

METROPOLITAN COAL

LONGWALLS 301-303

BUILT FEATURES MANAGEMENT PLAN AXICOM

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DP&E Approval Date
All	LW301-303 BFMP_AXICOM-R01-A	Original – Draft for Consultation	Axicom, DRG and DP&E	-
Sections 4.2.1 & 9.1, Tables 3 & 5 and Figure 4	LW301-303 BFMP_AXICOM-R01-B	Revised – Incorporating updates	Axicom, DRG and DP&E	11 May 2017*
Sections 4.2.2 & 7.2.2, Tables 2, 3, 5 & 7 and Appendix 3	LW301-303 BFMP_AXICOM-R01-C	Revised – Addressing DP&E and DRG requirements	Axicom, DRG and DP&E	-
Table 7 & 5	LW301-303 BFMP_AXICOM-R01-D	Revised TARP to include tower leg monitoring	Axicom and DRG	-
All	LW301-303 BFMP_AXICOM-R01-E	Revised TARP Revised for LW303	Axicom and DRG	-

* The approval allows for the extraction of Longwalls 301 and 302 only.

June 2018

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1 INTRODUCTION

Metropolitan Coal is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) under section 75J of the New South Wales (NSW) *Environmental Planning and Assessment Act, 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval is available on the Peabody website (<http://www.peabodyenergy.com>).

The Project comprises the continuation, upgrade and extension of underground coal mining operations and surface facilities at Metropolitan Coal. The underground mining longwall layout is shown on Figure 1. Following the completion of Longwall 27 in 2017, Longwalls 301, 302 and 303 (herein referred to as Longwalls 301-303) define the next mining sub-domain within the Project underground mining area (Figures 1 to 3).

1.1 PURPOSE AND SCOPE

In accordance with Condition 6(f), Schedule 3 of the Project Approval, this Built Features Management Plan – Axicom (Longwalls 301-303 BFMP-AXICOM) has been developed to manage the potential consequences of Longwalls 301-303 extraction on the Axicom assets.

The relationship of this Longwalls 301-303 BFMP-AXICOM to the Metropolitan Coal Environmental Management Structure and to the Metropolitan Coal Longwalls 301-303 Extraction Plan is shown on Figure 4.

In accordance with Condition 6, Schedule 3 of the Project Approval, the suitably qualified and experienced experts that have prepared this Longwalls 301-303 BFMP-AXICOM, namely representatives from Mine Subsidence Engineering Consultants (MSEC) and Metropolitan Coal were endorsed by the Director-General (now Secretary) of the Department of Planning and Environment (DP&E) on 6 June 2016. This Longwalls 301-303 BFMP-AXICOM has been prepared in consultation with Axicom.

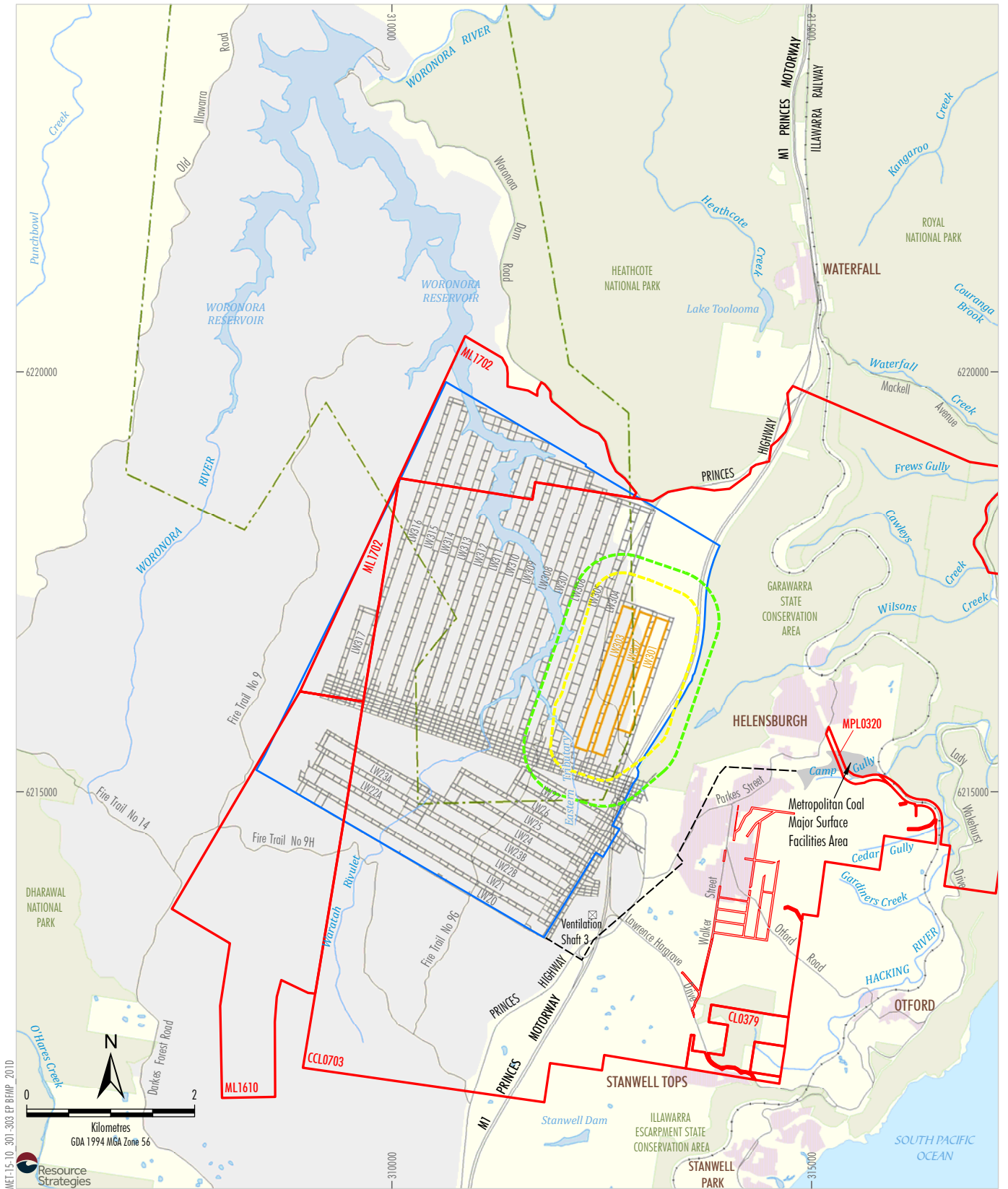
1.2 STRUCTURE OF THE LONGWALLS 301-303 BFMP-AXICOM

The remainder of the Longwalls 301-303 BFMP-AXICOM is structured as follows:

- Section 2: Describes the review and update of the Longwalls 301-303 BFMP-AXICOM.
- Section 3: Outlines the statutory requirements applicable to the Longwalls 301-303 BFMP-AXICOM.
- Section 4: Provides a revised assessment of the potential subsidence impacts and environmental consequences for Longwalls 301-303.
- Section 5: Details the performance measures and indicators that will be used to assess the Project.
- Section 6: Provides the detailed baseline data.
- Section 7: Describes the monitoring program.
- Section 8: Describes the management measures that will be implemented.
- Section 9: Provides a contingency plan to manage any unpredicted impacts and their consequences.

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- Section 10: Describes the Trigger Action Response Plan (TARP) management tool.
- Section 11: Describes the program to collect sufficient baseline data for future Extraction Plans.
- Section 12: Describes the annual review and improvement of environmental performance.
- Section 13: Outlines the management and reporting of incidents.
- Section 14: Outlines the management and reporting of complaints.
- Section 15: Outlines the management and reporting of non-compliances with statutory requirements.
- Section 16: Lists the references cited in this Longwalls 301-303 BFMP-AXICOM.



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LEGEND

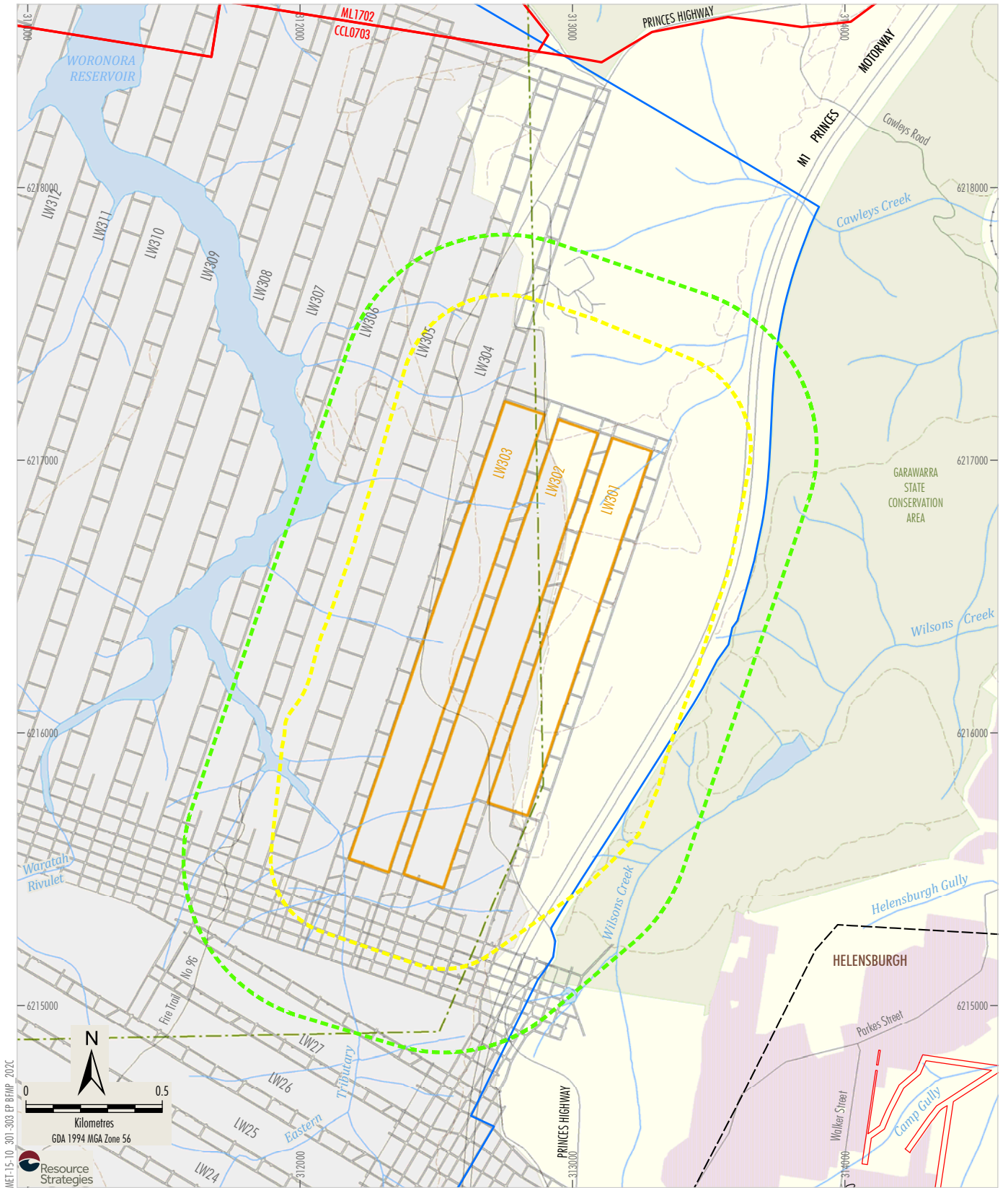
- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
Longwalls 20-27 and 301-317
- Longwalls 301 - 303 Secondary Extraction
- 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
- 600 m from Secondary Extraction of
Longwalls 301-303
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015);
Metropolitan Coal (2016); MSEC (2016)



