



APPIN MINE AREAS 7 AND 9 LONGWALLS 709 TO 711 AND 905 BUILT FEATURES MANAGEMENT PLAN

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DOCUMENT REVISION LOG

Persons authorising this Plan

Name	Title	Date
Gary Brassington	Manager Approvals	October 2021

Document Revisions

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1.0	Original Document	July 2021
1.1	Administrative update	October 2021
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1. INTRODUCTION

1.1 Project Background

South32 Illawarra Metallurgical Coal (IMC) operates the Bulli Seam Operations (BSO) extracting hard coking coal used for steel production.

On 22 December 2011 the Planning and Assessment Commission (PAC), under delegation of the Minister for Planning, approved BSO (MP 08_0150) under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) to continue mining operations until 2041.

This Built Features Management Plan (BFMP) supports the Extraction Plan for mining of coal from Longwalls 709 to 711 in Appin Area 7 (AA7) and Longwall 905 in Appin Area 9 (AA9). The relationship between the BFMP and other components of the Extraction Plan is illustrated in Figure 1 of the Extraction Plan.

1.2 Scope

This BFMP has been prepared in accordance with the BSO Approval (MP 08_0150) Condition 5(g), Schedule 3 as follows:

5. The Proponent shall prepare and implement an Extraction Plan for first and second workings within each longwall mining domain to the satisfaction of the Secretary. Each extraction plan must:
- g) include a Built Features Management Plan, which has been prepared in consultation with DRE and the owners of public infrastructure, to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which:
 - addresses in appropriate detail all items of key public infrastructure and other public infrastructure and all classes of other built features;
 - has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;
 - recommends appropriate pre-mining mitigatory measures to reduce subsidence impacts;
 - recommends appropriate remedial measures and includes commitments to mitigate, repair, replace or compensate all predicted impacts on potentially affected built features in a timely manner; and
 - in the case of all key public infrastructure, and other public infrastructure except roads, trails and associated structures, reports external auditing for compliance with ISO 31000 (or alternative standard agreed with the infrastructure owner) and provides for annual auditing of compliance and effectiveness during extraction of longwalls which may impact the infrastructure;

1.3 Objectives

The objectives of this BFMP are to identify key infrastructure, which may potentially be

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affected by the proposed mining of Longwalls 709 to 711 and 905 and to describe the processes implemented by IMC to develop asset specific Infrastructure Management Plans (IMPs) and Property Subsidence Management Plans (PSMP) for these assets. The BFMP will act as a covering document for the updated IMPs and PSMPs.

Agreements with individual asset owners (referred to as IMPs) are currently in place (for AA7 and 9) and will be updated in consultation with those owners and the relevant agencies, and submitted to the Resources Regulator prior to the extraction of Longwalls 709 to 711 and 905. This BFMP provides an overview the potential impacts to these features from the extraction of these longwalls and documents the arrangements that are currently in place which will be updated for Longwalls 709 to 711 and 905.

The aim of these IMPs is to manage the potential subsidence impacts and/or environmental consequences on affected infrastructure and all classes of other built features in consultation with the asset owner. PSMPs will be prepared on an as needs basis with private landowners in relation to assets such as houses and farm dams. The public infrastructure and other classes of built features identified in the Study Area are shown on the MSEC (2021) figures, MSEC1117-09 to MSEC1117-14.

1.4 Study Area

The Study Area for the Extraction Plan is defined in accordance with MSEC (2021) as the surface area predicted to be affected by the proposed mining of Longwalls 709 to 711 and 905 and encompasses the areas bounded by the following limits:

- A 35° angle of draw line from the maximum depth of cover, which equates to a horizontal distance varying between 530 m and 750 m around the limits of the proposed extraction areas for Longwalls 709 to 711 and 905, and
- The predicted limit of vertical subsidence, taken as the 20 mm subsidence contour, resulting from the extraction of the proposed Longwalls 709 to 711 and 905.

Additionally, features potentially sensitive to far field movements, which includes horizontal, valley closure and upsidence movements that may be outside the 20 mm subsidence zone or 35° angle of draw line have been assessed.

The location of the Longwalls 709 to 711 and 905 Study Area within the BSO is shown in Figure 1.

1.5 Distribution

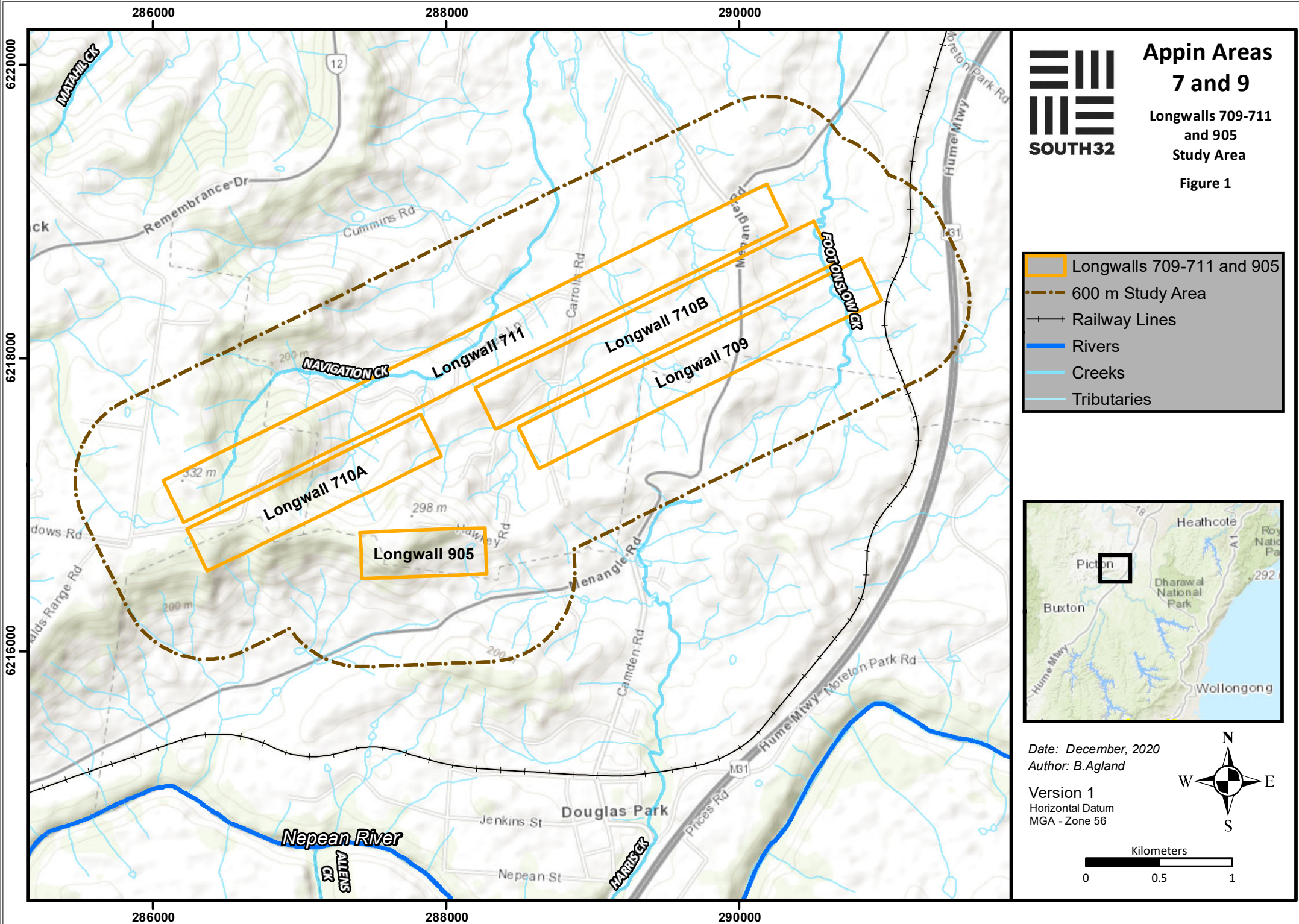
The finalised BFMP (and applicable IMPs) will be distributed to:

