMUNITY AND STAKEHOLDER CONSULTATION</u> | <u>158</u> |
| 14.1 | INTRODUCTION | 158 |
| 14.2 | HISTORY OF CONSULTATION | 158 |
| 14.3 | RELEVANT STAKEHOLDERS AND CONSULTATION PROCESS | 158 |
| 14.4 | ADVERTISING THE PROJECT | 159 |
| 14.5 | MEETINGS WITH GOVERNMENT AGENCIES | 159 |

| | | |
|-----------|--|------------|
| 14.6 | RISK ASSESSMENT | 160 |
| 14.7 | DENDROBIUM COMMUNITY CONSULTATION COMMITTEE | 161 |
| 14.8 | ABORIGINAL COMMUNITY | 161 |
| <u>15</u> | <u>STATEMENT OF COMMITMENTS</u> | <u>163</u> |
| 15.1 | COMMITMENT TO AVOID IMPACT ON MAJOR NATURAL FEATURES | 163 |
| 15.2 | LONGWALL LAYOUTS IN AREAS 3B AND 3C | 163 |
| 15.3 | SUBSIDENCE MANAGEMENT REMEDIATION MEASURES | 163 |
| 15.4 | WATER MONITORING PROGRAMS | 164 |
| 15.5 | TERRESTRIAL FAUNA AND FLORA | 165 |
| 15.6 | AQUATIC FAUNA AND FLORA MONITORING PLAN | 165 |
| 15.7 | ARCHAEOLOGICAL MONITORING AND MANAGEMENT MEASURES | 166 |
| 15.8 | GREENHOUSE GAS ABATEMENT MEASURES | 166 |
| <u>16</u> | <u>CONCLUSION</u> | <u>167</u> |

LIST OF TABLES

| | <u>Page</u> |
|---|-------------|
| TABLE 1.1 – DIRECTOR GENERAL’S REQUIREMENTS | 23 |
| TABLE 2.1 – APPROVED MINING AREAS (2001) VERSUS ACTUAL EXTRACTION AREAS | 27 |
| TABLE 2.2 – APPROVED MINING AREA VERSUS ESTIMATED EXTRACTION FOR THE PROPOSED AREA 3 MODIFICATION | 27 |
| TABLE 2.3 – TOTAL APPROVED MINING AREA VERSUS PROPOSED MODIFICATION FOR DENDROBIUM AREAS 1 – 3 | 27 |
| TABLE 5.1 - MAXIMUM PREDICTED INCREMENTAL SYSTEMATIC SUBSIDENCE PARAMETERS DUE TO THE EXTRACTION OF EACH PROPOSED LONGWALL IN AREA 3A | 49 |
| TABLE 5.2 - MAXIMUM PREDICTED CUMULATIVE SYSTEMATIC SUBSIDENCE PARAMETERS AFTER THE EXTRACTION OF EACH PROPOSED LONGWALL IN AREA 3A | 49 |
| TABLE 5.3 - MAXIMUM PREDICTED TRAVELLING SUBSIDENCE PARAMETERS DURING THE EXTRACTION OF EACH PROPOSED LONGWALL IN AREA 3A | 49 |
| TABLE 5.4 – MAXIMUM PREDICTED CUMULATIVE SUBSIDENCE, UPSIDENCE AND CLOSURE AT WONGAWILLI CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 57 |
| TABLE 5.5 – MAXIMUM PREDICTED CUMULATIVE NET VERTICAL MOVEMENTS AND CHANGES IN GRADE ALONG THE ALIGNMENT OF WONGAWILLI CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 57 |
| TABLE 5.6 – MAXIMUM PREDICTED TOTAL SYSTEMATIC AND VALLEY RELATED MOVEMENTS AT THE ROCKBARS AND RIFFLES ALONG WONGAWILLI CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 57 |
| TABLE 5.7 – MAXIMUM PREDICTED CUMULATIVE SUBSIDENCE, UPSIDENCE AND CLOSURE AT SANDY CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 58 |
| TABLE 5.8 – MAXIMUM PREDICTED CUMULATIVE NET VERTICAL MOVEMENTS AND CHANGES IN GRADE ALONG THE ALIGNMENT OF SANDY CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 58 |
| TABLE 5.9 – MAXIMUM PREDICTED SYSTEMATIC AND VALLEY RELATED MOVEMENTS AT THE WATERFALL, ROCK BARS, AND RIFFLES ALONG SANDY CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 59 |
| TABLE 5.10 – MAXIMUM PREDICTED TOTAL SUBSIDENCE, UPSIDENCE AND CLOSURE MOVEMENTS AT WC17A AND SC10 RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 63 |
| TABLE 5.11 – MAXIMUM PREDICTED SYSTEMATIC TILT, TENSILE STRAIN AND COMPRESSIVE STRAIN AT WC17(A) AND BANKSIA CREEK RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 63 |
| TABLE 5.12 – MAXIMUM PREDICTED SYSTEMATIC SUBSIDENCE, TILT AND STRAIN AT THE CLIFFS RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 65 |
| TABLE 5.13 – MAXIMUM PREDICTED SYSTEMATIC SUBSIDENCE, TILT AND STRAIN AT THE SWAMPS RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 69 |
| TABLE 5.14 – MAXIMUM PREDICTED TOTAL UPSIDENCE AND CLOSURE AT THE SWAMPS RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 70 |

| | |
|--|------------|
| TABLE 5.15 - MAXIMUM PREDICTED SYSTEMATIC SUBSIDENCE, TILT AND STRAIN AT THE FIRE TRAILS AND FOUR WHEEL DRIVE TRACKS RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 74 |
| TABLE 5.16 – MAXIMUM PREDICTED CUMULATIVE SYSTEMATIC SUBSIDENCE, TILT ALONG, TILT ACROSS, AND STRAIN AT THE 330 KV TRANSMISSION LINE RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 77 |
| TABLE 5.17 – MAXIMUM PREDICTED TRAVELLING TILTS AND STAINS AT THE 330 KV TRANSMISSION LINE DURING THE EXTRACTION OF LONGWALLS 6 TO 10 | 77 |
| TABLE 5.18 – MAXIMUM PREDICTED TOTAL SYSTEMATIC SUBSIDENCE, TILT ALONG, TILT ACROSS, AND STRAIN AT TENSION TOWER 44 RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 78 |
| TABLE 5.19 – MAXIMUM PREDICTED CUMULATIVE SYSTEMATIC SUBSIDENCE, TILT ALONG AND TILT ACROSS THE 33 KV POWERLINE RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 80 |
| TABLE 5.20 – MAXIMUM PREDICTED TRAVELLING TILTS AT THE 33 KV POWERLINE DURING THE EXTRACTION OF LONGWALLS 6 AND 7 | 80 |
| TABLE 5.21 – MAXIMUM PREDICTED CUMULATIVE SUBSIDENCE, UPSIDENCE AND CLOSURE AT LAKE CORDEAUX RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 81 |
| TABLE 5.22 – MAXIMUM PREDICTED TOTAL SYSTEMATIC SUBSIDENCE, TILT ALONG, TILT ACROSS AND STRAIN AT TENSION TOWER 44 RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 | 85 |
| TABLE 5.23 – MAXIMUM PREDICTED SYSTEMATIC SUBSIDENCE, TILT AND STRAIN AT THE ARCHAEOLOGICAL SITES RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 86 |
| TABLE 5.24 – MAXIMUM PREDICTED TOTAL SYSTEMATIC SUBSIDENCE, TILT AND HORIZONTAL MOVEMENT AT THE SURVEY CONTROL MARKS RESULTING FROM THE EXTRACTION OF LONGWALLS 6 TO 10 IN AREA 3A | 87 |
| TABLE 7.1 - ESTIMATE OF SEEPAGE REPORTING TO LONGWALL 6 | 103 |
| TABLE 8.1 - AFFECTED FLORA AND FINDINGS OF SEVEN PART TESTS | 107 |
| TABLE 8.2 – AFFECTED FAUNA AND FINDINGS OF SEVEN PART TESTS | 110 |
| TABLE 10.1 – ABORIGINAL ARCHAEOLOGICAL SITES IN AREA 3 | 130 |
| TABLE 10.2 - SUMMARY OF RISK OF IMPACTS AREA 3A | 133 |
| TABLE 10.3 – SITE SPECIFIC ASSESSMENTS FOR SITES WITH VOLUMES LARGER THAN 50M³ | 133 |
| TABLE 10.4 – GENERAL RISK OBSERVATION IN ARE AS 3B AND 3C | 135 |
| TABLE 13.1 – SCOPE 1, 2, & 3 EMISSIONS FROM DENDROBIUM AREA 3 PROJECT | 139 |
| TABLE 13.2 – PRELIMINARY ESTIMATION OF GHG EMISSIONS ASSOC. WITH SHIPPING | 144 |
| TABLE 13.3 – SOURCE DATA FOR GHG ASSESSMENT | 146 |
| TABLE 13.4 – ESTIMATED GHG EMISSIONS ASSOC. WITH DENDROBIUM AREA 3 OPERATIONS | 147 |

LIST OF FIGURES

| | <u>After Page</u> |
|-------------|---|
| FIGURE 1.1 | LOCALITY PLAN 17 |
| FIGURE 1.2 | CATCHMENT ANALYSIS 18 |
| FIGURE 1.3 | DIGITAL ELEVATION MODEL 18 |
| FIGURE 1.4 | SLOPE ANALYSIS 18 |
| FIGURE 1.5 | LANDUSE ANALYSIS 18 |
| FIGURE 1.6 | PROPOSED AND APPROVED AREA 3 MINE FOOTPRINTS 19 |
| FIGURE 1.7 | PROPOSED AREA 3A LONGWALL LAYOUT 19 |
| FIGURE 1.8 | PRELIMINARY CONCEPT MINING DOMAINS FOR AREAS 3B AND 3C20 |
| FIGURE 1.9 | PRELIMINARY CONCEPT LONGWALL MINING AREAS FOR AREAS 3B AND 3C 21 |
| FIGURE 2.1 | GEOLOGICAL STRUCTURES PLAN 28 |
| FIGURE 2.2A | EXAMPLE 1 WONGAWILLI CREEK – EAST WEST LONGWALL LAYOUT OPTION MINING DIRECTLY BENETH THE CREEK AND WITH OFFSETS VARYING BETWEEN 0 – 500M FROM THE CREEKS 30 |
| FIGURE 2.2B | EXAMPLE 2 PREDICTED MOVEMENTS ALONG WONGAWILLI CREEK BASED ON A NORTH-SOUTH LONGWALL LAYOUT HAVING VARYING NUMBERS OF LONGWALLS 31 |
| FIGURE 2.2C | EXAMPLE 3 PREDICTED MOVEMENTS ALONG SANDY CREEK BASED ON AN EAST-WEST LONGWALL LAYOUT HAVING VARIOUS OFFSETS 32 |
| FIGURE 2.3A | EXAMPLE 2 WONGAWILLI CREEK – NORTH-SOUTH LONGWALL LAYOUT ADJACENT TO THE CREEK 33 |
| FIGURE 2.3B | PREDICTED SUBSIDENCE, UPSIDENCE AND CLOSURE ALONG WONGAWILLI CREEK AFTER THE EXTRACTION OF EACH SUCCESSIVE NORTH-SOUTH LONGWALL WITHIN THE SERIES 34 |
| FIGURE 2.3C | SUMMARY OF MAXIMUM PREDICTED SUBSIDENCE, UPSIDENCE AND CLOSURE ALONG WONGAWILLI CREEK AND VOLUME OF STERILISED COAL FOR NORTH-SOUTH LONGWALL OPTION 35 |
| FIGURE 2.4A | EXAMPLE 3 SANDY CREEK – EAST-WEST LONGWALL LAYOUT OPTION MINING DIRECTLY BENEATH THE CREEK AND WITH OFFSETS VARYING BETWEEN 85 AND 285M FROM THE CREEK 36 |
| FIGURE 2.4B | PREDICTED SUBSIDENCE, UPSIDENCE AND CLOSURE ALONG SANDY CREEK FOR VARYING OFFSETS BASED ON AN EAST-WEST LONGWALL OPTION 37 |
| FIGURE 2.4C | SUMMARY OF MAXIMUM PREDICTED SUBSIDENCE, UPSIDENCE AND CLOSURE ALONG SANDY CREEK AND VOLUME OF STERILISED COAL FOR EAST-WEST LONGWALL OFFSET OPTION 38 |
| FIGURE 3.1 | LAND ZONING PLAN 45 |
| FIGURE 5.1 | SWAMP AND WATERCOURSE PLAN 51 |
| FIGURE 5.2 | BACK-PREDICTED UPSIDENCE AND CLOSURE AND THE OBSERVED IMPACTS FOR THE CASE STUDIES 53 |

| | | |
|-------------|--|-----|
| FIGURE 5.3 | COMPARISON OF PREDICTED UPSIDENCE AND CLOSURE AT THE ROCK BARS ALONG WONGAWILLI AND SANDY CREEKS WITH BACK-PREDICTED MOVEMENTS AND OBSERVED IMPACTS FOR THE CASE STUDIES | 53 |
| FIGURE 5.4 | COMPARISON OF PREDICTED AND OBSERVED UPSIDENCE MOVEMENTS IN DATABASE | 55 |
| FIGURE 5.5 | COMPARISON OF PREDICTED AND OBSERVED CLOSURE MOVEMENTS IN DATABASE | 55 |
| FIGURE 5.6 | CLIFFS AND STEEP SLOPES PLAN | 64 |
| FIGURE 5.7 | CROSS-SECTION THROUGH SWAMP 15A SHOWING THE PROFILE OF TOTAL PREDICTED SUBSIDENCE | 71 |
| FIGURE 5.8 | INFRASTRUCTURE PLAN | 73 |
| FIGURE 7.1 | INFERRED STRATIGRAPHIC PIEZOMETRIC SURFACES | 98 |
| FIGURE 7.2 | HYDROGEOLOGIC IMPACT POST MINING OF AREA 2 & AREA 3 ANTICIPATED MODIFICATIONS TO PIEZOMETRIC PRESSURES | 99 |
| FIGURE 9.1 | AQUATIC HABITAT AND FIELD SURVEY POINTS WITHIN WATERCOURSES | 121 |
| FIGURE 10.1 | ARCHEOLOGICAL SITE PLAN | 129 |
| FIGURE 13.1 | POSSIBLE SOURCES OF GHG EMISSIONS ASSOCIATED WITH DENDROBIUM AREA 3 | 140 |
| FIGURE 13.2 | BREAKDOWN OF SCOPE 1, 2 & 3 EMISSIONS FROM DENDROBIUM AREA 3 OPERATIONS | 150 |
| FIGURE 13.3 | BREAKDOWN OF SCOPE 1 EMISSIONS FROM DENDROBIUM AREA 3 OPERATIONS | 151 |
| FIGURE 13.4 | BREAKDOWN OF SCOPE 2 EMISSIONS FROM DENDROBIUM AREA 3 OPERATIONS | 152 |
| FIGURE 13.5 | BREAKDOWN OF SCOPE 3 EMISSIONS FROM DENDROBIUM AREA 3 OPERATIONS | 153 |

LIST OF ATTACHMENTS

- A. SUBSIDENCE PREDICTIONS AND IMPACT ASSESSMENTS ON NATURAL FEATURES AND SURFACE INFRASTRUCTURE (MSEC)
- B. SURFACE WATER QUALITY AND HYDROLOGY IMPACT ASSESSMENT (ECOENGINEERS)
- C. LANDSCAPE IMPACT ASSESSMENT AND MONITORING SITE OPTIMISATION (CARDNO FORBES RIGBY)
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- E. ASSESSMENT OF MINE SUBSIDENCE IMPACTS ON AQUATIC HABITAT AND BIOTA (THE ECOLOGY LAB)
- F. HYDROGEOLOGY IMPACT ASSESSMENT (GHD)
- G. ARCHAEOLOGICAL AND CULTURAL HERITAGE ASSESSMENT AND MANAGEMENT PLAN (BIOSIS RESEARCH)
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- I. STAKEHOLDER CONSULTATION DOCUMENTATION

LIST OF ABBREVIATIONS

| | |
|----------|---|
| AEMR | Annual Environmental Management Report |
| AGO | Australian Greenhouse Office |
| CCL | Consolidated Coal Lease |
| CMRA | Coal Mines Regulation Act 1982 |
| DCCC | Dendrobium Community Consultative Committee |
| DCCP | Dendrobium Coal Preparation Plant |
| DECC | NSW Department of Environment and Climate Change |
| DGR | Director General's Requirements |
| DoP | NSW Department of Planning |
| DPI | NSW Department of Primary Industries |
| DPIM | NSW Department of Primary Industries Minerals |
| DSC | NSW Dams Safety Committee |
| DWE | NSW Department of Water and Energy |
| EA | Environmental Assessment |
| EEC | Endangered Ecological Community |
| EIS | Environmental Impact Statement |
| EP&A Act | Environmental Planning and Assessment Act 1979 |
| EPBC Act | Environment Protection and Biodiversity Conservation Act 1999 |
| GHG | Greenhouse Gas |
| IC | Illawarra Coal |
| IERP | Independent Expert Review Panel |
| KTP | Key Threatening Processes |
| LCCCP | Longwall Mining Community Communication and Consultation Plan |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| LW | Longwall |
| MSEC | Mine Subsidence Engineering Consultants |
| Mtpa | Million tonnes per annum |
| NPWS | National Park and Wildlife Service |
| PKCT | Port Kembla Coal Terminal |
| POEO Act | Protection of the Environment Operations Act 1997 |
| REP | Regional Environmental Plan |
| ROM | Run of Mine |
| SC | Sandy Creek |
| SCA | Sydney Catchment Authority |
| SEMP | Subsidence Environmental Management Plan |
| SEPP | State Environmental Planning Policy |
| SIS | Species Impact Statement |
| SMP | Subsidence Management Plan |
| TSC Act | Threatened Species Conservation Act 1995 |
| WC | Wongawilli Creek |
| WCC | Wollongong City Council |
| WDSC | Wollondilly Shire Council |

EXECUTIVE SUMMARY

Illawarra Coal (IC) proposes to continue its underground coal mining operations at Dendrobium, located in the Southern Coalfield of New South Wales by extracting coal from the Wongawilli Seam in Area 3 using longwall mining techniques. The current mining schedule forecasts that longwall mining will commence in Area 3 around early 2010.

Pursuant to the original development consent for the Dendrobium mine issued in 2001, mining in Area 3 will require further approval by the Department of Planning for staged approval Area C. IC proposes to modify the original approved Area 3 mining footprint according to more contemporary geological information and assessment of environmental constraints. The modified footprint is intended to ensure adequate supply of coal to IC's local and overseas customers.

The Department of Planning has confirmed that the application for the modified Area 3 will require a modification to the original consent. The application will follow the process of s75W of the Environmental Planning and Assessment Act 1979.

A Preliminary Environmental Assessment was submitted to the Department of Planning, who have subsequently issued Director General's Requirements (DGR's) to guide the preparation of the Environmental Assessment. This report is a comprehensive Environmental Assessment (EA) that addresses the DGR's and supports the application to modify the mining footprint in Area 3.

The proposed footprint of Area 3 comprises an expanded area of 3,351ha (compared to the original 1,890ha in the 2001 consent). It is anticipated that not all of the proposed Area 3 will actually be extracted. It is likely that areas will be sterilised due to unsuitable geology and setbacks from Wongawilli and Sandy Creeks, Lake Cordeaux and Lake Avon. The total mining area within Areas 1, 2 and the modified Area 3, is estimated to be approximately 3,049ha, which represents 17% more than the original (2001) approved area of 2,611ha. This additional area is to allow for contingency in areas of geological uncertainty and avoid where possible any requirement for future modifications to the footprint.

