METROPOLITAN COAL

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LONGWALLS 301-303

BUILT FEATURES MANAGEMENT PLAN GARRAWARRA CENTRE COMPLEX

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DP&E Approval Date
All	LW301-303 BFMP_GAR-R01-A	Original – Draft for Consultation	NSW Health	-
Figure 4	LW301-303 BFMP_GAR-R01-B	Minor amendments to Figure 4	NSW Health	-

November 2016

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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 anticipated 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 – Garrawarra Centre Complex (Longwalls 301-303 BFMP-GAR) has been developed to manage the potential consequences of Longwalls 301-303 extraction on the Garrawarra Centre Complex.

The relationship of this Longwalls 301-303 BFMP-GAR 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-GAR, namely representatives from Mine Subsidence Engineering Consultants (MSEC) and Metropolitan Coal were endorsed by the Director-General (now Secretary) of the NSW Department of Planning and Environment (DP&E) on 6 June 2016.

This Longwalls 301-303 BFMP-GAR has been prepared in consultation with NSW Health.

1.2 STRUCTURE OF THE LONGWALLS 301-303 BFMP-GAR

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

Section 2: Describes the review and update of the Longwalls 301-303 BFMP-GAR.

Section 3: Outlines the statutory requirements applicable to the Plan.

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.

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.

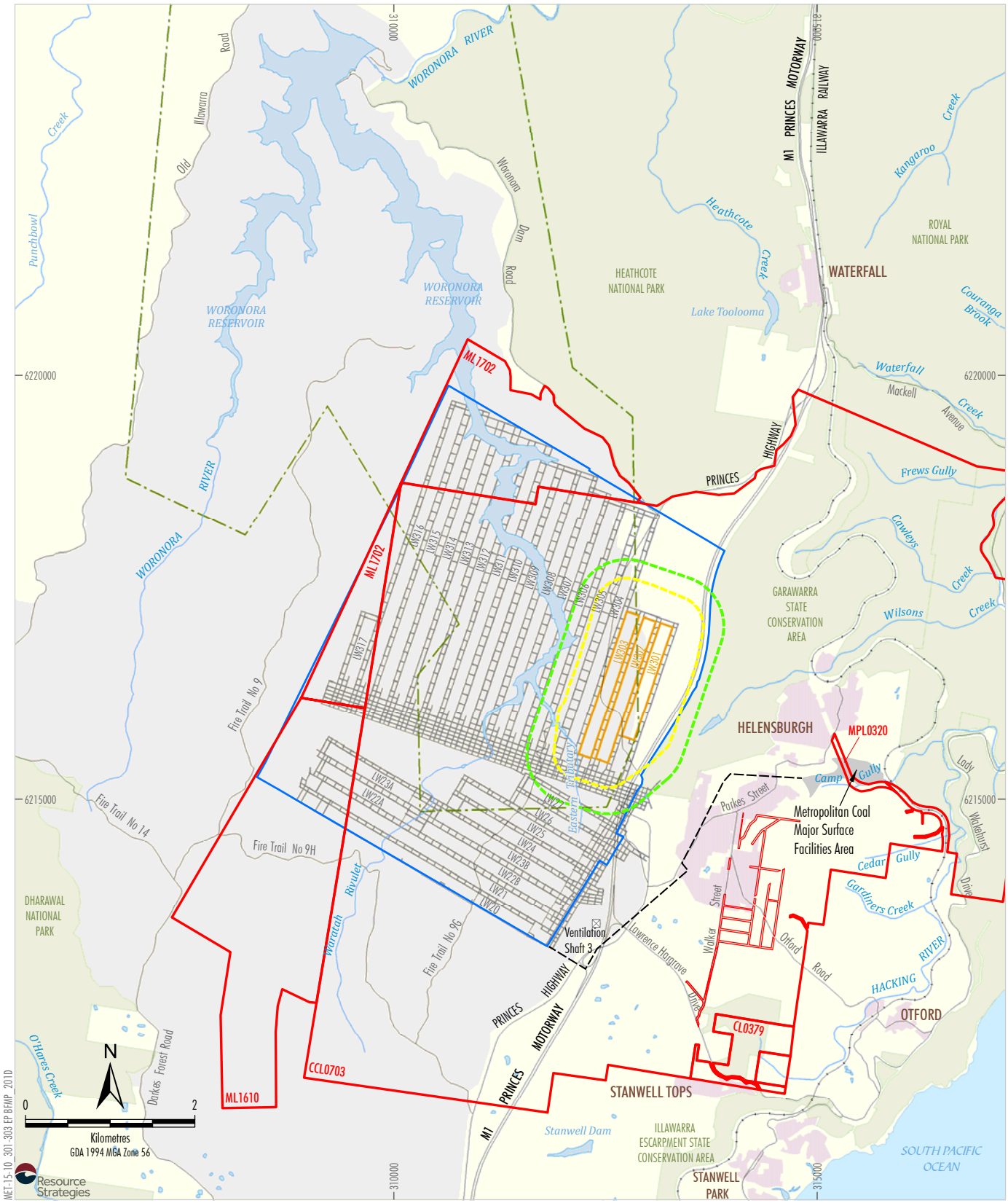
Section 12: Describes the annual review and improvement of environmental performance.

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-GAR.



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)

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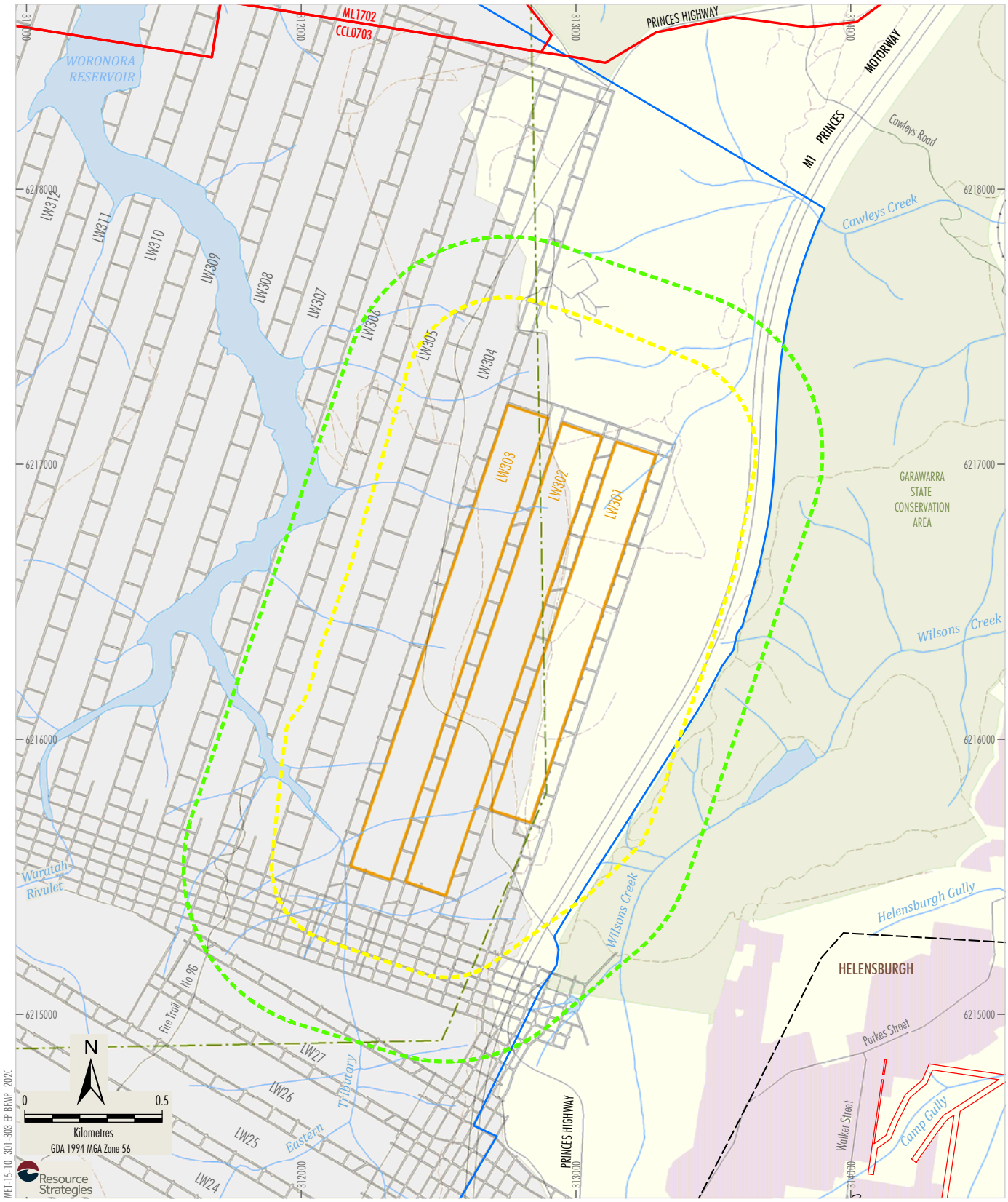
Project Longwalls 20 - 27 and Longwalls 301 - 317 Layout

Figure 1



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)

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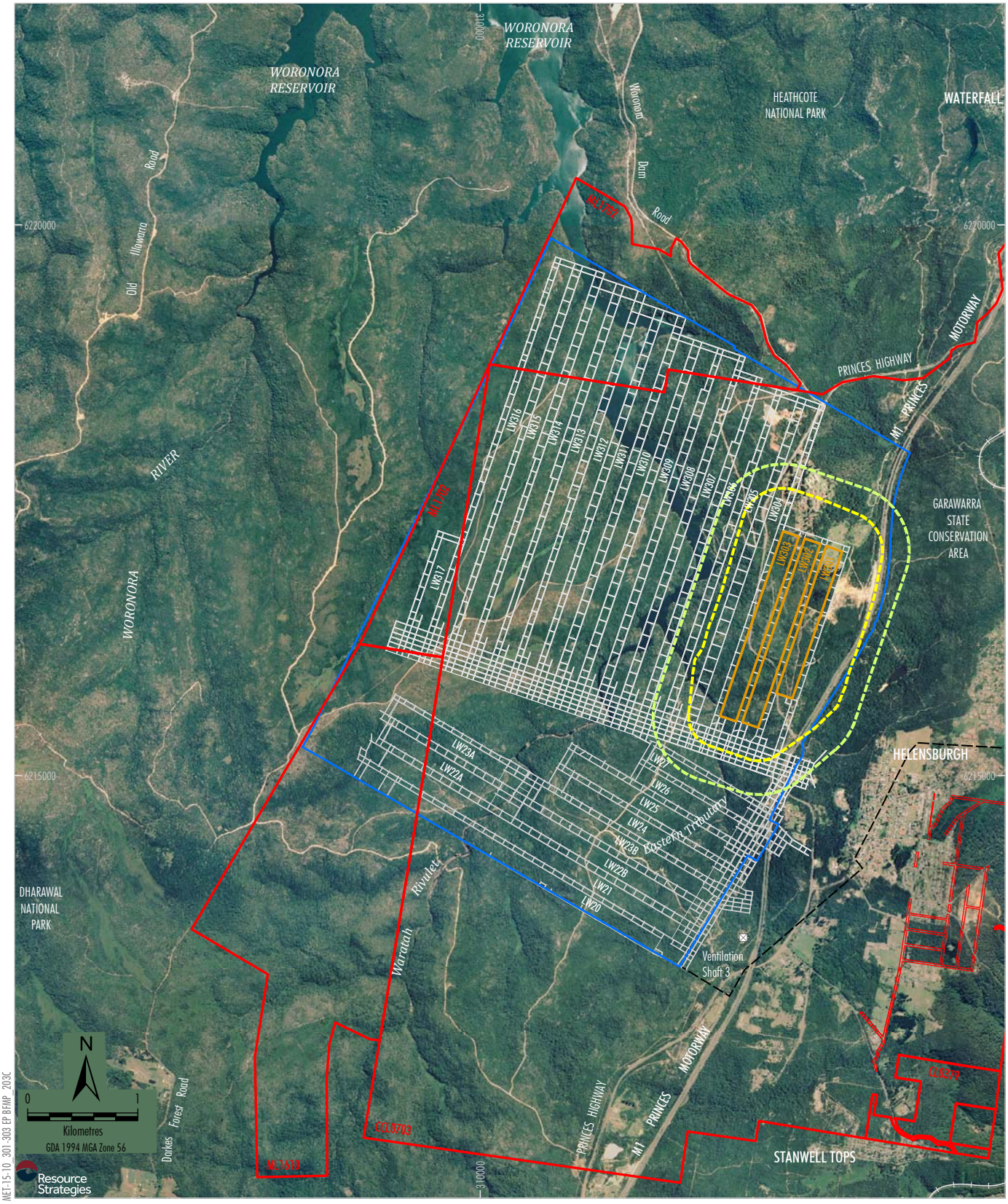
Longwalls 301 - 303 Layout

Figure 2



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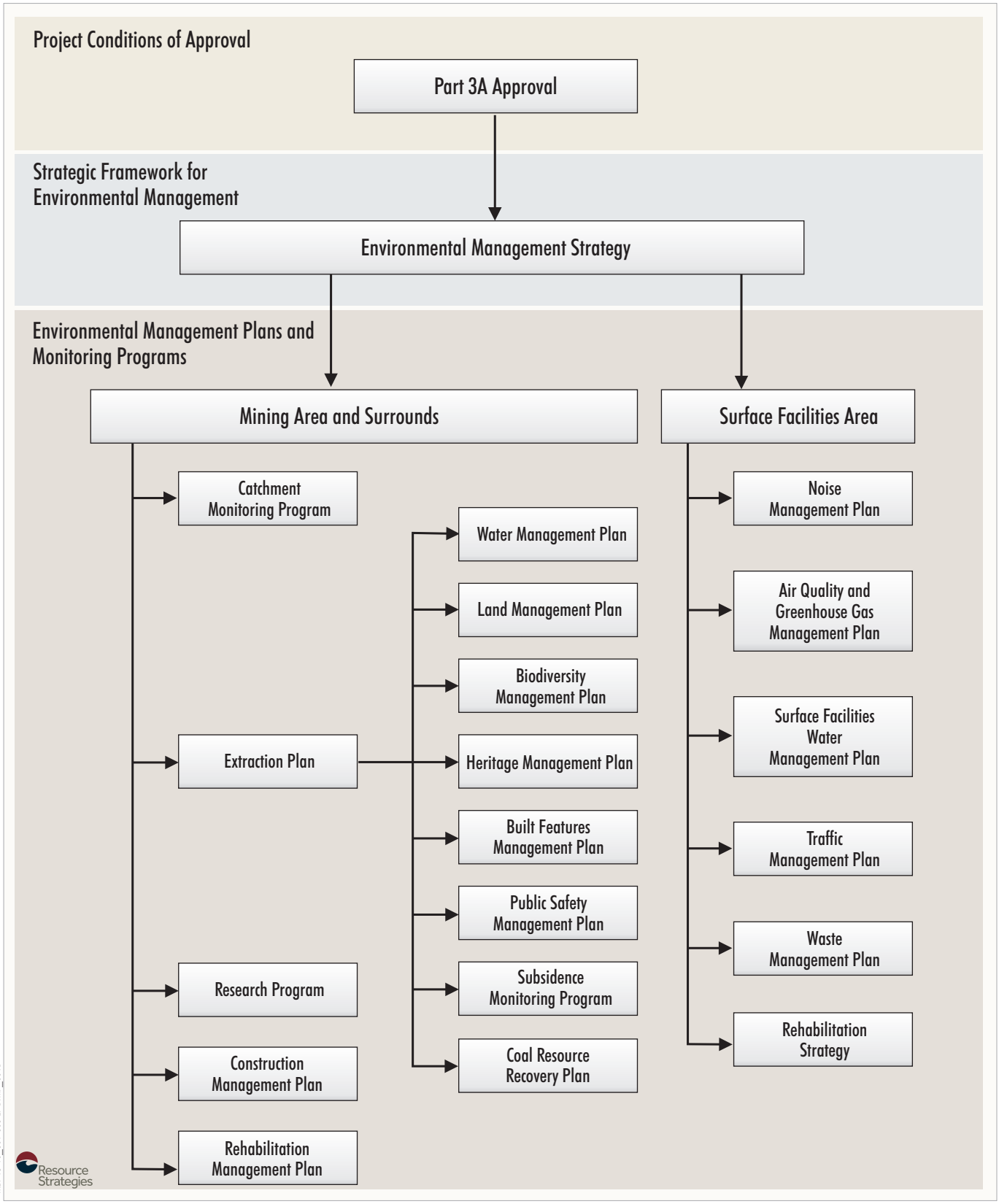
Project Longwalls 20 - 27 and Longwalls 301 - 317 Layout - Aerial Photograph

Figure 3



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Environmental Management Structure

Figure 4

2 LONGWALLS 301-303 BFMP-GAR REVIEW AND UPDATE

In accordance with Condition 4, Schedule 7 of the Project Approval, this Longwalls 301-303 BFMP-GAR 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 BFMP 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-GAR. The distribution register for controlled copies of the Longwalls 301-303 BFMP-GAR is described in Section 2.1.