- Department of Planning and Environment (DPE);
- Resources Regulator (formally DRE); and
- Owners of affected infrastructure.

The BSO Project Approval requires that the BFMP be developed in consultation with any potentially affected public authorities. This will be achieved through the consultation methods detailed in Section 7.2 and Section 7.3.

IMC will make the BFMP publicly available on the South32 website (Condition 11, Schedule 6). The PSMPs and the IMPs are the agreements between the asset owners and IMC and will not be made public if they include sensitive information.

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2. STATUTORY REQUIREMENTS

Extraction of coal from Longwalls 709 to 711 and 905 will be in accordance with the conditions set out in the BSO Approval, applicable legislation as detailed in Section 2.2 and the requirements of relevant licenses and permits (including conditions attached to mining leases).

2.1 BSO Approval

Condition 5 (l), Schedule 3 of the BSO Approval requires the preparation of a BFMP to manage the potential impacts and/or environmental consequences of the proposed second workings on public infrastructure and other built features (refer Section 1.2).

The specific IMPs also addresses the requirements detailed in Condition 6, Schedule 3 and Condition 2, Schedule 6 of the BSO Approval as shown in Table 1.

Table 1 Management Plan Requirements

Project Approval Conditions	Relevant BFMP Section
Condition 6, Schedule 3 The Proponent shall ensure that the management plans required under Condition 5 (g)-(l) above include: i. an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval; b) a detailed description of the measures that would be implemented to remediate predicted impacts.	Section 4 Section 7
Condition 2, Schedule 6 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; (b) a description of: - the relevant statutory requirements (including any relevant approval, licence or lease conditions); - any relevant limits or performance measures/criteria; - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures; (c) a description of the measures that would be implemented to comply with the relevant statutory, limits, requirements or performance measures/criteria;	Section 3 Section 2 Section 4 Section 4 to 7

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(d) a program to monitor and report on the: - impacts and environmental performance of the project; - effectiveness of any management measures (see c above);	Section 5
(e) a contingency plan to manage any predicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 7
(f) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 9
(g) a protocol for managing and reporting any: - incidents; - complaints; - non-compliances with statutory requirements; and - exceedances of the impact assessment criteria and/or performance criteria; and	Section 8
(h) a protocol for periodic review of the plan.	Section 9

Due consideration has been given to all BSO Approval Conditions in the preparation of this BFMP, including those relating to auditing, rehabilitation and environmental management.

2.2 Legislation and Guidelines

This BFMP conforms to the requirements of the relevant legislation and advisory documents and guidelines.

Details of specific legislation and guidelines applicable to each IMP will be contained within that plan.

2.3 Relevant Leases and Licences

The following licences or permits are applicable to IMC's operations in AA7 and 9:

- Mining Leases as per Table 2.
- Environment Protection Licence (EPL) 2504 which applies to BSO operations. A copy of the licence can be accessed at the EPA website via the following link <http://www.epa.nsw.gov.au/prpoeo/index.htm>
- BSO Mining Operation Plan (MOP) 1/10/2020 to 30/09/2024 (V1.3).
- All relevant Occupational Health, Safety, Environment and Community approvals.
- Any additional leases, licences and approvals resulting from the BSO Approval.

Table 2 Appin Mine Leases, Licences and other Reference Documents

Mining Lease - Document Number	Start	Finish
CCL 767	29 Oct 1991	08 Jul 2029

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CL 388	22 Jan 1992	22 Jan 2034
ML 1382	20 Dec 1995	20 Dec 2037
ML 1433	24 Jul 1998	23 Jul 2019 ¹
ML 1678	27 Sep 2012	26 Sep 2033

The BSO Project is located within the mining tenements listed in Table 2.

¹ Application for the renewal of Mining Lease 1433 which was lodged with the NSW Department of Planning and Environment – Division of Resources and Geoscience (Division) on 18 July 2018. Renewal Pending.



3. BASELINE ASSESSMENT

Built features within the Longwalls 709 to 711 and 905 Study Area were identified and assessed in the MSEC Report (MSEC, 2021), drawing numbers MSEC1117-09 to MSEC1117-14, appended to the Extraction Plan as Appendix A. The built features are listed below in **Table 3** and shown in **Figure 1**.

The assets identified in the Study Area are largely the same as the assets present in the currently mined AA7 and 9. As such there are existing IMPs in place for this infrastructure which detail the management and mitigation measures agreed between IMC and the asset owners (refer **Table 3**). These IMPs will be updated in consultation with asset owners to address the extraction of Longwalls 709 to 711 and 905.

Descriptions of these assets, and the potential impacts on them from the extraction of Longwalls 709 to 711 and 905, are provided in Section 4.

A summary of potential mitigation and management measures are provided in Section 7, however these will be further developed in consultation with the asset owners and included in the updated IMPs for each item prior to mining.