METROPOLITAN COAL
Project Longwalls 20 - 27 and
Longwalls 301 - 317 Layout

Figure 1



MEF15-10-301-303 EP BFMF 202C



Resource Strategies

LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
Longwalls 20-27 and 301-317
- Longwalls 301 - 303 Secondary Extraction
- 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
- 600 m from Secondary Extraction of
Longwalls 301-303
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

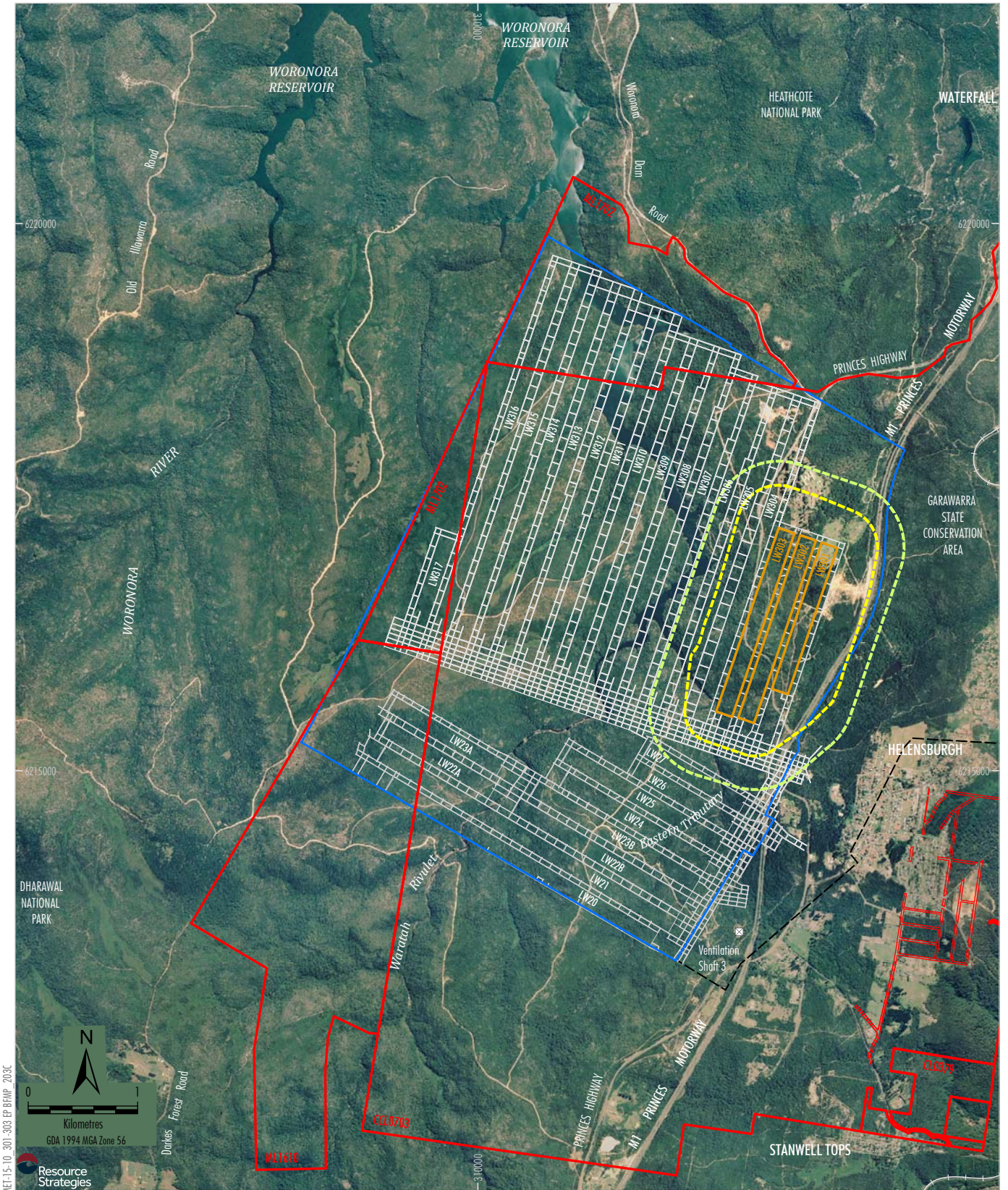
- Road
- Vehicular Track

Source: Land and Property Information (2015); Department of Industry (2015);
Metropolitan Coal (2016); MSEC (2016)



METROPOLITAN COAL
Longwalls 301 - 303 Layout

Figure 2



- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301 - 303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)

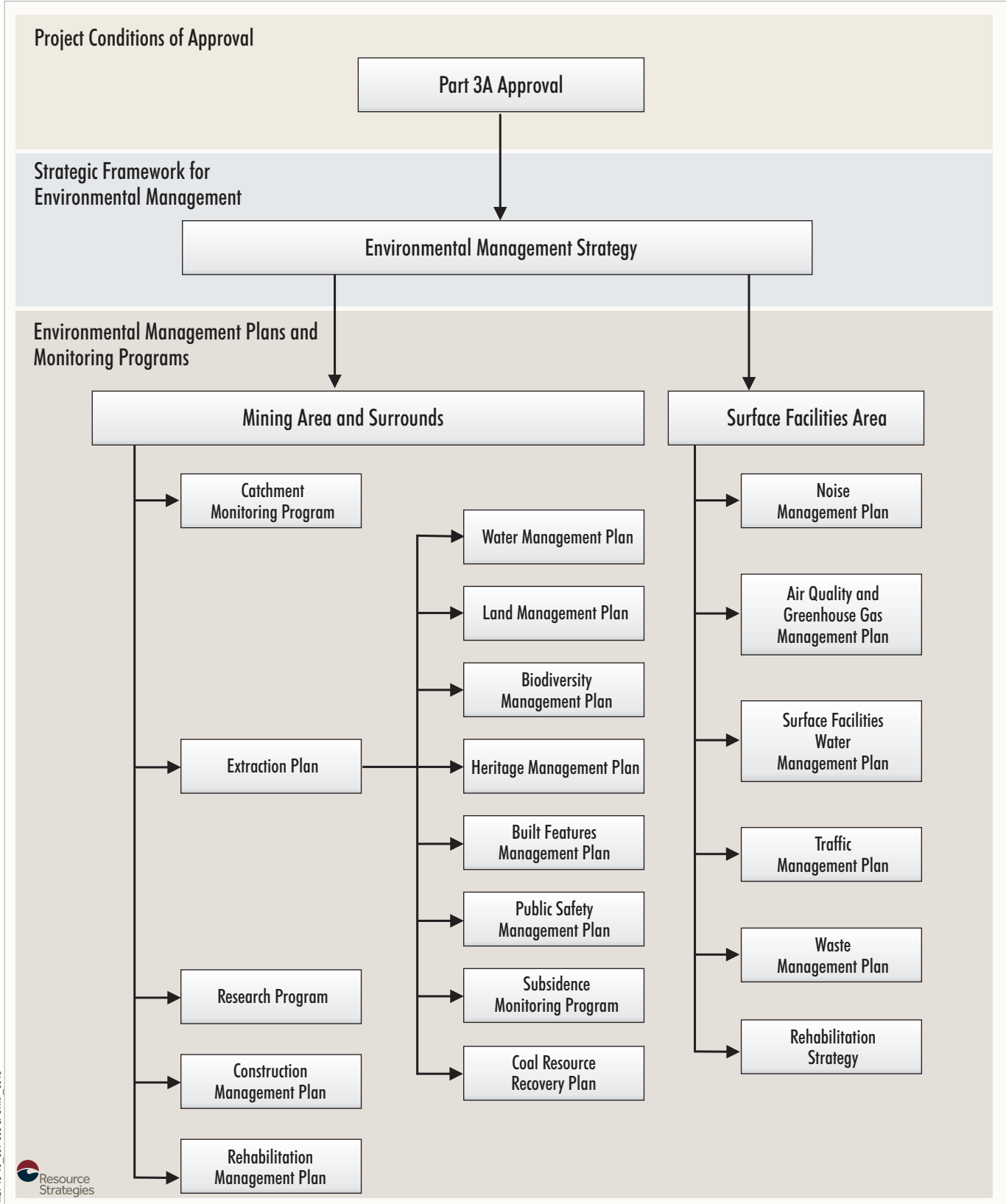
Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2016); MSEC (2016)

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ENERGY

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**Project Longwalls 20 - 27 and
Longwalls 301 - 317 Layout -
Aerial Photograph**

Figure 3



ME1-15-10-301-303 EP BRWP_001B



METROPOLITAN COAL
Environmental Management
Structure

Figure 4

2 LONGWALLS 301-303 BFMP-AXICOM REVIEW AND UPDATE

In accordance with Condition 4, Schedule 7 of the Project Approval, this Longwalls 301-303 BFMP-AXICOM will be reviewed within three months of the submission of:

- an audit under Condition 8 of Schedule 7;
- an incident report under Condition 6 of Schedule 7;
- an annual review under Condition 3 of Schedule 7; and

if necessary, revised to the satisfaction of the Director-General (now Secretary) of DP&E, to ensure the plan is updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

This Longwalls 301-303 BFMP-AXICOM will also be reviewed within three months of approval of any Project modification and if necessary, revised to the satisfaction of the DP&E.

The revision status of this plan is indicated on the title page of each copy of the Longwalls 301-303 BFMP-AXICOM. The distribution register for controlled copies of the Longwalls 301-303 BFMP-AXICOM is described in Section 2.1.