Revisions to any documents listed within this Longwalls 301-303 BFMP-GAR 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-GAR publicly available on the Peabody website. A hard copy of the Longwalls 301-303 BFMP-GAR 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-GAR, 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-GAR 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 Metropolitan Coal's computer system and the Peabody website.

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-GAR. Table 1 indicates where each component of the conditions is addressed within this Longwalls 301-303 BFMP-GAR.

Table 1
Management Plan Requirements

Project Approval Condition	Longwalls 301-303 BFMP-GAR Section
Condition 2 of Schedule 7	
2. The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include:	
a) detailed baseline data;	Section 6
b) a description of:	
• the relevant statutory requirements (including any relevant approval, licence or lease conditions);	Section 3
• any relevant limits or performance measures/criteria;	Section 5
• 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;	Section 5
c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Sections 7, 8, 9 and 10
d) a program to monitor and report on the:	Sections 7, 8 and 12
• impacts and environmental performance of the project;	
• effectiveness of any management measures (see c above);	
e) a contingency plan to manage any unpredicted impacts and their consequences;	Section 9
f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Sections 7 and 12
g) a protocol for managing and reporting any;	
• incidents;	Section 13
• complaints;	Section 14
• non-compliances with statutory requirements; and	Section 15
• exceedances of the impact assessment criteria and/or performance criteria; and	Section 9
h) a protocol for periodic review of the plan.	Section 2
Condition 7 of Schedule 3	
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:	
a) a program to collect sufficient baseline data for future Extraction Plans;	Section 11
b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;	Section 4
c) a detailed description of the measures that would be implemented to remediate predicted impacts; and	Section 8
d) a contingency plan that expressly provides for adaptive management.	Section 9

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 NSW Division of Resources and Energy (DRE), within the NSW Department of Industry, Skills and Regional Development (NSW Department of Industry) 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 NSW Department of Industry.
- 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 Department of Primary Industries (DPI) Water 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 NSW Department of Industry 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):

- *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;*
- *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;*
- *Threatened Species Conservation Act, 1995;*
- *Sydney Water Catchment Management Act, 1998;*
- *Water Act, 1912;*
- *Water Management Act, 2000;*
- *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 LONGWALL 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	April 2017	6 months	September 2017
302	November 2017	7 months	May 2018
303	June 2018	7 months	December 2018

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 NSW Health Assets - Garrawarra Centre Complex

Figures 5, 6 and 7 illustrate the NSW Health assets at the Garrawarra Centre Complex within and in proximity to the Study area for Longwalls 301-303. The assets comprise approximately 85 building structures, including:

- abandoned (and fenced) hospital buildings (A01a-A01k and B03a-B03l) and lodge (A01l);
- aged care building structures (B01a-B01j and B02a-B02h) and other associated structures (B01k-B01q and B02i-B02j);
- houses (A01m, A02a-A09a and B04a-B09a) and other associated structures (A02b, A03b-A03d, A06b, A08b-A08f and A09b);
- water storage tanks (B01t01, B01t02, B14t01, B14t02, B16t01-B16t03, B17t01 and B18t01) and a trickle filter tank (B15t01);
- gas storage tank (B01t03);
- kiln (F01b); and
- telecommunications towers and associated compounds (B06b and B10a-B12a).[1]

Other built features and services at the Garrawarra Centre Complex include private access roads/tracks, potable water and sewer pipelines[2], powerlines[3] and telecommunications cables[4].

4.2 REVISED SUBSIDENCE AND IMPACT PREDICTIONS

4.2.1 Revised Subsidence Predictions

Subsidence predictions for Longwalls 20-44 in relation to the Garrawarra Centre Complex 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 the Garrawarra Centre Complex were conducted by MSEC and reported in MSEC (2016) (Appendix 1).

It is noted that longwall layouts have been modified in order to minimise predicted subsidence movements at the Garrawarra Centre Complex building structures which house aged care patients and administrative support (e.g. B01a-B01e) by limiting the predicted conventional curvature to less than 0.01 km^{-1}.

1 Separate BFMPs for the telecommunication towers and compounds will be developed in consultation with the relevant asset owners (i.e. Axicom, Telstra and Sydney Trains).
2 A separate BFMP will be developed in consultation with Sydney Water for relevant water infrastructure / services owned by Sydney Water.
3 A separate BFMP will be developed in consultation with Endeavour Energy for relevant electricity infrastructure / services owned by Endeavour Energy.
4 A separate BFMP will be developed in consultation with Telstra for relevant telecommunication services owned by Telstra.

In relation to subsidence predictions, John Matheson and Associates (JMA) (2016) and MSEC (2016) make the following conclusions and are summarised for each building / structure in Table 3.

Table 3
Summary of Revised Predictions for Buildings / Structures

Building (MSEC, 2016, JMA, 2016 and Howard Tanner & Associates, 1993)		Predictions and Exceedance Probabilities (MSEC, 2016 and JMA, 2016)			
		Probability of Exceedance			Commentary
		Nil – Category 0 [Hairline Crack <0.1 mm]	< Category 1 [Fine Crack <1 mm not requiring repair]	Category 2 or greater [e.g. 2 mm Crack]	
Hospital Buildings (Abandoned)					
A01a	Former Male Wards* (Wards 1-8)	Refer below	Refer below	Refer below	Refer below
	• Building A01a-i*	20%	1%	Unlikely	Possible (up to 3mm cracks) if strain concentrates at pre-existing rock joints
	• Building A01a-ii*	7%	Unlikely	Remote	-
	• Building A01a-iii*	2%	Remote	Remote	-
	• Building A01a-iv*	<1%	Remote	Remote	-
	• Building A01a-v*	20%	0.01%	Remote	Possible (up to 3mm cracks) if strain concentrates at pre-existing rock joints
	• Building A01a-vi*	2%	Remote	Remote	-
	• Building A01a-vii (Pharmacy – A01b)	0.1%	Remote	Remote	Pharmacy A01b as described in MSEC (2016)
	• Small Adjoining Buildings	0.01%	Remote	Remote	-
A01b	Pharmacy	0.1%	Remote	Remote	-
A01c	Chalet^	0.1%	Remote	Remote	-
A01d	Chalet^	0.1%	Remote	Remote	-
A01e	PWD Workshop	4%	Unlikely	Remote	-
A01f	Chalet^	0.1%	Remote	Remote	-
A01g	Chalet^	0.1%	Remote	Remote	-
A01h	Chalet^	0.1%	Remote	Remote	-
A01i	Chalet^	0.1%	Remote	Remote	-
A01j	Chalet^	0.1%	Remote	Remote	-
A01k	Chalet^	0.1%	Remote	Remote	-
A01l	Gatehouse / Lodge*	0.1%	Remote	Remote	-
B03a	Laundry / Boilerhouse^	45%	10%	1%	-
B03b	Outdoor Staff	5%	Unlikely	Remote	-
B03c	Substation	0.1%	Remote	Remote	-
B03d	Seamstress	15%	Unlikely	Remote	Pre-existing pier tilt monitoring recommended
B03e	Transport Services	15%	Unlikely	Remote	-
B03f	Workshops	5%	Remote	Remote	-
B03g	Workshops	0.1%	Remote	Remote	-
B03h	Workshops	5%	Remote	Remote	-
B03i	Workshops	0.1%	Remote	Remote	-
B03j	Painters Workshop[#]	5%	Remote	Remote	-

Table 3 (Continued)
Summary of Revised Predictions for Buildings / Structures

Building (MSEC, 2016, JMA, 2016 and Howard Tanner & Associates, 1993)		Predictions and Exceedance Probabilities (MSEC, 2016 and JMA, 2016)			
		Probability of Exceedance			Commentary
		Nil – Category 0 [Hairline Crack <0.1 mm]	< Category 1 [Fine Crack <1 mm not requiring repair]	Category 2 or greater [e.g. 2 mm Crack]	
Hospital Buildings (Abandoned) (Continued)					
B03k	Shed	5%	Remote	Remote	-
B03l	Shed	5%	Remote	Remote	-
Aged Care Buildings					
B01a	Administration	20%	1%	Remote	20% (higher if plasterboard does not have a matching joint)
B01b	Administration	20%	1%	Remote	20% (higher if plasterboard does not have a matching joint)
B01c	Administration	20%	1%	Remote	20% (higher if plasterboard does not have a matching joint)
B01d	Administration	20%	1%	Remote	20% (higher if plasterboard does not have a matching joint)
B01e	Nurses Quarters / Administration*,^	Refer below	Refer below	Refer below	Refer below
	• Original Building*	25%	1%	Unlikely	-
	• Stage 2^ & 3 Additions	15%	1%	Unlikely	-
B01f	Link Building	10%	1%	Unlikely	-
B01g	Link Building	10%	1%	Unlikely	-
B01h	Link Building	10%	1%	Unlikely	-
B01i	Link Building	10%	1%	Unlikely	-
B01j	Link Building	10%	1%	Unlikely	-
B01k	Shed	Unlikely	Unlikely	Unlikely	-
B01l	Shed	Unlikely	Unlikely	Unlikely	-
B01m	Shed	Unlikely	Unlikely	Unlikely	-
B01n	Shed	Unlikely	Unlikely	Unlikely	-
B01o	Shed	Unlikely	Unlikely	Unlikely	-
B01p	Shed	Unlikely	Unlikely	Unlikely	-
B01q	Shed	Unlikely	Unlikely	Unlikely	-
B02a	Administration / Kitchen Group*	35%	1%	Unlikely	Possible (1mm opening and closure) between buildings [Further investigation recommended]
	Dining and Recreation (Activities 1)*,^	15%	Unlikely	Remote	Possible (1mm opening and closure) between buildings
B02b	Administration / Kitchen Group*	15%	Unlikely	Remote	Possible (2mm opening and closure) between buildings [More detailed analysis of brick arches recommended]
B02c	Former Female Wards (Wards 9-12)*	45%	10%	1%	Possible (up to 3mm cracks) if strain concentrates at pre-existing rock joints

Table 3 (Continued)
Summary of Revised Predictions for Buildings / Structures

Building (MSEC, 2016, JMA, 2016 and Howard Tanner & Associates, 1993)		Predictions and Exceedance Probabilities (MSEC, 2016 and JMA, 2016)			
		Probability of Exceedance			Commentary
		Nil – Category 0 [Hairline Crack <0.1 mm]	< Category 1 [Fine Crack <1 mm not requiring repair]	Category 2 or greater [e.g. 2 mm Crack]	
Aged Care Buildings (Continued)					
B02d	Library / Canteen / Female Dining Room*	15%	0.01%	Unlikely	-
B02e	X-Ray Block	15%	0.01%	Unlikely	-
B02f	Activities 2 / Open Air Ward	15%	0.01%	Unlikely	-
B02g	Shed	5%	Unlikely	Unlikely	-
B02h	Shed	5%	Unlikely	Unlikely	-
B02i	Amenities	1%	Unlikely	Remote	-
B02j	Amenities	1%	Unlikely	Remote	-
Houses					
A01m	Staff Cottage	5%	Unlikely	Remote	-
A02a	Doctor's Residence*	5%	Unlikely	Remote	-
A02b	Shed	Remote	Remote	Remote	-
A03a	Doctor's Residence*	5%	Unlikely	Remote	-
A03b	Shed	Remote	Remote	Remote	-
A03c	Shed	Remote	Remote	Remote	-
A03d	Shed	Remote	Remote	Remote	-
A04a	Doctor's Residence*	5%	Unlikely	Remote	-
A05a	Staff Cottage	5%	Unlikely	Remote	-
A06a	Staff Cottage[#]	5%	Unlikely	Remote	-
A06b	Shed	Remote	Remote	Remote	-
A07a	Staff Cottage[#]	5%	Unlikely	Remote	-
A08a	Medical Officer's Residence[#]	5%	Unlikely	Remote	-
A08b	Shed	5%	Unlikely	Remote	-
A08c	Shed	Remote	Remote	Remote	-
A08d	Shed	Remote	Remote	Remote	-
A08e	Shed	Remote	Remote	Remote	-
A08f	Shed	Remote	Remote	Remote	-
A09a	Palmer House*	25%	0.1%	Unlikely	-
A09b	Palmer House - Garage / Stable*	5%	Unlikely	Remote	-
B04a	Staff Cottage	1%	Unlikely	Remote	-
B05a	Staff Cottage	1%	Unlikely	Remote	-
B06a	Staff Cottage	1%	Unlikely	Remote	-
B06b	Shed	Remote	Remote	Remote	-
B07a	Staff Cottage	1%	Unlikely	Remote	-
B08a	Staff Cottage	1%	Unlikely	Remote	-
B09a	Staff Cottage	1%	Unlikely	Remote	-
B09b	Shed	1%	Unlikely	Remote	-

Table 3 (Continued)
Summary of Revised Predictions for Buildings / Structures

Building (MSEC, 2016, JMA, 2016 and Howard Tanner & Associates, 1993)		Predictions and Exceedance Probabilities (MSEC, 2016 and JMA, 2016)			
		Probability of Exceedance			Commentary
		Nil – Category 0 [Hairline Crack <0.1 mm]	< Category 1 [Fine Crack <1 mm not requiring repair]	Category 2 or greater [e.g. 2 mm Crack]	
Water Storage Tanks					
B14t01	Reservoir	50%	20%	5%	-
B14t02	Reservoir (no water)#	50%	20%	5%	-
B15t01	Trickle Filter Tank	50%	20%	5%	-
B16t01	Below Ground Tank	50%	20%	5%	-
B16t02	Below Ground Tank	50%	20%	5%	-
B16t03	Below Ground Tank	50%	20%	5%	-
B17a	Pump House	Unlikely to be affected			
B17t01	Fire Water Tank	Unlikely to be affected			
B18t01	Tank	Unlikely to be affected			
B01t01	Rainwater Tank	Unlikely to be affected			
B01t02	Rainwater Tank	Unlikely to be affected			
Gas Storage Tank					
B01t03	Gas Storage Tank	Unlikely to be affected			
Other					
F01b	Kiln	Tilt may add to pre-existing tilt – barrier fence recommended			

After: JMA (2016) and Howard Tanner & Associates (1993)
* Items of Exceptional Cultural Significance (Howard Tanner & Associates, 1993)
^ Items of High Cultural Significance (Howard Tanner & Associates, 1993)
# Items of Some Cultural Significance (Howard Tanner & Associates, 1993)

It is important to note that the above predictions and exceedance probabilities are for total subsidence after extraction of the three Longwalls 301, 302 and 303. Subsidence effects predicted for the Garrawarra Centre Complex buildings and structures during mining of Longwall 301 alone are minimal to nil as the total subsidence profile does not develop until after commencement of Longwall 302 (i.e. November 2017) and Longwall 303 (i.e. June 2018).