Table 3 Management Documentation for Built Features in Appin Areas 7 and 9

Public Utilities	Management Plan (to be updated if required)
Railways (Main Southern Railway)	Longwall 905 Management Plan for the Main Southern Railway. July 2022. Management Plan for Longwalls 706 to 710 mining beneath the Main Southern Railway. Revision D, 23 June 2020.
Roads (M31 Hume Highway and local roads)	Longwalls 706 to 710 M31 Hume Motorway Rev C dated December 2013. Longwalls 709-711 & 905 Public Road Management Plan. July 2022.
Bridges (associated with road and railways see above)	Longwall 905 Built Structures Management Plan. June 2022. Longwall 709 Built Structures Management Plan Revision 3 dated 22 February 2022.
Culverts (associated with road and railways see above)	See above.
Water, gas or sewerage pipelines	Mining Appin Longwalls 901 to 904 Beneath Sydney Water Sewerage Network, Version 4. April 2015. Mining Appin Longwalls 901 to 904 Beneath Sydney Water Potable Water Network, Version 2. April 2017.
Electricity transmission lines or associated plants	TransGrid Management Plan, Revision 3. 2012. Longwalls 709-711 & 905 Endeavour Energy. July 2022.

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Telecommunications lines or associated plants	AAPT Longwalls 707 to 710 Management Plan, Rev 1, August 2016. Nextgen Longwalls 707 to 710 Management Plan, Rev 1, August 2015. Telstra Longwalls 707 to 710 Management Plan, Rev 1, May 2015. Telstra Longwalls 901 to 902 Management Plan, Rev 1, August 2015. Longwalls 709-711 & 905 Axicom Telecommunications Tower. July 2022.
Houses, farm buildings or sheds, tanks, fences, farm dams, wells or bores,	Specific PSMP will be negotiated with the landowner.
Business or commercial establishments and improvements	Specific PSMP will be negotiated with the landowner.
Areas of heritage or archaeological significance	Heritage Management Plan has been developed.
Permanent Survey Control Marks	Specific PSMP will be negotiated with the Spatial Services NSW. IMC will restore any survey marks disrupted by mining in accordance with the <i>Surveying and Spatial Information Act 2002</i> (SSI Act) and Surveying and Spatial Information Regulation 2020.
Associated structures such as workshops, garages, on-site waste water systems, water or gas tanks, swimming pools or tennis courts	Property specific PSMP will be negotiated with the landowner.



4. PREDICTED IMPACTS

4.1 Main Southern Railway

The Main Southern Railway is a key national transport route that carries significant freight and passenger services between Sydney and Melbourne. The Main Southern Railway is located to the south and the east of the proposed longwalls. The railway is situated immediately adjacent to the north-eastern corner of Longwall 709 and it is 0.4 km from Longwall 710B and 0.9 km from Longwall 711, at its closest points. The total length of railway within the Study Area is approximately 1.3 km, which extends between kilometrages 68.2 km and 69.5 km.

Other infrastructure associated with the railway within the Study Area include:

- Railway cuttings;
- A railway embankment;
- Railway culverts; and
- Electrical, signalling and communications systems.

The maximum predicted subsidence effects on the Main Southern Railway, based on the Extraction Plan layout, are less than those predicted based on the longwall layout assessed in the BSO Application. The majority of the predicted subsidence effects for the section of railway within the Study Area occur due to the mining of Longwalls 702 to 708B, as it is located directly above these existing longwalls. Only low-level additional movements are predicted due to the mining of Longwalls 709 to 711 and 905, as the railway is located outside the extents of these proposed longwalls.

Mine subsidence will result in changes to rail stress and preventative measures will be implemented to ensure the rails remain within designated operating standards during the mining of the proposed longwalls.

Table 4 provides an assessment of the potential impacts to associated railway features.

Table 4 Impact Assessment for Features of Main Southern Railway

Feature	Impact Assessment (MSEC 2021)
Cuttings	The maximum predicted additional vertical subsidence for the railway cuttings, due to the mining of Longwalls 709 to 711 and 905, are 100 mm at 68.6 km and 20 mm at 69.6 km. Only low-level additional movements are predicted at the cuttings as they are located outside the extents of the proposed longwalls. Fracturing could occur in the cutting at 68.6 km, where it is located closest to Longwall 709, and this could result in spalling of rock if it is marginally stable. Fracturing in cutting 69.6 km is less likely due to its distance from the proposed longwalls and the very low levels of predicted movement. In the unlikely event that the faces of these cuttings are impacted by mine subsidence, the failure is likely to be very minor, in the form of

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	small fragments of rock, and likely to fall into the clear area adjacent to the railway, referred to as the cess (Christie, 2010).
Embankment	The maximum predicted additional vertical subsidence for the railway embankment at 69.0 km, due to the mining of Longwalls 709 to 711 and 905, is 150 mm. This embankment is located above the completed Longwalls 707B and 708B and it is predicted to have already experienced vertical subsidence up to 1150 mm due to the mining of those longwalls. The Rail Technical Committee will consider whether further investigations or mitigation measures should be carried out prior to any effects from the mining of the proposed Longwalls 709 to 711 and 905.
Culverts	The maximum predicted additional vertical subsidence for the railway culverts, due to the mining of Longwalls 709 to 711 and 905, are 60 mm at 68.621 km, 150 mm at 69.000 km and 30 mm at 69.455 km. Only low-level additional movements are predicted at the culverts as they are located outside the extents of the proposed longwalls. The culverts at 69.000 km and 69.455 km are located above the completed Longwalls 707B and 708B and they are predicted to have already experienced vertical subsidence up to 1100 mm due to the mining of those longwalls. The culvert at 69.000 km is a brick arch culvert and there is potential for physical impacts to occur. The potential for impact is greatest due to the mining of Longwalls 708B directly beneath it; however, lesser impacts could occur due to the mining of the proposed Longwall 709. It is possible that this culvert could experience some cracking and spalling of the masonry due to the mining of the proposed longwalls. Cracking may occur in the masonry arch or in the headwalls. Predicted movements are not considered likely to result in collapse of the culvert.

Mitigation measures for the Main Southern Railway and associated features are detailed in Section 7.4.1. It is considered that with the adoption of appropriate management measures, potential impacts can be managed, even if actual subsidence movements are greater than the predictions or substantial non-conventional movements occur.

4.2 M31 Hume Motorway

The M31 Hume Motorway is located outside and to the east of the Study Area. The motorway is located 470 m from the south-eastern corner of Longwall 709, at its closest point to the proposed longwalls. The motorway is located directly above the existing Longwalls 703 to 708B.

The predicted additional vertical subsidence for the M31 Hume Motorway due to the mining of the proposed Longwall 709 to 711 and 905 is less than 20 mm. While the motorway could experience very low levels of vertical subsidence, it is not predicted to experience measurable tilts, curvatures or strains.

It is not anticipated therefore that the M31 Hume Motorway would experience adverse impacts due to the mining of the proposed Longwalls 709 to 711 and 905.