In consultation with DoP and other key stakeholders, the following issues are identified for detailed assessments and the findings of these assessments are summarised below.

- Subsidence risks on the existing natural features and items of surface infrastructure, and measures to minimise the risks,
- Impacts on existing terrestrial and aquatic flora and fauna,
- Impacts on stored water and SCA assets on Lake Cordeaux and Lake Avon,
- Impacts on surface and ground water, including the impacts on Donalds Castle, Wongawilli and Sandy Creeks, upland swamps and aquifers,
- Impacts on Aboriginal Cultural Heritage,
- Greenhouse gas emission and the impacts on the environment.

Subsidence

IC has employed the management hierarchy of subsidence avoidance/minimisation/mitigation to design the layout of the proposed Area 3A longwalls. Alternative options are reviewed, analysed and modified until an optimised longwall layout is reached to achieve the following objectives:

- Avoid significant impacts on major natural features including Sandy and Wongawilli Creeks, and
- Minimise the volume of sterilised coal which could be efficiently extracted within the mining and environmental constraints of the area.

Substantial amount of investigations have been undertaken by Mine Subsidence Engineering Consultants to determine the parameters that dictate the longwall setback distance from the major creeks. The investigation suggests the following thresholds are appropriate for major impacts for the creeks in Area 3:

- Maximum predicted total valley closure across the major watercourses of 200 mm;
- Maximum predicted total systematic tensile strain within the beds of the major watercourses of 0.5 mm/m; and
- Maximum predicted total systematic compressive strain within the beds of the major watercourses of 2 mm/m.

The proposed longwalls in Area 3A have been set back from Wongawilli and Sandy Creeks by at least 110 m and 85 m, respectively, such that the maximum predicted subsidence parameters along these creeks are less than the thresholds above. It is predicted that major creek bed fracturing is unlikely to occur with these setbacks in place.

These set backs necessitate sterilising coal resources that otherwise could have been extracted. It has been assessed that it is unlikely that significant impacts, such as draining of pools, would occur along Wongawilli and Sandy Creeks as a result of the extraction of the proposed longwalls in Area 3A.

The layout of the future longwalls in Areas 3B and 3C will be determined as additional exploration data is gathered to better define the extractable resource. The longwalls in Areas 3B and 3C will be designed to meet the subsidence impact thresholds described above. Further SMP's will be submitted to the Department of Primary Industries for Areas 3B and 3C.

Subsidence predictions have also been carried out to assess the impacts of longwall mining in Area 3 on all natural features and items of surface infrastructure. The assessment indicates that the levels of impact on the natural features and items of surface infrastructure are not significant and can be managed by the preparation and implementation of management strategies. These requirements have been incorporated into the Statement of Commitment and are detailed in the SMP for Area 3A that accompanies this application. IC will also undertake monitoring of ground movements so that the observed ground movements can be compared with those predicted and to allow regular review of the predictions and impact assessment in the light of measured data.

Surface Water Quality and Hydrology

Assessment on the surface water quality and hydrology has been carried out by Ecoengineers, which concludes that:

- Whilst minor erosion will occur due to mine subsidence-induced slope stability effects during the mining of Area 3, the occurrence will be relatively isolated and will have only minor, localised impacts on the lower sections of the creeks or at the shorelines of Lakes Avon and Cordeaux. It is unlikely that the erosive effects induced by cliff or surface instabilities will lead to any significant impact on the aquatic ecology.
- Longwalls in Area 3 will be setback from Sandy and Wongawilli Creeks. It is unlikely that the mining of Area 3 will lead to significant creek bed fracturing and subsequent sub-bed hydrologic diversion and/or geochemical effects in Sandy and Wongawilli Creeks.
- Possible fracturing of bedrock in the ephemeral drainage lines that are directly

mined beneath will occur as a result of the proposal. This may result in re-direction of surface flows which may lead to draining of some pools over the longwalls. The depth of dilation is expected to be less than 15 m and any diverted surface water is likely to re-emerge into the catchment downstream. No net loss of water from the catchment is expected.

- It is possible one or more ferruginous springs may be induced in the slopes of the southwest catchments over Area 3B. Such an effect, if it does occur, is likely to be largely aesthetic rather than posing any adverse impact on stream ecology. Water monitoring sites will be located in this part of Area 3B to provide early detection and ongoing assessment of this potential effect.
- Any input of water-borne contaminants to Lake Avon & Lake Cordeaux would likely be restricted to a possible erosive export of fine sands and clays. The relevant creeks are all remote from their respective dam off-takes and outflows. Such zones would be localised to around the point of input to the Lakes and would be unlikely to have any significant impact on local freshwater ecology and would be undetectable in the bulk water supply quality.
- A program of hydrologic and water quality monitoring has been prepared. The program will provide pre-mining baseline and post-mining data to allow month-by-month assessment of the magnitude of any developing trends in overland, and subsurface flow and water quality effects as a result of longwall mining. The monitoring program has been incorporated in the Statement of Commitment and detailed in the Area 3A SMP that accompanies this application.

Upland Swamps

There are 22 upland swamps within or partially within Area 3. It is considered unlikely, on the basis of past experience, that mine subsidence-induced scour, hydrologic or geochemical effects will affect these swamps. However they will be targeted for frequent monitoring and assessment during the period in which they are approached or mined under.

Water Reservoirs and SCA Assets

A comprehensive hydrogeological assessment of the impact of the underground mining in Area 3 upon the stored water within Cordeaux reservoir has been conducted.

It is predicted that the post mining groundwater conditions, and their natural fluctuations, will

remain unchanged in the Hawkesbury Sandstone from the current pre mining condition. Whilst there will be a degree of de-pressurisation within the Bulgo Sandstone, it is expected however to generally remain a confined aquifer.

The hydrogeological analysis predicts seepage loss from the Cordeaux Reservoir storage due to mining in Area 3A to be less than 0.1ML/day, which is less than the acceptable loss of storage from Cordeaux Reservoir adopted by the Dams Safety Committee of 0.5ML/day. It is unlikely, therefore, that there would be any significant loss of water from Lakes Avon or Cordeaux resulting from the proposed mining.

Terrestrial Flora and Fauna

Biosis was commissioned to undertake a Species Impact Statement for Area 3. The key findings of the assessment are provided below:

- 23 potential threatened plant species are identified in the study area. Of these two threatened plant species, *Acacia bynoeana* and *Pultenaea aristata*, are recorded. Potential habitats for a further nine threatened species occur within the Study Area. The Seven Part Tests conclude that the proposal is unlikely to have a significant impact on any threatened flora with known or potential habitat in the study area.
- 63 potential threatened animal species are identified in the study area. Of these, 55 animal species are determined to have potential habitat within the Study Area. 16 threatened animal species were recorded in the Study Area during field surveys.
- The Seven Part Tests conclude that the proposal is likely to have a significant impact on local populations of Littlejohn's Tree Frog, Giant Burrowing Frog, Red-crowned Toadlet, Stuttering Frog and the Giant Dragonfly.
- Impacts from the proposal are restricted to animal species that are reliant on habitat provided in waterways, upland swamps or rocky outcrops/cliffs.
- No Endangered Populations occur within the Study Area.
- One Endangered Ecological Community, Shale Sandstone Transition Forest is recorded. This community is considered unlikely to be significantly impacted by the proposal.
- Monitoring and mitigation measures to minimise impacts on threatened species have been incorporated into the Statement of Commitment and the Area 3A SMP.

Aquatic Flora and Fauna

The Ecology Lab was commissioned to undertake an assessment on the aquatic ecology. The findings are summarised as follows:

- There is "significant" aquatic habitat along the main channel of Wongawilli Creek and in the mid to lower reaches of Sandy Creek, and "moderate" aquatic habitat in some of the tributaries of Wongawilli Creek, the upper reaches of Sandy Creek, some of the reaches of Banksia, Cascade and Donalds Castle Creek and lower reach of tributary CR2. The other tributaries generally have either "minimal" or "unlikely" aquatic habitat.
- The specific assessments of impacts undertaken for the three threatened species identified in the Area - Macquarie perch, Sydney hawk dragonfly and Adams emerald dragonfly, indicate that the proposed longwall mining does not pose a significant threat to these species, provided that longwall layouts are setback from the main channel of Wongawilli Creek.
- An aquatic monitoring plan has been designed to assess the potential impacts of mine subsidence on aquatic habitat and biota within the watercourses overlying Area 3. The plan will assess the habitat features and water quality, record the abundance and distribution of aquatic macrophytes and undertake sampling of fish and macroinvertebrates, paying attention to the occurrence of threatened species. The plan has been incorporated in the Statement of Commitment and the Area 3A SMP.

Cultural Heritage

Biosis Research was commissioned to undertake an archaeological and cultural heritage assessment on the proposed Area 3. The findings are summarised below:

- A total of 65 Aboriginal archaeological sites are identified within the study area, with 51 sites being within the proposed modified mine footprint area.
- Lake Cordeaux dam is listed on the State Heritage Register, and is in proximity to Area 3. The proposed mine will not impact on the physical structures associated with the dam, or the dam's heritage curtilage.
- Seven sandstone shelter sites are located directly over longwalls in Area 3A, and three shelters in close proximity to the longwalls. There is a risk of impact on these shelters, either through cracking of

rock surfaces, sheering or movement on bedding planes and joints, or block fall. Previous monitoring programs suggested that only shelters with internal volumes of greater than 50m³ and also situated directly over a longwall, have suffered impacts from subsidence related movements. Of the sites directly above, or in close proximity to the Area 3A longwall layout, six have volumes greater than 50m³, suggesting that the risk of impact to the other sites is very low.

- Where longwall mining has previously been carried out in the Southern Coalfield, approximately 10 % of the shelters have been affected by fracturing of the strata or shear movements along bedding planes and none of the shelters have collapsed. This suggests that the likelihood of any significant impacts on the overhang sites, resulting from the extraction of the proposed and future longwalls, is low.
- Detailed assessments of the risks to Aboriginal archaeological sites in Areas 3B and 3C will be carried out for SMP applications when the longwall layouts are finalised.
- A program of Archaeological monitoring has been designed for the sites potentially affected by subsidence movements. This program has been incorporated into the Statement of Commitment and detailed in the Area 3A SMP accompanying this application.
- A Section 90 Consent to destroy/damage/deface Aboriginal archaeological sites will be sought for 11 sites within Area 3A that are identified to be potentially impacted by the proposed longwall mining. Further applications will be sought for the sites within Areas 3B and 3C once the longwall layout are finalised.

Greenhouse Gas Assessment

The Greenhouse Gas assessment has been prepared in accordance with Australian Greenhouse Office (AGO) Methods. Findings are summarised as follows:

- The proposed modified Area 3 is estimated to produce up to a total of approximately 80 Mt of ROM coal and have a project life of approximately 20 years (based on an annual production of ROM coal of 4 Mtpa).
- The total emissions associated with project (incl. Scope 1, 2, and 3 GHG emissions) are estimated to be approximately 147.66 MtCO₂-e (approx. 1.846 tCO₂-e/t ROM coal mined).
- The estimated annual emission associated with the Dendrobium Area 3 project (incl.

Scope 1, 2, and 3 emissions) is 7.38MtCO₂-e. Approximately 98% of these emissions are Scope 3 emissions of which a significant portion are estimated as occurring during transportation to, and use in post-mining applications that are undertaken by customers of Illawarra Coal.

- Greenhouse gas emissions may lead to climate change resulting in increased global temperatures, rises in sea level, and more frequent extreme weather events. It is difficult to attribute the extent to which these impacts will occur as a direct result of this project however, it is likely to be very small and insignificant.
- IC has undertaken a number of greenhouse gas reduction programs and continues to investigate potential greenhouse gas abatement opportunities. The two most significant reduction programs implemented to date include:
 - Illawarra Coal has spent \$13 million to construct the WestVAMP project. West VAMP substantially reduces greenhouse gas emissions from IC's West Cliff Colliery. The outcome of the project will be a reduction in greenhouse gas emissions of up to 200,000 tCO₂-e/year, equivalent to removing emissions from 45,000 cars each year.
 - Illawarra Coal abates approximately 2.5 MtCO₂-e/year at the EDL gas fired power station at Appin.

The assessments indicate that the levels of impact on the natural features and items of surface infrastructure are not significant and can be managed by the implementation of monitoring and management strategies as outlined in the Area 3A SMP.

The proposed modification of the Area 3 footprint is vital to IC's business as minimal reserves of such coking coal exist. It represents continuing significant capital and operating investments in the Southern Coalfield of New South Wales. Continuing benefits will occur through continuity of employment, expendable income, export earnings and government revenue.

1 INTRODUCTION

1.1 BACKGROUND

BHP Billiton IC (IC) proposes to continue its underground coal mining operations at Dendrobium, located in the Southern Coalfield of New South Wales by extracting coal from the Wongawilli Seam in Area 3 using longwall mining techniques. The current mining schedule forecasts that longwall mining will commence in Area 3 in January 2010. IC is currently mining Area 2 of the Dendrobium Colliery, one of three operating underground mines managed by IC south of Sydney.

The modification being sought in this application comprises two components:

- IC intends to apply to modify the Dendrobium Mine development consent (DA- 60-03-2001) to incorporate a revised Area 3 footprint and longwall layout.
- This application will satisfy Condition 1.1 b (iii) of the existing Dendrobium development consent (2001), which required further approval of Area C (within the originally approved Area 3), by the Minister for Planning prior to the commencement of mining.

The Department of Planning (DoP) has previously advised that the application will follow the process under Part 3A of the *Environmental Planning and Assessment Act 1979* and the modification will be assessed pursuant to section 75W of the Act.

In order to commence the assessment process, a preliminary environmental assessment was submitted to the DoP in April 2007 and the Director-General's Requirements were subsequently issued providing the scope of the comprehensive Environmental Assessment (EA).

This document is the comprehensive Environmental Assessment to seek approval from the DoP to modify the consent under section 75W of the *Environmental Planning and Assessment Act 1979*.

IC will also submit Subsidence Management Plans (SMP's) to the Department of Primary Industries-Minerals (DPI) for approval to mine Area 3. The SMP will describe predicted impacts, and make commitments for the management and monitoring of proposed longwall mining. An SMP for Area 3A is being submitted concurrently with this EA to gain DPI approval to mine Longwalls 6 to10 (refer **Figure 1.1**).

1.2 THE APPLICANT

The owner of Dendrobium Mine is Dendrobium Coal Pty Ltd, part of Illawarra Coal Holdings, a wholly owned subsidiary of BHP Billiton, which is a large diversified international resources group. IC's three operating mines in the Illawarra region (Dendrobium, Appin and Westcliff) produce coking coal, approximately 65% of which is consumed at steelworks in Port Kembla and Whyalla, while the remainder is exported overseas.

Locality Plan
DENDROBIUM AREA 3

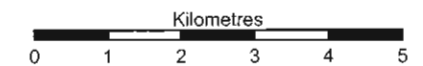
Legend

- Colliery Pit Tops
- Railway (LPI)
- Main Roads (LPI)
- Drainage (LPI)
- Lease Boundaries
- Waterbody (LPI)
- Proposed Area 3 Footprint
- Proposed Longwall Layout
- Existing Longwall Layout
- DSC Notification Area**
- Avon Dam
- Cordeaux Dam

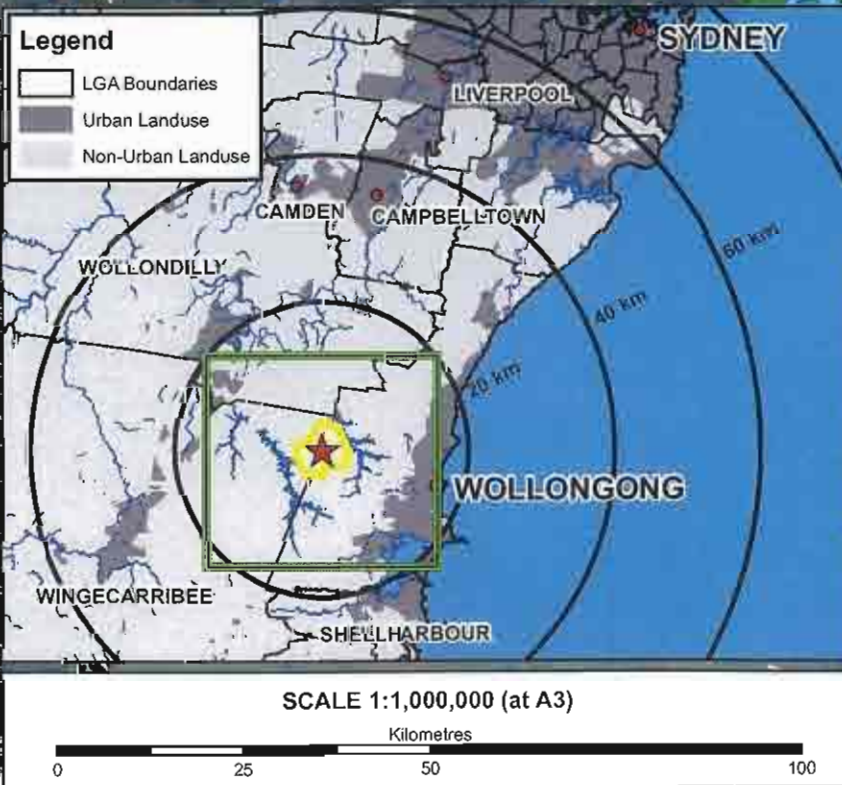
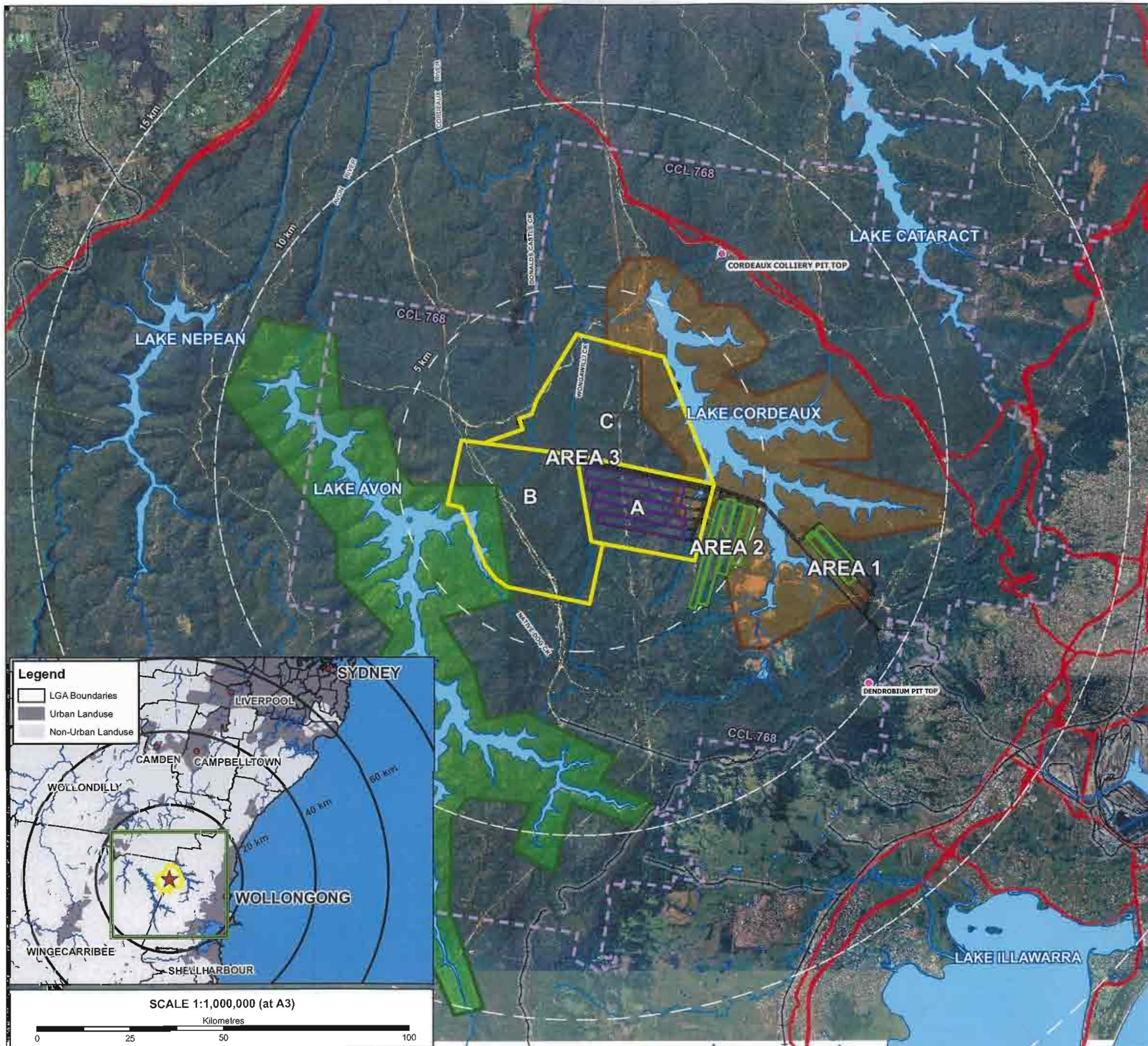


Figure 1.1

Scale 1:100,000 (at A3)



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 GIS MAP REF:
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1.3 APPLICATION AREA

The Dendrobium Mine obtained consent from the Minister for Urban Affairs and Planning on 20 November 2001. The consent related to the construction and operation of the Dendrobium mine and associated infrastructure at Kemira Valley, West Cliff and Port Kembla Steelworks.