Hospital Buildings (Abandoned)

- The buildings are fenced and therefore access is restricted.
- The structures are located outside the extents of Longwalls 301 to 303.
- The building structures are expected to remain safe and serviceable (or as otherwise identified during the pre-mining inspection, noting that some buildings have deteriorated).
- Negligible damage (i.e. hairline [<0.1 mm] or fine cracks which do not need repair [<1 mm]) is expected.
- It is noted that for Buildings A01a-i and A01a-v at the Former Male Wards, category 2 impacts or greater are possible (up to 3mm cracks) if strain concentrates at pre-existing rock joints due to length of structure however is considered unlikely and remote respectively.
- It is also noted for Buildings B03a (Laundry / Boilerhouse), category 2 impacts or greater has a 1% probability.
- As a contingency, should greater cracking occur, these could be repaired using normal building maintenance techniques in consultation with the relevant authorities.

Aged Care Buildings

- The aged care buildings are located outside the extents of Longwalls 301 to 303.
- The building structures are expected to remain safe and serviceable.
- Negligible damage (i.e. hairline [<0.1 mm] or fine cracks which do not need repair [<1 mm]) is expected.
- It is noted that for Building B02a at the Administration / Kitchen Group and Dining / Recreation, category 2 impacts or greater are possible (1mm opening and closure) between buildings however is considered unlikely and remote respectively.
- It is noted that for Building B02b at the Administration / Kitchen Group, category 2 impacts or greater are possible (2mm opening and closure) between buildings however is considered remote.
- It is noted that for Buildings B02c at the Former Female Wards, category 2 impacts or greater are possible (up to 3mm cracks) if strain concentrates at pre-existing rock joints due to length of structure with a 1% probability.
- As a contingency, should greater cracking or opening and closing of joints occur, these could be repaired using normal building maintenance techniques in consultation with the relevant authorities.

Houses

- The houses are located outside the extents of Longwalls 301 to 303.
- The houses are expected to remain safe and serviceable (or as otherwise identified during the pre-mining inspection, noting that some buildings have deteriorated).
- Negligible damage (i.e. hairline [<0.1 mm] or fine cracks which do not need repair [<1 mm]) is expected for all houses with a confidence level greater than 99%.
- As a contingency, should greater cracking occur, these could be repaired using normal building maintenance techniques in consultation with the relevant authorities.

Water Storage Tanks

- The water storage tanks (including the trickle filter tank) are located outside the extents of Longwalls 301 to 303.
- Given the low magnitude of predicted subsidence parameters, it is not expected that preventative measures would be required.
- It is expected that these tanks can be maintained in a safe and serviceable condition (or as otherwise identified during the pre-mining inspection, noting that some structures have deteriorated).
- As a management measure, if the tank base or lower sections of the tank walls were to develop leakage or if pre-existing leakage were to increase, the tank could be temporarily drained and lined with HDPE to establish a watertight envelope.
- As a management measure, should cracking occur (i.e. more than negligible damage) in the columns, elevated ring beam or central access shaft, these could be repaired using normal building maintenance techniques in consultation with the relevant authorities.

Gas Storage Tank

- The gas storage tank is located outside the extents of Longwalls 301 to 303, by more than 310 m.
- The maximum predicted subsidence parameters are negligible and therefore unlikely to adversely impact on the tank.
- The gas storage tank is supported on a concrete slab above the ground and therefore is unlikely to experience the mining induced curvatures and strains.

Kiln

- The kiln is located outside the extents of Longwalls 301 to 303 (north of Longwall 302).
- The kiln appears to have a pre-existing tilt (refer Section 6.6) and although predicted tilt is only 1.5 mm/m it is recommended that a barrier fence be erected around the kiln to maintain an exclusion zone with a radius of 1.5 times the chimney height.

Telecommunication Towers Compounds and Cables

- The optical fibre cable is direct buried and, therefore, will not be impacted by the tilts resulting from the extraction of Longwalls 301-303.
- The buried optical fibre cable is likely to experience curvatures and ground strains resulting from the extraction of Longwalls 301-303.
- The predicted curvatures and strains for the optical fibre cable are similar to those where longwalls in the Southern Coalfield have previously mined directly beneath similar cables.
- Based on the predicted curvatures and strains, it is unlikely the copper telecommunications cables would experience adverse impacts.
- The magnitude of tilt predicted at the telecommunications towers (and compounds) is very small (less than 1%) and is unlikely to be adversely impacted.
- It is expected that the building enclosure would remain in safe and serviceable conditions during and after mining.

Private Access Road/Tracks

- The private roads at the Garrawarra Centre Complex with bitumen seals are located outside the proposed longwall extents. Experience from the Southern Coalfield indicates that the impacts on these roads are not expected.
- Short lengths of road comprising chip seal or gravel surface are located near or above the proposed longwalls. Potential impacts to these roads may include minor and isolated cracks. Any impacts can be remediated using normal road maintenance techniques.
- It is expected that the private roads can be maintained in safe and serviceable conditions.

Powerlines

- The aerial conductors are supported by timber poles above the ground and therefore are not expected to experience adverse impacts due to curvature or strain.
- The buried cables could experience the mining induced curvatures and strains.

- Extensive experience of mining beneath aerial and buried powerlines in the Southern Coalfield indicates that the potential mining impacts are rare and generally of a minor nature.

Water Pipelines

- The distribution network at the Garrawarra Centre Complex comprises Cast Iron Cement Lined (CICL) pipelines with diameters ranging between 150 mm and 300 mm.
- Experience from the Southern Coalfield indicates that the potential impacts on these types of pipelines are rare and generally of a minor nature.
- It is possible that some minor leaks could develop as a result of the extraction of Longwalls 301 to 303. It is expected that any impacts could be remediated by locally exposing the pipeline and repairing or replacing the affected section.
- It is expected that the water services can be maintained in safe and serviceable conditions.

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 20 October 2016. Attendees at the risk assessment meeting included representatives from Metropolitan Coal, NSW Health, MSEC, John Matheson and Associates, Resource Strategies and Axys Consulting (risk assessment facilitator).

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

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

A number of risk control measures and procedures were identified during the risk assessment which considered the extraction of coal beneath the land within the Study area and in proximity to the NSW Health assets, and are summarised as follows:

Baseline Data / Validation

1. Provide a copy of the JMA (2016) report to NSW Health.
2. Carry out a visual / baseline audit of the NSW Health assets (i.e. occupied buildings, water storage tanks, gas storage tank and private roads) within the Study area.

Management / Monitoring / Response Measures

3. Establish a key contacts list between Peabody and NSW Health to provide a regular update of status of mining activities, and for ongoing liaison.
4. Install security fencing and signage (complete with entry gate) around the perimeter of both large water tanks during active mining of Longwall 301 to 303 that may result in impacts on the water towers.
5. Conduct visual inspections of the private roads within the Garrawarra Centre Complex during active mining to document the condition and serviceability.

Contingency Planning

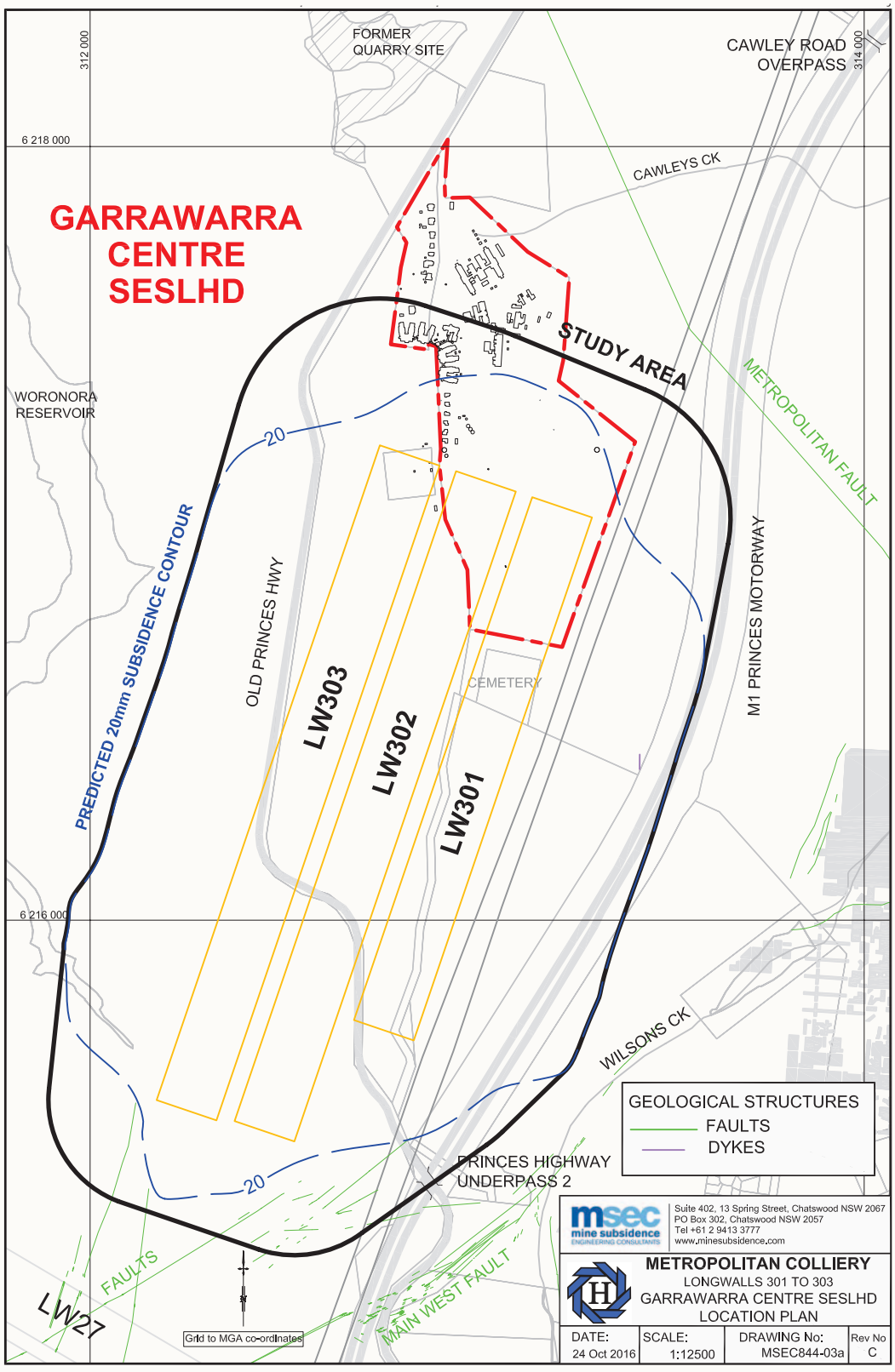
6. Include in the BFMP a table of key contacts of water suppliers that could assist to provide additional water for Garrawarra Centre Complex (if required).

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 4.

Table 4
Program for Implementation of Proposed Risk Control Measures and Procedures

	Risk Control Measure / Procedure	BFMP Section	Proposed Timing
Baseline Data / Validation			
1	Provide a copy of the JMA (2016) report to NSW Health	Section 6	Complete
2	Carry out a visual / baseline audit of the NSW Health assets (i.e. occupied buildings, water storage tanks, gas storage tank and private roads) in the Study area	Sections 6, 6.4, 6.5 and 7.2.1	Prior to LW301, or as otherwise agreed with NSW Health
Management / Monitoring / Response Measures			
3	Establish key contacts list in the BFMP	Section 6.9	Complete
4	Install security fencing and signage (complete with entry gate) around the perimeter of large water storage tanks during active mining of Longwall 301 to 303 that may result in impacts on the water towers	Section 6.4	Prior to LW301, or as otherwise agreed with NSW Health
5	Conduct visual inspections of the private roads within the Garrawarra Centre Complex during active subsidence	Section 7.2.1	As prescribed in Table 6
Contingency Planning			
6	Include a list of key contacts of water suppliers that could assist to provide additional water for Garrawarra Centre Complex (if required)	Section 8	Complete