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Therefore, it is unlikely that the highway pavement would experience any significant impacts resulting from the extraction of the proposed longwalls. Similarly, it is not expected that the drainage culverts, cuttings, embankments, emergency phone system and road signage would experience any significant impacts resulting from the extraction of the proposed longwalls. Management is anticipated to be undertaken in accordance with the current IMP, for AA9 (refer Section 7.4).

4.3 Bridges

Table 5 provides an assessment of the potential impacts to bridges located within the Study Area.

Table 5 Impact Assessment for Bridges

Feature	Impact Assessment (MSEC 2021)
Nepean Twin Bridges	The Nepean Twin Bridges are located where the M31 Hume Motorway crosses the Nepean River. These twin bridges are 1 km south of the completed Longwall 901 and 1.8 km south-west of the completed Longwall 703. The bridges are located 2.5 km south Longwall 905, at their closest point to the proposed longwalls. The Nepean Twin Bridges are located outside the Study Area for Longwalls 709 to 711 and 905. However, they could experience far-field horizontal movements and could be sensitive to these effects.
Moreton Park Road Bridge (North)	Moreton Park Road Bridge (North) is located 1.5 km north-east of the proposed Longwalls 709, 710B and 711. The bridge will experience low-level far-field horizontal movements due to the mining of the proposed longwalls. The longwall series in Areas 7 and 9 are mining away from this bridge and, therefore, the incremental movements decrease for successive longwalls.
Moreton Park Road Bridge (South)	Moreton Park Road Bridge (South) is located 0.6 km south-west of the completed Longwall 703 and is more than 2 km south of the proposed longwalls. The bridge will experience additional low-level far-field horizontal movements due to the mining of the proposed Longwalls 709 to 711 and 905. The longwall series in Areas 7 and 9 are mining away from this bridge and, therefore, the incremental movements decrease for successive longwalls.

Existing management measures are in place for the Twin Bridges and these will be reviewed, in consultation with Transport NSW, based on the potential movements resulting from the extraction of the proposed longwalls.

The study will include input from structural and geotechnical engineers and subsidence engineers. The management measures include a combination of:

- Mitigation measures prior to mining;

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- Installation of a monitoring system, which includes, among other things, the monitoring of ground movements, structure movements, sub-surface ground movements, bridge joint displacements and visual inspections;
- Implementation of a response plan, where actions are triggered by monitoring results; and
- Implementation of a reporting and communication plan.

IMC has an approved management plan for Moreton Park Road Bridge (South and North) for Longwalls 706 to 710 and Longwalls 901 to 904. This management plan will be reviewed and updated in consultation with Transport NSW prior to mining effects at the bridge.

4.4 Local Roads

The locations of the local roads are shown in Drawing No. MSEC1117-09.

The main local road within the Study Area is Menangle Road. This road provides a connection between the township of Campbelltown, located north-east of the Study Area, and Picton Road, to the south-west of the Study Area. There are also a number of local roads located across the Study Area; including: Cummins Road, Carrols Road, Donalds Range Road, Finns Road, Hawkey Road, Menangle Road, Quirkies Road and Top Ridge/Gibraltar Road.

Local roads may be subjected to the full range of predicted subsidence effects. The predicted subsidence impacts to local roads within the Study Area are expected to be similar to those observed and predicted at the local roads which have been mined directly beneath by previously extracted longwalls in the Southern Coalfield. It is expected, therefore, that the local roads can be maintained in a safe and serviceable condition throughout the mining period using normal road maintenance techniques.

Some local roads pass in the locality of cliffs and steep slopes within the Study Area which may be affected by subsidence. As such, due consideration will be given to the potential impacts that these features may have on the serviceability of these local roads as discussed in the Land Management Plan.

Existing management measures are in place for the local roads and these will be reviewed, in consultation with Wollondilly Shire Council (WSC) and Transport NSW, based on the potential movements resulting from the extraction of the proposed longwalls.

4.4.1 Culverts

Road culverts are located where the local roads cross streams or other topographical depressions. The culverts comprise concrete pipes or concrete box culverts with concrete headwalls.

The road culverts are located across the Study Area and, therefore, are expected to experience the full range of predicted subsidence movements

It is unlikely that the mining induced tilts would result in adverse impacts on the serviceability of the culverts, as the changes in grade are less than 1 %. If the flow of water through the culverts were to be adversely affected, due to the proposed mining, they could be remediated by re-levelling the affected culverts.

The predicted curvatures and strains could be of sufficient magnitudes to result in cracking in the culverts or the headwalls. It is unlikely, however, that these movements would

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adversely impact on the stabilities or structural integrities of the culverts. The potential impacts on the road culverts could be managed by visual inspection and, where required, the affected culverts can be repaired or replaced.

The road culverts are located along the streams and therefore could experience valley related effects. The culverts are orientated along the alignments of the streams and, therefore, the upsidence and closure movements are orientated perpendicular to the main axes of the culverts and unlikely therefore to result in adverse impacts.

Experience of mining beneath road culverts in the Southern Coalfield indicates that the incidence of impacts is low. Impacts have generally been limited to cracking in the concrete headwalls which can be readily remediated. In some cases, however, cracking in the culvert pipes occurred which required the culverts to be replaced.

IMC has an approved management plan for the local roads, including the drainage culverts. This management plan will be updated prior to any effects at the culverts from the extraction of Longwalls 709 to 711 and 905.

4.5 Water Infrastructure

The potable water infrastructure is shown in MSEC1117-12.

There is no potable water infrastructure identified within the Study Area. Potable water pipelines are located within Douglas Park to the south of the Study Area. These pipelines are located more than 1.1 km from the proposed Longwalls 709 to 711 and 905. At this distance, the potable water pipelines are not predicted to experience measurable conventional subsidence effects. It is not anticipated, therefore, that adverse impacts would occur to these pipelines due to the proposed mining.

4.6 Sewage Infrastructure

The sewerage infrastructure is shown in MSEC1117-12.

There is no sewerage infrastructure identified within the Study Area. A local sewer network is proposed to be constructed in the Menangle region in the next one to two years. The new infrastructure would need to be designed and constructed to accommodate mine subsidence effects prescribed by Subsidence Advisory NSW (SA NSW).

4.7 Gas Infrastructure

The gas infrastructure is shown in MSEC1117-12.

There is no gas infrastructure identified within the Study Area. A local gas distribution network services the houses located along Menangle Road and Finns Road to the north of the Study Area. These services are located more than 500 m from the proposed mining area. At this distance, the local gas distribution network is not predicted to experience measurable conventional subsidence effects. It is not anticipated, therefore, that adverse impacts would occur to the local gas distribution network due to the proposed mining.