The mining lease covering the proposed workings held by Dendrobium Mine is Consolidated Coal Lease 768 (refer **Figure 1.1**). Three separate longwall areas were approved in the 2001 development consent and these are referred to as Areas 1 (now extracted), Area 2 (being extracted) and Area 3 (not yet commenced). In relation to Area 3, the 2001 consent required IC to seek further approval from the Department of Planning for the Staged Development Area C. This application is to satisfy the requirement for further approval and to modify the approved footprint of Area 3.

The proposed Area 3 is further divided into three sub-areas, known as Areas 3A, 3B and 3C (refer **Figure 1.1**). The sub-areas are necessary to facilitate the staging of the mining operations in this area. The mining layout for Area 3A has been designed and a Subsidence Management Plan (SMP) for this area will be submitted to the DPI concurrently with this application. Mining layouts for Areas 3B and 3C are not yet defined due to uncertainty in the area's geology. Further SMPs for Areas 3B and 3C will be lodged when the longwall layouts are finalised, subject to further exploration.

Area 3 is located to the west of Lake Cordeaux and east of Lake Avon. Dendrobium Mine pit top is located approximately 10 kilometres west of Wollongong on the Illawarra escarpment near Mt Kembla Village (refer **Figure 1.1**). The mine's surface facilities are located within the catchment of American Creek and Water and Brandy Creek which flows to Allans Creek and then into the Inner Harbour at Port Kembla.

The surface overlying Area 3 is located within the catchment for Cordeaux Dam and Avon Dam and consists largely of undisturbed native vegetation (refer **Figure 1.2**). Wongawilli, Sandy and Donalds Castle Creeks traverse the study area in a north-south direction. The creeks have created an incised valley that slopes away from the Illawarra Escarpment to the west. **Figures 1.3** and **1.4** illustrate the topographic and slope characteristics of Area 3. With the exceptions of fire trails, a power line easement, rehabilitated seismic lines and boreholes, the study area is undeveloped (refer **Figure 1.5**).

The surface overlying Area 3 is part of the Sydney Catchment Authority's Special Area as defined in the *Sydney Water Catchment Management Act 1998* (refer **Figure 1.5**). The longwalls will be partly located within the Dams Safety Committee Notification Area for the Cordeaux Reservoir (refer **Figure 1.1**).

1.4 MODIFICATION OF LONGWALL FOOTPRINT IN AREA 3

1.4.1 Mine Planning to Avoid Major Impacts

IC's process for developing mining geometry aims to avoid significant impacts on major natural features. Different options of longwall layout are reviewed, analysed, and modified until an optimal longwall layout is reached. The following two important objectives form part of IC's longwall layout optimisation process:

- Avoid significant impact on major natural features, and

Catchment Analysis
DENDROBIUM AREA 3

Legend

-  Major Catchments
-  Minor Streams
-  Rivers & Creeks (LPI)
-  Lakes (LPI)
-  Proposed Area 3 Footprint
-  Proposed Longwall Layout
-  Existing Longwall Layout

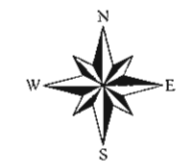
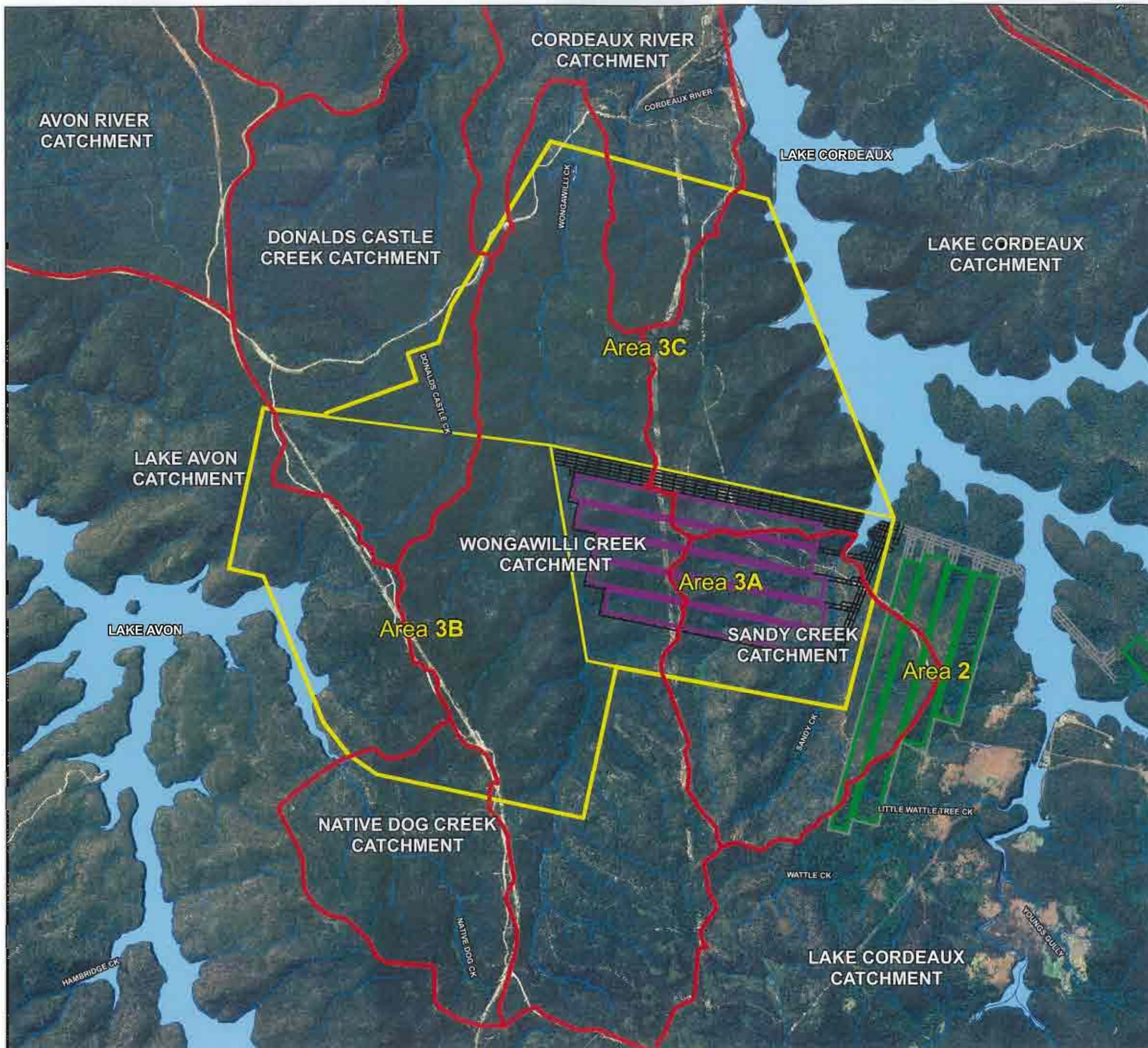
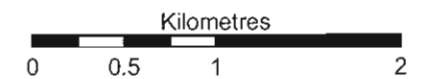


FIGURE 1.2

Scale 1:40,000 (at A3)









Digital Elevation Model

DENDROBIUM AREA 3

Legend

-  Minor Streams
-  Rivers & Creeks (LPI)
-  Lakes (LPI)
-  Proposed Area 3 Footprint
-  Proposed Longwall Layout
-  Existing Longwall Layout

Elevation:

-  500 - 550m
-  450 - 500m
-  425 - 450m
-  400 - 425m
-  350 - 400m
-  275 - 300m

(D.E.M. Derived from LPI 10m Contours)

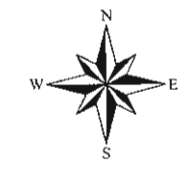
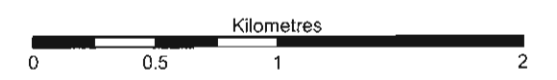
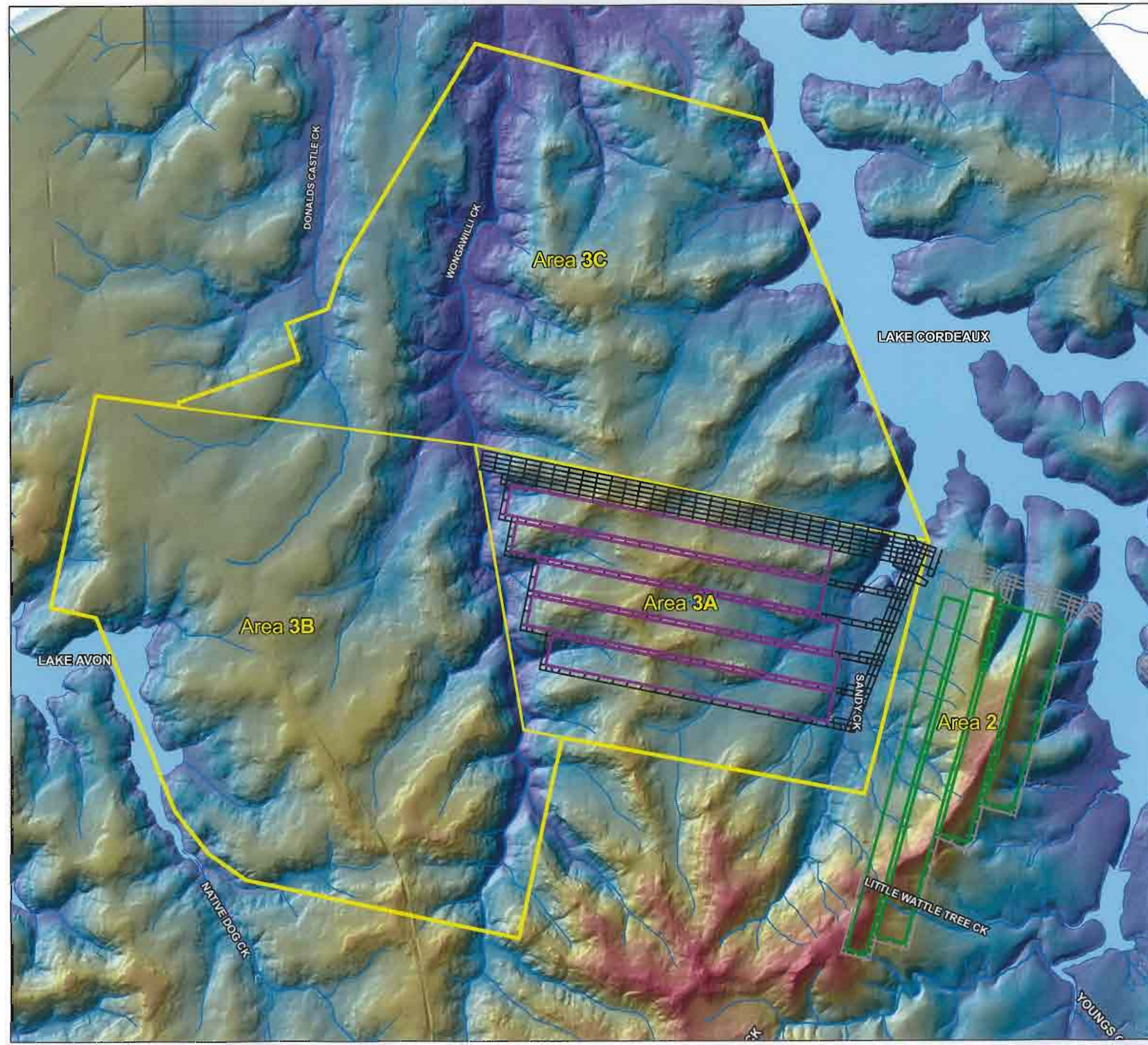


FIGURE 1.3

Scale 1:30,000 (at A3)



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Slope Analysis
DENDROBIUM AREA 3

Legend

- Minor Streams
- Rivers & Creeks (LPI)
- Lakes (LPI)
- Proposed Area 3 Footprint
- Proposed Longwall Layout
- Existing Longwall Layout

| SLOPE CLASS (Handbook) | SLOPE RANGE (Degrees) | % Within SMP Area |
|---------------------------|-----------------------|-------------------|
| Level (LE) | < 0°35' | 1.95% |
| Very gently inclined (VG) | 0°35' - 1°45' | 4.05% |
| Gently inclined (GE) | 1°45' - 5°45' | 28.96% |
| Moderately inclined (MO) | 5°45' - 18° | 51.58% |
| Steep (ST) | 18° - 30° | 11.66% |
| Very Steep (VS) | 30° - 45° | 1.71% |
| Precipitous (PR) | 45° - 72° | 0.09% |

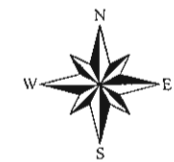
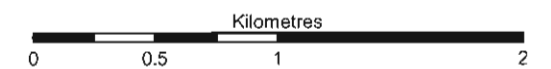


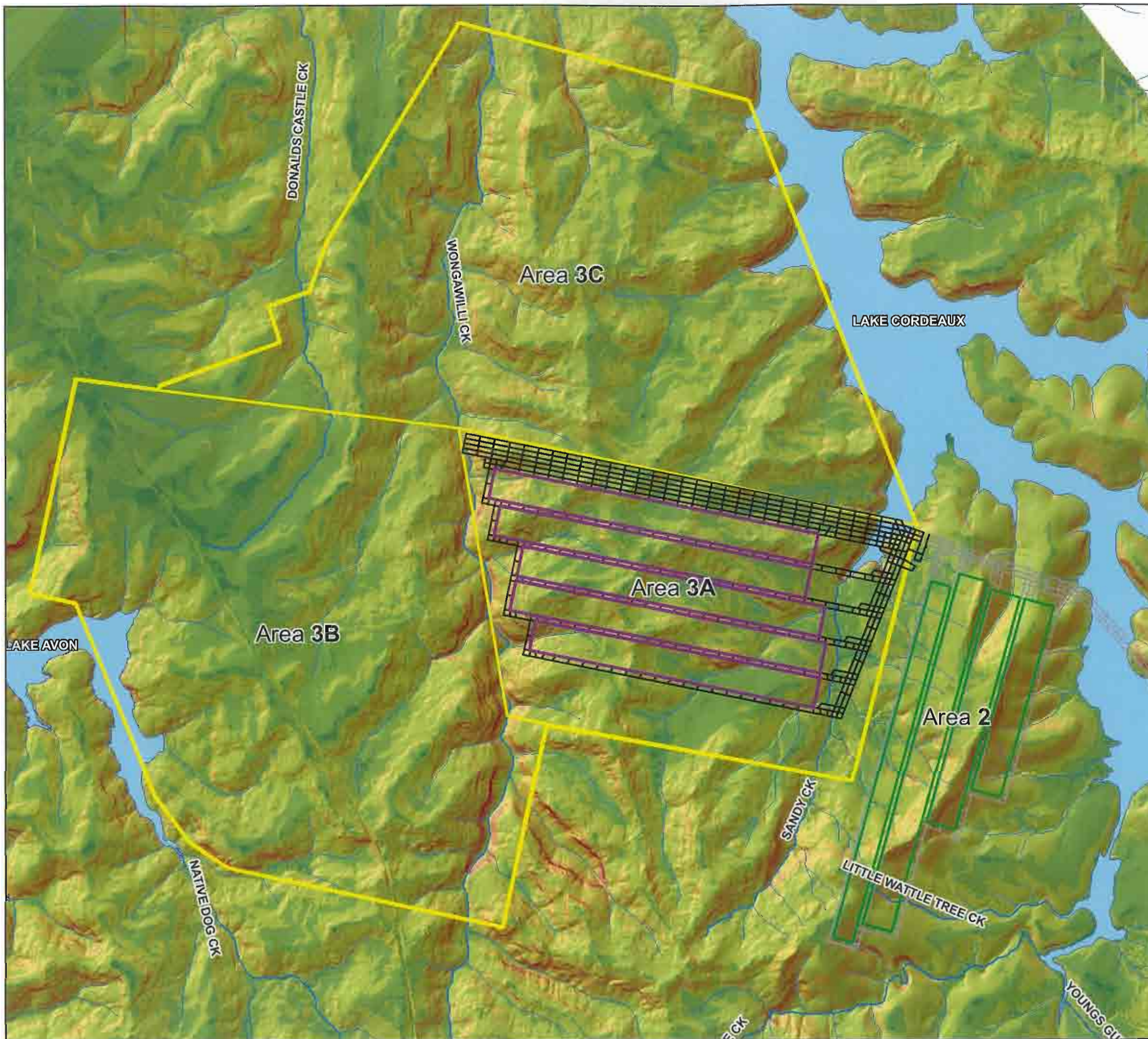
FIGURE 1.4

Scale 1:30,000 (at A3)



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(Base data provided by LPI)



Landuse Analysis

DENDROBIUM AREA 3

Legend

-  Railways
-  Existing Longwall Layout
-  Fire Road
-  330Kv Powerlines
-  33Kv Powerlines
-  Minor Streams
-  Rivers & Creeks (LPI)
-  Proposed Area 3 Footprint (I.C.)
-  Proposed Longwall Layout
-  Existing Longwall Layout
-  Drinking Water Storage (LPI)
-  Drinking Water Catchment (ABS)