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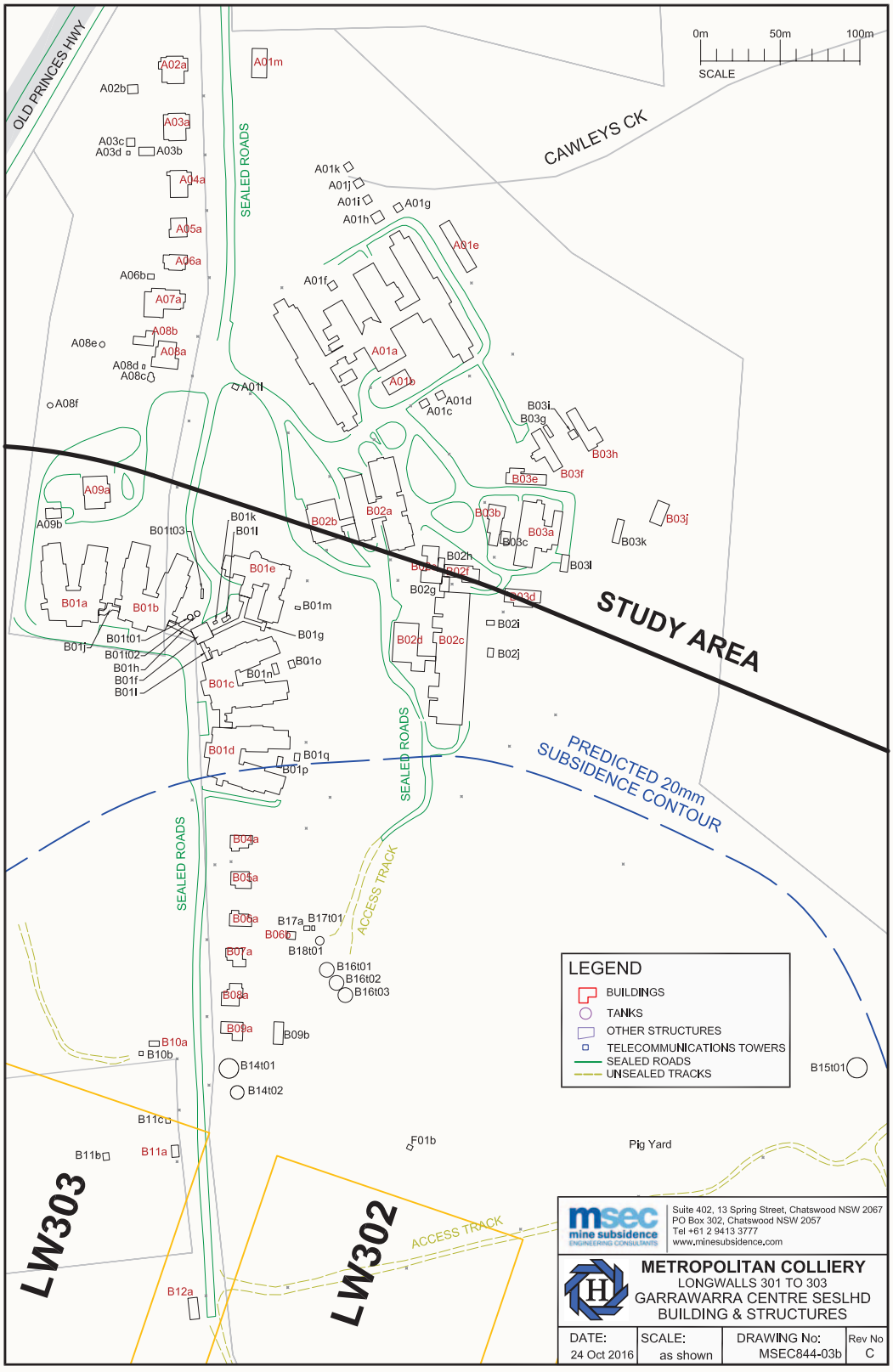
Resource Strategies

Peabody ENERGY

METROPOLITAN COAL

Garrawarra Centre Complex

Figure 5

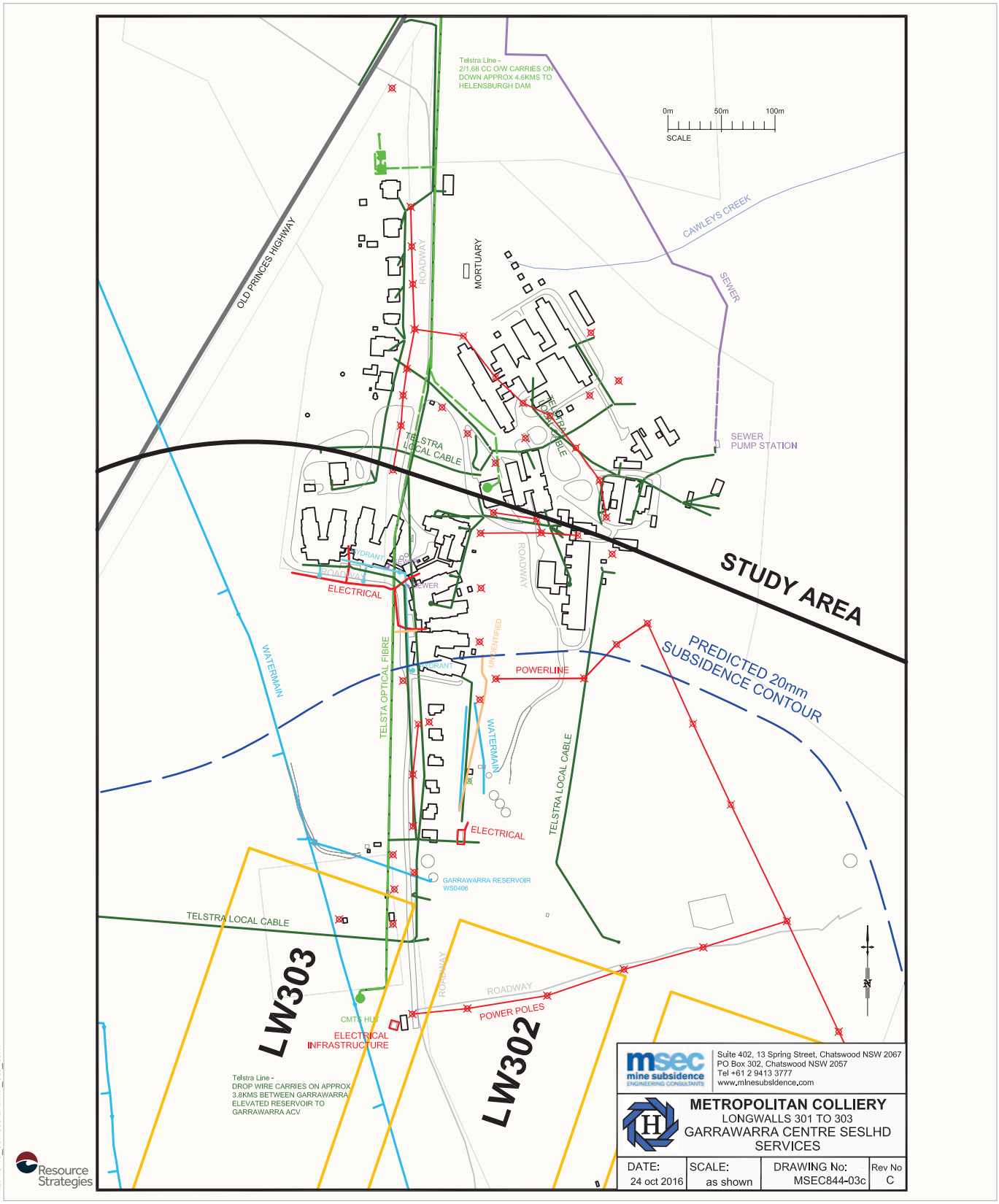


Peabody ENERGY

METROPOLITAN COAL

Garrawarra Centre Complex
- Buildings & Structures

Figure 6



Peabody ENERGY

METROPOLITAN COAL

Garrawarra Centre Complex
- Services

Figure 7

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.*

Of specific relevance to the Garrawarra Centre Complex, a subsidence impact performance measure outlined in Table 1 of Condition 1, Schedule 3 in relation to items of historical or heritage significance at the Garrawarra Centre is:

> *Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing.*

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

- no greater tilt impact to buildings than Category A or B (i.e. mining induced ground tilt of less than 7 mm/m) for items of historical or heritage significance (i.e. either 'high' or 'exceptional' in the *Conservation Plan for the Garrawarra Centre for Aged Care* [Howard Tanner & Associates, 1993]);
- no greater strain impact to buildings than Category 0 or 1 (i.e. crack width of less than 1 mm) for items of historical or heritage significance (i.e. either 'high' or 'exceptional' in the *Conservation Plan for the Garrawarra Centre for Aged Care* [Howard Tanner & Associates, 1993]);
- no more than repairable (minor) defects (cracks, etc.) in the structural integrity for all other buildings, houses, structures and other services (including telecommunications towers and compounds, powerlines, pipelines and associated connections) due to mining;
- the electrical clearance from vegetation is maintained;
- serviceability of the private roads and access roads/tracks has been maintained; and
- the land in general is expected to experience minor cracking consistent with that observed during the extraction of previous longwalls at Metropolitan Coal (i.e. no more than minor cracking).

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

6 BASELINE DATA

An audit on the occupied NSW Health assets at the Garrawarra Centre Complex (i.e. houses and aged care buildings) will be conducted within the Study area prior to extraction of Longwall 301 (or as otherwise agreed with NSW Health) to document the current condition of building structures.

John Matheson and Associates (JMA) (2016) has prepared a preliminary structural inspection report for the Garrawarra Centre Complex and includes the construction type of different buildings / structures, including abandoned (non-occupied) buildings. A copy of the report has been provided to NSW Health.

6.1 HOSPITAL BUILDINGS (ABANDONED)

The locations of the hospital building structures (A01a-A01k and B03a-B03l) at the Garrawarra Centre Complex are shown on Figure 6.

No abandoned hospital buildings will be directly undermined by Longwalls 301-303. The abandoned hospital buildings are located more than 375 m away from the nearest longwall. No hospital buildings (including Former Male Wards [i.e. Wards 1 to 8 and Dining Room], Former Female Wards [i.e. Wards 1 to 9 and Library/Canteen], Laundry/Boilerhouse or Workshops nor the Gatehouse and Gate Piers are within the predicted 20 mm subsidence contour for Longwalls 301-303.

Photographs of the abandoned hospital building structures are shown on Plates 1 to 4.

Plates 1 & 2 – Abandoned Hospital Buildings [A01a] {Former Male Wards} (Source: MSEC, 2016)

Plates 3 & 4 – Abandoned Hospital Buildings [B03a] {Laundry / Boilerhouse} (Source: MSEC, 2016)

6.2 AGED CARE BUILDINGS

The locations of the aged care building structures (B01a-B01j and B02a-B02h) and other associated structures (B01k-B01q and B02i-B02j) at the Garrawarra Centre Complex are shown on Figure 6.

No aged care building structures will be directly undermined by Longwalls 301-303. The aged care buildings are located more than 210 m away from the nearest longwall. With the exception of building structure B01d (administration), no aged care buildings (including the Nurses Quarters and Administration/Kitchen Group) are within the predicted 20 mm subsidence contour for Longwalls 301-303.

Photographs of the aged care building structures are shown on Plates 5 to 10.

Plates 5 & 6 – Aged Care Building Structures [B01a-B01d] {Administration} (Source: MSEC, 2016)

Plates 7 & 8 – Aged Care Building Structures [B01e] {Nurses Quarters} (Source: MSEC, 2016)


Plates 9 & 10 – Aged Care Building Structures [B02a & B02b] {Administration/Kitchen Group} (Source: MSEC, 2016)

6.3 HOUSES

The locations of the houses (A01m, A02a-A09a and B04a-B09a) and other associated structures (A01l, A02b, A03b-A03d, A06b, A08b-A08f and A09b) at the Garrawarra Centre Complex are shown on Figure 6.

No houses will be directly undermined by Longwalls 301-303.

Houses A01m and A02a-A08a {Former Staff Residences} are located outside the Study area (more than 600 m from the nearest longwalls). House A09a & A09b {Palmer House and adjacent garage/stable} is located outside the predicted 20 mm subsidence contour for Longwalls 301-303.

Houses B04a-B09a {Staff Residences} are within the predicted 20 mm subsidence contour for Longwalls 301-303. The nearest house (B09a) is located more than 60 m away from the Longwall 303.

Photographs of the houses are shown on Plates 11 to 14.


Plates 11 & 12 – Houses [A09a & A09b] {Palmer House and Adjacent Garage/Stable} (Source: MSEC, 2016)

Plates 13 & 14 – Houses [B06a & B08a] {Staff Residences} (Source: MSEC, 2016)

6.4 WATER STORAGE TANKS

The locations of the water storage tanks (B01t01, 101t02, B14t01, B14t02, B16t01-B16t03, B17t01 and B18t01) and the trickle filter tank (B15t01) at the Garrawarra Centre Complex are shown on Figure 6.

It is understood that while the water storage tanks within the Garrawarra Centre Complex (including Garrawarra Reservoir WS0406 and connecting pipelines) are used by Sydney Water, the assets are owned by NSW Health.

No water storage tanks will be directly undermined by Longwalls 301-303. The water storage tanks are within the predicted 20 mm subsidence contour for Longwalls 301-303.

The two large water storage tanks (B14t01 and B14t02) and the below ground water storage tanks (B16t01-B16t03) are shown on Plates 15 and 16. It is noted that no water is currently stored in the elevated tank structure (Plate 15 - reservoir on the left).

Plates 15 & 16 – Large Water Storage Tanks (Source: MSEC, 2016)

The fire water tank and steel tank adjacent the pump house (B17t01 and B18t01), and the trickle filter tank (B15t01) are shown on Plates 17 and 18.

Plates 17 & 18 – Fire Water Tank and Steel Tank Adjacent Pump House, and Trickle Filter Tank (Source: MSEC, 2016)

A baseline audit will be conducted to assess the integrity of the water storage tanks at the Garrawarra Centre Complex. Subject to the outcomes of the baseline audit, Metropolitan Coal will determine the type of temporary fencing and signage required around the two large water storage tanks at the Garrawarra Centre Complex and timing for installation (i.e. during active mining which may result in impact on the tanks).

6.5 GAS STORAGE TANK

The location of the gas storage tank (B01t03) at the Garrawarra Centre Complex is shown on Figure 6.

The gas storage tank will not be directly undermined by Longwalls 301-303. The gas storage tank is located more than 310 m away from the nearest longwall. The gas storage tank is not within the predicted 20 mm subsidence contour for Longwalls 301-303.

The gas storage tank is shown on Plate 19.

Plate 19 – Gas Storage Tank (Source: MSEC, 2016)

A baseline audit will be conducted to confirm the system of connection between gas storage tank and associated pipeline(s) at the Garrawarra Centre Complex. Subject to the outcomes of the baseline audit, Metropolitan Coal will consider the need for providing a flexible connection between the gas storage tank and the pipelines(s) at the Garrawarra Centre Complex.

6.6 KILN

The location of the kiln (F01b) at the Garrawarra Centre Complex is shown on Figure 6. While the kiln will not be directly undermined by Longwalls 301-303, it will experience tilt and strains as it is located within the predicted 20 mm subsidence contour for Longwalls 301-303.

The kiln is shown on Plate 20.

Plate 20 – Kiln (Source: JMA, 2016)

As described in Section 8, a barrier fence will be erected around the kiln to maintain an exclusion zone with a radius of 1.5 times the chimney height during active mining (i.e. which may result in impact on the kiln).

6.7 TELECOMMUNICATION TOWERS AND COMPOUNDS

The locations of the telecommunications towers and associated compounds (B06b and B10a-B12a) at the Garrawarra Centre Complex are shown on Figure 6.

Separate BFMPs for the telecommunication towers and compounds will be developed in consultation with the relevant asset owners (i.e. Axicom, Telstra and Sydney Trains).

6.8 OTHER SERVICES

The locations of other built features and services at the Garrawarra Centre Complex include private access roads/tracks, potable water and sewer pipelines, powerlines and telecommunications cables at the Garrawarra Centre Complex are shown on Figure 6.

Separate BFMPs will be developed in consultation with:

- Sydney Water for relevant water infrastructure / services owned by Sydney Water.
- Endeavour Energy for relevant electricity infrastructure / services owned by Endeavour Energy.
- Telstra for relevant telecommunication services owned by Telstra.

6.9 KEY CONTACTS LIST

The list of key contacts for Peabody and NSW Health during the development and implementation of this BFMP are provided in Table 5.

Table 5
List of Key Contacts

Company	Position	Name
Peabody (Metropolitan Coal)	Manager – Technical Services	Jon Degotardi
NSW Health	General Manager	Paula McShane

7 MONITORING

A monitoring program will be implemented to monitor the impacts of the Project on the Garrawarra Centre Complex as determined in consultation with NSW Health. Table 6 summarises the Longwalls 301-303 BFMP-GAR monitoring components.

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

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

The frequency of monitoring will be further 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-GAR.