4.8 Electrical Infrastructure

The locations of the electrical infrastructure are shown in Drawing No. MSEC1117-10.

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The electrical infrastructure within the Study Area comprises 66 kV powerlines, 11 kV powerlines and low voltage powerlines. There are no transmission lines located within the Study Area.

There are three 66 kV powerlines located within the Study Area. All three powerlines cross directly above the proposed Longwalls 709, 710B and 711 and one of these powerlines also crosses directly above the proposed Longwall 905. The 11 kV and low voltage powerlines are located across the Study Area and the generally follow the alignments of the local roads.

The 66 kV, 11 kV and low voltage powerline will not be directly affected by the ground strains, as the cables are supported by the power poles above ground level. However, the cables may be affected by the changes in bay lengths, i.e. the distances between the poles at the levels of the cables, resulting from the differential subsidence, horizontal movements and tilt at the pole locations. The stabilities of the poles and the cable clearances may also be affected by the mining-induced tilts and the changes in the catenary profiles of the cables.

There is extensive experience of mining directly beneath powerlines at Appin Mine and elsewhere in the Southern Coalfield. The past experiences demonstrate that there have only been minor impacts on aerial powerlines that have been directly mined beneath by previously extracted longwalls in the Southern Coalfield. Some remedial measures were required, which included adjustments to cable catenaries, pole tilts and to consumer cables which connect between the powerlines and houses. The incidence of these impacts was very low.

Based on this experience, it is likely that the extraction of the proposed longwalls would result in only minor impacts on the powerlines within the Study Area. It is expected that the remedial measures would include some adjustments of the cable catenaries, pole tilts and the consumer cables, as has been undertaken in the past, but any other impacts are expected to be relatively infrequent.

11 kV and low voltage powerlines follow Top Ridge Road and Gibraltar Drive at the top of Razorback Range above the proposed Longwall 710A and the western end of the proposed Longwall 711. Increased horizontal movements could develop in the downslope direction due to mining beneath the steep slopes.

Existing management measures are in place for the local power distribution network and will be reviewed, in consultation with Integral, based on the potential movements resulting from the extraction of the proposed longwalls as detailed in Section 7.4.

4.9 Telecommunication Infrastructure

Existing management measures are in place for the communications infrastructure detailed below. It will be reviewed, in consultation with infrastructure owners, based on the potential movements resulting from the extraction of the proposed longwalls.

4.9.1 Fiber Optic Cables

The locations of the telecommunications infrastructure are shown in Drawing No. MSEC1117-11. There are optical fibre cables owned by Telstra and Optus that are located within the Study Area.

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The optical fibre cables are direct buried and therefore could potentially be impacted by ground strains. The greatest potential for impacts will occur as the result of localised ground strains due to non-conventional movements or valley-related effects.

The tensile strains in the optical fibre cables could be higher than predicted, where the cables connect to the support structures, which may act as anchor points, preventing any differential movements that may have been allowed to occur with the ground. Tree roots have also been known to anchor cables to the ground. The extent to which the anchor points affect the ability of the cables to tolerate the mine subsidence movements depends on the cable size, type, age, installation method and ground conditions.

In addition to this, optical fibre cables contain additional fibre lengths over the sheath lengths, where the individual fibres are loosely contained within tubes. Compression of the sheaths can transfer to the loose tubes and fibres and result in “micro-bending” of the fibres constrained within the tubes, leading to higher attenuation of the transmitted signal. If the maximum predicted compressive strains were to be fully transferred into the optical fibre cables, the strains could be of sufficient magnitude to result in the reduction in capacities of the cables or transmission loss.

The strains transferred into the optical fibre cables can be monitored using Remote Fibre Monitoring Systems (RFMS) such as Optical Time Domain Reflectometry (OTDR), which can be used to notify the infrastructure owners of strain concentrations due to non-conventional ground movements or valley-related effects.

There is extensive experience of mining directly beneath optical fibre cables at Appin Mine and elsewhere in the Southern Coalfield.

4.9.2 Copper Cables

Copper telecommunications cables are also located within the Study Area. These underground cables generally follow the local roads and they service the properties within the Study Area.

The copper telecommunications cables are located across the Study Area. There is extensive experience of mining beneath copper telecommunications cables at Appin Mine and elsewhere in the Southern Coalfield. There have been no reported impacts on the direct buried copper telecommunications cables in these cases. It is not anticipated, therefore, that the copper telecommunications cables within the Study Area will experience adverse impacts.

4.9.3 Telecommunications Tower

There is one telecommunications tower located within the Study Area, as shown in Drawing No. MSEC1117-11. The tower is located on Razorback Range and it is outside and immediately adjacent to the maingate of the proposed Longwall 905.

The maximum predicted tilt for the telecommunications tower is 3.0 mm/m (i.e. 0.3 %, or 1 in 333). The tilt is small and unlikely to adversely impact on the tower structure itself or the shed structures containing the telecommunications equipment.

The maximum predicted angular deviation due to both vertical subsidence and tilt of the tower sites is therefore approximately 0.3°. It is expected that the angular deviations of the microwave dishes can be managed by making any necessary adjustments to the lines of sight as the proposed Longwall 905 is mined adjacent to it.

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4.10 Buildings Houses and Other Assets

There are 581 rural structures that have been identified within the Study Area. These structures include sheds, garages, carports and other non-residential building structures.

The majority of the rural structures within the Study Area are of lightweight construction and are expected to tolerate the predicted mining-induced tilt. It has been found from past longwall mining experience, that tilts of the magnitudes predicted for the proposed longwalls generally do not result in adverse impacts on rural structures. Some minor serviceability impacts could occur at the higher levels of predicted tilt, including door swings and issues with roof and pavement drainage. These serviceability impacts can generally be remediated using normal building maintenance techniques.

All these features will be managed in accordance with specific PSMPs as described in Section 7.4.

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5. PERFORMANCE MEASURES AND INDICATORS

The BSO Approval provides Subsidence Impact Performance Measures (Condition 3, Schedule 3). **Table 6** below details the conditions relevant to built features within the Study Area.

In order to mitigate the potential subsidence impacts and environmental consequences from the mining of Longwalls 709 to 711 and 905 monitoring and recording will be undertaken prior to mining, throughout the extraction and at the completion of subsidence (refer Section 6).

In the event a subsidence impact is recorded, consideration will be given to implementing appropriate management, remediation and/or mitigation measures in consultation with relevant stakeholders (refer Section 7).

If the subsidence impact performance measures are exceeded, IMC will notify the appropriate stakeholders and implement the Contingency Plan (Section 8).

Table 6 Subsidence Impact Performance Measures

Built Features (Condition 3, Schedule 3)	
Key public infrastructure; • Main Southern Railway • Hume Highway; and • Key SCA Infrastructure (SCA infrastructure, Cataract Tunnel, Upper Canal, Broughtons Pass Weir and other Weirs)	Always safe and serviceable. Damage that does not affect safety or serviceability must be fully repaired.
Other public infrastructure (including water supply pipelines, high pressure gas pipelines; high pressure gas pipelines and the gas distribution network; electricity transmission and distribution lines; telecommunications cables and optical fibre networks; roads, trails and associated structures). Other built features (including houses, industrial premises, swimming pools, farm dams and other improvements)	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated, or else the damaged built feature or damaged infrastructure component must be replaced.

Note. Not all of the above mentioned features are present in the Study Area as the subsidence impact performance measures in Schedule 3 relate to the entire BSO Area.

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6. MONITORING AND REPORTING

6.1 Monitoring Program

The aim of monitoring and review programs is to ensure relevant and accurate data is gathered in a timely manner to allow appropriate decision making. Monitoring programs will be developed in consultation with the relevant infrastructure owner and undertaken with their prior consent. Further monitoring detail will be provided in the revised IMPs or PSMPs for each infrastructure item as appropriate.

6.2 Reporting

Monitoring results will be presented and reviewed at the monthly IMC Subsidence Management Meetings. However, if the findings of monitoring are deemed to warrant an immediate response the Superintendent Infrastructure will initiate the requirements of the Trigger Action Response Plan (TARP) developed as part of the IMPs and PSMPs.

Monitoring results will be provided to infrastructure owners such as Transport NSW, WSC, Australian Rail Track Corporation, Telstra, Sydney Water, Endeavour Energy, SA NSW and relevant government regulators as appropriate.

Monitoring results will be made publicly available in accordance with BSO Approval Condition 8 & 11, Schedule 6 and will also be included in the Annual Reporting Condition 4, Schedule 6.

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7. MANAGEMENT AND MITIGATION STRATEGIES

7.1 Built Features Management Plan Process

The management of subsidence impacts on built features has been successfully undertaken by IMC for several decades.

The BFMP process involves frequent consultation with infrastructure owners and key stakeholders, as well as thorough revision and planning. Each IMP is a live document and may be modified at any time (with relevant stakeholder input as required) to reflect monitoring outcomes and lessons learnt.

Each of the key infrastructure owners will be consulted and the existing IMPs for the built features in AA7 and 9 will be updated prior to any effects from the extraction of Longwalls 709 to 711 and 905. Individual PSMPs will be developed as required. The existing management plans that have been prepared in consultation with asset owners in AA7 and 9 are commercially sensitive and have not been attached to the BFMP. These documents can be provided upon request.

7.2 Consultation Process

IMC continues to consult with key stakeholders on a regular basis as part of current IMPs with regards to the management of their assets in current and future mining areas.

Each IMP and PSMP is developed in consultation with the relevant owner and will be provided to the infrastructure owner/manager prior to effects from longwall extraction. These Plans will include the following information:

- Background information on IMC and the mining operations.
- Specific features identified on the property and where applicable, any proposed additional infrastructure.
- Details of predicted subsidence impacts and associated probabilities of these impacts occurring.
- The expected timing of mine subsidence.
- A monitoring program to be undertaken by IMC and the infrastructure owner.
- Performance measures and indicators.
- Appropriate pre-mining mitigatory measures.
- Process for identifying and managing impacts, including the assistance IMC and SA NSW would provide to the infrastructure owner.
- A TARP developed in consultation with the infrastructure owners.
- Contact details and any further information from IMC for improvements to the process defined above.

7.3 Technical Committee

The current process undertaken at IMC for the management of major infrastructure with the potential to be at risk from mining induced subsidence is via the formation of a Technical Committee. The Technical Committee is comprised of asset owners, technical specialists, and IMC representatives.

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Further development of each IMP will involve input from a Technical Committee developed specifically for each built feature. Meetings facilitated by the Technical Committee may also be attended by a representative from the Resources Regulator.

The Technical Committee will further develop management measures to ensure the safe operation of infrastructure during mining and will review the performance of the management measures following the mining of each longwall.

Modification to existing IMPs for AA7 and 9 will include a review and update of all relevant management measures.

7.4 Mitigation Measures

The BSO Approval Conditions (Condition 5 (g), Schedule 3) require that the BFMP recommends pre-mining mitigatory measures to reduce subsidence impacts where appropriate. The pre-mining mitigatory measures for the infrastructure within the Study Area will be detailed in IMPs. An overview of the proposed management measures for built features within the Study Area is provided below.

7.4.1 Main Southern Rail Line

Management of ARTC assets will be undertaken in consultation with the Technical Committee as detailed in Section 7.3. A Rail Technical Committee has been coordinated to develop the risk management strategies. This Technical Committee includes representatives from ARTC, IMC, and specialist consultants in the fields of railway track engineering, geotechnical engineering, structural engineering, track signalling, mine subsidence, risk assessment and project management. The Technical Committee consults with the Resources Regulator, Department of Regional NSW and the Office of the National Rail Safety Regulator (ONRSR).

Works by the Rail Technical Committee include:

- identification of potential impacts on the railway;
- undertaking a risk management approach, where identified risks are assessed and risk control measures are implemented; and
- development of management measures that include mitigation and preventive works, monitoring plans, triggered response plans and communication plans.

The primary potential impact on the track results from changes in rail stress, which will be managed through implementation and adjustment of track expansion switches. A significant advantage of using rail expansion switches and zero toe load clips is that the system is flexible and can be adjusted during mining should the tolerance of the switches reach their design limits. The rails can be cut and steel can be either added or removed as necessary to restore capacity in the switches. The process is significantly faster than conventional re-stressing work as the clips do not have to be removed and reinstated and no stressing work is required. The process can be safely achieved between the passage of trains without delaying the operation of trains.

It is likely that the following management measures will be used to manage changes in rail stress:

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- assess pre-mining track condition and adjust track if required so that pre-mining track geometry and sleeper arrangements are at or close to design prior to the development of subsidence;
- identify potential sites of non-conventional movement, such as creeks and geological structures;
- assess the required spacing of expansion switches based on the predicted ground movements;
- install the expansion switches and zero toe load clips;
- install a monitoring system, which includes, among other things, the monitoring of ground movements, rail stress, rail temperature, switch displacement and track geometry;
- regularly review and assess the monitoring data;
- conduct regular visual inspections of the track, switches and clips; and
- adjust the track in response to monitoring results during mining if required.

Specific management measures will also be implemented as detailed in Table 7.

Experience has shown that management measures that address the safety and operational aspects of the rail system are developed and implemented prior to the commencement of the impact to the rail infrastructure – usually many months ahead to facilitate effective baseline measurements for the modifications undertaken. Often these measures require access to routine track closures, which are scheduled infrequently throughout the year.

Table 7 Mitigation Measures for Railway Structures

Feature	Impact Assessment (MSEC, 2021)
Cuttings	The Rail Technical Committee will consider mitigation measures before the cuttings experience subsidence effects. Mitigation works could include, for example, scaling the cutting faces and removing debris from the crest. The following management measures could be used to manage potential impacts on the cuttings: • assess condition of the cuttings prior to mining; • consider and implement mitigation measures such as scaling the cutting faces and removing debris from the crest; • install a monitoring system, which includes, among other things, the monitoring of ground movements at the cuttings; • regularly review and assess the monitoring data; • conduct regular visual inspections of the cuttings; and • clear the crest of debris if required based on observations during mining.
Embankment	IMC has appointed an embankment sub-committee, which has completed detailed studies and reviews on potential changes to embankment stability as a result of mine subsidence for the embankment at 69.0 km. Reviews were completed in 2016, 2019 and 2020.

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	The Rail Technical Committee will consider whether further investigations or mitigation measures should be carried out prior to the mining of the proposed Longwalls 709 to 711 and 905. The following management measures will be considered to manage potential impacts on the embankment: • assess pre-mining condition of the embankments; • consider and implement mitigation measures such as cleaning out of culverts and strengthening of the culverts to prevent collapse; • install a monitoring system, which includes, among other things, the monitoring of ground movements at the embankments; • regularly review and assess the monitoring data; • conduct regular visual inspections of the embankments and culverts; and • provide additional culvert support in response to actual measurements and observations during mining.
Culverts	Given the potentially severe consequences of culvert collapse, the Rail Technical Committee will consider mitigation measures prior to each culvert experiencing subsidence effects. The following management measures will be considered to manage potential impacts on the railway culverts: • assess pre-mining condition of culverts; • consider and implement mitigation measures to reduce or avoid the potential for culvert collapse. In the case of the culvert at 69.000 km, a reinforced concrete pipe has been inserted into the culvert; • install a monitoring system, which includes, among other things, the monitoring of ground movements around the culvert and change in track geometry and rail stress; • regularly review and assess the monitoring data; • conduct regular visual inspections of the culverts; and • provide additional track and/or culvert support in response to actual measurements and observations during mining.

7.4.2 M31 Hume Highway

The M31 Hume Motorway would experience adverse impacts due to the mining of the proposed Longwalls 709 to 711 and 905. Management is anticipated to be undertaken in accordance with the current IMP.

7.4.3 Twin Bridges

IMC has an approved management plan for the Nepean Twin Bridges for Longwalls 706 to 710 and Longwalls 901 to 904. These existing management strategies will be reviewed, in consultation with the Transport NSW based on the potential movements resulting from the extraction of the proposed longwalls. All necessary management measures will be in place before mine subsidence effects occur at the bridges.

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7.4.4 Moreton Park Road Bridge (North and South)

IMC has an approved management plan for Moreton Park Road Bridge (South and North) for Longwalls 706 to 7010 and Longwalls 901 to 904. These existing management strategies will be reviewed based on the potential movements resulting from the extraction of the proposed longwalls. All necessary management measures will be in place before mine subsidence effects occur at the bridges.

7.4.5 Water Infrastructure

Water pipelines are located more than 1.1 km from the proposed Longwalls 709 to 711 and 905. At this distance, the potable water pipelines are not predicted to experience measurable conventional subsidence effects. It is not anticipated, therefore, that adverse impacts would occur to these pipelines due to the proposed mining.

7.4.6 Electrical Infrastructure

IMC has an approved management plan for the powerlines. This existing management plan will be reviewed, in consultation with the infrastructure owner based on the potential movements resulting from the extraction of the proposed longwalls. All necessary management measures will be in place before mine subsidence effects occur on the infrastructure.

7.4.7 Telecommunications Infrastructure

IMC has a number of approved management plans for the telecommunications infrastructure for Longwalls 707 to 710 and 901 to 902. This existing management plan will be reviewed, in consultation with the infrastructure owner based on the potential movements resulting from the extraction of the proposed longwalls. All necessary management measures will be in place before mine subsidence effects occur on the infrastructure.

7.4.8 Other Assets

IMC will prepare PSMP for all landholders within the Study Area². The PSMPs will be based on those prepared for the properties within AA7 and 9.

The PSMPs will address the management of all surface infrastructure including rural buildings and commercial structures. The PSMPs will be developed in consultation with the individual property and asset owners prior to subsidence effects at the property. Any mitigation measures will also be developed in consultation with the asset owner and SA NSW where required.

² Subject to landowner participation in the process.

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8. CONTINGENCY RESPONSE PLAN

In the event the subsidence performance measures detailed in Section 5 of this BFMP are considered to have been exceeded, or are likely to be exceeded, IMC will implement a Contingency Plan to manage any unpredicted impacts and their consequences.

This will involve:

- Capture photographic record.
- Notify relevant stakeholders soon as practicable.
- Notify relevant agencies and specialists soon as practicable.
- Offer site visits with stakeholders.
- Contract specialists to investigate and report on changes identified.
- Provide incident report to relevant agencies.
- Establish weekly monitoring frequency until stabilised.
- Updates from specialists on investigation process.
- Inform relevant agencies and stakeholders of results of investigation.
- Develop site CMA in consultation with key stakeholders if required, (pending stakeholder availability) and seek approvals.
- Implement CMA as agreed with stakeholders following approvals.
- Conduct initial follow up monitoring and reporting of CMA completion.
- Review Management Plan.
- Report in regular reporting and Annual Review.

IMC will consult with appropriate specialists and relevant agencies to develop an appropriate response in respect to any identified exceedance.

The development and implementation of contingency measures will be specifically designed to address the circumstances of the exceedance.

If the contingency measures implemented by IMC fail to remediate the impact or the Secretary determines that it is not reasonable or feasible to remediate the impact, IMC will provide a suitable offset to compensate for the impact to the satisfaction of the Secretary in accordance with the BSO Approval Condition 4, Schedule 3.

8.1 Trigger Action Response Plan

A TARP will be developed in consultation with the infrastructure owners and provided in the IMPs.

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9. COMPLAINTS AND COMPLIANCE MANAGEMENT

9.1 Incidents

IMC will notify DPIE and any other relevant agencies of any incident associated with the BSO as soon as practicable after IMC becomes aware of the incident. IMC will provide DPIE and any relevant agencies with a detailed report on the incident within seven days of confirmation of any event.

In relation to impacts to built features the assets owner and the SA NSW will also be notified as soon as practicable so the appropriate mitigation and management can be undertaken.

9.2 Complaints and Dispute Resolution

IMC has a 24 hour, free call community hotline number (1800 102 210) and email address (illawarracommunity@south32.net) through which all complaints and general enquiries regarding environmental or community issues associated with IMC's operations can be reported.

All complaints received in relation to Appin Mine are managed in accordance with the Handling Community Complaints, Enquiries and Disputes Procedure.

Upon receipt of a community complaint, preliminary investigations will commence as soon as practicable to determine the likely cause of the complaint using information such as activities being undertaken on site at the time or area of the complaint.

An initial response will be provided to the complainant within 24 hours of the complaint being made, with a follow up response being provided as soon as practicable once a more detailed investigation is complete.

A summary of all complaints received during the reporting year will be provided as part of the Annual Review. A log of complaints is also maintained on the South32 website at:

<https://www.south32.net/our-business/australia/illawarra-metallurgical-coal/documents>.

9.3 Non-Compliance, Corrective Action and Preventative Action

Events, non-compliances, corrective actions and preventative actions are managed in accordance with the Reporting and Investigation Standard and Environmental Compliance/Conformance Assessment and Reporting Procedure. These procedures, which relate to all IMC operations, detail the processes to be utilised with respect to event and hazard reporting, investigation and corrective action identification. The key elements of the process include:

- identification of events, non-conformances and/or non-compliances;
- recording of the event, non-conformance and/or non-compliance in the event management system G360;
- investigation/evaluation of the event, non-conformance and/or non-compliance to determine specific corrective and preventative actions;
- assigning corrective and preventative actions to responsible persons in G360; and
- review of corrective actions to ensure the status and effectiveness of the actions.

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Exceedances or non-compliances with built feature related criteria will be reported to all relevant agencies via the Annual Review or notified in accordance with Section 9.

For any incident, as defined by the BSO Approval, IMC will notify the Secretary and any other relevant agencies as soon as practicable after IMC identifies or is made aware of the incident.

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10. PLAN ADMINISTRATION

This BFMP will be administered in accordance with the requirements of the Appin Mine Environmental Management Strategy (EMS) and the BSO Approval Conditions. A summary of the administrative requirements is provided below.

10.1 Roles and Responsibilities

Statutory obligations applicable to this Plan are identified and managed via an online compliance management system (TICKIT). The online system can be accessed from the link below:

<https://illawarracoal.tod.net.au/login>.

The overall responsibility for the implementation of this BFMP resides with the Manager Approvals who is the BFMP's authorising officer.

Parties responsible for environmental management in AA7 and 9 and the implementation of the BFMP include:

Manager Approvals

- Ensure that the requisite personnel and equipment are provided to enable this BFMP to be implemented effectively.
- Authorise the BFMP and any amendments thereto.

Superintendent Infrastructure Protection

- Document any changes to the BFMP, recognising the potential for those changes to affect other aspects of the BFMP.
- Provide regular updates to IMC on the results of the BFMP.
- Arrange information forums for key stakeholders as required.
- Prepare any report in accordance with the BFMP. Maintain records required by the BFMP.
- Organise and participate in assessment meetings called to review mining impacts.
- Within 24 hours, respond to any queries or complaints made by members of the public in relation to aspects of this BFMP.
- Organise audits and reviews of the BFMP.
- Address any identified non-conformances, assess improvement ideas submitted and implement if considered appropriate.
- Arrange for the implementation of any agreed actions, responses or remedial measures.
- Ensure surveys required by this BFMP are conducted and record details of instances where circumstances prevent these from taking place.

Survey Coordinator

- Collate survey data and present in an acceptable form for review at assessment meetings.

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- Bring to the attention of the Superintendent Infrastructure Protection any findings indicating an immediate response may be warranted.
- Bring to the attention of the Superintendent Infrastructure Protection any non-conformances identified with the Plan provisions or ideas aimed at improving the BFMP.

Technical Experts

- Conduct the roles assigned to them in a competent and timely manner to the satisfaction of the Superintendent Infrastructure Protection and formally provide expert opinion as requested.

Person(s) Performing Inspections

- Formally bring to the attention of the Superintendent Infrastructure Protection any nonconformances identified with the Plan, or ideas aimed at improving the Plan.
- Conduct inspections in a safe manner.

10.2 Resources Required

The Manager Approvals provides resources sufficient to support this BFMP.

Equipment may be needed for this BFMP. Where this equipment is of a specialised nature, it will be provided by the supplier of the relevant service. All equipment is to be appropriately maintained, calibrated and serviced as required in operation manuals.

It is the responsibility of the Manager Approvals to ensure that personnel and equipment are provided as required to allow the provisions of this Plan to be implemented.

10.3 Training

All staff and contractors working on IMC sites are required to complete the IMC training program which includes:

- An initial site induction (including all relevant aspects of heritage, environment, safety and community).
- Safe Work Methods Statements and Job Safety Analyses, Toolbox Talks and Pre-shift communications.
- On-going job specific training and re-training (where required).

All training records are maintained by the IMC Training Department.

It is the responsibility of the Manager Approvals to ensure that all persons and organisations having responsibilities under this Plan are trained and understand their responsibilities.

The person(s) performing regular inspections will be under the supervision of the Superintendent Infrastructure Protection and be trained in observation and reporting. The Superintendent Infrastructure Protection shall be satisfied that the person(s) performing the inspections are capable of meeting and maintaining this standard.

10.4 Review and Update

In accordance with Condition 5 of Schedule 6 of the BSO Approval, the BFMP will be reviewed, and if necessary revised, within three months, of:

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- the submission of an Annual Review;
- the submission of an incident report;
- the submission of an Independent Environmental Audit (IEA) report; or
- any modification to the conditions of the BSO Approval (unless the conditions require otherwise).

If significant deficiencies in this BFMP are identified in the interim period, the Plan will be modified as required. This process has been designed to ensure that documentation continues to meet current requirements, including changes in technology and operational practice, and expectations of stakeholders.

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11. REFERENCES

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Mine Subsidence Engineering Consultants, 2009, *Bulli Seam Operations Subsidence Assessment*. Report for BHP Billiton Illawarra Coal.

Mine Subsidence Engineering Consultants 2021, *Appin Longwalls 709 to 711 and 905: Subsidence Predictions and Impact Assessments for the Natural and Built Features due to the Extraction of the Proposed Longwalls 709 to 711 and 905 at Appin Colliery*. Report for South32 IMC.

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