Revisions to any documents listed within this Longwalls 301-303 BFMP-AXICOM will not necessarily constitute a revision of this document.

2.1 DISTRIBUTION REGISTER

In accordance with Condition 10, Schedule 7 'Access to Information', Metropolitan Coal will make the Longwalls 301-303 BFMP-AXICOM publicly available on the Peabody website. A hard copy of the Longwalls 301-303 BFMP-AXICOM will also be maintained at the Metropolitan Coal site.

Metropolitan Coal recognises that various regulators have different distribution requirements, both in relation to whom documents should be sent and in what format. An Environmental Management Plan and Monitoring Program Distribution Register has been established in consultation with the relevant agencies and infrastructure owners that indicates:

- to whom the Metropolitan Coal plans and programs, such as the Longwalls 301-303 BFMP-AXICOM, will be distributed;
- the format (i.e. electronic or hard copy) of distribution; and
- the format of revision notification.

Metropolitan Coal will make the Distribution Register publicly available on the Peabody website.

Metropolitan Coal will be responsible for maintaining the Distribution Register and for ensuring that the notification of revisions is sent by email or post as appropriate.

In addition, Metropolitan Coal employees with local computer network access will be able to view the controlled electronic version of this Longwalls 301-303 BFMP-AXICOM on the Metropolitan Coal local area network. Metropolitan Coal will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on the Metropolitan Coal computer system and Peabody website.

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3 STATUTORY REQUIREMENTS

Metropolitan Coal's statutory obligations are contained in:

- (i) the conditions of the Project Approval;
- (ii) relevant licences and permits, including conditions attached to mining leases; and
- (iii) other relevant legislation.

These are described below.

3.1 EP&A ACT APPROVAL

Condition 6(f), Schedule 3 of the Project Approval requires the preparation of a BFMP as a component of Extraction Plan(s) for second workings. Project Approval Condition 6(f), Schedule 3 states:

SECOND WORKINGS

Extraction Plan

6. *The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General. This plan must:*

...

(f) *include a:*

...

- *Built Features Management Plan, which has been prepared in consultation with the owner of the relevant feature, to manage the potential environmental consequences of the Extraction Plan on any built features;*

...

In addition, Condition 2, Schedule 7 and Condition 7, Schedule 3 of the Project Approval outline management plan requirements that are applicable to the preparation of the Longwalls 301-303 BFMP-AXICOM. Table 1 indicates where each component of the conditions is addressed within this Longwalls 301-303 BFMP-AXICOM.

**Table 1
Management Plan Requirements**

Project Approval Condition	Longwalls 301-303 BFMP-AXICOM Section
<p>Condition 2 of Schedule 7</p> <p>2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:</p> <p>a) detailed baseline data;</p> <p>b) a description of:</p> <ul style="list-style-type: none"> • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; • the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; <p>c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> • impacts and environmental performance of the project; • effectiveness of any management measures (see c above); <p>e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>f) a program to investigate and implement ways to improve the environmental performance of the project over time;</p> <p>g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> • incidents; • complaints; • non-compliances with statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and <p>h) a protocol for periodic review of the plan.</p>	<p align="center">Section 6</p> <p align="center">Section 3</p> <p align="center">Section 5</p> <p align="center">Section 5</p> <p align="center">Sections 7, 8, 9 and 10</p> <p align="center">Sections 7, 8 and 12</p> <p align="center">Section 9 and Appendix 3</p> <p align="center">Sections 7 and 12</p> <p align="center">Section 13</p> <p align="center">Section 14</p> <p align="center">Section 15</p> <p align="center">Section 9 and Appendix 3</p> <p align="center">Section 2</p>
<p>Condition 7 of Schedule 3</p> <p>7. In addition to the standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 6(f) above include:</p> <p>a) a program to collect sufficient baseline data for future Extraction Plans;</p> <p>b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;</p> <p>c) a detailed description of the measures that would be implemented to remediate predicted impacts; and</p> <p>d) a contingency plan that expressly provides for adaptive management.</p>	<p align="center">Section 11</p> <p align="center">Section 4</p> <p align="center">Section 8</p> <p align="center">Section 9 and Appendix 3</p>

3.2 LICENCES, PERMITS AND LEASES

In addition to the Project Approval, all activities at or in association with Metropolitan Coal will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- The conditions of mining leases issued by the DRG (Division of Resources and Geoscience, previously Division of Resources and Energy [DRE]), under the NSW Mining Act, 1992 (e.g. Consolidated Coal Lease [CCL] 703, Mining Lease [ML] 1610, ML 1702, Coal Lease [CL] 379 and Mining Purpose Lease [MPL] 320).
- The Metropolitan Coal Mining Operations Plan 1 October 2012 to 30 September 2019 approved by the DRG.
- The conditions of Environment Protection Licence (EPL) No. 767 issued by the NSW Environment Protection Authority (EPA) under the NSW Protection of the Environment Operations Act, 1997. Revision of the EPL will be required prior to the commencement of Metropolitan Coal activities that differ from those currently licensed.
- The prescribed conditions of specific surface access leases within CCL 703 for the installation of surface facilities as required.
- Water Access Licences (WALs) issued by the NSW Department of Primary Industries – Water (DPI Water) (now the Department of Industry – Crown Lands and Water Division [CLWD]) under the NSW Water Management Act, 2000, including WAL 36475 under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011 and WAL 25410 under the Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011.
- Mining and workplace health and safety related approvals granted by the NSW Resources Regulator and WorkCover NSW.
- Supplementary approvals obtained from WaterNSW (previously the Sydney Catchment Authority [SCA]) for surface activities within the Woronora Special Area (e.g. fire road maintenance activities).

3.3 OTHER LEGISLATION

Metropolitan Coal will conduct the Project consistent with the Project Approval and any other legislation that is applicable to an approved Part 3A Project under the EP&A Act.

The following Acts may be applicable to the conduct of the Project (Helensburgh Coal Pty Ltd [HCPL], 2008):

- *Biodiversity Conservation Act, 2016;*
- *Contaminated Land Management Act, 1997;*
- *Crown Lands Act, 1989;*
- *Dams Safety Act, 1978;*
- *Dangerous Goods (Road and Rail Transport) Act, 2008;*
- *Energy and Utilities Administration Act, 1987;*
- *Fisheries Management Act, 1994;*

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- *Mining Act, 1992;*
- *Noxious Weeds Act, 1993;*
- *Protection of the Environment Operations Act, 1997;*
- *Rail Safety (Adoption of National Law) Act, 2012;*
- *Roads Act, 1993;*
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *Water NSW Act, 2014;*
- *Work Health and Safety Act, 2011; and*
- *Work Health and Safety (Mines and Petroleum Sites) Act, 2013.*

Relevant licences or approvals required under these Acts will be obtained as required.

4 REVISED ASSESSMENT OF POTENTIAL ENVIRONMENTAL CONSEQUENCES

4.1 LONGWALLS 301-303 EXTRACTION LAYOUT

Longwalls 301-303 and the area of land within 600 metres (m) of Longwalls 301-303 secondary extraction are shown on Figures 2 and 3. Longwall extraction occurs from north to south. The longwall layout includes 163 m panel widths (void) with 45 m pillars (solid).

The provisional extraction schedule for Longwalls 301-303 is provided in Table 2.

Table 2
Provisional Extraction Schedule

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
301	June 2017	6 months	February 2018
302	March 2018	7 months	October 2018
303	November 2018	7 months	May 2019

The layout for Longwalls 301-303 (i.e. 163 m panel widths [void] and 45 m pillars [solid]) will be trialled to build on the experience and dataset obtained from Longwalls 20-27. The outcomes of the trial will be used to inform the potential for a similar mine layout to be applied to the next Extraction Plan (i.e. Longwall 304 onwards). The assessment of the trial longwall layout is described in Section 11.1.

The future Extraction Plans will consider the cumulative subsidence effects, subsidence impacts and/or environmental consequences. Note that the total cumulative predicted subsidence effects, subsidence impacts and/or environmental consequences at the completion of the Project are considered in the Metropolitan Coal Project Environmental Assessment (Project EA) (HCPL, 2008) and the Preferred Project Report (HCPL, 2009).

4.1.1 Axicom Assets

Figure 5 illustrates the Axicom assets in relation to Longwalls 301-303 extraction. The assets include two telecommunications towers within separate compounds.

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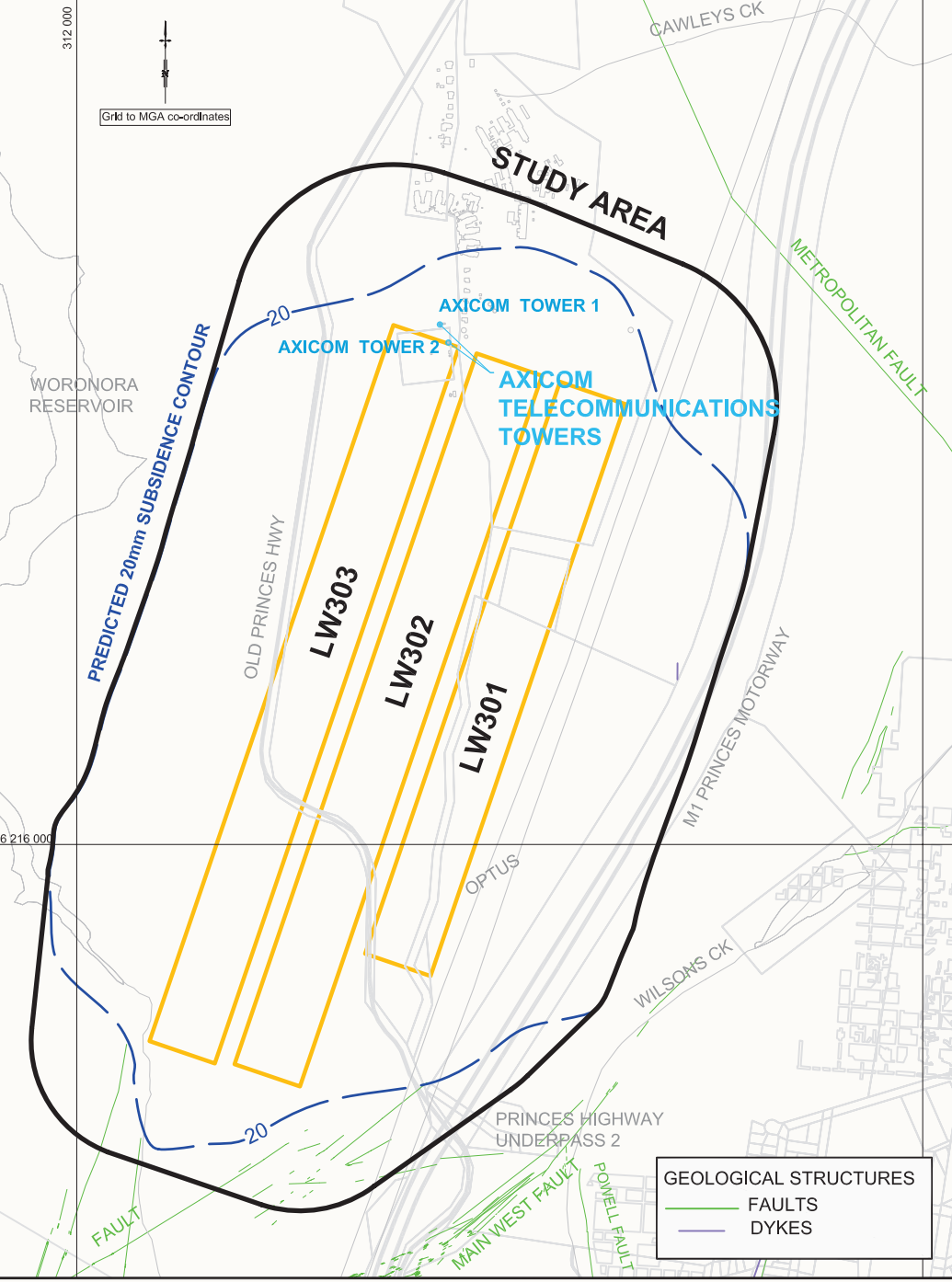