Table 6
Longwalls 301-303 BFMP-GAR Monitoring Program Overview

Monitoring Component	Locations	Frequency	Parameters
Subsidence Parameters	• As described in the Metropolitan Coal Longwalls 301-303 Subsidence Monitoring Program (SMP). This includes subsidence line along the optic / water line (Figure 8).	• Prior to the commencement of Longwall 301 extraction. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Monitoring parameters include: subsidence, tilt, tensile strain, compressive strain.
Subsidence Impacts			
• Hospital Buildings	• Former Male Wards (Building A01a-i and A01a-v) (Figure 6). • Laundry / Boilerhouse, (Building B03a) (Figure 6). • Seamstress (Building B03d) (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity. • Cracking at pre-existing rock joints. • Tilt at pre-existing tilted piers (at Building B03d only).
• Aged Care Buildings	• Building structures (B01a-B01e) (Figure 6). • Administration / Kitchen Group (Buildings B02a and B02b) (Figure 6). • Former Female Wards (Building B02c) (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity. • Cracking at pre-existing rock joints. • Opening and closing of joints (between Buildings B02a and B02b only).

Table 6 (Continued)
Longwalls 301-303 BFMP-GAR Monitoring Program Overview

Monitoring Component	Locations	Frequency	Parameters
Subsidence Impacts			
• House Structures	• Houses (B04a-B09a) (Figure 6). • Palmer House (A09a) (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity. • Cracking at pre-existing rock joints.
• Water Storage Tanks	• Water storage tanks (B14t01, B14t02, B16t01-B16t03, B17t01 and B18t01) and trickle filter tank (B15t01) (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Weekly visual inspection for B14t02 on commencement of Longwall 303 until wall has retreated away 400m from tank. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity. • Leaks. • Cracking in columns, elevated ring beam or central access shaft (B14t01).
• Gas Storage Tank	• Gas storage tank (B01t03) (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity. • Leaks.
• Kiln	• Kiln (Figure 6).	• Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. • Weekly visual inspection on commencement of Longwall 302 and 303 until wall has retreated 400m away from kiln chimney. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity of the kiln chimney.
• Telecommunications Towers	• As per Figure 8, tower monitoring.	• Prior to the commencement of Longwall 301 extraction. • Within 3 months following the completion of extraction of Longwalls 301-303.	• Structural integrity of the telecommunications tower and compound.
• Other Services (powerlines and poles)	• As per Figure 7, including timber poles and powerlines.	• Prior to the commencement of Longwall 301 extraction. • Within 3 months following the completion of extraction of Longwalls 301-303. • At any time in case of fault or emergency.	• Degradation of structure. • Movement of conductors. • Vegetation clearance. • Land clearance. • Road clearance. • Integrity and function of support clamps or other items.

Table 6 (Continued)
Longwalls 301-303 BFMP-GAR Monitoring Program Overview

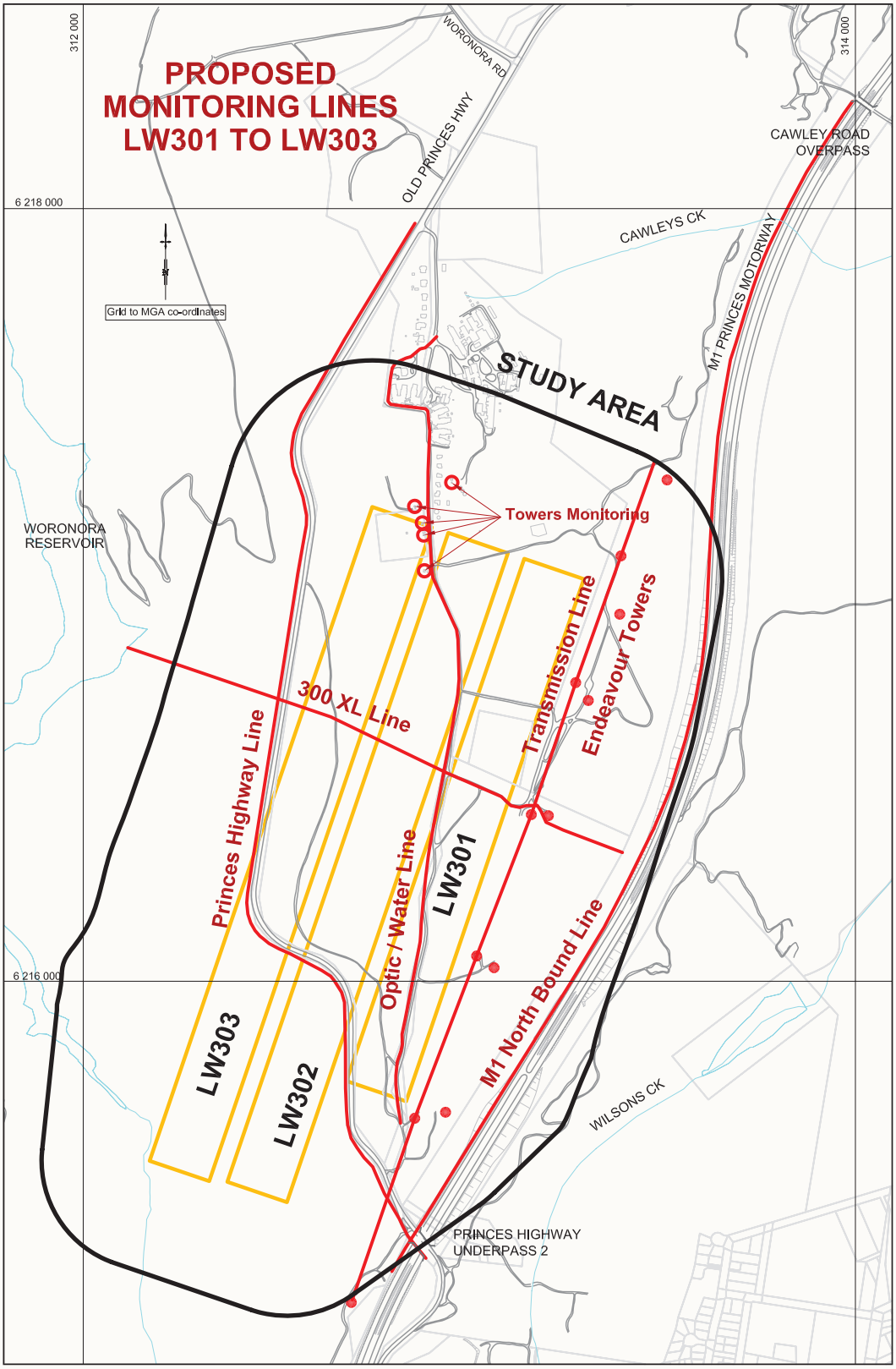
Monitoring Component	Locations	Frequency	Parameters
Subsidence Impacts (Continued)			
• Other Services (pipelines)	• As per Figures 7 and 8, including water pipelines.	• Prior to the commencement of Longwall 301 extraction. • Following the completion of extraction of Longwalls 301, 302 and 303.	• Surface ground cracks. • Cracks or leaks in the pipelines. • Fittings can be accessed beneath surface fittings and are operable.
• Private Roads and Access Roads/ Tracks	• Within 600 m of Longwalls 301-303 extraction.	• Prior to the commencement of Longwall 301 extraction. • Within 3 months following the completion of extraction of Longwalls 301-303. • Opportunistic visual observations during catchment visits as per the Longwalls 301-303 Land Management Plan.	• Surface cracks, buckling and general safety.

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 8).

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 Garrawarra Centre Complex will be measured by a single survey line along the nearby optic / water line, and by survey of telecommunications towers.



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Resource Strategies

Peabody ENERGY

METROPOLITAN COAL

Longwalls 301-303 Subsidence Monitoring
Layout

Figure 8

7.2 SUBSIDENCE IMPACTS

7.2.1 Garrawarra Centre Complex

Visual inspections will be conducted at the Garrawarra Centre Complex at the buildings and structures, and private roads prescribed in Table 6 or as otherwise determined in consultation with NSW Health.

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 3) and reported in accordance with the Project Approval conditions.

7.2.2 Access Roads/Tracks

Visual inspection of the access roads/tracks to the NSW Health assets will occur prior to the commencement of Longwall 301, and following extraction of each longwall panel.

Opportunistic visual observations of access roads/tracks would 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 NSW Health access roads/tracks 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 the access road/track to the NSW Health 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.

7.3 ENVIRONMENTAL CONSEQUENCES

Metropolitan Coal and NSW Health 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 NSW Health 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 the Garrawarra Centre Complex are considered to be applicable.

For buildings or houses requiring repairs, normal building maintenance techniques could be applied in consultation with NSW Health and relevant authorities.

For the water storage tanks, if the tank base or lower sections of the tank walls were to develop leakage or if pre-existing leakage were to increase, the tank could be temporarily drained and lined with high-density polyethylene (HDPE) to establish a watertight envelope. For water pipelines, leaks could be remediated by locally exposing the pipeline and repairing or replacing the affected section.

A list of potential water suppliers (and key contact details) to temporarily supply water to the Garrawarra Centre Complex (if required) is provided below:

- Aquarius (02 4776 2496); and
- CAC Transport (0418 386 177).

For powerlines and poles, management measures may include alteration of conductor tensions or strengthening of timber poles footings.

Where significant subsidence impacts on access roads/tracks are detected (e.g. those that affect the serviceability) or at any time Metropolitan Coal, NSW Health or the landholder considers that the integrity of the access roads/tracks may be compromised, the following management measures will be implemented. Where significant cracks are detected, the cracks would be repaired as soon as practicable in consultation with the landholder. This may include the use of earthmoving equipment if considered the most appropriate means of repair. Appropriate sedimentation controls will be implemented during repair works. Management measures for access roads/tracks will be implemented in accordance with the Longwalls 301-303 Land Management Plan.

For the kiln, a barrier fence will be erected to maintain an exclusion zone with a radius of 1.5 times the chimney height during active mining (i.e. which may result in impact on the kiln).

Management measures for other services at the Garrawarra Centre Complex have also been developed separately with each asset owner in the BFMPs (e.g. Endeavour Energy, Sydney Water, Telstra, Axicom and Sydney Trains).

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 BFMP, Metropolitan Coal will implement the following Contingency Plan:

- The observation will be reported to the Metropolitan Coal Manager - Technical Services or the Manager – Safety & Environmental 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-GAR.
- If relating to an access road/track, the observation will be recorded in the Metropolitan Coal Longwalls 301-303 Land Management Plan – Subsidence Impact Register.
- Metropolitan Coal will report any exceedance of the performance measure or indicators to the DP&E and NSW Health 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.
- 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.

  Potential 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 *Mine Subsidence Compensation Regulation, 2002* 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). Potential contingency measures that could be considered in the event the performance measures or indicators are exceeded are summarised in Table 7.

Table 7
Potential Contingency Measures

Environmental Consequence	Potential Contingency Measures	
	Measure	**Description**
Impact on:		
Buildings or houses	Repair of building	• Building maintenance techniques (in consultation with the relevant authorities). • Installation of supports.
Items of historical or heritage significance	Repair of building	• Building maintenance techniques (in consultation with the relevant heritage authorities).
Water storage tanks	Redundancy	• Alternate water storage tanks in Helensburgh.
Water pipelines	Replacement	• Construction of new section of water main.
	Contingency	• Alternative water supply provided to service properties while repair of the water main is in progress.
Timber poles	Stabilisation	• Installation of supports.
	Rebuilding	• Construction of new pole(s) or emergency structures.
Powerline wires	Stabilisation	• Sheaving of conductors and/or earth wires.
	Rebuilding	• Construction of new powerlines.
Telecommunication towers	Stabilisation	• Installation of tower supports such as guy wires in response to tilt.
	Rebuilding	• Construction of new tower and foundations.
	Contingency	• Deployment of temporary broadcast/receiving tower as per special event infrastructure (temporary mobile tower systems available).
	Redundancy	• Alternate phone towers nearby.
Building compounds	Repair of building	• Building maintenance techniques. • Replacement of building compound.
Kiln	Stabilisation techniques	• Installation of supports.
Fibre Optic Cable (Telstra)	Stabilisation	• Technician travels to tower and undertakes localised monitoring to identify location of issue. Soil removed at location to allow fibre to flex.
	Emergency	• Spare cores available in cable. Bypass affected cores to re-establish functionality.
	Rebuilding	• Fibre heat treatment to soften compression point and return affected cores to operation.
	Redundancy	• Phone tower operation requires 2 cores; fibre supplying tower has 12 cores, 10 spare.
Copper Cable	Emergency	• Failure in local phone cables at Garrawarra Centre Complex rectified by repairs. If extended duration outage then temporary mobile phone connection to be provided to Garrawarra Centre Complex commercial user by Telstra.
	Redundancy	• Mobile phone coverage to replace landlines, all commercial carriers have towers located at Garrawarra Centre Complex.

10 TARP – MANAGEMENT TOOL

The framework for the various components of the Longwalls 301-303 BFMP-GAR are summarised in the Longwalls 301-303 BFMP-GAR TARP shown in Table 8. The Longwalls 301-303 BFMP-GAR 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.

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). However 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 Garrawarra Centre Complex.

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-GAR will inform the appropriate type and frequency of monitoring 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, and during the mining of Longwall 302, Metropolitan Coal will review the available subsidence monitoring results and assess the changes to, and impacts on, NSW Health assets.

Table 8
Longwalls 301-303 BFMP-GAR Trigger Action Response Plan

Condition	Baseline Conditions	Predicted Impacts	Restoration/Contingency Phase
Trigger	• Buildings, houses and structures are safe, serviceable and repairable or as otherwise identified by pre-mining inspection. • Water and sewer pipelines and water storage tanks are safe serviceable and repairable or as otherwise identified by pre-mining inspection. • Timber poles and high voltage powerlines are safe serviceable and repairable or as otherwise identified by pre-mining inspection. • Fibre optic cable and cobber cables are safe and serviceable. • Telecommunications towers and building compounds are safe serviceable and repairable (or as otherwise identified by pre-mining inspection). • Access roads/tracks serviceable.	• Negligible damage (that is fine or hair line cracks that do not require repair) for items of historical or heritage significance at the Garrawarra Centre Complex (i.e. large buildings which have important heritage values). • Negligible and repairable impacts for all other buildings, houses and structures. • Repairable impact (e.g. minor leakage) to pipelines and associated assets. • Negligible impact to timber power poles. • Negligible impact to fibre optic and copper cables and associated infrastructure (connection points at hut). • Negligible and repairable impacts to telecommunications towers and building compounds. • Surface cracking developed on access road/track.	• Damage to items of historical or heritage significance at the Garrawarra Centre Complex (i.e. large buildings which have important heritage values) requiring repair. • Detection of building structural integrity comprised. • Detection of water storage tank structural integrity comprised. • Detection of kiln structural integrity comprised. • Reduction in serviceability of the pipelines. • Significant ground tension cracks developed about the pipelines. • Detection of transmission fault or structural integrity or function of connection pits. • Reduction in structural integrity or function of poles and/or high voltage power line. • Reduced structural integrity of telecommunications tower and compounds. • Tension cracks developed on access roads/tracks.
Action	Establish baseline data. Includes: • Pre-mining inspection. • Pre-extraction subsidence survey as per the Longwalls 301-303 Subsidence Monitoring Program.	• Conduct monitoring as per Table 6. • Management measures as described in Section 8. • Update the 'Built Features Management Plan – Subsidence Impact Register'. • For access roads/tracks, update the 'Land Management Plan – Subsidence Impact Register'. • Repair of access roads/tracks where significant cracks are detected (e.g. those that affect serviceability).	• Implement Contingency Plan as per Section 9. • Implement measures in relation to maintenance of access roads/tracks as described in Land Management Plan.
Position of Decision-making	• Manager - Technical Services. • NSW Health.	• Manager - Technical Services. • NSW Health.	• General Manager. • NSW Health.