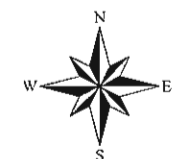
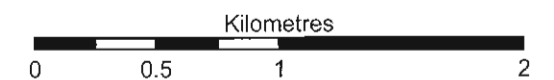
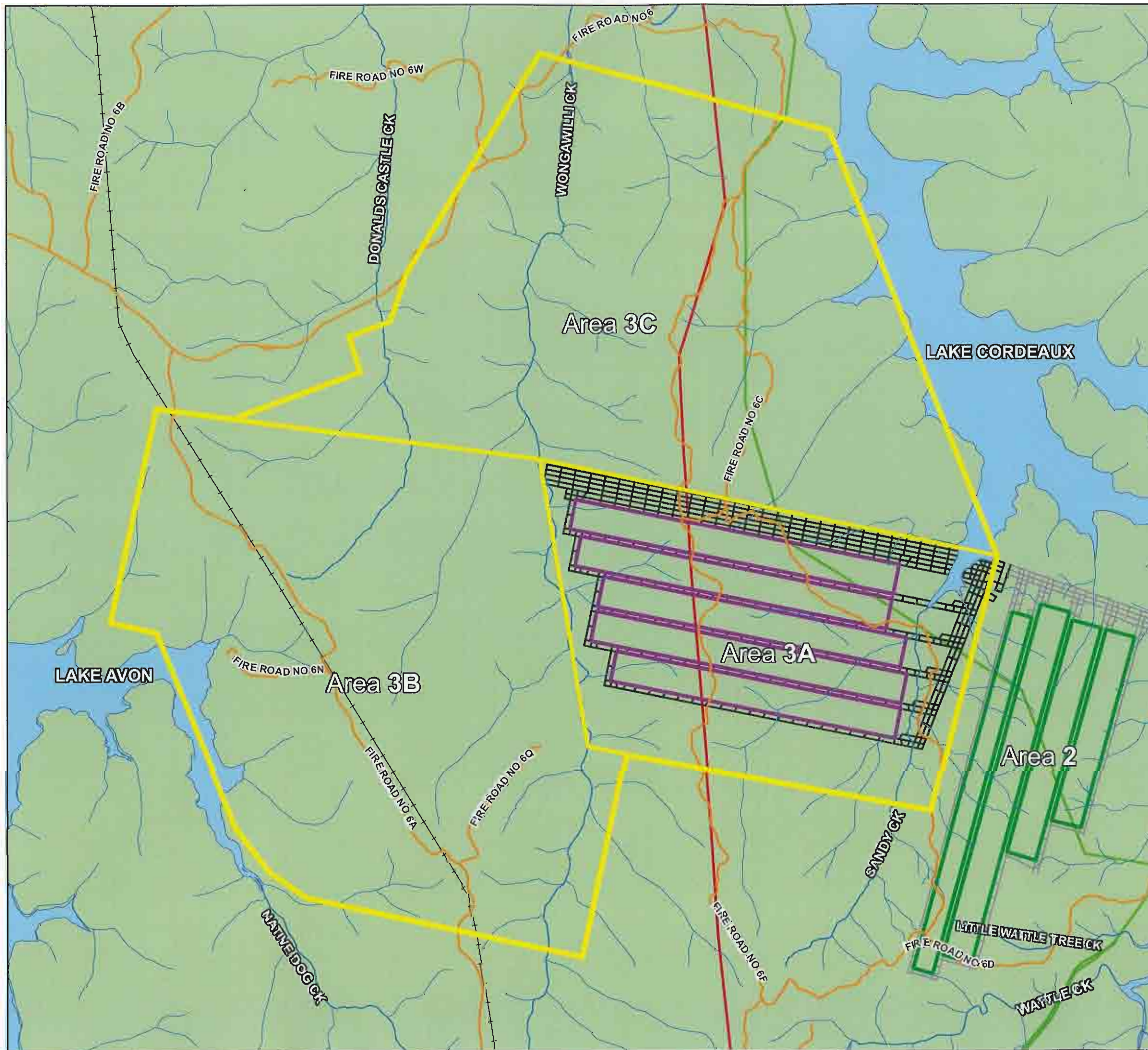


FIGURE 1.5

Scale 1:30,000 (at A3)



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- Minimise the volume of sterilised coal which could be efficiently extracted within the mining and environmental constraints of the area.

The longwall layout optimisation process and the alternative options for Area 3A is further discussed in **Section 2.3**.

1.4.2 Proposed Modified Footprint

Figure 1.6 shows the Area 3 layout approved in the 2001 consent, which has a total area of 1,890ha. **Figure 1.7** also shows the proposed maximum footprint now being sought, which has a total area of 3,350ha.

The proposed Area 3 footprint represents the maximum extent of *development roadways and longwall extraction*. It is important to note that it does not represent the proposed mining domains or longwall layouts, which are shown in a preliminary form in **Figures 1.8** and **1.9**.

Geological investigations suggest that in practice, much of the periphery of the footprint, particularly in the northwest of the area, may be sterilised by geological constraints such as igneous intrusions and other geological features such as faults and dykes. The presence of Avon and Cordeaux Reservoirs and other sensitive surface features will also reduce the effective area of longwall extraction within the footprint. Final longwall layouts will be developed when further investigations are undertaken on the geological conditions of Areas 3B & 3C.

Longwalls in Area 3A will be set back from Wongawilli and Sandy Creeks by at least 110 m and 85m, respectively, which will sterilise coal production within the Area 3A footprint. **Figure 1.7** depicts the proposed Longwalls 6 to 10 proposed under the Area 3A SMP.

Future longwalls in Areas 3B and 3C will also be set back from Wongawilli Creek to avoid significant impacts within the Creek. The preliminary concept maximum mining domains for the future longwalls in Areas 3B and 3C are shown below in **Figure 1.8**. These are developed based on limiting the maximum predicted tensile and compressive strains at Wongawilli Creek, Lake Cordeaux and Lake Avon to less than 0.5mm/m and 2mm/m, respectively.

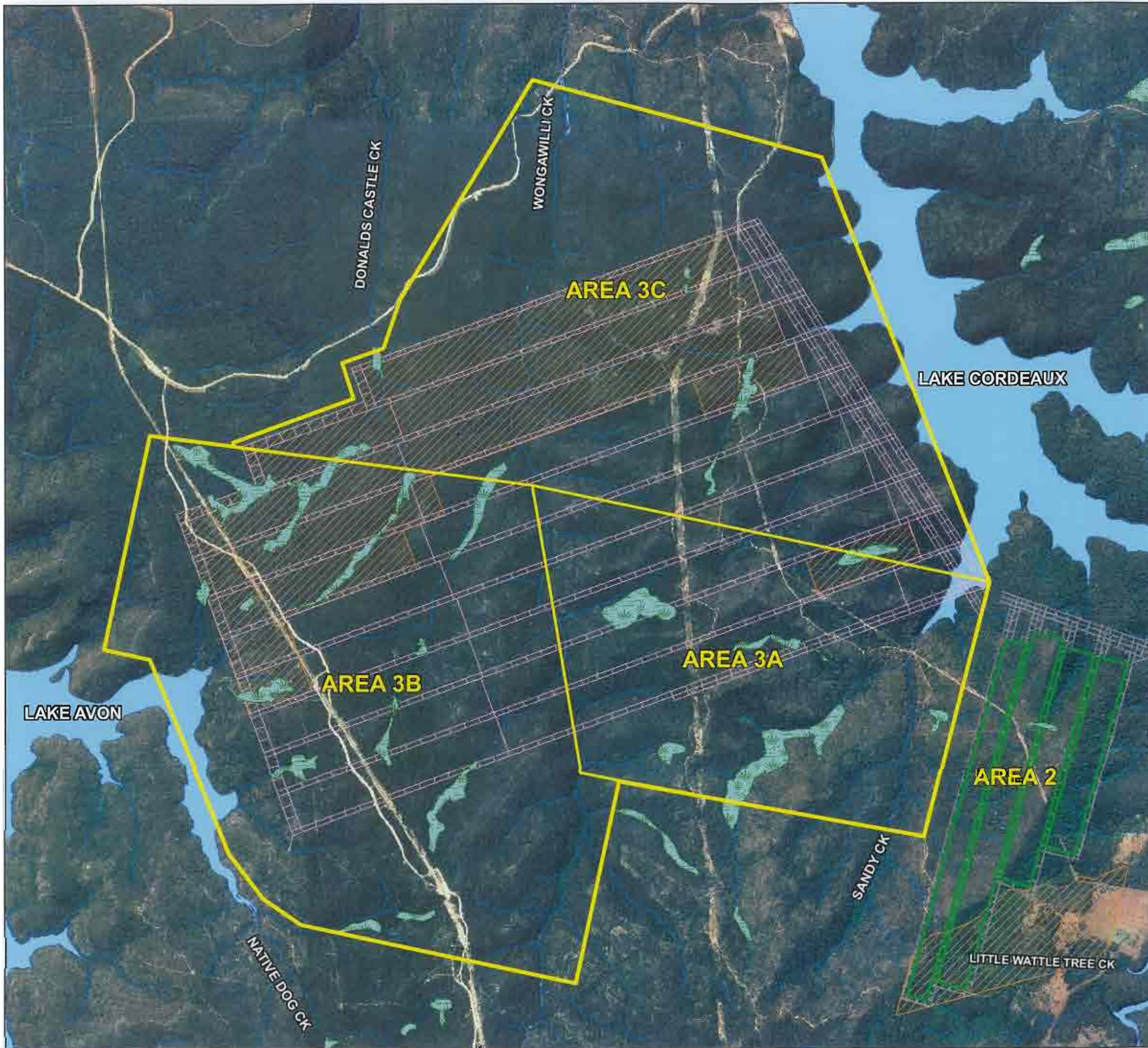
The preliminary concept longwall mining areas for the future longwalls in Areas 3B and 3C are shown in **Figure 1.9**.



ILLAWARRA COAL

Proposed and Approved Area 3 Mine Footprints

DENDROBIUM AREA 3



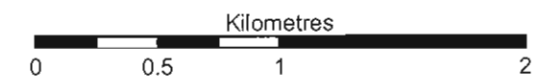
Legend

- Minor Streams
- Rivers & Creeks (LPI)
- Lakes (LPI)
- Swamps
- Existing Longwall Layout
- Staged Development Area
- Approved Mine Layout (2001) = 1890 Ha
18.90 km²
- Proposed Area 3 Footprint = 3349.92 Ha
33.50 km²



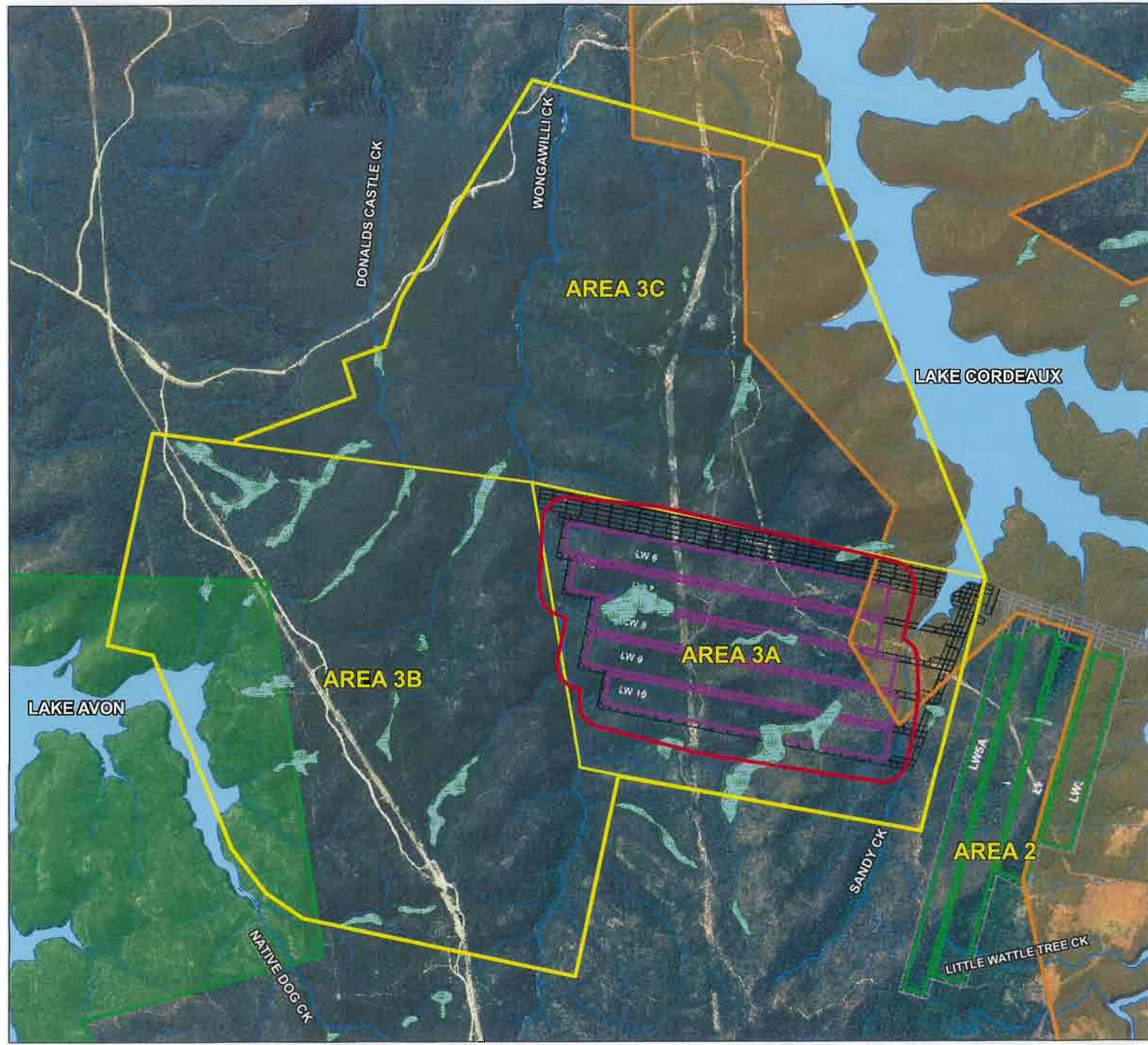
FIGURE 1.6

Scale 1:30,000 (at A3)



Map Produced by Cardno Forbes Rigby
 Date: 13 November 2007
 Coordinate System: Zone 56 MGA/GDA 94
 GIS MAP REF:
 107055_01_1801_EIA_Site_Plan_P2.mxd

**Proposed Area 3A
 Longwall Layout**
 DENDROBIUM AREA 3



Legend

- Minor Streams
- Rivers & Creeks (LPI)
- Lakes (LPI)
- Proposed Area 3 Footprint
- Proposed Longwall Layout
- Existing Longwall Layout
- Area 3A SMP Area
- Swamps
- Cordeaux Notification Zone (DSC)
- Avon Notification Zone (DSC)

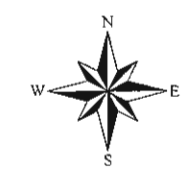
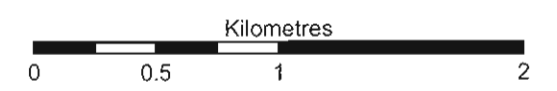
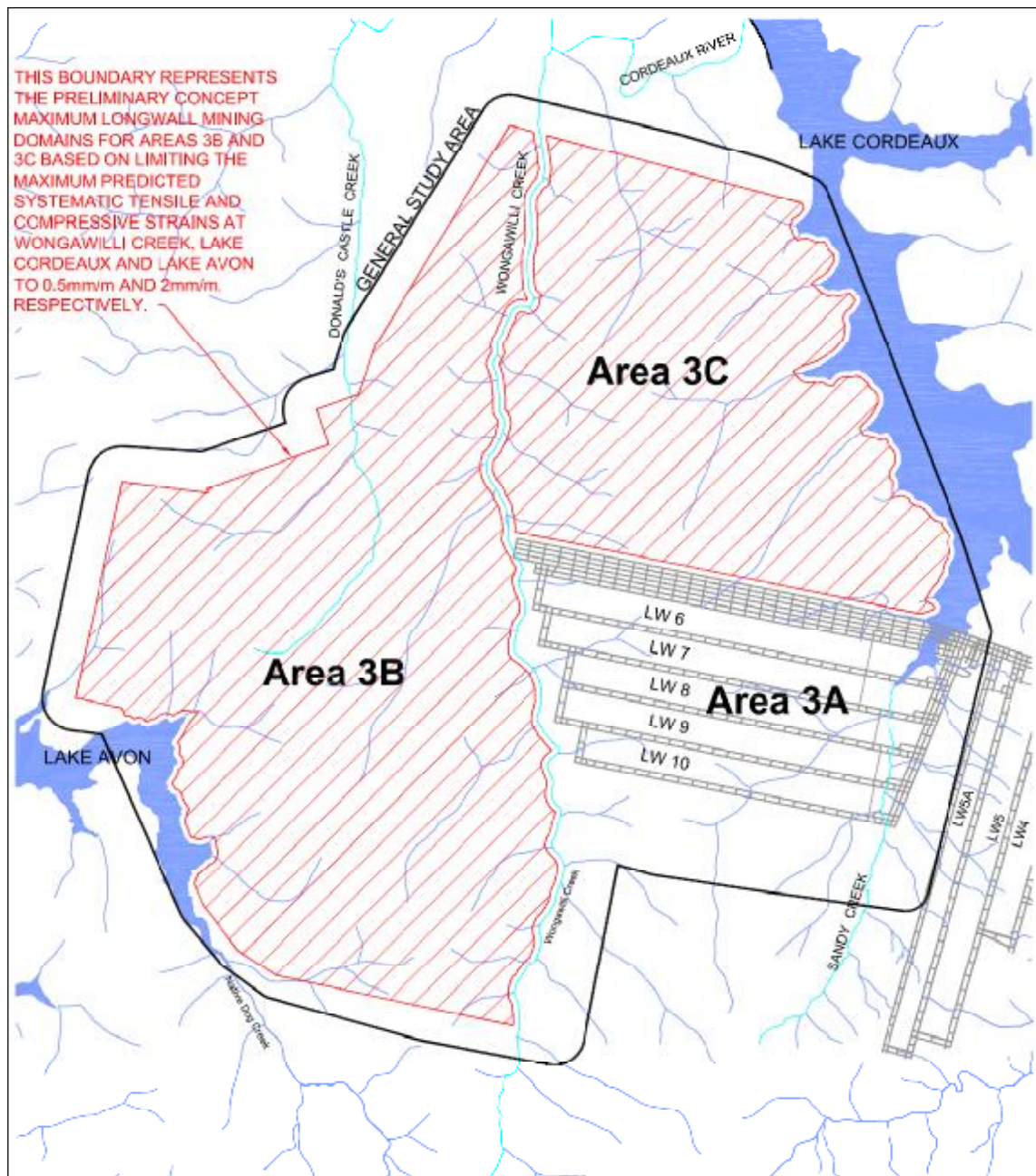