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METROPOLITAN COAL
 METROPOLITAN COLLIERY
 LONGWALLS 301 TO 303
 AXICOM INFRASTRUCTURE

DATE: 26 Aug 2016	SCALE: 1:12500	DRAWING No: MSEC844-14	Rev No B
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ME1-15-10_301-303 EP BRWP_Axicom_005A



METROPOLITAN COAL
 Axicom Assets

Figure 5

4.2 REVISED SUBSIDENCE AND IMPACT PREDICTIONS

4.2.1 Revised Subsidence Predictions

Subsidence predictions for Longwalls 20-44 in relation to the Axicom assets was conducted by MSEC (2008) as part of the Metropolitan Coal Project EA. MSEC (2008) includes a table summarising the incremental systematic subsidence parameters for the extraction of each longwall from Longwalls 20-44. These include:

- maximum predicted incremental subsidence (vertical movement);
- maximum predicted incremental tilt along alignment;
- maximum predicted incremental tilt across alignment;
- maximum predicted incremental tensile strain; and
- maximum predicted incremental compressive strain.

Revised subsidence and impact predictions for the extraction of Longwalls 301-303 on Axicom assets were conducted by MSEC and reported in MSEC (2016) (Appendix 1).

In relation to subsidence predictions, MSEC (2016) make the following conclusions (Appendix 1):

- The magnitude of tilt predicted at the telecommunications towers (and compounds) is very small (less than 1% or an equivalent angle of 0.09 degrees) and is unlikely to be adversely impacted.
- The building enclosures are all elevated above the natural ground on short concrete piers, a concrete ground slab or concrete pads, and therefore are unlikely to experience adverse impacts.
- It is expected that the building enclosures would remain in safe and serviceable conditions during and after mining.

It is important to note that the above predictions are for total subsidence after extraction of the three Longwalls 301, 302 and 303. Subsidence effects predicted for the telecommunications towers (and compounds) during mining of Longwall 301 alone are minimal to nil as the total subsidence profile does not develop until after commencement of Longwall 302.

4.2.2 Risk Assessment Meeting

In accordance with the draft *Guidelines for the Preparation of Extraction Plans* (DP&E and DRE, 2014) a risk assessment meeting was held on 26 August 2016. Attendees at the risk assessment meeting included representatives from Metropolitan Coal, Axicom, MSEC and Resource Strategies.

The investigation and analysis methods used during the risk assessment included:

- preliminary identification of Axicom assets;
- review of the revised subsidence predictions and potential impacts on Axicom assets (including consideration of past experience in the Southern Coalfield); and
- development of a preliminary monitoring plan.

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A number of risk control measures and procedures were identified during the risk assessment which considered the extraction of coal beneath the Axicom assets, and are summarised as follows:

Baseline Data / Validation

1. Obtain information from Axicom Engineering Group on the effect of mining under the mobile towers may have based on the revised subsidence predictions and have Axicom confirm that it is within the limitation of the current towers.
2. Obtain from Axicom the mobile towers footing details to assist with a review of the potential for horizontal sheer that mining would have on the tower footings.
3. Conduct a review of the horizontal sheer impact on the structural integrity / footings of the towers due to mining of Longwalls 301 to 303 and provide this information to Axicom.
4. Obtain from Axicom if there is any impact on the proposed tilt of the towers after the mining of Longwalls 301 to 303 has completed to confirm if there is any impact on services supplied by the towers.
5. Obtain from Axicom an audit to confirm that all services (including any vulnerabilities due to age, installation process, etc.) and cables entering the tower hut that may be affected by mining of Longwalls 301 to 303 have been identified and documented in the BFMP.

Management / Monitoring / Response Measures

6. Include a pre and post inspection in the BFMP of the Axicom compounds (including the hut, fencing, etc.) to document if there has been any damage to the Axicom infrastructure as a result from the mining of Longwalls 301 to 303.

Contingency Planning

7. Include in the BFMP contact information from Axicom to mobilise auxiliary mobile towers if the existing Axicom mobile tower(s) was to become unserviceable.
8. Obtain an understanding from Axicom of the time involved that it would take to mobilise an auxiliary mobile tower.

Metropolitan Coal considers all risk control measures and procedures to be feasible to manage all identified risks.

The proposed risk control measures and procedures have been incorporated where relevant in this BFMP and the program for implementation is summarised in Table 3.

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Table 3
Program for Implementation of Proposed Risk Control Measures and Procedures

Risk Control Measure / Procedure		BFMP Section	Timing
<i>Baseline Data / Validation</i>			
1	Obtain tower details from Axicom	Section 6	Complete
2	Obtain tower footings details from Axicom	Section 6	Complete
3	Provide horizontal sheer impact information to Axicom	Section 6	Complete
4	Obtain tower tilt details from Axicom to confirm if any impact on services supplied by the towers	Section 6	Complete
5	Obtain from Axicom an audit to confirm that all services (including any vulnerabilities due to age, installation process, etc.) and cables entering the tower hut have been identified and documented in the BFMP	Section 6	Complete
<i>Management / Monitoring / Response Measures(Continued)</i>			
6	Include a pre and post inspection of the Axicom huts and fencing at the compounds	Sections 6 and 7.2.3	Complete
<i>Contingency Planning</i>			
7	Include contact information from Axicom in the BFMP to mobilise auxiliary mobile towers	Sections 6.1 and 9.1	Complete
8	Obtain timing estimate from Axicom to mobilise auxiliary towers	Section 9.1	If required

5 PERFORMANCE MEASURES AND INDICATORS

The Project Approval requires Metropolitan Coal not to exceed the subsidence impact performance measures outlined in Table 1 of Condition 1, Schedule 3. The subsidence impact performance measure specified in Table 1 of Condition 1, Schedule 3 in relation to built features is:

Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.

The performance indicators proposed to ensure that the above performance measure is achieved include:

- structural integrity of the telecommunications towers and compounds has been maintained; and
- serviceability of the access roads/tracks has been maintained.

Section 7 of this Longwalls 301-303 BFMP-AXICOM describes the monitoring that will be conducted to assess the Project against the above performance measure. Section 9 of this Longwalls 301-303 BFMP-AXICOM provides a Contingency Plan in the event the performance measure is exceeded.

6 BASELINE DATA

Photographs of the Axicom telecommunication towers and compounds are shown in Plates 1 to 4.



Plates 1 & 2 – Telecommunications Tower 1 and Compound (Source: MSEC, 2016)



Plates 3 & 4 – Telecommunications Tower 2 and Compound (Source: MSEC, 2016)

An audit and site inspection of the Axicom assets including inspection of entries and cable lines to the hut and condition of the cable was conducted prior to extraction of Longwall 302.

6.1 KEY CONTACTS LIST

The list of key contacts for Peabody and Axicom during the development and implementation of this BFMP are provided in Table 4.

**Table 4
List of Key Contacts**

Company	Position	Contact
Peabody (Metropolitan Coal)	Jon Degotardi Manager – Technical Services	Metropolitan Coal 24 hr control room 02 4294 7333
Axicom	Nathan Ward Sales - Account Manager	Axicom General 9495 9000 Operational Issues 1800 006 667 accesstosite@axicom.com.au

7 MONITORING

A monitoring program will be implemented to monitor the impacts of the Project on the Axicom assets. Table 5 summarises the Longwalls 301-303 BFMP-AXICOM monitoring components.

Where relevant, inspections of subsidence impacts will include photographic record of the impacts for comparison with baseline photographic records.

Axicom or their delegates will conduct the various visual inspections. Metropolitan Coal will be notified of the timing of inspections and accompany Axicom or delegates if considered necessary. All personnel will complete necessary inductions or orientation relevant to the tasks required.

**Table 5
Longwalls 301-303 BFMP-AXICOM Monitoring Program Overview**

Program	Aspect	Method	How	Why	Timing	Frequency
Baseline	Telecommunications Towers (and compounds)	Survey	Adjacent optic / water subsidence line points at approximately 20 m spacing	Establish base conditions – to track general land movement*	Prior to Longwall 301 extraction	Completed
			Survey marks at Towers	Establish base conditions – to track 3D movement.	Prior to Longwall 302 extraction	Completed
		Visual Inspection (including photographs of infrastructure, services and cables)	Establish base condition	Prior to Longwall 302 extraction	Completed	
	Access roads/tracks	Visual inspection (including notes on general condition of access roads/tracks)	Establish base condition	Prior to Longwall 302 extraction	Completed	
During Mining	Telecommunications Towers (and compounds)	Survey (subsidence, tilt, strain)	Adjacent optic / water subsidence line points at approximately 20 m spacing	Monitor subsidence effects during mining*	On commencement of LW302 and LW303	Weekly until effects of subsidence no longer detectable
		Survey	Survey Ground monitoring Points Survey Tower leg mounted prisms	Monitor any structural movements as per Tower TARP	On commencement of LW302 and LW303	Weekly until effects of subsidence no longer detectable
		Visual inspection (for evidence of subsidence effects on compounds – movement of building/cables entering compounds)	Monitor structural integrity of compounds	On commencement of LW302 and LW303	Weekly until effects of subsidence no longer detectable	
	Access roads / tracks	Visual inspection (including notes on general condition of access roads/tracks)	Monitor for surface cracks, buckling and general safety	On commencement of LW302 and LW303	Weekly until effects of subsidence no longer detectable	
				As per Longwalls 301-303 LMP		

Table 5 (Continued)
Longwalls 301-303 BFMP-AXICOM Monitoring Program Overview

Program	Aspect	Method	How	Why	Timing	Frequency
Post Mining	Telecommunications Towers (and compounds)	Visual Inspection (including photographs of infrastructure, services and cables)		Determine level of impact of mining (if any)	Within 3 months of the completion of Longwall 302 and 303	Once per longwall
	Access roads/tracks	Visual inspection (including notes on general condition of access roads/tracks)		Determine level of impact of mining (if any)	Within 3 months of the completion Longwall 302 and 303	Once per longwall

* Subsidence effects predicted for the telecommunications towers (and compounds) during mining of Longwall 301 alone are minimal to nil as the total subsidence profile does not develop until after commencement of Longwall 302.