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.

As described in Section 2, this BFMP 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.

NSW Health 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 Manager – Safety & Environmental Services 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 Manager – Safety & Environmental Services 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 Manager – Safety & Environmental Services.

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 Manager – Safety & Environmental Services 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.

The Manager – Safety & Environmental Services 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 Manager – Safety & Environmental Services 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.*

Howard Tanner & Associates (1993) *Conservation Plan for the Garrawarra Centre for Aged Care.*

John Matheson and Associates (2016) *Garrawarra: R0295-Rev 2 Preliminary Structural Inspection Report*. 30 September 2016.

Mine Subsidence Engineering Consultants (2008) *Subsidence Assessment Report on the Prediction of Subsidence Parameters and the Assessment of Mine Subsidence Impacts on Natural Features and Surface Infrastructure Resulting from the Proposed Extraction of Longwalls 20 to 44 at Metropolitan Colliery in Support of a Part 3A Application.*

Mine Subsidence Engineering Consultants (2016) *Metropolitan Colliery – Proposed Longwalls 301 to 303 Subsidence Predictions and Impact Assessments for the Garrawarra Complex*, dated 24 October 2016.

APPENDIX 1

MSEC (2016) METROPOLITAN COLLIERY – PROPOSED LONGWALLS 301 TO 303 - SUBSIDENCE PREDICTIONS AND IMPACT ASSESSMENTS FOR THE GARRAWARRA COMPLEX, DATED 24 OCTOBER 2016

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24th October 2016

Jon Degotardi
Peabody Energy Australia
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PO Box 402
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Ref: MSEC844-03

Dear Jon,

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

This letter report summarises the predicted subsidence movements and the assessed subsidence impacts for the built features of the Garrawarra Complex resulting from the extraction of the proposed Longwalls 301 to 303 at Metropolitan Colliery. Several services within the Garrawarra Complex are owned by other stakeholders and will be assessed and managed as necessary, through consultation with the relevant owners.

The locations of the Garrawarra Complex and the proposed longwalls are shown in the attached Drawing No. MSEC844-03a. The locations of the building structures, private roads and services on the complex are shown in Drawings Nos. MSEC844-03b and MSEC844-03c.

The type and size of the building structures are shown in the attached Table A.1 at the end of this letter report. There are a total of 86 building structures on the complex, comprising 57 residential or hospital buildings and 29 ancillary structures. All residential and hospital buildings are located outside the footprint of the proposed longwalls. There are also nine water storage tanks and a number of telecommunications towers located within the complex.

The *hospital* building structures are Refs. A01a to A01k and B03a to B03l. These structures are located outside the extents of the longwalls at a minimum distance of 375 metres from Longwalls 301 to 303. The buildings are not currently in use and have been fenced off. Photographs of the main hospital building structures are provided in Figure 1 and Figure 2.

Figure 1 Hospital Building Structure (Ref. A01a)

Figure 2 Hospital Building Structure (Ref. B03a)

The main *aged care* building structures are Refs. B01a to B01j and B02a to B02h. The other buildings associated with the aged care are Refs. B01k to B01q, B02i and B02j.

Structure Refs. B01a to B01d are the main patient wards currently in use and are located at a minimum distance of 210 metres from Longwall 303. These buildings comprise single storey structures founded on a combination of ground slabs, strip footings and pad footings. The external walls are brick-veneer and the internal walls are of lightweight construction. The roofs are steel framed with metal sheeting. Photographs of these structures are provided in Figure 3.

Figure 3 Aged Care Building Structure Refs. B01a to B01d

Structure Ref. B01e is located at a minimum distance of 315 metres from Longwall 303. This building is a double storey brick structure founded on a ground slab with a tiled roof. Photographs of this structure are provided in Figure 4.

Figure 4 Aged Care Building Structure Ref. B01e

Structure Refs. B02a to B02h are located at a minimum distance of 290 metres from Longwall 302. These buildings comprise one and two storey structures founded on strip footings and ground slabs. The perimeter walls are double brick, but in some cases the upper levels have timber framed walls. The suspended floors are timber framed and in some cases are supported on steel frames. The tiled roofs are supported by timber frames. Photographs of two of these structures are provided in Figure 5.

Figure 5 Aged Care Building Structure Refs. B02a and B02b

The *houses* are Refs. A01m, A02a to A09a and B04a to B09a. The other buildings associated with the houses are Refs. A01l, A02b, A03b to A03d, A06b, and A08b to A08f.

Structure Refs. A01m, A02a to A09a are located at a minimum distance of 350 metres from Longwall 303. Structure Ref. A09a is the nearest structure to Longwall 303. This building is a two storey double brick structure on strip footings with timber floor and a tiled roof. Photographs of this house and the associated structure are provided in Figure 6.

Figure 6 House Structure Ref. A09a (left side) and A09b (right side)

Structure Refs. B04a to B09a are located at a minimum distance of 60 metres to a maximum distance of 185 metres from Longwall 303. These houses are one storey structures founded on brick piers and low level perimeter brickwalls with timber floors, fibro walls and tiled roofs. Photographs of two of these houses are provided in Figure 7.

Figure 7 Houses Structure Refs. B06a (left side) and B08a (right side)

The other main structures on the complex include water storage tanks (Refs. B14t01, B14t02, B16t01 to B16t03, B17t01, and B18t01), above ground gas storage tank (Ref. B01t03), trickle filter tank B15t01, and telecommunications towers and compounds (Refs. B06b and B10a to B12a). Photographs of these features are provided in Figure 8 to Figure 12.

Figure 8 Water Storage Tanks Refs. B14t01 and B14t02 (left side) and Refs. B16t01 to B16t03 (right side)

Figure 9 Water Storage Tanks Refs. B17t01 (poly tank) and B18t01 (steel tank)

Figure 10 Gas Storage Tanks Refs. B01t03 and B01t04

Figure 11 Trickle Filter Tank B15t01

Figure 12 Telecommunications Towers and Compounds Refs. B10a (left side) and B12a (right side)

Other built features on the complex include the private roads, potable water and sewer pipelines, powerlines and telecommunications cables.

The predictions and impact assessments for the built features on the Garrawarra Complex are provided in the following sections.

Conventional Subsidence Parameters for the Built Features

The following provides summaries of the maximum predicted conventional movements for the built features 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 or valley closure effects. Discussions on the potential for non-conventional movements are provided in this letter report.

The maximum predicted subsidence, tilt and curvature for each of the building structures and tanks, resulting from the extraction of Longwalls 301 to 303, are provided in Table A.1 at the end of this letter report. The values are the maxima within a distance of 20 metres from the mapped extents of these features.

Summaries of the maximum predicted values of total subsidence, tilt and curvature are provided in: Table 1 for the hospital building structures; Table 2 and Table 3 for the aged care building structures; Table 4 and Table 5 for the houses; Table 6 for the water storage tanks; Table 7 for the above ground gas storage tanks; and Table 8 for the telecommunications towers and compounds.

Table 1 Maximum Predicted Total Subsidence, Tilt and Curvature for the Hospital Building Structures (Refs. A01a to A01k and B03a to B03l)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	< 20	< 0.5	< 0.01	< 0.01
After LW303	< 20	< 0.5	< 0.01	< 0.01

Table 2 Maximum Predicted Total Subsidence, Tilt and Curvature for the Aged Care Building Structures (Refs. B01a to B01c, B01e to B01q, and B02a to B02j)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	< 20	< 0.5	< 0.01	< 0.01
After LW303	< 20	< 0.5	< 0.01	< 0.01

Table 3 Maximum Predicted Total Subsidence, Tilt and Curvature for the Aged Care Building Structures (Ref. B01d)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	< 20	< 0.5	< 0.01	< 0.01
After LW303	25	< 0.5	< 0.01	< 0.01

Table 4 Maximum Predicted Total Subsidence, Tilt and Curvature for the Northern Houses (Refs. A01m and A02a to A09a)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	< 20	< 0.5	< 0.01	< 0.01
After LW303	< 20	< 0.5	< 0.01	< 0.01

Table 5 Maximum Predicted Total Subsidence, Tilt and Curvature for the Southern Houses (Refs. B04a to B09a)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	25	< 0.5	< 0.01	< 0.01
After LW303	100	1.0	< 0.01	< 0.01

Table 6 Maximum Predicted Total Subsidence, Tilt and Curvature for the Water Tanks and Trickle Filter Tank (Refs. B14t01, B14t02, B15t01, B16t01 to B16t03, B17t01 B18t01)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	25	< 0.5	< 0.01	< 0.01
After LW303	125	1.5	0.02	< 0.01

Table 7 Maximum Predicted Total Subsidence, Tilt and Curvature for the Gas Storage Tank (Ref. B01t03)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	< 20	< 0.5	< 0.01	< 0.01
After LW303	< 20	< 0.5	< 0.01	< 0.01

Table 8 Maximum Predicted Total Subsidence, Tilt and Curvature for the Telecommunications Towers and Compounds (Refs. B06b and B10a to B12a)

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})
After LW301	< 20	< 0.5	< 0.01	< 0.01
After LW302	125	2.0	0.03	< 0.01
After LW303	525	3.5	0.03	0.04

A large proportion of the building structures are located outside or close to the Study Area boundary and are not expected to experience measurable conventional vertical subsidence, tilts or curvatures.

The private roads and the services directly associated with the hospital and residential building structures are located outside the footprint of the proposed Longwalls 301 to 303 and are therefore expected to experience negligible predicted movements, consistent with the above tables. A short section of access road and powerlines are located above the northern ends of Longwalls 302 and 303. A summary of the maximum predicted subsidence, tilt and curvature for the services located above the proposed longwalls, resulting from the extraction of Longwalls 301 to 303, is provided in Table 9.

Table 9 Maximum Predicted Total Subsidence, Tilt and Curvature for the Private Roads and Services on the Garrawarra Complex

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})
After LW301	20	< 0.5	< 0.01	< 0.01
After LW302	325	3.0	0.02	0.02
After LW303	450	4.0	0.03	0.03

The maximum predicted total subsidence for the private roads and services is 450 mm. The maximum predicted conventional tilt is 4.0 mm/m (i.e. 0.4 %, or 1 in 250). The maximum predicted conventional curvatures are 0.03 km^{-1} hogging and sagging, which equate to minimum radii of curvature of 33 kilometres.

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 built features 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.

Where features are located above the proposed longwalls, predicted strains have been determined from observed strains above previously extracted longwalls. A histogram of the maximum tensile and compressive strains measured in survey bays located above previously extracted longwalls in the Southern Coalfield is provided in Figure 13. The probability distribution functions, based on a fitted *Generalised Pareto Distribution (GPD)*, have also been shown in this figure.

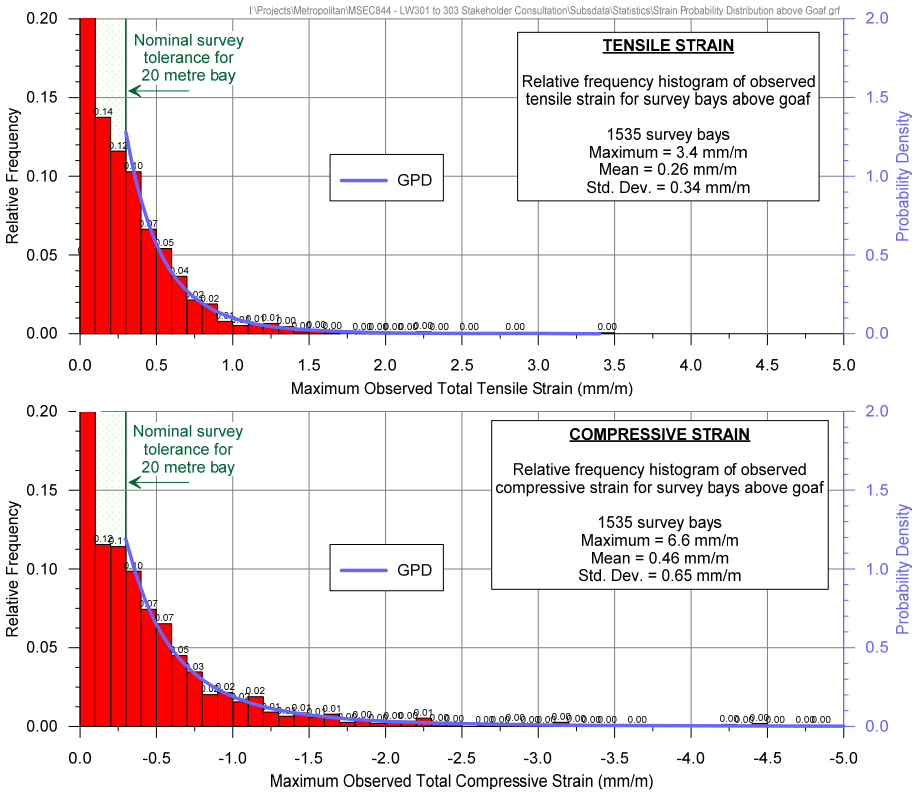

Figure 13 Distributions of the Measured Maximum Tensile and Compressive Strains during the Extraction of Previous Longwalls in the Southern Coalfield Above Goaf

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 goaf, based on the fitted GPDs, is provided in Table 10.

Table 10 Probabilities of Exceedance for Strain for Survey Bays Located above Goaf

Strain (mm/m)		Probability of Exceedance
Compression	-8.0	1 in 1,300
	-6.0	1 in 570
	-4.0	1 in 185
	-2.0	1 in 35
	-1.0	1 in 9
	-0.5	1 in 3
	-0.3	1 in 2
Tension	+0.3	1 in 3
	+0.5	1 in 6
	+1.0	1 in 30
	+2.0	1 in 300
	+3.0	1 in 1,800

The 95 % confidence intervals for the maximum total strains that the individual survey bays above goaf experienced at any time during mining are 0.9 mm/m tensile and 1.6 mm/m compressive. The 99 % confidence intervals for the maximum total strains that the individual survey bays above goaf experienced at any time during mining are 1.5 mm/m tensile and 3.2 mm/m compressive.

Where features are located outside the proposed longwalls, as is the case for the majority of the structures at the Garrawarra complex, the database has been analysed to extract the maximum tensile and compressive strains outside the longwalls, referred to as '*above solid coal'.* The majority of building structures are greater than 100 metres from the longwalls and, therefore, 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 and within 100 metres to 250 metres of the nearest longwall goaf edge.

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 14. The probability distribution functions, based on a fitted *Generalised Pareto Distribution (GPD)*, have also been shown in this figure.