FIGURE 1.7

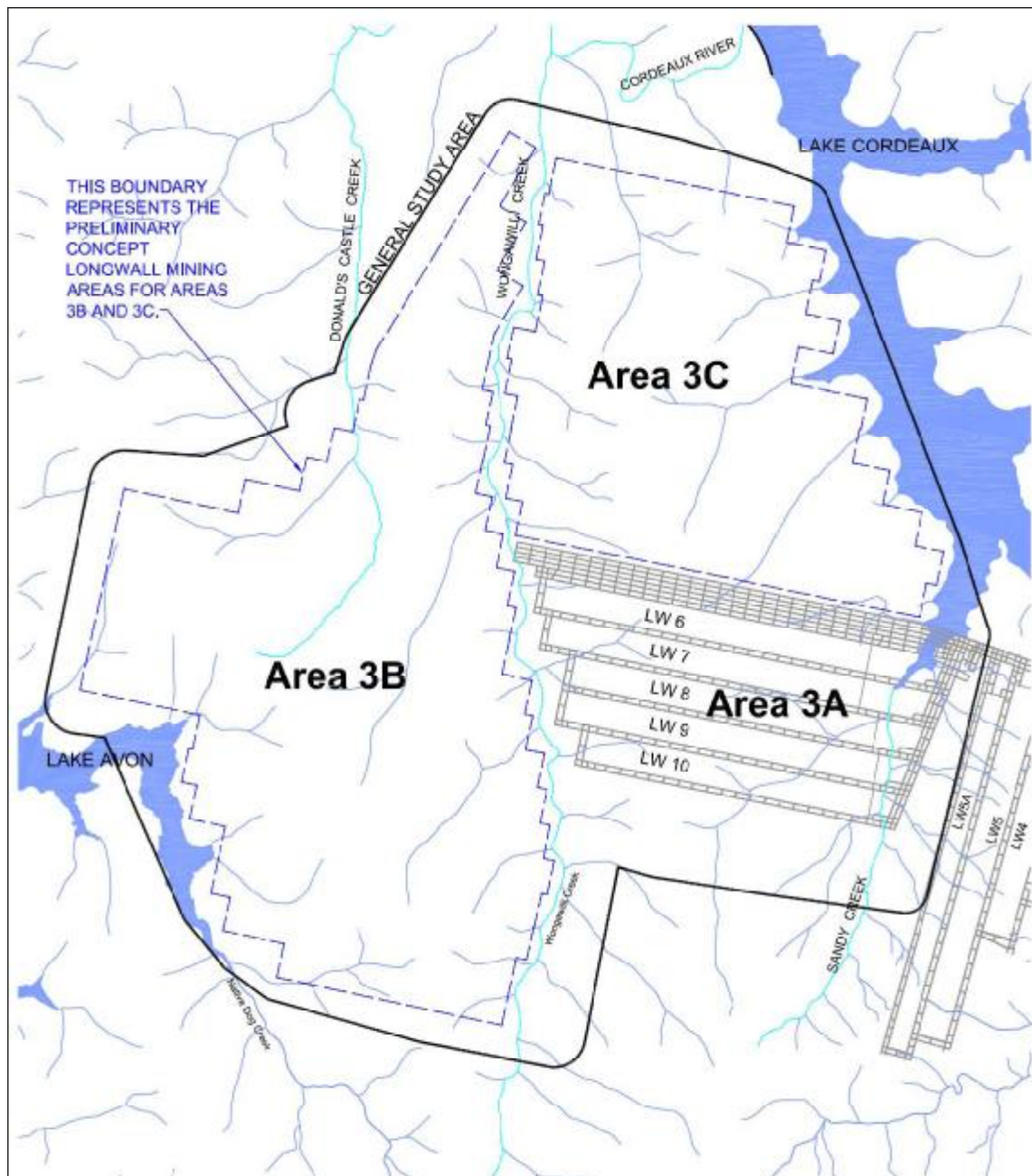
Scale 1:30,000 (at A3)





Source: MSEC (2007)

Figure 1.8 – Preliminary Concept Mining Domains for Areas 3B and 3C



Source: MSEC 2007

Figure 1.9 – Preliminary Concept Longwall Mining Areas for Areas 3B and 3C

1.5 APPROVALS SOUGHT

A number of approvals are required, including:

- **Modification to the Development Consent for Dendrobium Area 3** pursuant to section 75W of the *Environmental Planning and Assessment Act 1979*). This is requested to approve the revised Area 3 footprint.

- **Further approval** pursuant to Condition 1.1 (b) (iii) of the Dendrobium consent which required further assessment of Staged Development Area C, of the originally approved Area 3. It is proposed that the abovementioned s75W modification to the Dendrobium Mine consent will supersede this requirement.
- **Area 3A Subsidence Management Plan (SMP) approval (by DPI).** The specific requirements for SMPs are described in the *Guideline for Applications for Subsidence Management Approvals (DPI, 2003)*.
- **Subsidence Environmental Management Plan (SEMP) approval** by the DoP under the Dendrobium Consent, Condition 3.3.2 of which states:
'The Applicant shall prepare and implement a Subsidence Environmental Management Plan for each longwall panel or group of panels for which an application for secondary workings approval under s. 138 of the Coal Mines Regulation Act 1982 will be sought. The plan is to be approved by the Director-General, in consultation with and taking into account requirements of the Director-General of the DMR and the Sydney Catchment Authority, prior to the submission of the s.138 application to the DMR.'

As there is considerable overlap between the requirements of an SMP (as required by DPI) and the SEMP (as required by the 2001 consent), henceforth, SMP applications will be prepared to meet the requirements of both, minimising duplication of reports. This approach is supported by DPI, DoP and IC, and has been used in preparing the Dendrobium Area 2 SMP.

1.5.1 Additional Approval Required

Additional approvals required will include:

- NSW Dams Safety Committee endorsement and approval by DPI for mining within the Cordeaux Dam Notification Area pursuant to *condition 13 of the Dendrobium mining lease (CCL768)*.
- Section 88 Approval to mine using the longwall method under the *Coal Mine Health and Safety Regulation 2006* (replacing the old Section 138 Approval by DPI for extraction by Longwall method pursuant to the Coal Mines Regulation Act 1982).
- Revision of Asset Protection Plans to the satisfaction of the SCA pursuant to *Dendrobium Consent, Condition 3.11*.
- Section 90 consent under the *National Parks and Wildlife Act 1974* to impact on sites of Aboriginal cultural significance.

1.6 DIRECTOR GENERAL'S REQUIREMENTS

This report is structured into sections based on the DGRs issued by the DoP. **Table 1.1** notes the relevant sections of this Environmental Assessment that address each requirement.

Table 1.1 – Director General’s Requirements

| Director General’s Requirements | Relevant Section(s) in this EA |
|--|--|
| General Requirements | |
| The EA must include: | |
| <ul style="list-style-type: none"> • An executive summary | Executive summary |
| <ul style="list-style-type: none"> • A detailed description of the modification including the: <ul style="list-style-type: none"> - need for the modification; - alternatives considered; - various components of the modifications; and - the likely inter-relationship between the proposed modification and existing or approved mining operations in the region; | Section 2 |
| <ul style="list-style-type: none"> • Consideration of any relevant statutory provisions | Section 3 |
| <ul style="list-style-type: none"> • A general overview of the environmental impacts of the modification, identifying the key issues for further assessment; and taking into consideration the issues raised during consultation. | Section 4 |
| <ul style="list-style-type: none"> • A detailed assessment of the key issues specified below, and any other significant issues identified in the general overview of environmental impacts of the modification, which includes: <ul style="list-style-type: none"> - A description of the existing environment, and - An assessment of the potential impacts of the modification including potential cumulative impacts that may arise from the combined operation of the modified development, together with the other approved and existing mines in the region. | Preliminary Environmental Assessment, Sections 5 – 13 |
| <ul style="list-style-type: none"> • A description of the measures that would be implemented to avoid, minimise, mitigate, offset, manage, remediate and/or monitor the impacts of the modification, and how the existing environmental monitoring and management programs/plans at the Dendrobium Mine would be revised to accommodate the proposed modification. | Sections 5 – 13 Area 3A SMP |
| <ul style="list-style-type: none"> • Include relevant material from documents considered by the Dendrobium Commission of Inquiry, particularly the Environmental Impact Statement; Species Impact Statement and environmental Effects of Subsidence. | Sections 5 – 13 |
| <ul style="list-style-type: none"> • A Statement of Commitments, outlining environmental management, mitigation and monitoring measures. | Section 16 |
| <ul style="list-style-type: none"> • A conclusion justifying the modification, taking into consideration the environmental impacts of the project, and the benefits of the project. | Section 17 |
| <ul style="list-style-type: none"> • A signed statement from the author of the Environmental Assessment report certifying that the information contained in the report is neither false nor misleading. | Certification at the end of the EA |
| Key Issues | |
| <ul style="list-style-type: none"> • <i>For the expanded Mining Area 3 (including Area C)</i> – address all issues set out under condition 1.1(b)(iii) of the consent in accordance with requirements set out in that condition. | Section 2 |
| <ul style="list-style-type: none"> • <i>Stored Waters and SCA Assets</i> – assess the potential impacts on Lake Cordeaux and Lake Avon (including inflows and water quality), assess the likelihood and consequence of loss of stored waters, assess potential impacts (including likelihood and consequence) on Cordeaux and Avon Dams and other SCA assets. | Sections 5 and 6 |

| Director General's Requirements | Relevant Section(s) in this EA |
|--|---|
| <ul style="list-style-type: none"> • <i>Surface and Ground Water</i> – assess the potential impacts on Donalds Castle, Wongawilli and Sandy Creeks; upland swamps and aquifers | Sections 6 and 7 |
| <ul style="list-style-type: none"> • <i>Aboriginal Cultural Heritage</i> | Section 10 |
| <ul style="list-style-type: none"> • <i>Greenhouse Gases</i> – a full greenhouse gas assessment (including a quantitative analysis of the greenhouse emissions associated with the combustion of product coal, and a quantitative assessment of the impacts of these emissions on the environment. | Section 13 |
| References | |
| <ul style="list-style-type: none"> • The Environmental Assessment must take into account relevant State and Commonwealth Government technical and policy guidelines. | Section 3 and Reference |
| Consultation | |
| <ul style="list-style-type: none"> • During the preparation of the Environmental Assessment, you should consult with the relevant local, State or Commonwealth authorities, service providers, community groups or affected landowners. The consultation process and the issues raised must be described in the Environmental Assessment. | Section 15 |
| <p>In particular you should consult with all agencies and other parties identified in condition 1.1(b)(iii) and the Dendrobium Community Consultative Committee.</p> | |
| <p>The consultation process and the issues raised must be described in the Environmental Assessment.</p> | |

1.7 ENVIRONMENTAL ASSESSMENT STUDY TEAM

The study team involved in the preparation of this Environmental Assessment comprises:

- Engineering, Landscape Impact Assessment, Monitoring Site Selection, Environmental Planning and Project Management – *Cardno Forbes Rigby*.
- Subsidence Prediction and Impact Assessment – *Mine Subsidence Engineering Consultants*.
- Water Quality & Surface Hydrology – *Ecoengineers*.
- Hydrogeology – *GHD Geotechnics*.
- Terrestrial Flora & Fauna Species Impact Statement – *Biosis Research*.
- Aquatic Flora & Fauna Impact Assessment – *The Ecology Lab*.
- Archaeological and Cultural Heritage Assessment – *Biosis Research*.
- Risk Assessment – *AXYS*.

1.8 STRUCTURE OF THIS REPORT

This report is organised as follows:

- **Chapter 1** – describes the background and approval requirements for the project, justifies the need for the project and introduces the study team that undertake the environmental assessment.
- **Chapter 2** – describes the proposed modification application, the alternative options considered and the inter-relationship between the proposed modification and the existing mining operations.
- **Chapter 3** – identifies the statutory and environmental planning policies applicable to the site.
- **Chapter 4** – identifies the key issues as a result of the proposal.
- **Chapters 5 to 13** – analyse the environmental issues, describes the existing conditions of the application area, assesses the impacts of the proposal and proposes mitigation measures to minimise risks.
- **Chapter 14** – summarises the process of the risk assessment that was undertaken as part of the environmental assessment process.
- **Chapter 15** – describes the community and stakeholder consultation that was carried out for the project.
- **Chapter 16** – presents the Statement of Commitment of the application.
- **Chapter 17** – concludes on the need of the project, summarises the key issues and mitigation measures.

2 JUSTIFICATION FOR THE PROJECT

2.1 INTRODUCTION

Dendrobium mine currently produces approximately 1.7 million tonnes per annum (Mtpa) of high quality coking and energy coal from Dendrobium Area 2. It is anticipated that longwall production from Dendrobium Area 2 will reach completion in 2009 and will be replaced in the long term by mining in Dendrobium Area 3. IC proposes to commence extracting coal from Area 3 around January 2010, with the production in the order of 1.7 Mtpa and a maximum capability of 3.4 Mtpa (equivalent to maximum ROM coal production of 5.2 Mtpa).

The Area 3 longwalls are proposed to be extracted from the Wongawilli Seam, which is at a depth of cover varying between 225 and 400m below the natural land surface. The Wongawilli Seam underlies the Bulli Seam by approximately 20m. The Bulli Seam has not been extracted, and is not proposed to be extracted in Area 3, as it has been judged to be uneconomical.

The Wongawilli Seam proposed to be extracted in Area 3 is required to meet customer requirements. IC supplies the Port Kembla and Whyalla Steelworks and overseas export customers with a blend of Wongawilli Seam and Bulli Seam coal. When combined, this coal has unique characteristics and IC's major customers have developed their facilities based on these characteristics. Consequently, IC must continue to provide this blended coal to its customers. Without an ongoing supply of Wongawilli Seam coal for the blend, IC will not be able to meet current market specifications for the Australian steel industry or export markets. It is important to note that the Appin and West Cliff Collieries extract coal from the Bulli Seam, and that the Appin and West Cliff Bulli Seam coal alone cannot meet the specifications required by IC customers.

2.2 NEED FOR A MODIFIED AREA 3 FOOTPRINT

The 2001 consent for the Dendrobium Mine granted approval for approximately 2,610ha of extraction within the three approved areas. The consent further capped the volume of coal to be extracted from the Dendrobium Mine at 5.2Mt/year (condition 2.2(a)).

Since the 2001 approval, the area in Dendrobium Areas 1 and 2 that has been actually extracted represents on average 70% of the approved mining area (within Areas 1 and 2). The reduced mining area was the result of a number of risk management mechanisms that were in place (eg. coal barrier set backs to protect creeks) and underground geological constraints that restricted extraction in approved mining areas. The proposed modification to the Area 3 mining footprint has been determined on the basis of more contemporary exploration data that was not available during the development of the 2001 approved Area 3 longwall plan, and improved understanding of the interactions of mining and the environment.

Table 2.1 shows the approved and actual mining areas in Areas 1 and 2. The 2001 consent approved a total footprint 725ha in Areas 1 and 2. Of this, only approximately 501.4ha was actually mined, and approximately 30% of the area was sterilised due to various environmental and/or geological constraints.

Based on the experience from Areas 1 and 2, it is reasonable to assume that some portion of the maximum Area 3 footprint will not be extracted because of unknown geological conditions and longwall set backs from major natural features such as Wongawilli Creek, Lake Cordeaux and Lake Avon. **Tables 2.1 to 2.3** below indicate the likely extraction from

Area 3 based on experience from Dendrobium Areas 1 and 2 (where 75% of the approved area being mined).

Table 2.1 – Approved Mining Areas (2001) versus Actual Extraction Areas

| Mining Area | Approved EIS (ha) | Actual (ha) | % (Actual/EIS) |
|--------------|-------------------|----------------------------------|----------------|
| Area 1 | 287.9 | 227 | 78 |
| Area 2 | 436.5 | 314 | 72 |
| | | (approved SMP inc. modification) | |
| Area 3 | 1,886.6 | 1,415* | 75* |
| Total | 2,611 | 1,956 | 75 |

*Estimated 75% of the approved area based on experience in Areas 1 and 2 and geological uncertainties in Area 3.

Table 2.2 – Approved Mining Area versus Estimated Extraction for the Proposed Area 3 Modification

| Mining Area 3 | Approved EIS (ha) | Proposed Max. (ha) | Estimated Likely Extraction(ha) (Assume 75%) |
|---------------------------------|-------------------|--------------------|--|
| Area 3A | - | 736 | 547 (proposed) |
| Area 3B | - | 1,302 | 976.5 |
| Area 3C | - | 1,313 | 984.75 |
| Proposed Modified Area 3 | 1,886.6 | 3,351 | 2,508.25 |

Table 2.3 – Total Approved Mining Area versus Proposed Modification for Dendrobium Areas 1 – 3

| Mining Area | Approved EIS (ha) | Proposed Modification Actual Areas 1 & 2 & Proposed Area 3 (ha) | % (Actual/EIS) |
|--|-------------------|---|------------------------|
| Maximum Mining Area Total Areas 1 – 3 | 2,611 | 3,892 | 149 |
| Likely Extraction Total Areas 1 – 3 | 1,956 | 3,049.25 | 117[#] |

[#]Likely extraction of the proposed modification / Maximum Mining Area under Approved EIS (ie. 3049.25/2611)

Table 2.2 shows that the proposed Area 3 modification will allow a maximum mining area of 3,351ha within Area 3. However, only 2,508ha is estimated to be extracted due to potential sterilisation of coal in certain areas. Comparing this likely extracted area with the approved area of 1,887ha represents an increase of approximately 33%.

Table 2.3 presents a comparison between the total mining area approved in the 2001 consent, and the estimated likely mining area, taking into account the potential sterilisation of coal in certain areas. The 2001 consent permits a maximum mining area (Areas 1-3) of 2,611ha, however, only 1,956ha is likely to be actually mined due to various geological constraints.

The proposed modification will result in a maximum total mining area (Areas 1-3) of 3,892.4ha. Of this area, only 3,049.25ha is likely to be extracted as a result of potential geological constraints and the proposed setbacks from major creeks. The proposed modification will therefore result in a total likely mining area comparable with (17% more than) the approved total mining area in 2001 consent.

It is likely that the additional mining area will be further reduced as a result of the existence of faults and dykes at seam level and other geological constraints. MSEC has identified preliminary locations of the irregular profile and these are shown in **Figure 2.1**.

As the figure presented above demonstrate, geological constraints and IC's commitment to avoid significant impacts by employing set backs from major natural features such as Wongawilli and Sandy Creek as well as water reservoirs, has created a need to modify Area 3 to develop an efficient, effective and responsible mine plan. The additional total area proposed to be extracted (compared to the 2001 consent) will provide additional business certainty for IC and it's customers. The modified footprint also aims to minimise the requirement for future consent modifications if mine plan changes are required for Areas 3B or 3C based on contemporary exploration data.

2.3 LONGWALL LAYOUT OPTIMISATION PROCESS

The proposed longwall layout in Area 3A has been designed through an optimisation process, where alternative longwall layouts are considered. Alternative layouts include variations in the numbers of longwalls and variations in the orientations, lengths, and offsets of the longwalls from significant natural features. Different options of longwall layout are reviewed, analysed, and modified until an optimal longwall layout is achieved that meets the following objectives:

- Avoid significant impact on the major natural features, including Wongawilli Creek, Sandy Creek and the waterfall where Sandy Creek flows into Lake Cordeaux.
- Minimise volume of sterilised coal which could be efficiently extracted within the mining and environmental constraints of the area.

Examples of the alternative layout are presented in the next section.

This optimization process adopts the hierarchy of avoid/minimise/mitigate as requested by the DoP during consultation with IC. This approach was also requested by the DECC in their comments to DoP during the preparation of the Director Generals Requirements (DGR's).

During the process, the potential for significant impact along Wongawilli and Sandy Creeks has been assessed by comparing the predicted movements along these creeks with back-predicted movements along a number of creeks and rivers which have been affected by longwall mining within the Southern Coalfield. A detailed description of the methodology is provided in **Section 5.3.2**. Based on these case studies, the following limits were adopted for the predicted subsidence parameters along Wongawilli and Sandy Creeks, such that it could be assessed that it was unlikely that significant impacts would occur along the creeks:

- a maximum predicted total valley closure across the major watercourses of 200 mm;
- a maximum predicted total systematic tensile strain within the beds of the major watercourses of 0.5 mm/m; and
- a maximum predicted total systematic compressive strain within the beds of the major watercourses of 2 mm/m.

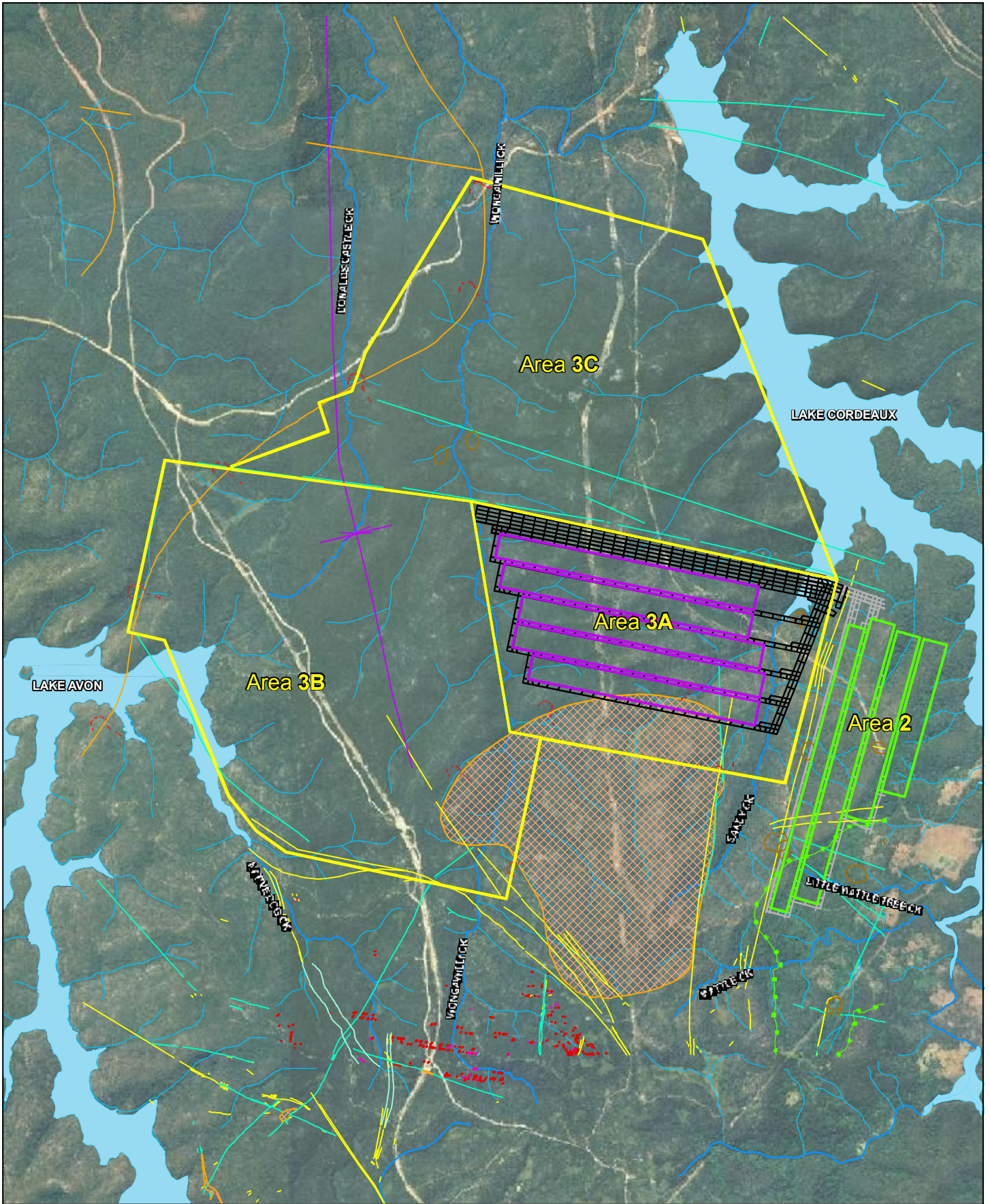


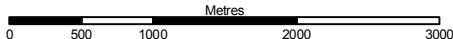
FIGURE 2.1

Geological Structures DENDROBIUM AREA 3

- | | | |
|-----------------|-----------------|-----------------------------|
| — LONGWALLS | — DYKE | ▣ CINDER |
| — ANTICLINE | — FAULT | ▣ STONE ROLLS |
| — VOLCANIC PLUG | — JOINTS | ▣ Proposed Area 3 Footprint |
| — CINDER | — SILL | ▣ Proposed Longwall Layout |
| ● CRINANITE | — STONE ROLLS | ▣ Existing Longwall Layout |
| — DISTURBED | — MINOR STREAMS | — RIVERS & CREEKS (LPI) |

bhpbilliton
ILLAWARRA COAL

1:35,000 (at A3)



**Cardno
Forbes Rigby**

Map Produced by Cardno Forbes Rigby
Date: 13 November 2007
Coordinate System: Zone 56 MGA/GDA 94
GIS MAP REF:
107055_01_1832_Geological_Structures.mxd

Source: Mine Subsidence
Engineering Consultants (MSEC 2007)

Based on this process, the proposed longwalls in Area 3A have been set back from Wongawilli and Sandy Creeks such that the maximum predicted parameters along these creeks were less than the above parameters. These set backs have necessitated sterilising of coal resources that otherwise could have been extracted.

It has been assessed that it is unlikely that significant impacts, such as major fracturing or draining of pools, would occur along Wongawilli and Sandy Creeks as a result of the extraction of the proposed longwalls in Area 3A. It is likely, however, that minor impacts would occur along these creeks as a result of the extraction of the proposed longwalls. Detailed assessments on the impacts on Wongawilli and Sandy Creeks are provided in **Section 5.3.2**.

IC is committed to planning future longwall proposals in Areas 3B and 3C using the methodology described above. This commitment is reflected in the Statement of Commitment accompanying this application.

2.4 ALTERNATIVE OPTIONS CONSIDERED

During IC's longwall layout optimisation process, the proposed longwalls in Area 3A are set back from major watercourses such that the maximum predicted parameters along these features are less than the above targets. These set backs necessitate sterilizing coal resources that otherwise could have been extracted.

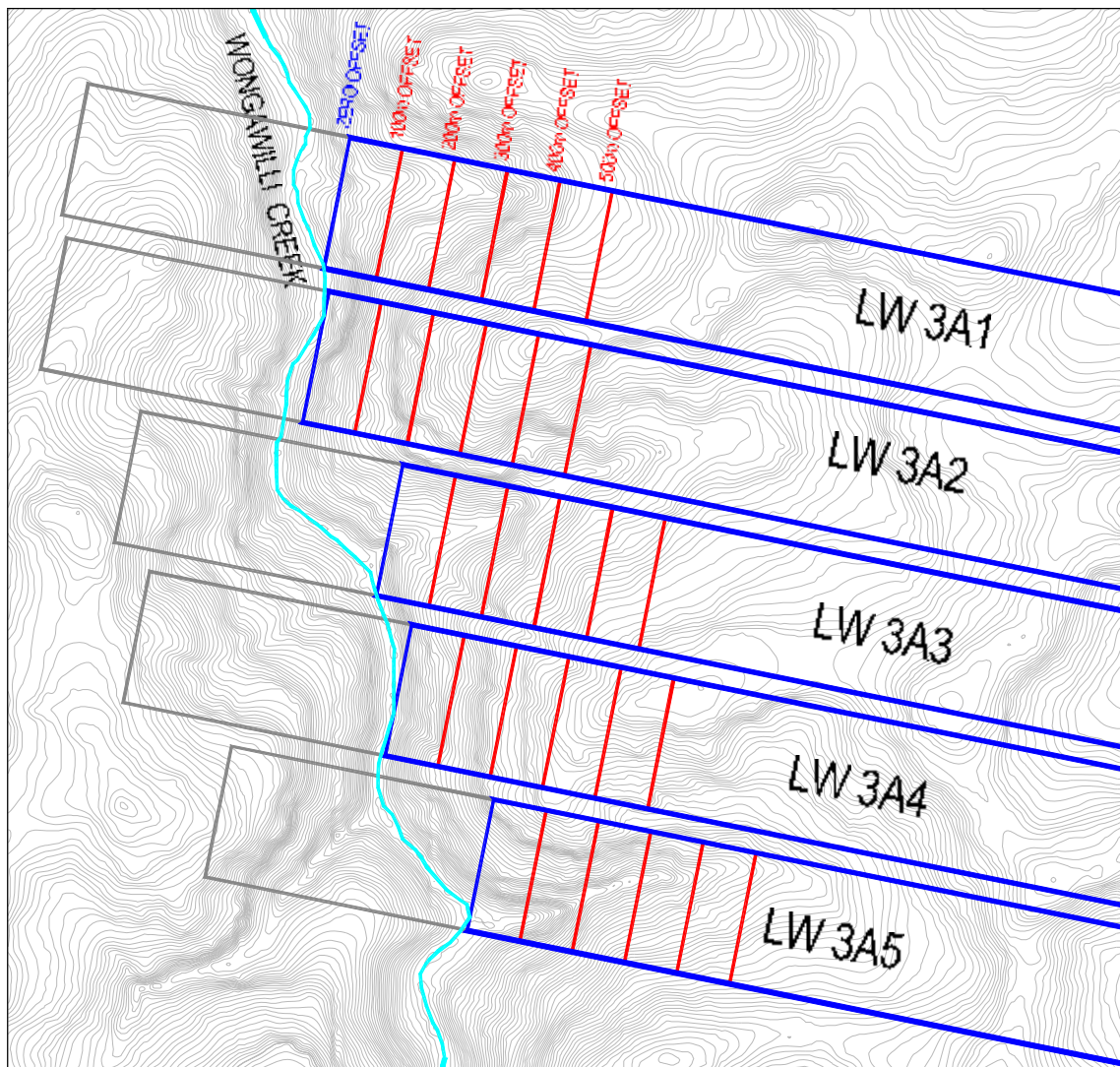
Three examples of the longwall layouts considered in the Area 3A longwall layout optimisation process are presented. These examples are illustrated in **Figures 2.2 to 2.4**.

The first example comprises a series of five longwalls, oriented east-west, having a range of offsets from Wongawilli Creek. The second example comprises a series of up to nine longwalls, orientated north-south, mined progressively towards Wongawilli Creek. The third example comprises a series of five longwalls, orientated east-west, having a range of offsets from Sandy Creek. For each example, the predictions for systematic subsidence, valley related movements and volume of sterilised coal were undertaken for a range of longwall offsets from the creeks.

The greatest components of the predicted movements at the waterfall site are the result of the first two longwalls in the series, being LW3A1 and LW3A2. The offset of these longwalls from the creek were, therefore, governed by the predicted movements at the waterfall site. The predicted movements at the waterfall site resulting from the following longwalls, being LW3A3 to LW3A5, were relatively small in comparison and, therefore, the offsets of these longwalls were not governed by the predicted movements at the waterfall site.

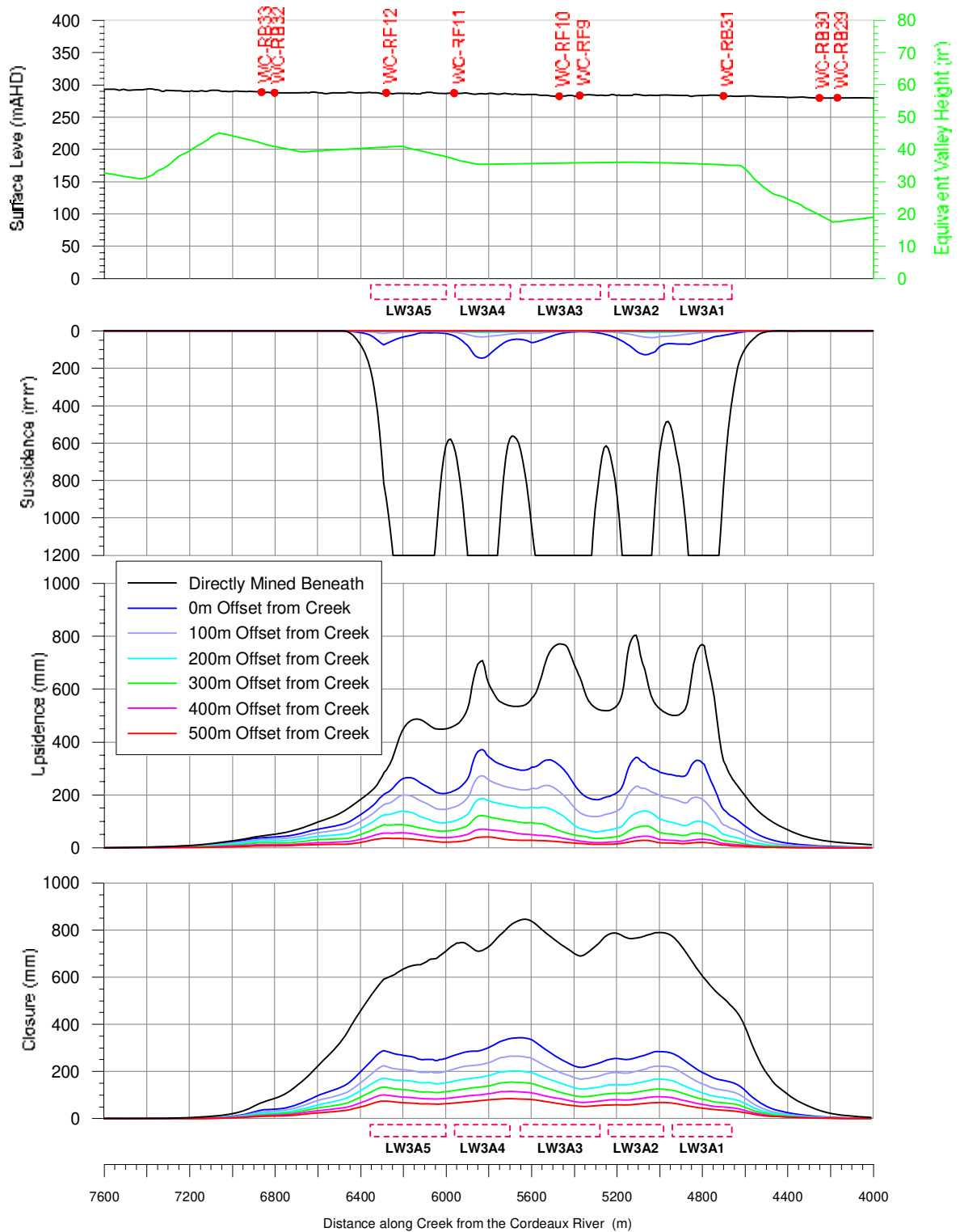
The upper reaches of Sandy Creek has a relatively small equivalent valley height and, therefore, the minimum offsets of the final three longwalls in the series, being LW3A3 to LW3A5, were governed by the systematic movements rather than the valley related movements along this section of creek. A maximum tensile strain of 0.25mm/m is predicted along Sandy Creek based on the longwalls having an offset of 85m from the creek.

The predicted movements along Sandy Creek were, therefore, determined based on the creek being directly mined beneath, based on all longwalls having an offset of 85 metres from the creek, as well as based on Longwalls 3A1 and 3A2 having offsets of 135, 185, 235 and 285m from the creek and, hence, from the waterfall site. The predicted profiles of subsidence, upsidence and closure along Sandy Creek based on each case are shown in **Figure 2.4b**. A summary of the maximum predicted upsidence and closure movements at the waterfall site and the tonnage of sterilised coal for each case are provided in **Figure 2.4c**.



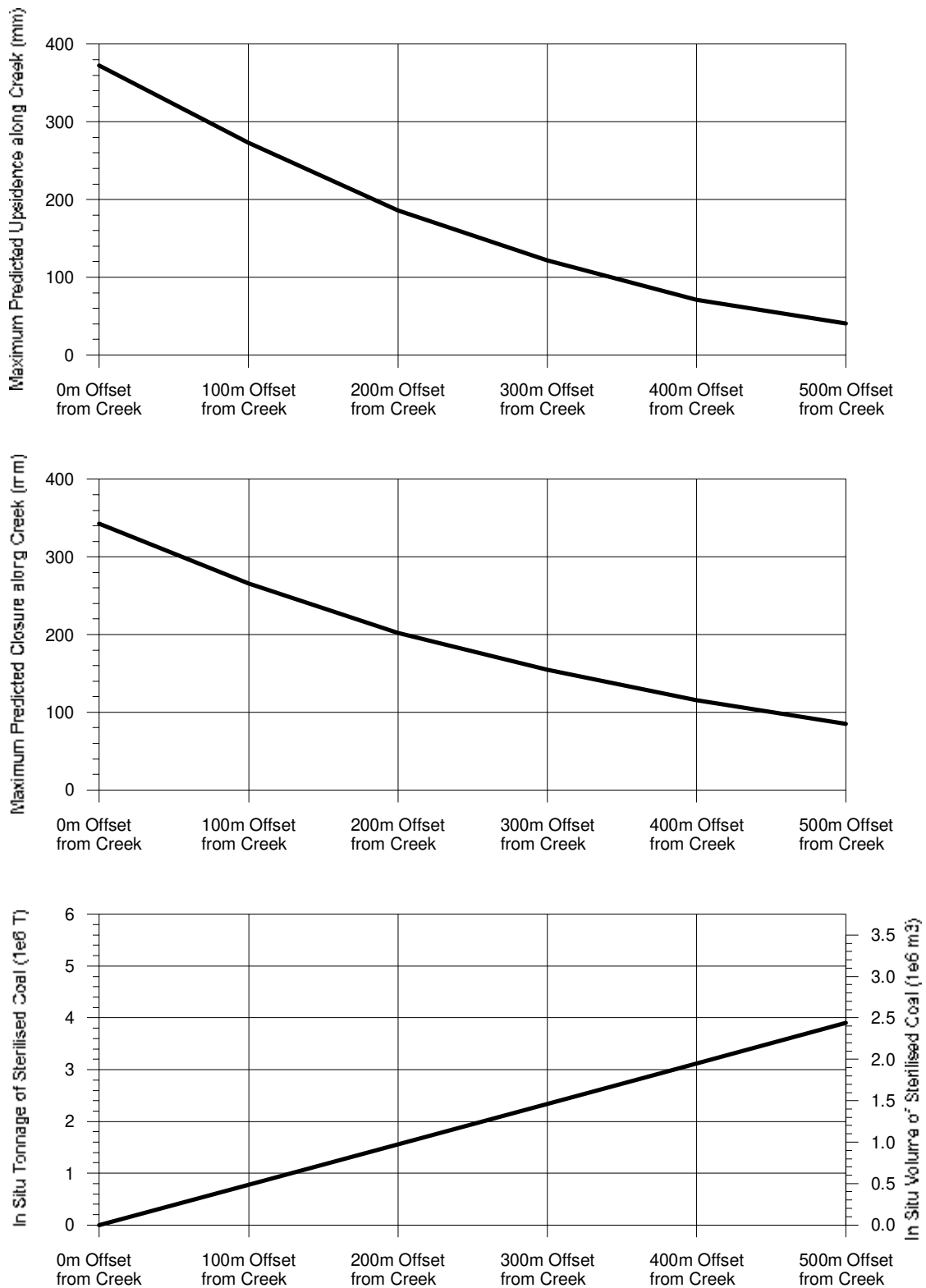
Source: MSEC 2007

Figure 2.2a - Example 1 Wongawilli Creek – East-West longwall layout option mining directly beneath the Creek and with offsets varying between 0 and 500m from the Creeks



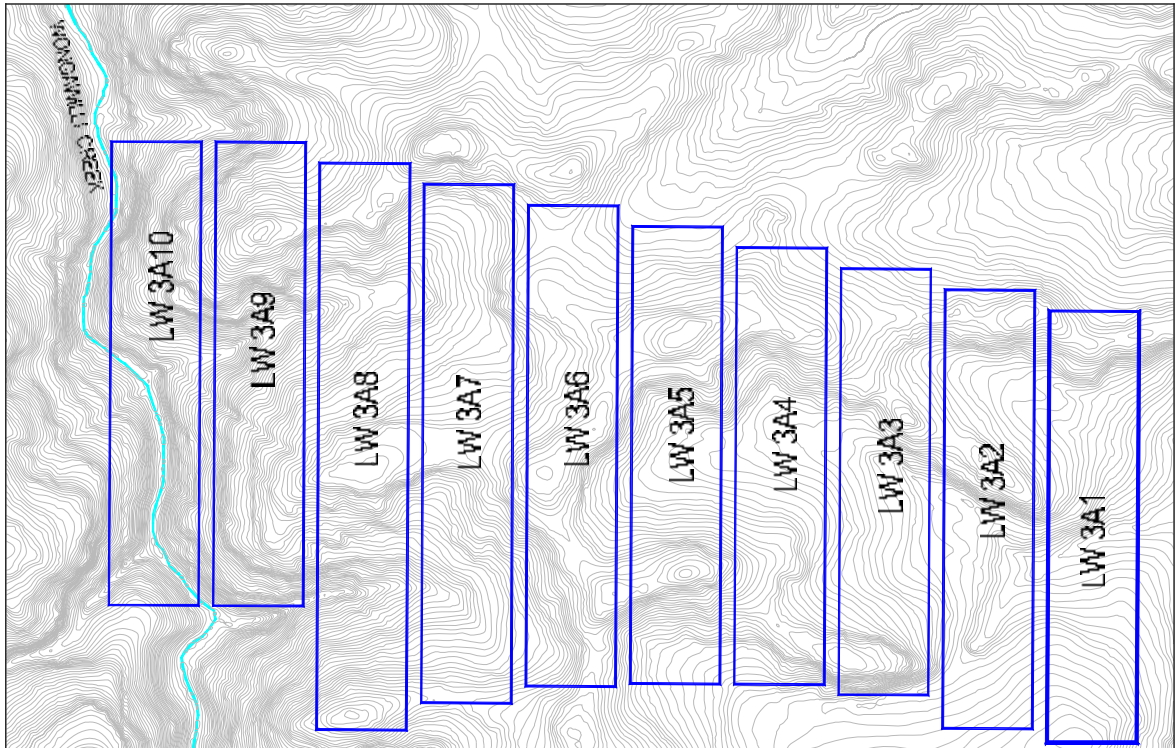
Source: MSEC 2007

Figure 2.2b – Predicted Subsidence, Upsidence and Closure along Wongawilli Creek for varying offsets based on an East-West longwall layout



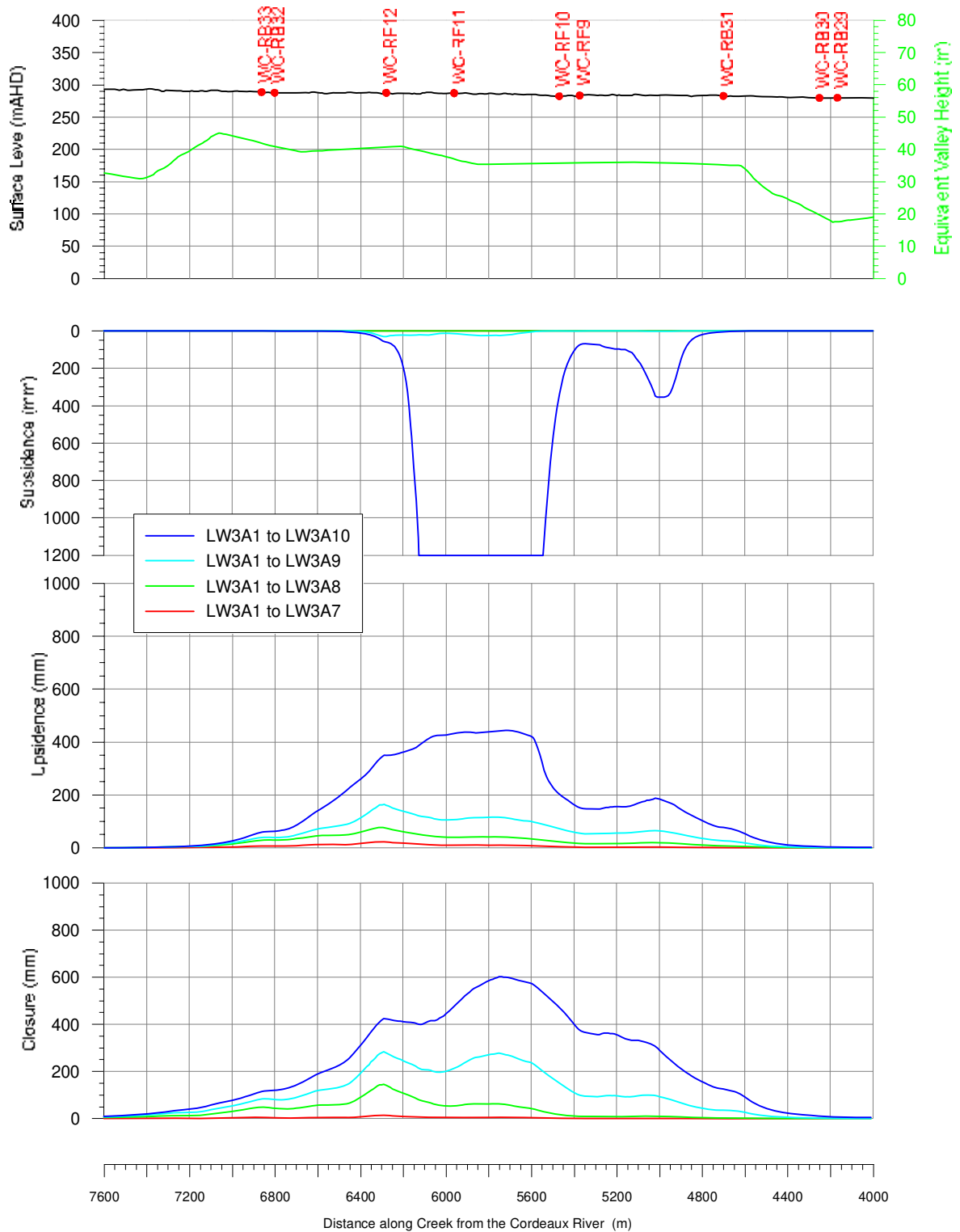
Source: MSEC 2007

Figure 2.2c – Summary of Maximum Predicted Subsidence, Upsidence and Closure along Wongawilli Creek and Volume of Sterilised Coal for East-West Longwall Offset Option



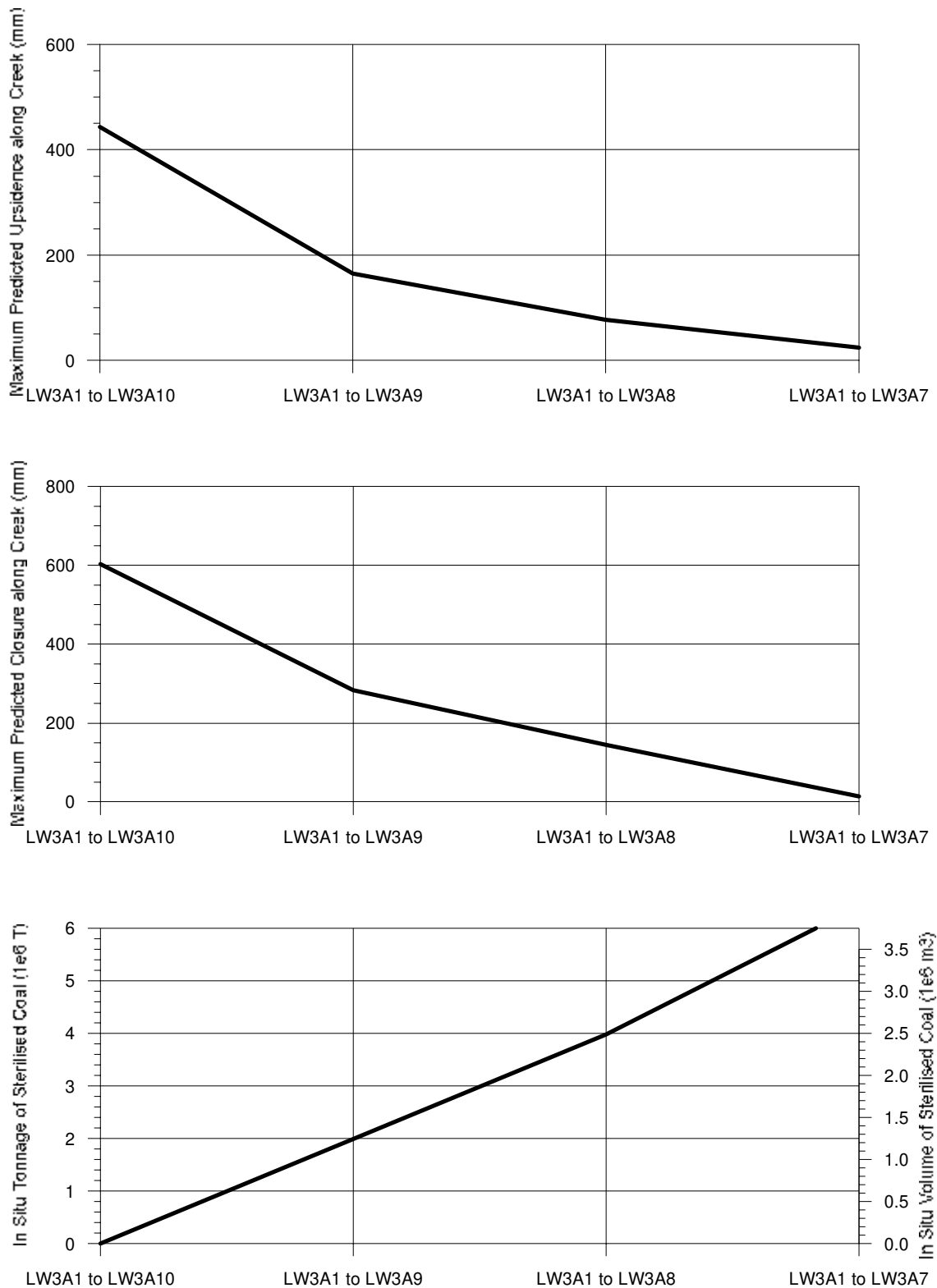
Source: MSEC 2007

Figure 2.3a – Example 2 Wongawilli Creek – North-South Longwall Layout adjacent to the Creek



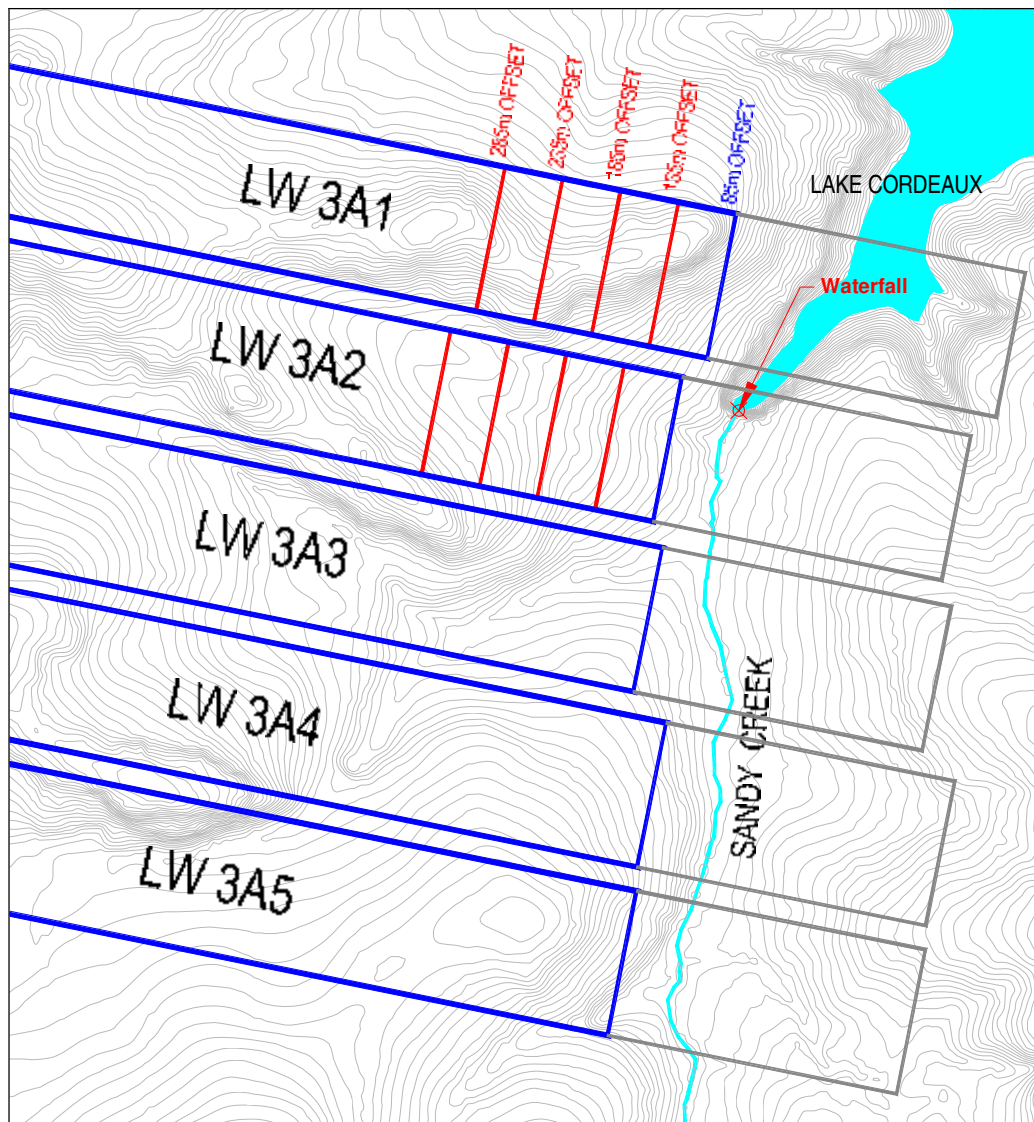
Source: MSEC 2007

Figure 2.3b – Predicted Subsidence, Upsidence and Closure along Wongawilli Creek after the Extraction of each successive North-South longwall within the series



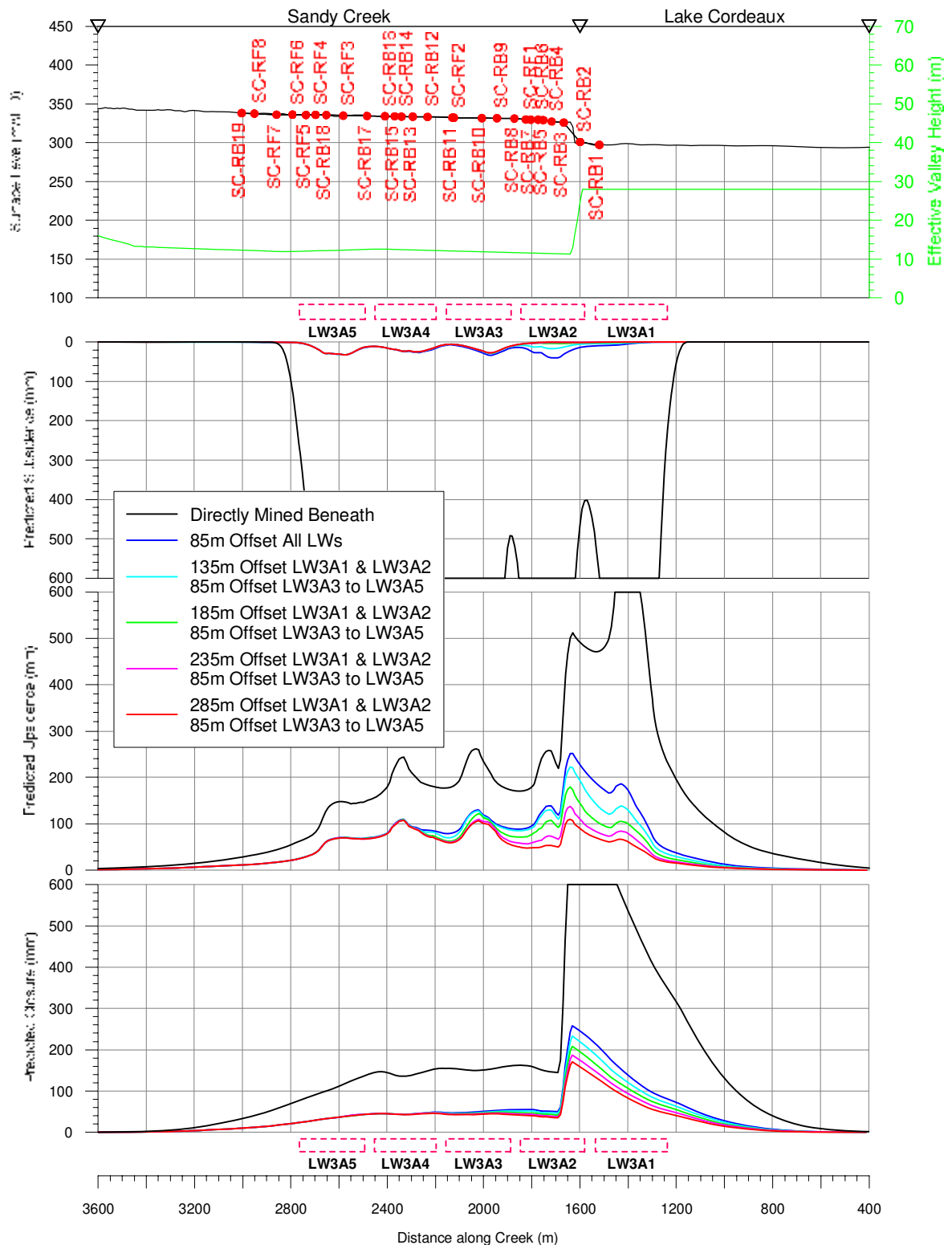
Source: MSEC 2007

Figure 2.3c - Summary of Maximum Predicted Subsidence, Upsidence and Closure along Wongawilli Creek and Volume of Sterilised Coal for North-South Longwall Option



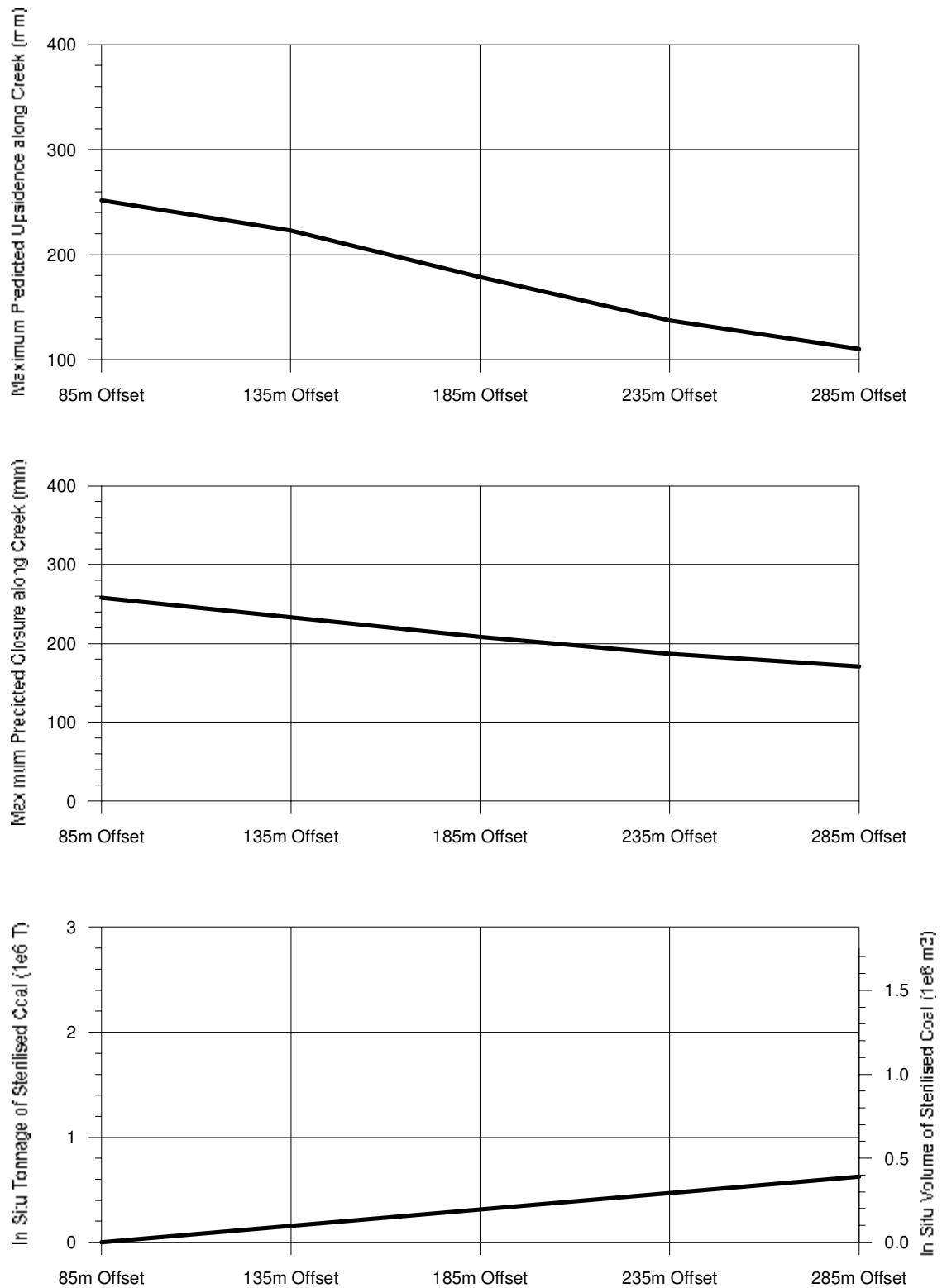
Source: MSEC 2007

Figure 2.4a – Example 3 Sandy Creek – East-West longwall layout option mining directly beneath the Creek and with offsets varying between 85 and 285m from the Creek



Source: MSEC 2007

Figure 2.4b – Predicted Subsidence, Upsidence and Closure along Sandy Creek for varying offsets based on an East-West longwall option



Source: MSEC 2007

Figure 2.4c - Summary of Maximum Predicted Subsidence, Upsidence and Closure along Sandy Creek and Volume of Sterilised Coal for East-West longwall offset option

2.5 INTER-RELATIONSHIP BETWEEN THE PROPOSED MODIFICATION AND EXISTING/APPROVED MINING OPERATIONS

The mining operation in Area 3 will continue the longwall method that was employed in Areas 1 and 2. Area 3A would be accessed via a gate-road extending from the current Area 2, under the Sandy Creek arm of Lake Cordeaux, and progress the mining area to the northwest (refer **Figure 1.7**).

No additional surface facilities such as ventilation shafts are required as part of this proposal.

Additional exploration activities will be required in Areas 3B and 3C to better define the geology of the area and facilitate mine planning. Approvals for this work will be pursued with the SCA using the agreed REF process at the appropriate time.

The coal is transported to the surface at the Kemira Valley Portal via conveyors and is hauled from site by rail to the Dendrobium Coal Preparation Plant. The clean coal is then delivered to the Port Kembla steelworks or Port Kembla Coal Terminal for export.

2.6 BENEFITS OF THE PROPOSED DEVELOPMENT

The extraction of underground coal reserves from Area 3 is necessary to ensure continuity of coal supply to customers and achieve business objectives for IC. At the same time, it provides financial benefits at international, national, state and local levels.

About 60% of the high quality coal produced is blended with coal with different characteristics to supply a specific coal product to the steelworks. The remainder is exported to overseas customers. The proposed extraction of coal from Area 3 represents a continuing significant operating investment in the Southern Coalfield of New South Wales. Continuing benefits occur through continuity of employment, expendable income, export earnings and government revenue. Dendrobium Colliery directly employs 183 people plus a similar number of contractors. These jobs are reliant on maintaining continuity of longwall coal extraction.

There are no alternative supplies of Wongawilli Seam coal in the local region that are currently economic to mine. Imported coal suitable as a replacement for Wongawilli Seam coal is more costly and does not constitute an exact replacement. Should imported coal be used, it will pose potential technical difficulties to key customers.

The proposed extraction of coal from Area 3 is vital to the business as minimal reserves of such coal exist. It also represents continuing significant capital and operating investments in the Southern Coalfield of New South Wales. Continuing benefits occur through continuity of employment, expendable income, export earnings and government revenue.

The proponent generates employment for approximately 1,400 direct employees and contractors throughout its operations. In addition, the jobs of 16,000 workers at the Port Kembla Steelworkers are secured by the local supply of coking coal from IC's mines. The company is a major contributor to the economy of the local region and New South Wales. IC's expenditure on goods and services in 2006-7 was in the order of \$591 million.

In 2006-07, IC contributed \$86.4 million to local, state and federal government taxes.

In the context of the existing operations, the proposed Area 3 modification will ensure the socio-economic benefits discussed above continue in the medium term by increasing the life

of the mine and/or providing some contingency extraction area if the geology in Areas 3B and 3C compromises the availability of extractable coal.

The modification to Area 3 also reduces the potential for significant impact to occur to Wongawilli Creek. The currently approved Area 3 mine plan allows mining to occur directly beneath Wongawilli Creek, whereas the modified Area 3 does not mine directly beneath this waterway. The modified Area 3 mine plan is unlikely to give rise to significant impacts such as bed cracking causing pool drainage or water loss from the creek.

3 RELEVANT STATUTORY PROVISIONS

3.1 INTRODUCTION

This chapter identifies the Commonwealth and State legislation applicable to the project, and the local planning instrument applicable to the site.

3.2 COMMONWEALTH LEGISLATION

3.2.1 Environmental Protection and Biodiversity Conservation Act 1999

Under the EPBC Act, further approval from the Commonwealth Minister for the Environment is required for any actions that may have a significant impact on the matters of national environmental significance. The Dendrobium Coal Project has been referred to the Commonwealth Government on the basis of nationally listed threatened species and internationally listed migratory species and has EPBC approval 20 December 2001. The Department of Environment and Heritage has confirmed 30 July 2007 that the proposed modification to the Area 3 mining domain is within the scope of the original approval.

3.3 STATE LEGISLATION

3.3.1 Environmental Planning and Assessment Act 1979

The original project was identified as an Integrated State Significant project, and was approved in 2001 by the then Minister for Urban Affairs and Planning. This modification is lodged under Section 75W of the Act. The Minister for Planning will be the consent authority for the modification.

The DGR specifies the scope of the EA as required by Part 3A of the Act. **Section 1.7** identifies the relevant sections of the EA that address the requirements.

3.3.2 Mining Act 1992

The Dendrobium Mine operates under the mining lease – Consolidated Coal Lease 768, which was granted under the Mining Act. The Consolidated Lease was granted on 29 October 1991. It covers Areas 1, 2 and 3 as shown in **Figure 1.1**.

3.3.3 Threatened Species Conservation Act 1995

Section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act), and Section 94 of the Threatened Species Conservation Act 1995 (TSC Act) lists seven factors to be considered when determining whether there is likely to be a significant effect of a proposal on a Threatened species, population (including their habitats) or Endangered Ecological Community. These seven factors constitute a Seven Part Test. This impact, if deemed significant, may require the preparation of a Species Impact Statement (SIS).

Following application of the Seven Part Test to a number of fauna and flora species, an SIS was required to be prepared for this s75W modification to the Dendrobium Mine development consent.

3.3.4 The National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 provides the primary basis for the legal protection and management of Aboriginal sites with NSW. The implementation of the Aboriginal heritage provisions of the Act is the responsibility of the Department of Environment and Climate Change (DECC).

Generally it is an offence to disturb or to excavate any land for the purpose of discovering, disturbing or moving a relic without written consent of the Director General of the DECC. Consents regarding the use or destruction of relics are managed through the DECC permit system. The issuing of permits is dependant upon adequate archaeological review and assessment, together with an appropriate level of Aboriginal community liaison and involvement. **Section 7.6** discusses the impacts on Aboriginal Cultural Heritage.

3.3.5 Coal Mines Health and Safety Regulation 2006

The *Coal Mines Health and Safety Regulation 2006* (CMH&S Reg) is administered by DPIM. It replaces the *Coal Mines Regulation Act 1982* (CMRA). Under Section 88 of the Regulation, a mining company must submit and have approved an application for approval to the DPIM prior to commencement of secondary extraction.

Approval will be sought under Section 88 of the CMH&S Reg for the extraction of longwalls 6 to 10 in Area 3A after this Area 3 modification and Area 3A SMP has been approved.

3.3.6 NSW Dams Safety Committee

The NSW Dams Safety Committee is a Government Statutory Authority, which has as one of its functions, the surveillance of mining within the Notification Area of any Prescribed Dam in NSW. The aim of the surveillance is to ensure the safety of the Prescribed Dam and the security of its stored water.

Both Cordeaux and Avon Dams are Prescribed Dams.

To assist in the achievement of its objectives, the Dams Safety Committee publishes a series of Information Sheets or guidelines. Sheets with particular relevance to the Dendrobium Coal Project are Nos 32, 33, 34 & 35.

Information Sheet No. 32 sets out the administrative procedures involved in obtaining consent for mining within Notification Areas.

Information Sheet No. 33 indicates which aspects the Dam Safety Committee will consider before making recommendations on a mining application and provides guidelines on the extent and type of mining which the Committee may recommend to the Minister.

Information Sheet No. 34 gives some guideline on the types of monitoring conditions normally recommended by the Committee to the Minister.

Information Sheet No. 35 gives some guidelines on preparing a contingency plan for mining under stored waters.

An application must be made to the Dams Safety Committee when mining is planned within the Notification Zone. BHPIC and its consultants have liaised with the Dams Safety Committee during the planning of the Dendrobium Coal project.

3.3.7 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act* 1997 (POEO Act) is administered by the DECC. The Act establishes the procedures for issuance of licences for environmental protection including waste, air, water and noise pollution control. The owner or operator of a premise that is engaged in scheduled activities is required to hold an Environment Protection Licence and comply with the conditions of the licence.

Dendrobium Mine holds Environment Protection Licence No. 3241 granted by the EPA. No variance to this licence is required for the proposed longwall extraction.

3.3.8 Fisheries Management Act 1994

The *Fisheries Management Act* 1994 was amended by the inclusion of provisions (listed in the *Fisheries Management Amendment Act* 1997) to declare and list threatened species of fish and marine vegetation, endangered populations and ecological communities and key threatening processes. One of the major features of the legislation is the integration of threatened aquatic species into the development control processes under the EP&A Act.

EP&A 1979 Act sets out the factors to be considered in a preliminary assessment of whether there is likely to be a significant effect on threatened species arising from a development. Seven factors are considered in a process referred to as the Seven-Part Test. The test is a series of questions, the answers to which assist in determining whether a planned action will significantly affect threatened species, populations, ecological communities or their habitats. For the Seven-Part Test to have relevance there must be the likelihood that one or more threatened species occur in an area which could be affected by the proposal.

If it is determined by the Government Regulator that, on the basis of the Seven-Part Test, that the proposal is likely to significantly affect threatened species, populations, ecological communities or their habitats, the preparation of a Species Impact Statement (SIS) is required as part of the environmental assessment process for approval of the development under Part 5 of the EP&A Act. In making such a determination, it is important that the proposal be considered in its entirety, including mitigating measures designed to remove or minimise impacts to the aquatic environment.

3.3.9 Sydney Water Catchment Management Act 1998

The *Sydney Water Catchment Management Act* establishes arrangements for the supply of bulk water, the management of water quality and the improvement of catchment health. It outlines the role, objectives and functions of the SCA including the management and protection of catchment areas, catchment infrastructure and water quality in the catchments.

3.4 ENVIRONMENTAL PLANNING POLICIES

3.4.1 SEPP (Major Project) 2005

Statement of Environmental Planning Policy (Major Projects) 2005 identifies the types of development that should be assessed under Part 3A of the Environmental Planning and Assessment Act. Under Clause 5 of the SEPP, coal mining development is a major project and the Department has confirmed that this proposal represents a modification that will follow the Part 3A path under section 75w of the Act.

3.4.2 SEPP (Mining, Petroleum Production and Extractive Industries) 2007

Statement of Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) was recently gazetted in February 2007. The SEPP aims:

- a) *to provide for the proper management and development of mineral, petroleum and extractive material resources for the purpose of promoting the social and economic welfare of the State, and*
- b) *to facilitate the orderly and economic use and development of land containing mineral, petroleum and extractive material resources, and*
- c) *to establish appropriate planning controls to encourage ecologically sustainable development through the environmental assessment, and sustainable management, of development of mineral, petroleum and extractive material resources*

The SEPP includes provisions for prohibited, permissible, company and exempt developments. Under Clause 7, underground mining is permissible with consent on any land.

Part 3 of the SEPP requires assessment of land use compatibility as part of an application for new mines. The proposal is not a new mine, but a modification to an existing approved mine. A land use compatibility assessment is not required for this application.

3.4.3 SEPP 44 Koala Habitat

State Environmental Planning Policy (SEPP) 44 aims to encourage the proper conservation and management of areas of natural vegetation that provide habitat for Koalas. The identification of core Koala habitat areas is one of the major aims of this policy.

Core Koala habitat can be defined as an area containing an extant population of Koalas or the presence of feed-trees that account for at least 15% of the canopy species.

Area 3 contains habitat for Koalas. **Section 8.3** assesses the impacts of the proposed project on the Koala habitat.

3.4.4 Sydney Drinking Water Catchment REP

The site is within the Sydney Drinking Water catchment, protected and managed by the Sydney Catchment Authority. The *Sydney Drinking Water Catchment Regional Environmental Plan (REP)* applies to the site. The REP replaced SEPP 58 and seeks to

protect the quality of Sydney's drinking water and provides water quality objectives for the catchments.

Under the REP, developments within the catchment must demonstrate a neutral or beneficial effect. The proposed project is also required to seek agreement from the Sydney Catchment Authority on drinking water quality.

The site is within the Cordeaux and Avon subcatchments. The Sydney Catchment Authority was consulted by the DoP for the compilation of the DGRs. The following scope of environmental assessment was provided by the Authority in response to the requirements of the REP:

- Subsidence prediction and the potential environmental impacts.
- Impacts and mitigation measures to avoid adverse impacts on dams, water storage (Lake Cordeaux and Lake Avon), watercourse (Donalds Castle, Wongawilli and Sandy Creeks), groundwater and major swamps.
- Details of potential impacts on SCA assets, including dams, water storage and roads, including the potential loss of stored waters, supported by geological investigations.
- Potential impacts on the quality and quantity of water in the watercourses, water storages and groundwater.
- Potential impacts on the terrestrial and aquatic ecosystems with regard to protection of the ecological integrity of the catchments including watercourses and swamps.
- Subsidence risk assessment to consider the risk of the loss of stored waters in the reservoirs.
- Baseline environmental monitoring and the cumulative impacts of the project.

These issues are assessed in **Sections 6 to 7** of this report. Specifically, **Section 6** assesses the impacts on surface water and the bulk raw water supply quality.

Programs of baseline monitoring have been designed to monitor the following elements:

- Subsidence impact.
- Water quality.
- Hydrology.
- Aquatic ecology and Biota.

Details of these monitoring programs for Area 3A have been designed and are contained in the SMP. Monitoring programs for Areas 3B and 3C will be developed once the longwall layout of these areas are finalised.

3.4.5 Wollongong and Wingecarribee Local Environmental Plans

The surface area traverses across two Councils' LGAs. It is zoned 7(a) Environmental Protection under the Wollongong LEP 1990 and 5(c) Special Use (Water Catchment) under the Wingecarribee LEP 1989 (**Figure 3.1**). The objectives of these zones are:

7(a) zone under Wollongong LEP:

The objectives of the zone are:

Land Zoning Plan
DENDROBIUM AREA 3

- Legend**
- LGA Boundary
 - Rivers and Creeks (LPI)
 - Minor Streams
 - Lakes (LPI)
 - Area Boundaries
 - Proposed Area 3 Footprint
- Wollongong City Council**
 1990 L.E.P.
 7(a) - Environmental Protection
- Wingecarribee Shire Council**
 1989 L.E.P.
 5(c) - Special Use (Water Catchment)

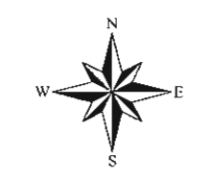
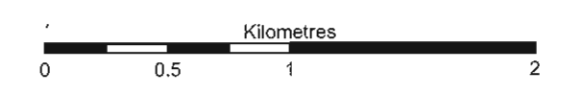


FIGURE 3.1

Scale 1:30,000 (at A3)



Map Produced by Cardno Forbes Rigby
 Date: 5 October 2007
 Coordinate System: Zone 56 MGA/GDA 94
 GIS MAP REF:
 107055_01_1816_EIA_land_zoning_plan.mxd



-
- (a) *to protect environmentally important land having special aesthetic, ecological or conservational value, and*
 - (b) *to identify and protect the foreshore environment that enhances the visual amenity and possesses ecological or conservational value, and*
 - (c) *to identify and protect land forming part of the catchment areas for water supply, and*
 - (d) *to allow some diversity of activities on degraded land that will not prejudice achievement of the objectives referred to in paragraphs (a), (b) and (c) or significantly detract from the environmental or visual quality or character of the locality or the amenity or operation of any existing or proposed development in the locality.*

5(c) zone under Wingecarribee LEP:

The objective of this zone is to protect land which is designated as being part of a water catchment from incompatible land uses.

Mining is permissible with consent under both LEPs.