The frequency of monitoring will be reviewed either:

- in accordance with the Annual Review outlined in Section 12; or
- if triggered as a component of the Contingency Plan as outlined in Section 9 of this Longwalls 301-303 BFMP-AXICOM.

7.1 SUBSIDENCE PARAMETERS

Subsidence parameters (i.e. subsidence, tilt, tensile strain, compressive strain, absolute horizontal translation, and differential leg movement) associated with mining will be measured in accordance with the Longwalls 301-303 Subsidence Monitoring Program (Figure 6).

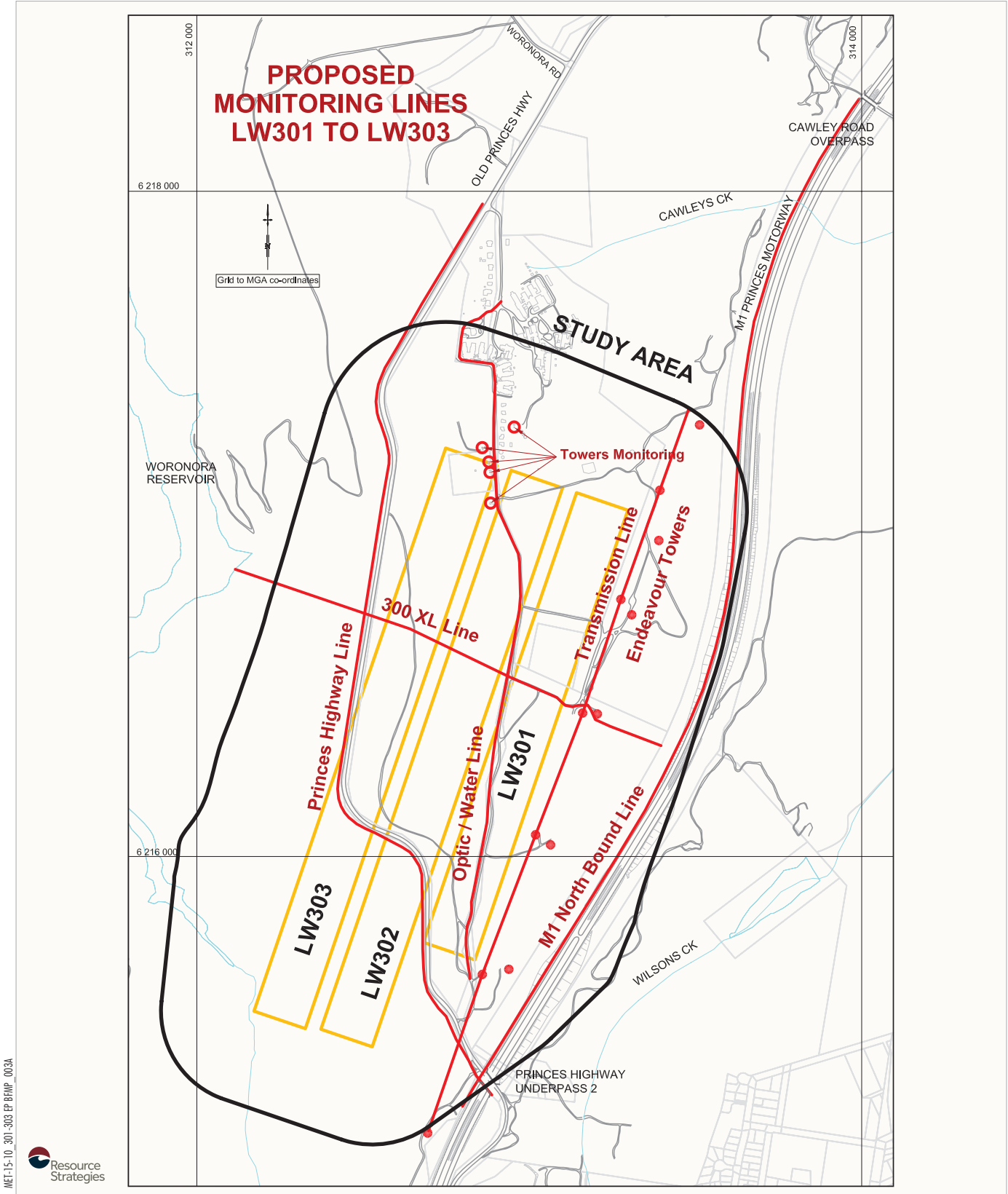
In summary, surveys will be conducted to measure subsidence movements in three dimensions using a total station survey instrument. Subsidence movements (i.e. subsidence, tilt, tensile strain and compressive strain) will be measured along subsidence lines that have been positioned across the general landscape.

Monitoring of subsidence parameters specific to the Axicom assets will be measured by a survey line along the adjacent Optic / Water Line, and by survey of each transmission tower. These surveys will monitor the general movement about the longwalls and the data will allow evaluation of the likely ground movements about the telecommunications towers and compounds (by comparison between measured and predicted movements).

7.2 SUBSIDENCE IMPACTS

7.2.1 Telecommunications Towers and Compounds

A pre and post-mining inspection of the Axicom towers and huts (including fencing) at the compound will be undertaken. Visual inspections will be conducted of the telecommunications towers and compounds.



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METROPOLITAN COAL
 Longwalls 301-303 Subsidence Monitoring
 Layout

Figure 6

Specific details that will be noted and/or photographed include:

- the date of the inspection;
- the location of longwall extraction (i.e. the longwall chainage);
- assessment against the performance indicators and performance measure;
- whether any actions are required (e.g. initiation of the Contingency Plan, incident notification, implementation of appropriate safety controls, review of public safety, etc.); and
- any other relevant information.

The information will be recorded in the Built Features Management Plan - Subsidence Impact Register (Appendix 2) and reported in accordance with the Project Approval conditions.

7.2.2 Access Roads/Tracks

Visual inspection of the access roads/tracks to the Axicom assets will occur prior to the commencement of Longwall 302 (or otherwise agreed with Axicom), and following extraction of each longwall panel.

Visual observations of access roads/tracks would also occur as part of routine works and inspections as well as during catchment visits within 600 m of Longwalls 301-303 secondary extraction as described in the Metropolitan Coal Longwalls 301-303 Land Management Plan (Longwalls 301-303 LMP).

Specific details that will be noted and/or photographed that are relevant to the access roads/tracks to the Axicom assets include:

- the location, approximate dimensions (length, width and depth), and orientation of surface tension cracks;
- the location of the surface tension crack in relation to access road/track to the Axicom asset;
- whether any actions are required (e.g. implementation of management measures as outlined in the Longwalls 301-303 LMP, initiation of the Contingency Plan as outlined in the Longwalls 301-303 LMP, incident notification, implementation of appropriate safety controls, review of public safety, etc.); and
- any other relevant information.

The date of the observation, details of the observer and the location of longwall extraction will also be documented.

The information obtained will be recorded in the Longwalls 301-303 LMP - Subsidence Impact Register and reported in accordance with the Project Approval conditions.

The information obtained will be used to assess the potential environmental consequences of the subsidence impact (described in the Longwalls 301-303 LMP) and to identify required management measures. Management measures are discussed in the Longwalls 301-303 LMP.

In the event the subsidence impacts are deemed to present a safety hazard (i.e. regardless of the nature or extent of the subsidence impact), actions will be implemented in accordance with the Metropolitan Coal Longwalls 301-303 Public Safety Management Plan.

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7.3 ENVIRONMENTAL CONSEQUENCES

Metropolitan Coal and Axicom will compare the results of the subsidence impact monitoring against the built features performance measure and indicators. In the event the observed subsidence impacts exceed the performance measure or indicators, Metropolitan Coal and Axicom will assess the consequences of the exceedance in accordance with the Contingency Plan described in Section 9.

8 MANAGEMENT MEASURES

A number of potential management measures in relation to telecommunications towers and compounds are considered to be applicable and further measures are summarised in the Contingency Plan (Section 9.1). In relation to access roads/tracks, if, for example, minor surface cracks eventuate, and can be identified, they can be readily repaired by infilling with soil or other suitable materials.

Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures.

Management measures will be reported in the Annual Review (Section 12).

9 CONTINGENCY PLAN

In the event the subsidence impacts observed exceed the performance measure or indicators detailed in Section 5 of this Longwalls 301-303 BFMP-AXICOM, Metropolitan Coal will implement the following Contingency Plan (Appendix 3):

- The observation will be reported to the Manager - Technical Services within 24 hours.
- With the exception of access roads/tracks, the observation will be recorded in the Built Features Management Plan - Subsidence Impact Register (Appendix 2) consistent with the monitoring program described in Section 7 of this Longwalls 301-303 BFMP-AXICOM.
- If relating to an access road/track, the observation will be recorded in the Metropolitan Coal LW301-303 Land Management Plan – Subsidence Impact Register.
- Metropolitan Coal will report any exceedance of the performance measure or indicators to the DP&E and Axicom as soon as practicable after Metropolitan Coal becomes aware of the exceedance.
- Metropolitan Coal will assess public safety and where appropriate implement safety measures in accordance with the Metropolitan Coal Longwalls 301-303 Public Safety Management Plan;
- Metropolitan Coal will conduct an investigation to evaluate the potential contributing factors. The investigation will:
 - include the re-survey of relevant subsidence monitoring lines;
 - compare and critically analyse measured versus predicted subsidence parameters;
 - review measured subsidence parameters against the observed impact; and
 - review the subsidence monitoring program and update the program where appropriate.

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- The course of action with respect to the identified impact(s), in consultation with specialists and relevant agencies, will include:
 - a program to review the effectiveness of the contingency measures; and
 - consideration of adaptive management.

Contingency measures are provided in Section 9.1.

- Metropolitan Coal will submit the proposed course of action to the DP&E for approval.
- Metropolitan Coal will implement the approved course of action to the satisfaction of the DP&E.

In accordance with Condition 6, Schedule 6 of the Project Approval, Metropolitan Coal will provide a suitable offset to compensate for the impact to the satisfaction of the Director-General (now Secretary) of DP&E if either the contingency measures implemented by Metropolitan Coal have failed to remediate the impact or the Director-General (now Secretary) determines that it is not reasonable or feasible to remediate the impact.

Metropolitan Coal will comply with the NSW Coal Mine Subsidence Compensation Bill 2017 in the event that property damages occur as a result of mining Longwalls 301-303.

9.1 CONTINGENCY MEASURES

Contingency measures will be developed in consideration of the specific circumstances of the feature (e.g. the location, nature and extent of the impact, and the assessment of environmental consequences).

Contingency measures are summarised in Table 6. The decision tree for the contingency measures is shown in Appendix 3.

**Table 6
Contingency Measures**

Asset	Contingency Measures / Description	
Phone Tower	Stabilisation	<ul style="list-style-type: none"> • Installation of tower supports such as guy wires in response to tilt.
	Rebuilding	<ul style="list-style-type: none"> • Construction of new tower and foundations.
	Contingency	<ul style="list-style-type: none"> • Deployment of temporary broadcast/receiving tower as per special event infrastructure (temporary mobile tower systems available).
	Redundancy	<ul style="list-style-type: none"> • Alternate phone towers nearby.

It is understood that there may be opportunities to deploy temporary broadcast/receiving tower as per special event infrastructure that could be used as a contingency. If required, Metropolitan Coal would consult with Axicom to obtain contact details and timeframes for mobilisation.

10 TARP – MANAGEMENT TOOL

The framework for the various components of the Longwalls 301-303 BFMP-AXICOM are summarised in the Longwalls 301-303 BFMP-AXICOM TARP shown in Table 7. The Longwalls 301-303 BFMP-AXICOM TARP illustrates how the various predicted subsidence impacts, monitoring components, performance measures, and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

The TARP comprises:

- baseline conditions;
- predicted subsidence impacts;
- trigger levels from monitoring to assess performance; and
- triggers that flag implementation of contingency measures.

The TARP system provides a simple and transparent snapshot of the monitoring of environmental performance and the implementation of management and/or contingency measures.

**Table 7
Longwalls 301-303 BFMP-AXICOM Trigger Action Response Plan**

Performance Measure	Performance Indicator	Monitoring Site(s)	Parameters	Frequency/ Sample Size	Analysis Methodology	Error Types	Baseline	Significance Levels/ Triggers		Action/Response	
Safe, serviceable and repairable	The structural integrity of the tower and compound is maintained. Subsidence parameters.	Visual inspection of the compound. Survey lines along the adjacent optic/water subsidence line. Ground Monitoring points at each tower Tower leg mounted prisms	Direct signs of subsidence effects on structures, i.e. new cracking evident in masonry Subsidence, Tilt Tensile Strain. Differential horizontal movement.	End of LW302.	Visual inspection. Evaluation of the subsidence movements about the site and comparison between measured and predicted movements.	Subsidence measurement accuracy.	Pre-mining audit conducted prior to commencement of LW 302. Pre-mining survey of subsidence monitoring points	Level 1	Negligible impact to towers or compound. At end of LW 302 Subsidence < 150 mm Tilt < 1.5 mm/m Tensile strain < 0.8 mm/m Differential horizontal movement < 2.5mm At end LW 303 Subsidence < 50 mm Tilt < 0.5 mm/m Tensile strain < 0.8 mm/m Differential horizontal movement < 2.5mm (i.e. measured subsidence parameters generally in accordance with predicted).	Continue monitoring.	
				Weekly on commencement of LW303 until subsidence becomes negligible.				After LW 303	Level 2	Negligible impact to towers or compound. Subsidence effects up to 15% greater than predicted. At end LW 302 Subsidence between 150 mm and 175 mm Tilt between 0.1 and 1 degree Strain between 0.8 and 1.0 mm/m. Differential horizontal movement between 2.5 and 2.9 mm At end LW 303 Subsidence effects up to 15% greater than predicted. Subsidence between 50 mm and 57 mm Tilt between 0.5 and 0.6 Strain between 0.8 and 1.0 mm/m. Differential horizontal movement between 2.5 and 2.9 mm	Implement actions in accordance with the Axicom Management Plan Agreement (Appendix 1). MCPL Report subsidence anomaly. Immediately resurvey subsidence line to confirm results. Engage subsidence expert to assess results. Confirm results are consistent with other subsidence lines. Compare and critically analyse measured versus predicted subsidence. Inform and provide report to Axicom of subsidence results. Collaboratively share information with Axicom to monitor situation. Axicom Assess information provided by Metropolitan Coal.
				End of LW302.				Level 3	Indication of impact to towers or compound. Subsidence effects greater than 15% more than predicted. At end LW 302 Subsidence > 175 mm Tilt > 1 degree Strain > 1.0 mm/m. Differential horizontal movement > 2.9 mm At end LW 303 Subsidence > 57 mm Tilt > 0.6 Strain > 1.0 mm/m. Differential horizontal movement > 2.9 mm	MCPL Increase frequency of subsidence line (Optic / Water Line) surveys to weekly in affected area. In conjunction with Axicom identify impact location and work with Axicom to resolve. Review the subsidence monitoring program and update the program where appropriate. Provide report on issue to both Axicom and DP&E. Axicom In conjunction with Metropolitan Coal identify impact location; install guy wires in response to tilt. Make determination if other measures necessary to avoid further impact.	

**Table 7 (Continued)
Longwalls 301-303 BFMP-AXICOM Trigger Action Response Plan**

Performance Measure	Performance Indicator	Monitoring Site(s)	Parameters	Frequency/ Sample Size	Analysis Methodology	Error Types	Baseline	Significance Levels/ Triggers		Action/Response
								Level 4	Impact occurs or Fault detected	Implement Contingency Plan as per BFMP Section 9. MCPL General Manager to be involved in all decision making processes. Assess public safety implications and where appropriate implement safety measures in accordance with Metropolitan Coal Longwalls 301-303 Public Safety Management Plan. Report exceedance of the performance measure or indicators to the DP&E as soon as practicable. Update the 'Built Features Management Plan – Subsidence Impact Register'. Axicom Axicom to enact automatic partial redundancy and use alternate phone towers nearby to share load. Determine appropriate course of action for restoration of service (e.g. deploy temporary tower as per special event infrastructure) and rebuilding (e.g. construct new tower and foundations). Complete restoration/rebuilding works. Work in conjunction with Metropolitan Coal to investigate root cause of incident and determine appropriate future control measures.
	The serviceability of the access roads and tracks are maintained.	Access roads and tracks in the vicinity of the Axicom assets.	Cracking about access road/tracks.	After LW 301, 302, and 303	Visual Inspection. Visual observations of access roads/tracks will also be conducted by Metropolitan Coal as part of routine works and inspections as well as during catchment visits within 600 m of Longwalls 301-303 secondary extraction as described in the Metropolitan Coal Longwalls 301-303 Land Management Plan (Longwalls 301-303 LMP).		Pre-mining audit conducted prior to commencement of LW 301.	Level 1	Minor cracking.	Continue monitoring. Consider whether any actions are required (e.g. implementation of management measures as outlined in the Longwalls 301-303 LMP, initiation of the Contingency Plan as outlined in the Longwalls 301-303 LMP, incident notification, implementation of appropriate safety controls, review of public safety, etc.).
								Level 2	Moderate cracking (ie cracking that requires implementation of management measures).	Implement management measures as outlined in the Longwalls 301-303 LMP.
								Level 3	Greater than moderate cracking.	Implement contingency measures as outlined in the Longwalls 301-303 LMP.

11 FUTURE EXTRACTION PLANS

In accordance with Condition 7, Schedule 3 of the Project Approval, Metropolitan Coal will collect baseline data for the future Extraction Plan (e.g. Longwall 304 onward). The collection of baseline data will be consistent with the baseline data collected for Longwalls 301-303. Where possible, the baseline (and post-mining) data collected for Longwalls 301-303 will be used as baseline for Longwalls 304 onward as longwall mining progressively moves further away from the Axicom assets.

In addition to the baseline data collection, consideration of the environmental performance and management measures in accordance with the review(s) conducted as part of this Longwalls 301-303 BFMP-AXICOM will inform the appropriate type and frequency of monitoring of the assets relevant to the next Extraction Plan.

11.1 ASSESSMENT OF TRIAL LONGWALL LAYOUT FOR LONGWALLS 301-303

As described in Section 4.1, the layout for Longwalls 301-303 (i.e. 163 m panel widths [void] and 45 m pillars [solid]) will be trialled to build on the experience and dataset obtained from Longwalls 20 to 27. The outcomes of the trial will be used to inform the potential for a similar mine layout to be applied to the next Extraction Plan (i.e. Longwall 304 onwards).

Following the completion of Longwall 301, 302 and during the mining of Longwall 303, Metropolitan Coal will review the available subsidence monitoring results and assess the changes to, and impacts on, Telstra assets.

12 ANNUAL REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

In accordance with Condition 3, Schedule 7 of the Project Approval, Metropolitan Coal will conduct an Annual Review of the environmental performance of the Project by the end of March each year.

The Annual Review will:

- describe the works carried out in the past year, and the works proposed to be carried out over the next year;
- include a comprehensive review of the monitoring results and complaints records of the Project over the past year, including a comparison of these results against the:
 - relevant statutory requirements, limits or performance measures/criteria;
 - monitoring results of previous years; and
 - relevant predictions in the EA, Preferred Project Report and Extraction Plan;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

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As described in Section 2, this Longwalls 301-303 BFMP-AXICOM will be reviewed within three months of the submission of an Annual Review and revised where appropriate.

13 INCIDENTS

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the Project Approval.

The reporting of incidents will be conducted in accordance with Condition 6, Schedule 7 of the Project Approval. Metropolitan Coal will notify the Director-General (now Secretary) of DP&E and any other relevant agencies of any incident associated with the Project as soon as practicable after Metropolitan Coal becomes aware of the incident. Within seven days of the date of the incident, Metropolitan Coal will provide the Director-General (now Secretary) of DP&E and any relevant agencies with a detailed report on the incident.

Axicom will be notified within 24 hours of any access limitations or restrictions.

14 COMPLAINTS

A protocol for the managing and reporting of complaints has been developed as a component of Metropolitan Coal’s Environmental Management Strategy and is described below.

The Environment & Community Superintendent is responsible for maintaining a system for recording complaints.