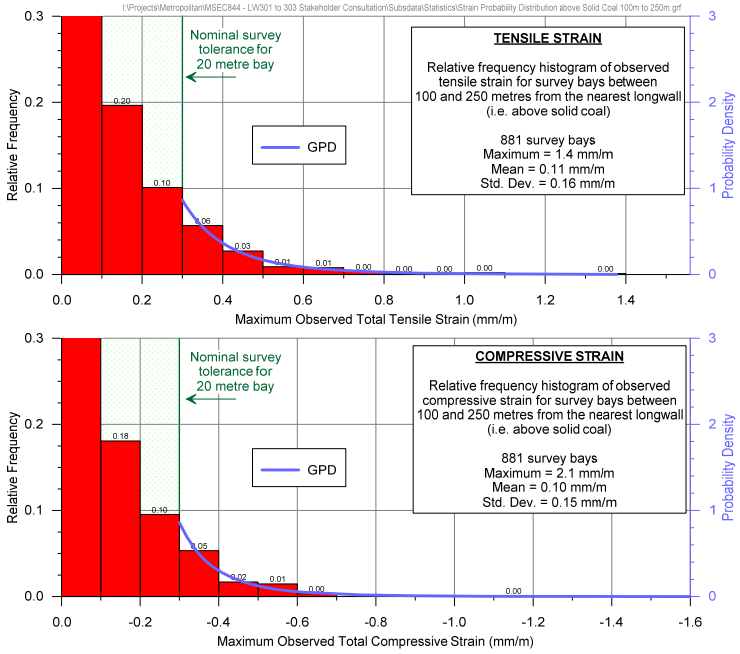

Figure 14 Distributions of the Measured Maximum Tensile and Compressive Strains during the Extraction of Previous Longwalls in the Southern Coalfield Above Solid Coal (100 to 250 metres)

The 95 % confidence intervals for the maximum total strains that the individual survey bays above solid coal (100 to 250 metres) experienced at any time during mining are 0.4 mm/m tensile and 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 0.7 mm/m tensile and 0.6 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. MSEC844-03a.

There are no mapped geological structures above Longwalls 301 to 303 or within the Garrawarra Complex. The Metropolitan Fault is located to the north east of the property boundary for the complex. It is possible that the built features located above the longwalls could experience localised and elevated strains due to unknown geological structures (i.e. anomalies). The location of the Garrawarra complex is at a topographical high point and the likelihood of significant unknown geological structures at his location is considered to be low. The range of strains provided in the previous section include those resulting from irregular anomalous movements.

There are no major streams located within the complex. The built features, therefore, are not expected to experience any measurable valley closure effects.

Impact Assessments for the Building Structures

Longwall layouts have been modified in order to minimise predicted subsidence movements at the Garrawarra building structures B01a to B01e, which house aged care patients and administrative support. The longwall layouts have been modified to limit the predicted conventional curvature to less than normal limits of survey accuracy, or < 0.01 km^{-1}. In addition, based on a longwall offset distance of 100 to 250 metres from buildings B01a to B01e the 95 % confidence intervals for the maximum total strains that the individual survey bays above solid coal experienced at any time during mining are 0.4 mm/m tensile and compressive.

A structural assessment of the building structures was undertaken by John Matheson and Associates Pty Ltd (JMA 2016). A summary of the results of the structural inspection is provided in Table 3 of JMA (2016). The assessment indicates that based on the Longwall 301 to 303 layout, the likelihood of greater than negligible damage developing in the building structures is low, with an assessed probability of exceedance for Category 1 damage (i.e. fine cracks of less than 1mm) of 1% or less for all buildings with the exception of Building B02c. The abandoned building B02c has a probability of exceedance of 10% for Category 1 damage and a probability of exceedance of 1% for a 2 mm crack in Category 2. The assessed probability exceedance of 1% is generally associated with large masonry structures. The assessed probability exceedance for the smaller building structures is generally unlikely to remote. The buildings were expected to remain safe and serviceable and potential impacts could be repaired using normal building maintenance techniques.

A detailed discussion of the structural assessments is provided in the report by JMA (2016).

Impact Assessments for the Water Tanks and Trickle Filter Tank

The maximum predicted tilt for the water tanks and trickle filter tank is 1.5 mm/m (i.e. 0.15 %, or 1 in 667). The magnitude of tilt is very small (i.e. less than 1 %) and therefore unlikely to adversely impact on these structures. Tilt can potentially affect the stored water levels within these tanks. It is recommended that infrastructure owner reviews the potential changes in freeboard resulting from the mining induced tilt.

The maximum predicted conventional curvatures are 0.02 km^{-1} hogging and less than 0.01 km^{-1} sagging, which equate to minimum radii of curvature of 50 kilometres and greater than 100 kilometres, respectively.

The tanks are located at distances of 30 metres or greater from the longwalls. The strain database has therefore 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.

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 15. The probability distribution functions, based on a fitted *Generalised Pareto Distribution (GPD)*, have also been shown in this figure.

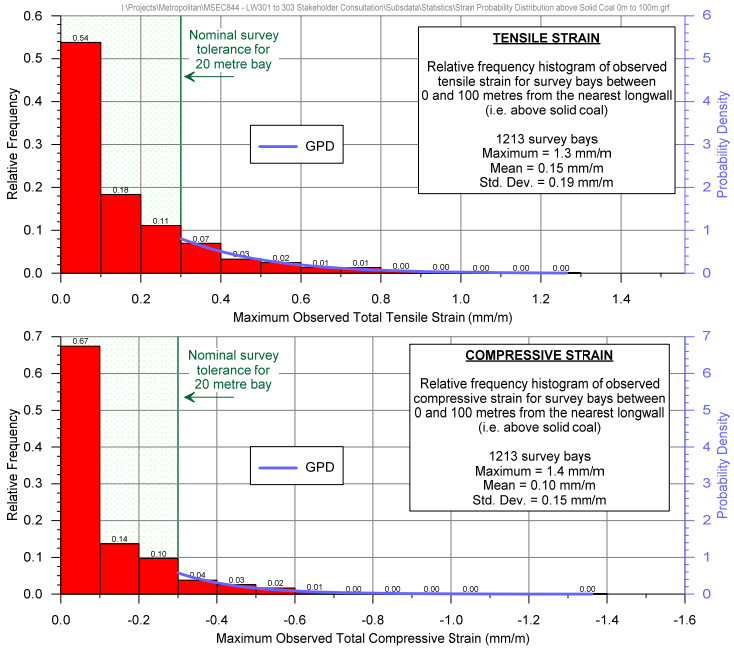

Figure 15 Distributions of the Measured Maximum Tensile and Compressive Strains during the Extraction of Previous Longwalls in the Southern Coalfield Above Solid Coal (0 to 100 metres)

The 95 % confidence intervals for the maximum total strains that the individual survey bays above solid coal (0 to 100 metres) 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.

As assessment of the tanks was undertaken by John Matheson and Associates Pty Ltd (JMA 2016). A summary of the results of the structural inspection is provided in Table 3 of JMA (2016). The assessment indicates that based on the Longwall 301 to 303 layout, the likelihood of greater than negligible damage developing in the water storage tanks is 20% for Category 1 damage (i.e. fine cracks of less than 1mm) of 1% or less. The tanks were expected to remain safe and serviceable and potential impacts could be repaired using normal building maintenance techniques.

It is recommended that monitoring and management strategies are developed, in consultation with the infrastructure owner, to manage the potential impacts on the water storage tanks and trickle filter tank. It is expected that these tanks can be maintained in safe and serviceable conditions with the implementation of the appropriate monitoring and management strategies.

Impact Assessments for the Gas Storage Tank

The gas storage tank is located more than 310 metres from the proposed longwalls. The maximum predicted subsidence parameters are negligible and therefore unlikely to adversely impact on this tank.

The maximum predicted conventional curvatures are 0.01 km^{-1} hogging and less than 0.01 km^{-1} sagging, which equate to minimum radii of curvature of 100 kilometres and greater than 100 kilometres, respectively. The predicted strains are less than 0.5 mm/m tensile and compressive based on the 95 % confidence level.

The gas storage tank is supported on a concrete slab above the ground and therefore is unlikely to experience the mining induced curvatures and strains.

At this distance, it is unlikely that the storage tank and pipework would experience adverse impacts as a result of the extraction of Longwalls 301 to 303.

Impact Assessments for the Telecommunications Towers and Compounds

The maximum predicted tilt for these installations is 3.5 mm/m (i.e. 0.35 %, or 1 in 285). The magnitude of tilt is very small (i.e. less than 1 %) and therefore unlikely to adversely impact on the towers or compounds. Tilt can potentially affect directional antennas (i.e. microwave dishes) and therefore it is recommended that the radio engineers review 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 0.03 km^{-1} hogging and 0.04 km^{-1} sagging, which equate to minimum radii of curvature of 33 kilometres and 25 kilometres, respectively. The predicted strains are 0.9 mm/m tensile and 1.6 mm/m compressive based on the 95 % confidence level and 1.5 mm/m tensile and 3.2 mm/m compressive based on the 99 % confidence level.

The predictions and assessment of potential impacts for the telecommunications towers and compounds are provided in Reports Nos. MSEC844-04, MSEC844-07, and MSEC844-14.

It is recommended that the structural engineers review the structural integrity of the tower structures 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 are either brick structures on ground slabs or steel framed structures supported above the ground on piers. The building enclosures could potentially experience adverse impacts such as cracking of the brickwork or sticky entry doors. It is unlikely that the steel framed structures would experience adverse impacts due to their lightweight constructions and their elevation above natural ground. It is expected that the enclosures would remain in safe and serviceable conditions during and after mining. Adverse impacts could be remediated using normal building maintenance techniques.

Impact Assessments for the Private Roads

The private roads on the complex with bitumen seals are located outside the proposed longwalls. Experience from the Southern Coalfield indicates that the impacts on these roads are not expected.

Short lengths of road comprising chip seal or gravel surface are located above the proposed longwalls. The roads are not well maintained. Potential impacts to these roads may include minor and isolated cracks. Any impacts can be managed using monitoring (visual or ground survey lines) during active subsidence and remediation of impacts using normal road maintenance techniques.

It is expected that the private roads can be maintained in safe and serviceable conditions with the development of the appropriate monitoring and management plans.

Impact Assessments for the Services

The consumer powerlines comprise aerial conductors supported on timber poles and buried cables. Experience from the Southern Coalfield indicates that the potential impacts on these types of powerlines are rare and generally of a minor nature. Some remedial measures have been required, which include adjustments to cable catenaries, pole tilts and consumer cables which connect between the poles and building structures. The incidence of these impacts, however, was very low.

The predictions and assessment of potential impacts for the Telstra optical fibre cable are provided in Report No. MSEC844-04. The predictions and assessments for the copper telecommunications have also been provided in that report and have been reproduced below.

The copper telecommunications cables within the Study Area include both buried and aerial cables. The buried cables can be affected by curvatures and ground strains and the aerial cables can be affected by the changes in cable catenaries. Copper telecommunications cables are flexible and it has been found that these types of cables can typically tolerate strains up to 20 mm/m without adverse impacts.

Extensive experience of mining beneath copper telecommunications cables in the NSW Coalfields, where the observed strains were similar or greater than those predicted for the longwalls, indicates that incidences of impacts is very low and generally of a minor nature. Some remedial measures have been required, which include adjustments to cable catenaries, pole tilts and consumer cables which connect between the poles and building structures. The incidence of these impacts, however, was very low.

The predictions and assessment of potential impacts for the Sydney Water potable water and sewer pipelines are provided in Report No. MSEC844-09. The distribution network on the complex comprises Cast Iron Cement Lined (CICL) pipelines with diameters ranging between 150 mm and 300 mm.

Experience from the Southern Coalfield indicates that the potential impacts on these types of pipelines are rare and generally of a minor nature. It is possible that some minor leaks could develop as a result of the extraction of Longwalls 301 to 303. It is expected that any impacts could be remediated by locally exposing the pipeline and repairing or replacing the affected section.

It is expected that the services can be maintained in safe and serviceable conditions with the development of the appropriate monitoring and management plans.

Summary

The building structures and services associated with the Garrawarra Complex are located outside the proposed longwalls to the north of Longwall 303. The main patient wards are located more than 210 metres from the nearest longwall. Assessments of the building structures were carried out by JMA (2016) and indicate that the structures can be maintained in a safe and serviceable condition during the extraction of Longwalls 301 to 303.

It is expected that the potential impacts on the building structures and services could be managed with the implementation of the appropriate monitoring and management strategies. These strategies should be developed in consultation with SESLHD and other relevant asset owners.

Yours sincerely

Peter DeBono

Attachments:
Drawing No. MSEC844-03a – Longwalls 301 to 303 – Location Plan
Drawing No. MSEC844-03b – Longwalls 301 to 303 – Buildings and Structures
Drawing No. MSEC844-03c – Longwalls 301 to 303 – Services

Table A.1 Predicted Subsidence, Tilt and Curvature for the Building Structures

References:

John Matheson and Associates (JMA 2016), Garrawarra:R0295-Rev 3 *Preliminary Structural Inspection Report.* 10 October 2016

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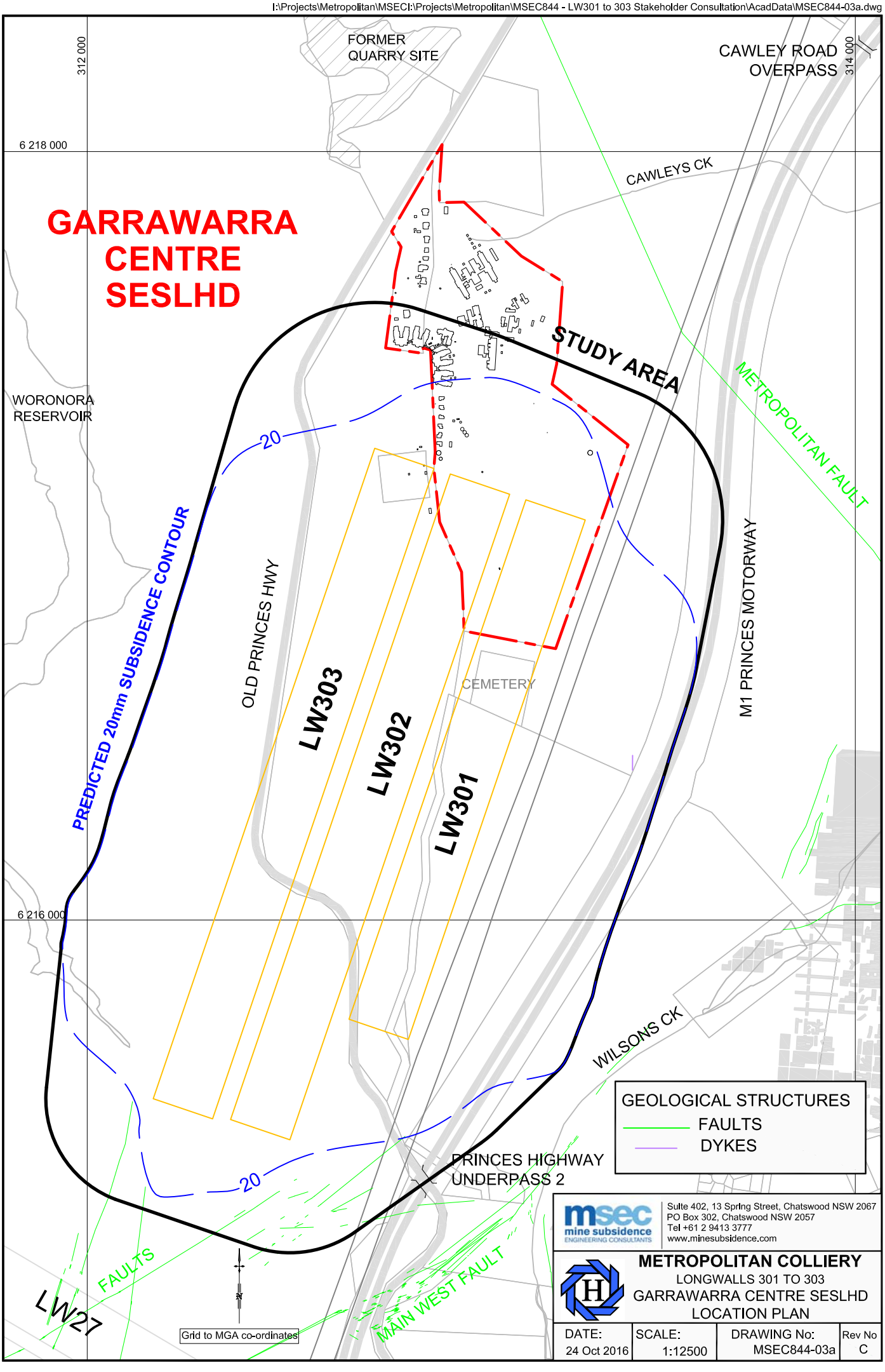