Metropolitan Coal will maintain public signage advertising the telephone number on which environmental complaints can be made. The Environment & Community Superintendent is responsible for ensuring that the currency and effectiveness of the service is maintained. Notifications of complaints received are to be provided as quickly as practicable to the Environment & Community Superintendent.

Complaints and enquiries do not have to be received via the telephone line and may be received in any other form. Any complaint or enquiry relating to environmental management or performance is to be relayed to the Environment & Community Superintendent as soon as practicable. All employees are responsible for ensuring the prompt relaying of complaints. All complaints will be recorded in a complaints register.

For each complaint, the following information will be recorded in the complaints register:

- date and time of complaint;
- method by which the complaint was made;
- personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- nature of the complaint;
- the action(s) taken by Metropolitan Coal in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by Metropolitan Coal, the reason why no action was taken.

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The Environment & Community Superintendent is responsible for ensuring that all complaints are appropriately investigated, actioned and that information is fed back to the complainant, unless requested to the contrary.

In accordance with Condition 10, Schedule 7 of the Project Approval, the complaints register will be made publicly available on the website and updated on a monthly basis. A summary of complaints received and actions taken will be presented to the Community Consultative Committee as part of the operational performance review.

15 NON-COMPLIANCES WITH STATUTORY REQUIREMENTS

A protocol for the managing and reporting of non-compliances with statutory requirements has been developed as a component of Metropolitan Coal’s Environmental Management Strategy and is described below.

Compliance with all approvals, plans and procedures will be the responsibility of all personnel (staff and contractors) employed on or in association with Metropolitan Coal, and will be developed through promotion of Metropolitan Coal ownership under the direction of the General Manager.

The Manager - Technical Services and/or Environment & Community Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 13, Metropolitan Coal will notify the Director-General (now Secretary) of the DP&E and any other relevant agencies of any incident associated with Metropolitan Coal as soon as practicable after Metropolitan Coal becomes aware of the incident. Within seven days of the date of the incident, Metropolitan Coal will provide the Director-General (now Secretary) of the DP&E and any relevant agencies with a detailed report on the incident.

A review of Metropolitan Coal’s compliance with all conditions of the Project Approval, mining leases and all other approvals and licenses will be undertaken prior to (and included within) each Annual Review. The Annual Review will be made publicly available on the Peabody website.

Additionally, in accordance with Condition 8, Schedule 7 of the Project Approval, an independent environmental audit was undertaken by the end of December 2011, and is undertaken a minimum of once every three years thereafter. A copy of the audit report will be submitted to the Director-General (now Secretary) of the DP&E and made publicly available on the Peabody website. The independent audit will be undertaken by an appropriately qualified, experienced and independent team of experts whose appointment has been endorsed by the Director-General (now Secretary) of the DP&E.

16 REFERENCES

Department of Planning & Environment and Division of Resources and Energy (2014) *Guidelines for the Preparation of Extraction Plans*. Draft.

Helensburgh Coal Pty Ltd [HCPL] (2008) *Metropolitan Coal Project Environmental Assessment*.

Helensburgh Coal Pty Ltd [HCPL] (2009) *Metropolitan Coal Project Preferred Project Report*.

Mine Subsidence Engineering Consultants (2016) *Metropolitan Colliery – Proposed Longwalls 301 to 303 - Subsidence Predictions and Impact Assessments for the Axicom Infrastructure*, 25 August 2016.

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APPENDIX 1

MSEC (2016) METROPOLITAN COLLIERY – PROPOSED LONGWALLS 301 TO 303
- SUBSIDENCE PREDICTIONS AND IMPACT ASSESSMENTS FOR THE AXICOM
INFRASTRUCTURE, DATED 25 AUGUST 2016

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25th August 2016

Jon Degotardi
Peabody Energy Australia
Metropolitan Colliery
PO Box 402
Helensburgh NSW 2508

Ref: MSEC844-14

Dear Jon,

RE: Metropolitan Colliery – Proposed Longwalls 301 to 303 - Subsidence Predictions and Impact Assessments for the Axicom Infrastructure

This letter report summarises the predicted subsidence movements and the assessed subsidence impacts for the Axicom infrastructure resulting from the extraction of the proposed Longwalls 301 to 303 at Metropolitan Colliery.

The locations of the Axicom infrastructure and the proposed longwalls are shown in the attached Drawing No. MSEC844-14. Tower 1 is located 35 metres to the north of the commencing end of Longwall 303. Tower 2 is close to the commencing end of Longwall 303. Photographs of this installation are provided in Figure 1 and Figure 2.



Figure 1 Axicom Telecommunications Tower 1 and Compound



Figure 2 Axicom Telecommunications Tower 2 and Compound

The predictions and impact assessments for the Axicom infrastructure are provided in the following sections.

Conventional Subsidence Parameters for the Axicom Infrastructure

The following provides summaries of the maximum predicted conventional movements for the Axicom infrastructure resulting from the extraction of Longwalls 301 to 303. It is possible that localised and elevated movements could develop as the result of non-conventional ground movements due to geological structures. Discussions on the potential for non-conventional movements are provided in this letter report.

A summary of the maximum predicted values of total subsidence, tilt and curvature for this installation, resulting from the extraction of Longwalls 301 to 303, is provided in Table 1.

Table 1 Maximum Predicted Total Subsidence, Tilt and Curvature for the Axicom Telecommunications Towers and Compounds Resulting from the Extraction of Longwalls 301 to 303

Locaiton	Longwall	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km ⁻¹)	Maximum Predicted Total Sagging Curvature (km ⁻¹)
Tower 1 and compound	After LW301	< 20	< 0.5	< 0.01	< 0.01
	After LW302	< 20	< 0.5	< 0.01	< 0.01
	After LW303	100	1.0	0.01	< 0.01
Tower 2 and compound	After LW301	< 20	< 0.5	< 0.01	< 0.01
	After LW302	30	< 0.5	< 0.01	< 0.01
	After LW303	150	1.5	0.02	< 0.01

The maximum predicted conventional tilt for the telecommunications towers and compounds is 1.5 mm/m (i.e. 0.15 %, or 1 in 667). The maximum predicted conventional curvatures are less than 0.02 km⁻¹ hogging and 0.01 km⁻¹ sagging, which equate to minimum radii of curvature of greater than 50 kilometres and 100 kilometres, respectively.

Predicted Strains

The prediction of strain is more difficult than the predictions of subsidence and tilt. The reason for this is that strain is affected by many factors, including ground curvature and horizontal movement, as well as local variations in the near surface geology, the locations of pre-existing natural joints at bedrock and the depth of bedrock. Survey tolerance can also represent a substantial portion of the measured strain, in cases where the strains are of a low order of magnitude. The profiles of observed strain, therefore, can be irregular even when the profiles of observed subsidence, tilt and curvature are relatively smooth.

In previous MSEC subsidence reports, predictions of conventional strain were provided based on the best estimate of the average relationship between curvature and strain. Similar relationships have been proposed by other authors. The reliability of the strain predictions was highlighted in these reports, where it was stated that measured strains can vary considerably from the predicted conventional values.

Adopting a linear relationship between curvature and strain provides a reasonable prediction for the conventional tensile and compressive strains. In the Southern Coalfield, it has been found that a factor of 15 provides a reasonable relationship between the predicted maximum curvatures and the predicted maximum conventional strains. The locations that are predicted to experience hogging or convex curvature are expected to be net tensile strain zones and locations that are predicted to experience sagging or concave curvature are expected to be net compressive strain zones.

At a point however, there can be considerable variation from the linear relationship, resulting from non-conventional movements or from the normal scatters which are observed in strain profiles. When expressed as a percentage, observed strains can be many times greater than the predicted conventional strain for low magnitudes of curvature. We have therefore provided a statistical approach to account for the variability, instead of just providing a single predicted conventional strain.

The range of predicted strains for the Axicom infrastructure has been determined using the monitoring data from Metropolitan Colliery and other nearby collieries. The data used in the analysis of observed strains included those resulting from both conventional and non-conventional anomalous movements, but did not include those resulting from valley related movements. The strains resulting from damaged or disturbed survey marks have also been excluded.

The Axicom infrastructure is near the commencing end of Longwall 303. The database has been analysed to extract the maximum tensile and compressive strains that have been measured at any time during the extraction of the previous longwalls in the Southern Coalfield, for survey bays that were located outside between zero and 100 metres of the nearest longwall goaf edge, which has been referred to as "*above solid coal*".

A histogram of the maximum observed tensile and compressive strains measured in survey bays located above solid coal, for monitoring lines in the Southern Coalfield, is provided in Figure 3. The probability distribution functions, based on a fitted *Generalised Pareto Distribution (GPD)*, have also been shown in this figure.

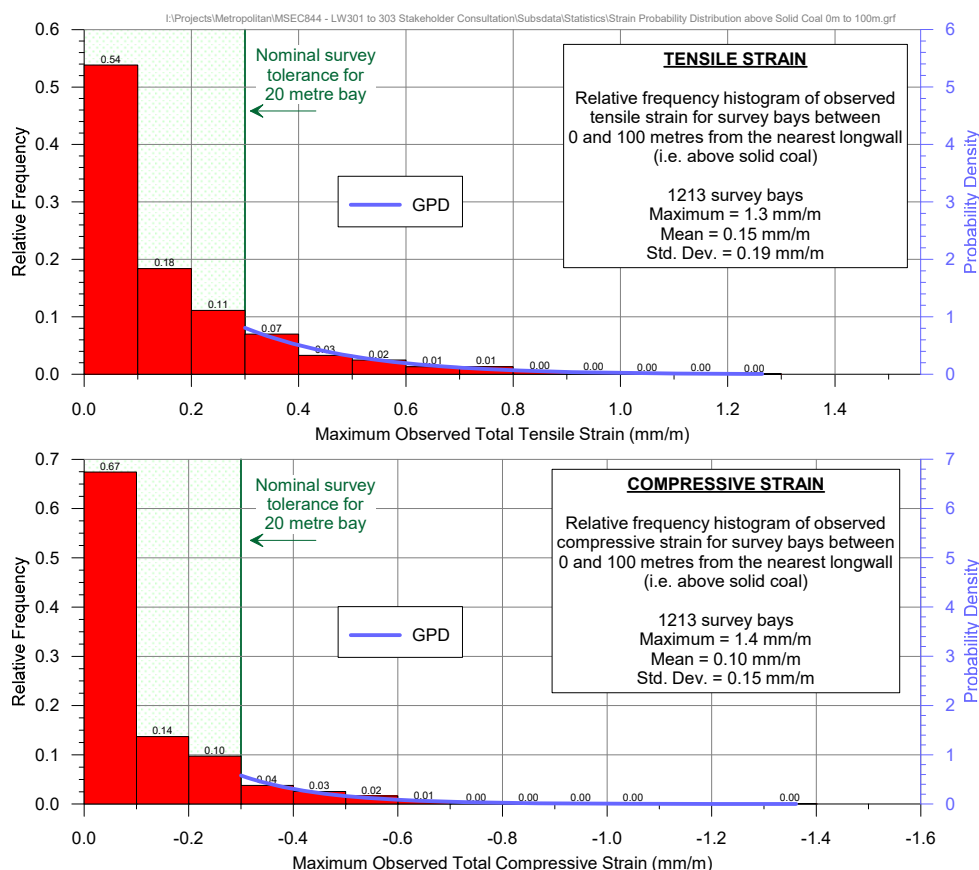


Figure 3 Distributions of the Measured Maximum Tensile and Compressive Strains during the Extraction of Previous Longwalls in the Southern Coalfield Above Solid Coal (0 to 100 metres)

Confidence intervals have been determined from the empirical strain data using the fitted GPDs. In the cases where survey bays were measured multiple times during a longwall extraction, the maximum tensile strain and the maximum compressive strain were used in the analysis (i.e. single tensile strain and single compressive strain measurement per survey bay).

A summary of the probabilities of exceedance for tensile and compressive strains for survey bays located above solid coal, based the fitted GPDs, is provided in Table 2.

Table 2 Probabilities of Exceedance for Strain for Survey Bays Located above Solid Coal

Strain (mm/m)		Probability of Exceedance
Compression	-1.5	1 in 3,100
	-1.0	1 in 630
	-0.5	1 in 40
	-0.3	1 in 10
Tension	+0.3	1 in 6
	+0.5	1 in 15
	+1.0	1 in 250
	+1.5	1 in 2,200

The 95 % confidence intervals for the maximum total strains that the individual survey bays above solid coal experienced at any time during mining are 0.5 mm/m tensile and 0.4 mm/m compressive. The 99 % confidence intervals for the maximum total strains that the individual survey bays above solid coal experienced at any time during mining are 0.8 mm/m tensile and 0.7 mm/m compressive.

Potential for Non-Conventional Movements

Non-conventional movements can develop due to the presence of geological structures or valley related effects. In some cases, non-conventional movements can develop with no known cause and these are often referred to as 'anomalous' movements.

The locations of the known geological structures and the streams are shown in Drawing No. MSEC844-14.

There are no mapped faults or streams located in the vicinity of the Axicom infrastructure. It is possible that the infrastructure located near the longwalls could experience localised and elevated strains due to unknown geological structures (i.e. anomalies). The range of strains provided in the previous section include those resulting from irregular anomalous movements.

Impact Assessments for the Axicom Infrastructure

The telecommunications towers and compounds are located near the commencing end of Longwall 303.

The maximum predicted tilt is 1.5 mm/m (i.e. 0.15 %, or 1 in 667) which equates to an angle of 0.09 degrees. The magnitude of tilt is very small (i.e. less than 1 %) and therefore is unlikely to adversely impact on the tower or compound. Tilt can potentially effect directional antennas (i.e. microwave dishes) and therefore it is recommended that the radio engineer reviews the predicted change in alignment. If adverse impacts were anticipated, the alignments of the directional antennas could be adjusted during active subsidence.

The maximum predicted conventional curvatures are less than 0.02 km⁻¹ hogging and 0.01 km⁻¹ sagging, which equate to minimum radii of curvature of greater than 50 kilometres and 100 kilometres, respectively. The predicted strains are 0.5 mm/m tensile and 0.4 mm/m compressive based on the 95 % confidence level and 0.8 mm/m tensile and 0.7 mm/m compressive based on the 99 % confidence level.

It is recommended that the structural engineer reviews the structural integrity of the tower structure based on the predicted conventional subsidence, tilt and curvatures and the predicted distributions of strain. If adverse impacts were anticipated, then preventive measures should be implemented that could include the installation of additional bracing members and/or strengthening members to the existing frame.

The building enclosures include brick structure adjacent to Tower 1 and a steel framed structure adjacent to Tower 2, both supported on short concrete piers. The steel framed structure is founded on a concrete ground slab. A small structure similar to a shipping container is also located adjacent to Tower 1 and is supported on small concrete pads. It is unlikely that these structures would experience adverse impacts due to the elevation above natural ground.

Summary

Two telecommunications towers and compounds are located above solid coal near the commencing end of Longwall 303. It is recommended that the predicted movements are reviewed by the telecommunications and structural engineers. Preventive measures for the towers should be installed if adverse impacts are anticipated. It is unlikely that adverse impacts would occur for the building enclosures.

It is expected that the potential impacts on the Axicom infrastructure can be managed with the implementation of the appropriate monitoring and management strategies.

Yours sincerely



Peter DeBono

Attachments:

Drawing No. MSEC844-14 – Longwalls 301 to 303 – Axicom Infrastructure

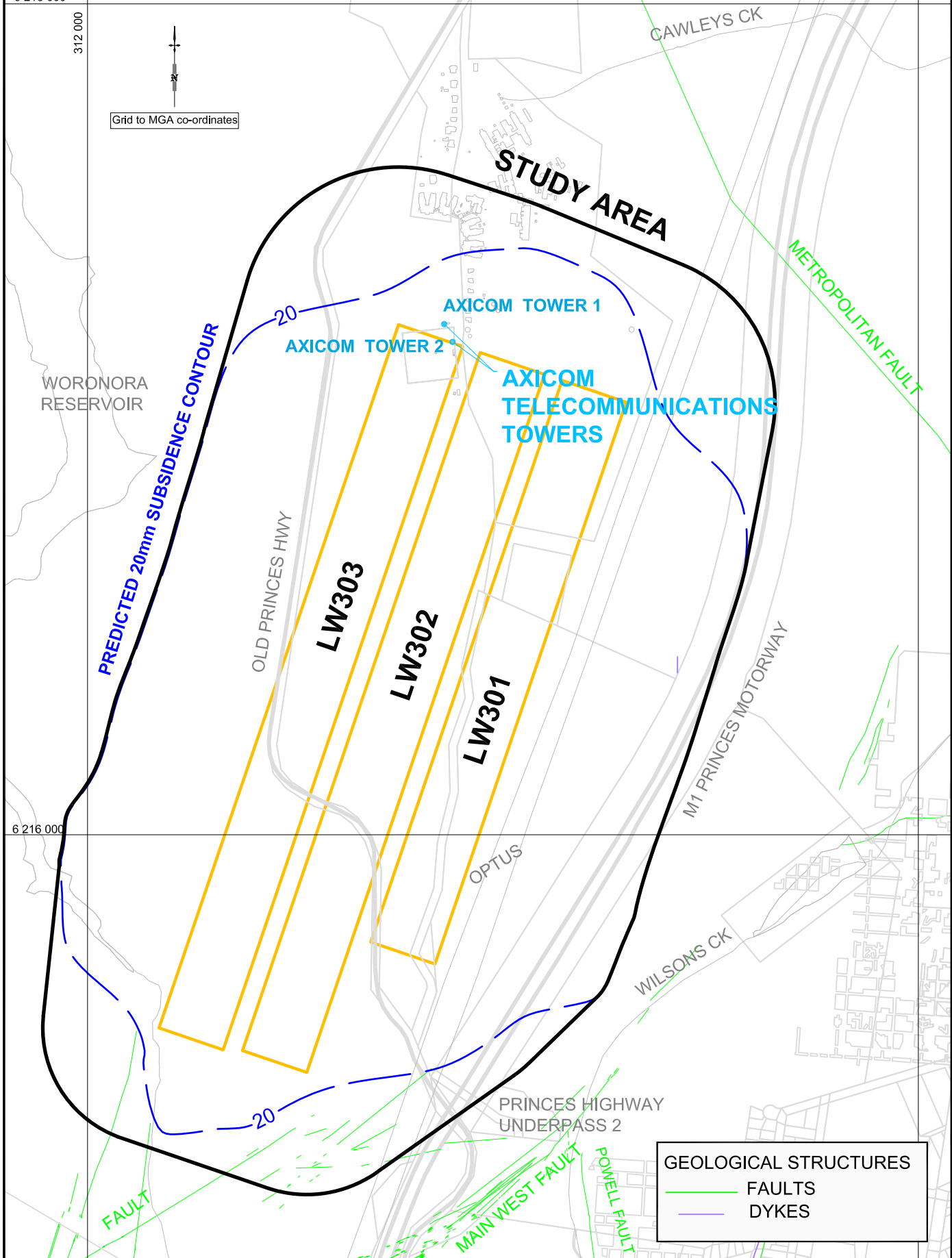


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METROPOLITAN COAL
 METROPOLITAN COLLIERY
 LONGWALLS 301 TO 303
 AXICOM INFRASTRUCTURE

DATE: 26 Aug 2016 6 218 000	SCALE: 1:12500	DRAWING No: MSEC844-14	Rev No B
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GEOLOGICAL STRUCTURES	
	FAULTS
	DYKES

APPENDIX 2

BUILT FEATURES MANAGEMENT PLAN – SUBSIDENCE IMPACT REGISTER

Metropolitan Coal – Built Features Management Plan – Axicom	
Revision No. LW301-303 BFMP_AXICOM-R01-E	
Document ID : Built Features Management Plan – Axicom	

Built Features Management Plan - Subsidence Impact Register

Impact Register Number ¹	Built Feature ²	Impact Description	Does Impact Exceed the Built Feature Performance Measure/Indicators? (Yes/No)	Management Measures Implemented	Were Management Measures Effective? (Yes/No)

- Notes:
- 1: Fill out all details in the Assessment Form and record the register number here.
 - 2: Built feature (e.g. tower, etc.).
 - 3: Impacts to access roads/tracks to be included in the Land Management Plan – Subsidence Impact Register.

**Built Feature Management Plan – Subsidence Impact Register
Assessment Form**

Date:

Observer (Name and position):

Register Number (i.e. Number 1, 2, etc.):

Longwall Number and Chainage:

Location of Observed Impact:

(Examples: location of tower, include GPS co-ordinates and a sketch)

Description of Observed Impact:

(Examples: nature and extent of impact - cracks in road etc any relevant information, attach photographs)

Person Notified: Manager - Technical Services

Description of Photographs:

Actions Required:

Contingency Plan Initiated

Incident Notification

Safety Measures/Public Safety

Management Plan Requirements

Management or Contingency Measures Implemented:

Effectiveness of Management or Contingency Measures:

APPENDIX 3

CONTINGENCY PLAN PROCEDURE AND DECISION TREE

Metropolitan Coal – Built Features Management Plan – Axicom	
Revision No. LW301-303 BFMP_AXICOM-R01-E	
Document ID : Built Features Management Plan – Axicom	