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METROPOLITAN COLLIERY
LONGWALLS 301 TO 303
GARRAWARRA CENTRE SESLHD
LOCATION PLAN

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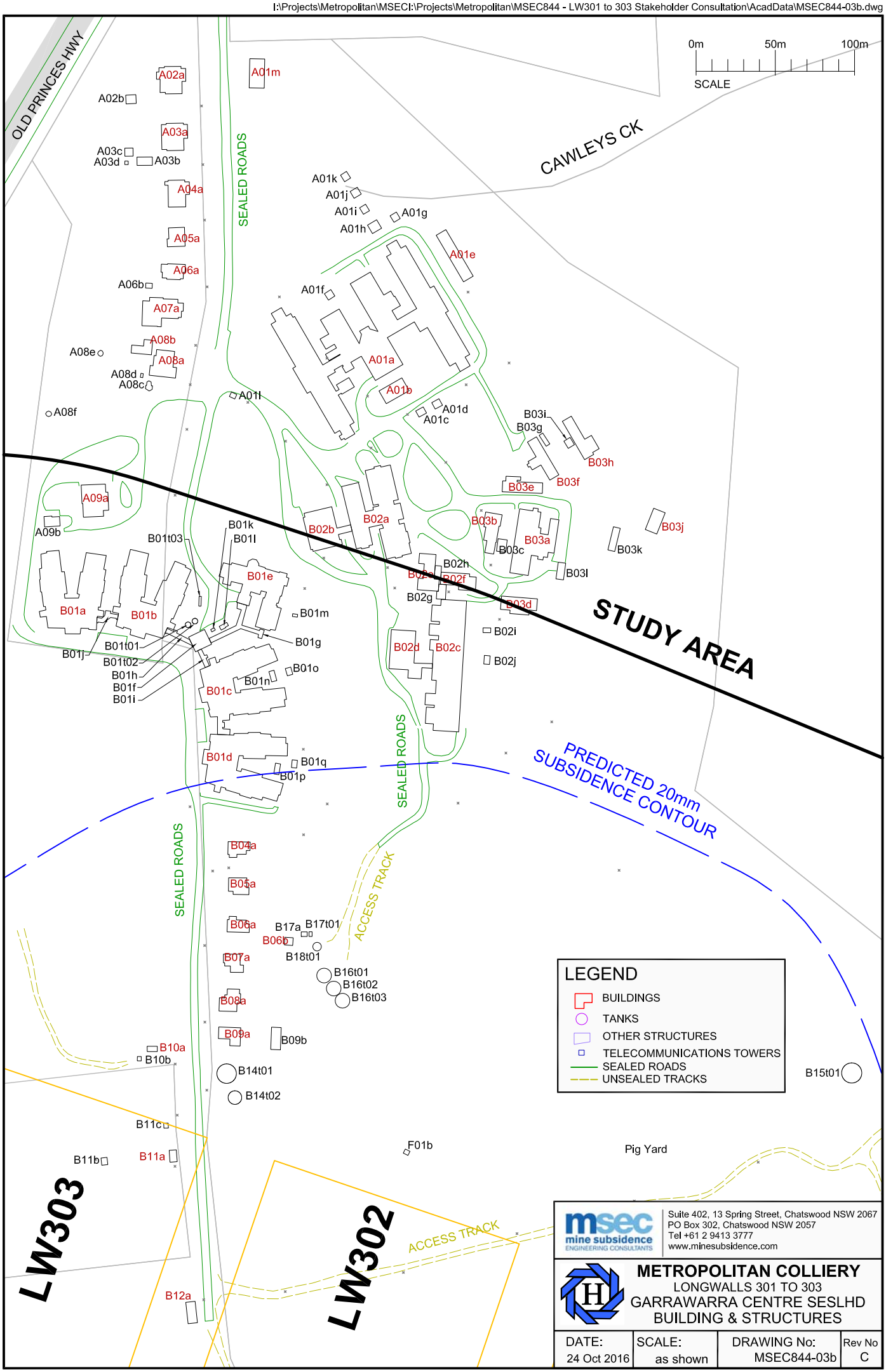

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METROPOLITAN COLLIERY
LONGWALLS 301 TO 303
GARRAWARRA CENTRE SESLHD
BUILDING & STRUCTURES

DATE:	SCALE:	DRAWING No:	Rev No
24 Oct 2016	as shown	MSEC844-03b	C

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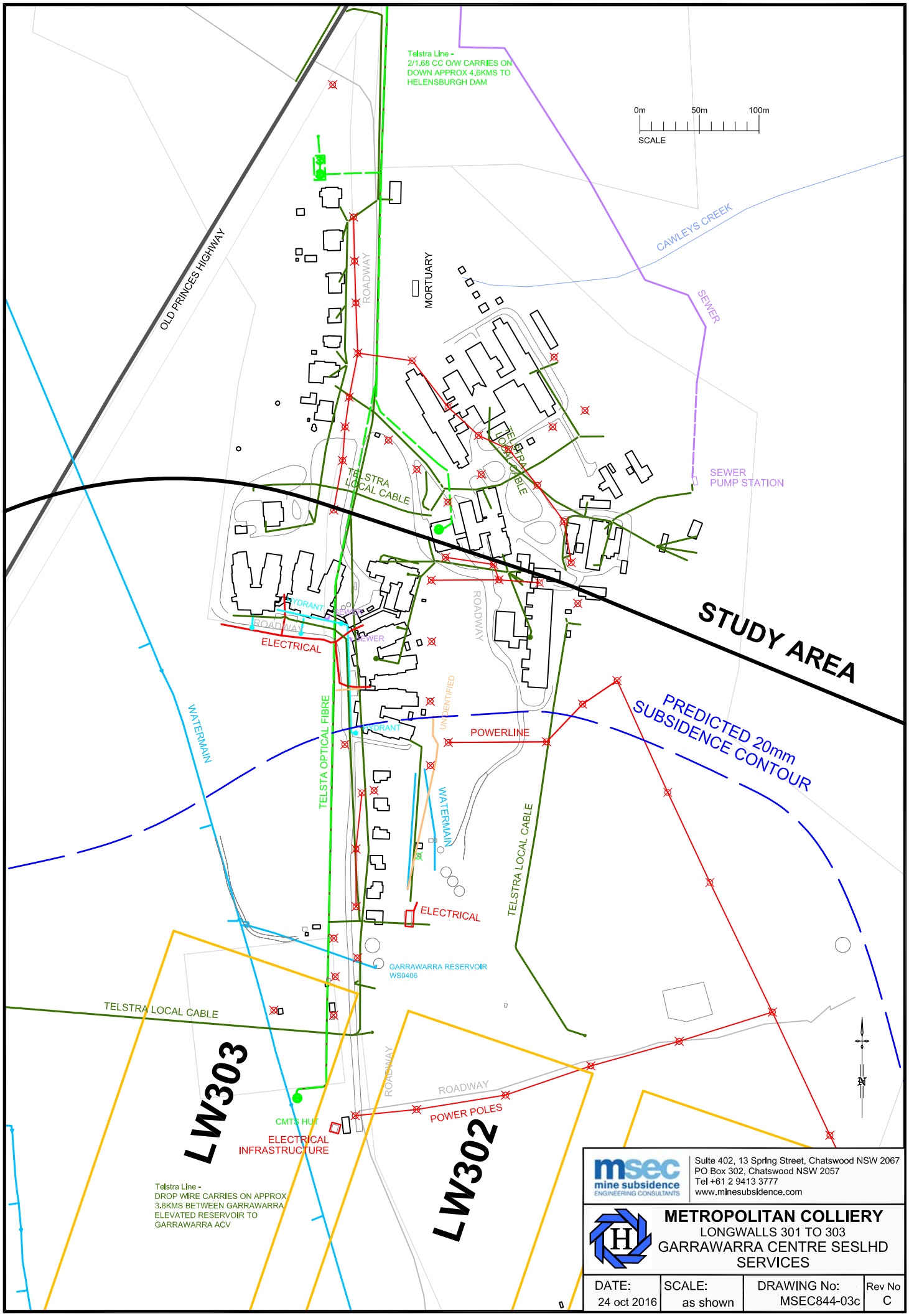

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LONGWALLS 301 TO 303
GARRAWARRA CENTRE SESLHD
SERVICES

DATE:	SCALE:	DRAWING No:	Rev No
24 oct 2016	as shown	MSEC844-03c	C

Table A.1 - Predicted Subsidence, Tilt and Curvature for the Building Structures

Structure Ref.	Description	Maximum Dimension (m)	Predicted Total Subsidence after LW301 (mm)	Predicted Total Subsidence after LW302 (mm)	Predicted Total Subsidence after LW303 (mm)	Predicted Total Tilt after LW301 (mm/m)	Predicted Total Tilt after LW302 (mm/m)	Predicted Total Tilt after LW303 (mm/m)	Predicted Total Hogging Curvature after LW301 (1/km)	Predicted Total Hogging Curvature after LW302 (1/km)	Predicted Total Hogging Curvature after LW303 (1/km)	Predicted Total Sagging Curvature after LW301 (1/km)	Predicted Total Sagging Curvature after LW302 (1/km)	Predicted Total Sagging Curvature after LW303 (1/km)
A01a	Hospital	38	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01b	Hospital	17	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01c	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01d	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01e	Hospital	34	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01f	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01g	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01h	Hospital	7	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01i	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01j	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01k	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01l	Shed	4	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A01m	House	18	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A02a	House	11	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A02b	Shed	6	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A03a	House	16	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A03b	Shed	10	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A03c	Shed	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A03d	Shed	2	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A04a	House	14	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A05a	House	12	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A06a	House	11	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A06b	Shed	4	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A07a	House	16	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08a	House	17	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08b	Shed	13	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08c	Shed	3	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08d	Shed	3	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08e	Shed	2	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A08f	Shed	2	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A09a	House	15	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
A09b	Shed	10	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01a	Retirement Home	14	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01b	Retirement Home	14	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01c	Retirement Home	14	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01d	Retirement Home	15	< 20	< 20	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01e	Retirement Home	19	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01f	Retirement Home	11	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01g	Retirement Home	21	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01h	Retirement Home	19	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01i	Retirement Home	12	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01j	Retirement Home	6	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01k	Shed	3	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01l	Shed	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01m	Shed	3	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01n	Shed	7	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01o	Shed	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01p	Shed	7	< 20	< 20	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01q	Shed	5	< 20	< 20	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01t01	Tank	4	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Table A.1 - Predicted Subsidence, Tilt and Curvature for the Building Structures

Structure Ref.	Description	Maximum Dimension (m)	Predicted Total Subsidence after LW301 (mm)	Predicted Total Subsidence after LW302 (mm)	Predicted Total Subsidence after LW303 (mm)	Predicted Total Tilt after LW301 (mm/m)	Predicted Total Tilt after LW302 (mm/m)	Predicted Total Tilt after LW303 (mm/m)	Predicted Total Hogging Curvature after LW301 (1/km)	Predicted Total Hogging Curvature after LW302 (1/km)	Predicted Total Hogging Curvature after LW303 (1/km)	Predicted Total Sagging Curvature after LW301 (1/km)	Predicted Total Sagging Curvature after LW302 (1/km)	Predicted Total Sagging Curvature after LW303 (1/km)
B01t02	Tank	4	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B01t03	Tank	6	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02a	Retirement Home	40	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02b	Retirement Home	21	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02c	Retirement Home	83	< 20	< 20	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02d	Retirement Home	25	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02e	Retirement Home	15	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02f	Retirement Home	18	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02g	Retirement Home	9	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02h	Retirement Home	8	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02i	Shed	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B02j	Shed	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03a	Hospital	41	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03b	Hospital	11	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03c	Hospital	8	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03d	Hospital	23	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03e	Hospital	25	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03f	Hospital	28	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03g	Hospital	8	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03h	Hospital	28	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03i	Hospital	5	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03j	Hospital	14	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03k	Hospital	15	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B03l	Hospital	11	< 20	< 20	< 20	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B04a	House	14	< 20	< 20	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B05a	House	11	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B06a	House	14	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B06b	Shed	5	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B07a	House	11	< 20	< 20	75	< 0.5	< 0.5	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B08a	House	11	< 20	< 20	75	< 0.5	< 0.5	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B09a	House	14	< 20	25	100	< 0.5	< 0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B09b	Shed	14	< 20	25	100	< 0.5	< 0.5	1.0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B10a	Shed	6	< 20	< 20	100	< 0.5	< 0.5	1.0	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
B10b	Shed	3	< 20	25	100	< 0.5	< 0.5	1.0	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
B11a	Shed	7	< 20	50	200	< 0.5	0.5	2.5	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01
B11b	Shed	5	< 20	50	200	< 0.5	< 0.5	2.5	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
B11c	Shed	3	< 20	25	150	< 0.5	< 0.5	2.0	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
B12a	Shed	14	< 20	125	525	< 0.5	2.0	3.5	< 0.01	0.03	0.03	< 0.01	< 0.01	0.04
B14t01	Reservoir	12	< 20	25	125	< 0.5	< 0.5	1.0	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01
B14t02	Reservoir	8	< 20	25	125	< 0.5	< 0.5	1.5	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01
B15t01	Tank	13	< 20	25	25	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B16t01	Tank	9	< 20	25	75	< 0.5	< 0.5	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B16t02	Tank	9	< 20	25	75	< 0.5	< 0.5	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B16t03	Tank	9	< 20	25	75	< 0.5	< 0.5	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B17a	Pump house	4	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B17t01	Fire water tank	3	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
B18t01	Tank	5	< 20	< 20	50	< 0.5	< 0.5	< 0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

APPENDIX 2

BUILT FEATURES MANAGEMENT PLAN – SUBSIDENCE IMPACT REGISTER

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. transmission line, 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: