



# APPIN MINE AREA 7 Environmental Management Plan August 2021

<i>This document UNCONTROLLED once printed</i>				Page 1 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



# Table of Contents

**1. OVERVIEW.....4**

    1.1 Purpose and Scope.....4

    1.2 Monitoring and Trigger Action Response Plan.....6

    1.3 Reporting Framework.....23

    1.4 Avoidance, Mitigation and Contingency Response.....25

**FIGURES**

Figure 1 Appin Longwalls 707 to 710 Environmental Monitoring.....29

**TABLES**

Table 1 Requirements of the Environmental Management Plan and supporting documentation.....4

Table 2 Appin Longwalls 707 to 710 Environmental Monitoring.....7

Table 3 Appin Longwalls 707 to 710 Trigger Action Response Plan.....12

Table 4 Summary of Reporting Framework.....24

Table 5 Avoidance, Mitigation and Contingency Measures.....25

<i>This document UNCONTROLLED once printed</i>				Page 2 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



## DOCUMENT REVISION LOG

### Persons authorising this Plan

Name	Title	Date
Gary Brassington	Manager Approvals	August 2021

### Document Revisions

Revision	Description of Changes	Date
<b>ICH Document</b>		
1.0	Revised the LW705 & 706 EMP approved documents (Monitoring Table, TARP Table, Figure 1a) for LW707-710. Combined the tables and figure to one document, and incorporate South32 format.	25 June 2015
1.1	Addition of Table 1, renumbering Table 2 and Table 3 (previously Table 1.1 and Table 1.2).	31 August 2015
2.0	Updated to include monitoring frequencies	27 January 2021
2.1	Updated to incorporate the Resource Regulator feedback on 2.0	August 2021

### Persons involved in the review of this Plan

Name	Title	Company	Exp (yrs)	Date
Cody Brady	Principal Approvals	South32	5	August 2021
Gary Brassington	Manager Approvals	South32	25	August 2021
Josh Carlon	Coordinator Environment	South32	12	August 2021

*This document UNCONTROLLED once printed*

<b>Document ID</b>		<b>Version</b>	2.1	Page 3 of 29
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



# 1. OVERVIEW

South32 Illawarra Metallurgical Coal (IMC) operates the Bulli Seam Operations (BSO) Appin Mine located in the Southern Coalfield of New South Wales (NSW). Mining is currently underway in two areas, referred to as Appin Area (AA) 7 and 9. Appin Mine produces high quality hard coking coal for steel production.

On 22 December 2011 the Planning and Assessment Commission (PAC), under delegation of the Minister for Planning (now the Secretary of the Department of Planning, Industry and Environment DPIE), 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.

## 1.1 Purpose and Scope

This Environmental Management Plan (EMP) outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences in the Appin Area 7 underground mining area during the extraction of Longwalls 707 to 710.

This EMP has been prepared in accordance with Conditions 13, Schedule 2 of the Appin Area 7 Subsidence Management Plan (SMP) Approval which was approved by the Resource Regulator on 17 April 2020.

The requirements of Condition 13, Schedule 2 are listed in **Table 1**, along with the relevant document in which the requirements are addressed.

**Table 1 Requirements of the Environmental Management Plan and supporting documentation**

SMP Approval Condition 13	Supporting Documentation
<p><b>This Plan must address subsidence impacts on:</b></p> <p>a) Surface and groundwater quality and quantity including groundwater bores on privately-owned land within a 3 kilometre radius of the limit of mining;</p>	<p>Longwall 705 to 710 SMP, Part B Chapter 18, supported by Chapter 9, Section 15.4 and Appendices B and H.</p> <p>Displayed on Figure 1.</p>
<p>b) Aquatic and terrestrial flora and fauna (special focus on threatened species and endangered ecological communities)</p>	<p>Longwall 705 to 710 SMP, Part B Chapters 20, 21 and 23. Supported by Chapter 10, Section 15.2 and Appendices C and D.</p>
<p>c) Aboriginal sites and non-Aboriginal heritage items</p>	<p>Longwall 705 to 710 SMP, Part B Chapter 22, supported by Section 11.12 and Appendix E.</p>
<p>d) The Nepean River gorge and associated landforms;</p>	<p>Longwall 705 to 710 SMP, Part B Chapter 19, supported by Chapter 8, Section 15.1 and Appendix A.</p>

<i>This document UNCONTROLLED once printed</i>				Page 4 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



e) Water quality in the Nepean River	Longwall 705 to 710 SMP, Part B Chapters 18 and 20, supported by Chapter 10, Section 15.2 and Appendices B and C.
f) Land in general (cliffs and steep slopes)	<ul style="list-style-type: none"> <li>Longwall 705 to 710 SMP, Part B Chapter 19 supported by Chapter 8, Section 15.1 and Appendix A.</li> <li>Nepean River Cliff Safety Management Plan, Appin Area 7 Longwalls 707-710, July 2015.</li> </ul>
<b>This Plan must address subsidence impacts above and must include:</b>	
a) Detailed monitoring programme, including groundwater inflows to underground workings;	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Table 2.
b) Trigger levels for subsidence impacts that require actions and responses;	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Table 3.
c) The procedures that would be followed in the event that the monitoring indicates an exceedance of trigger levels;	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Section 1.3.
d) Measures to mitigate, remediate and/or compensate any identified impacts;	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Table 5.
e) A protocol for the notification of identified exceedances of the trigger levels;	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Section 1.4.
f) A contingency plan; and	Appin Longwalls 707 to 710 Environmental Management Plan, Rev 2.1, August 2021, Section 1.4.
g) Collection of sufficient baseline data for use in future extraction applications.	All data collected during environmental monitoring contributes to future Extraction Plan applications. Future impact sites are identified during the longwall planning stages, to allow for adequate collection of baseline data.

<i>This document UNCONTROLLED once printed</i>				Page 5 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



## 1.2 Monitoring and Trigger Action Response Plan

There is extensive environmental monitoring undertaken across Appin Area 7 to detect and potential impacts from mining, including:

- surface and groundwater monitoring (quality and quantity); including groundwater bores on privately-owned land within a 3 kilometre radius of the limit of mining.
- Aquatic and terrestrial flora and fauna (special focus on threatened species and endangered ecological communities).
- Aboriginal sites and non-Aboriginal heritage items. Any sites identified during the mining period would be monitored as required by the Bulli Seam Operations Heritage Management Plan.
- The Nepean River gorge and its associated landforms.
- Water quality in the Nepean River.
- Land in general including cliffs and steep slopes.

Monitoring for these features are detailed in **Table 2**.

### 1.2.1 Aboriginal Heritage

Four Aboriginal cultural heritage sites were identified in the Appin Area 7 mining area during recent archeological surveys, see Figure 1. These Aboriginal heritage sites are open sites and it is unlikely that the artefacts and deposits themselves would be impacted by surface cracking. The risk of impact from Longwalls 709 to 710 has been deemed as negligible (Biosis 2021). No further assessment is recommended for these sites (Biosis 2021).

Given the sites are unlikely to be impacted by subsidence, no monitoring is proposed. If additional sites are identified in the Appin Area 7 mining area, they will be monitored in accordance with the BSO Heritage Management Plan which is available on the IMC website.

<i>This document UNCONTROLLED once printed</i>				Page 6 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



**Table 2 Appin Longwalls 707 to 710 Environmental Monitoring**

MONITORING SITE	MONITORING TYPE	MONITORING FREQUENCY	PARAMETERS	
<b>Water Quality</b>				
<p><b>Nepean River</b>                      Baseline upriver sites for crosschecking for upriver perturbations:                      • NR110                      Impact monitoring sites adjacent to each longwall:                      • NR12                      • NR13                      Downstream site:                      • NR50                      Other sites:                      • NRO                      • NR2                      • NR4                      • NR6                      • NR7                      • NR9                      • NR11                      Refer Figure 1</p>	<p>Grab Sample and field measurements</p>	<ul style="list-style-type: none"> <li>• Monthly baseline prior to mining</li> <li>• Monthly observations and field analysis during mining (1)</li> <li>• Monthly detailed laboratory analysis during mining</li> <li>• Monthly monitoring for 2 years post mining (or as otherwise required/approved)</li> <li>• If required as a result of assessment of mining impacts</li> </ul>	<p>Field measurements of:</p> <ul style="list-style-type: none"> <li>• Temperature</li> <li>• Electrical Conductivity (EC)</li> <li>• pH</li> <li>• ORP</li> <li>• Time</li> <li>• Dissolved Oxygen (DO)</li> <li>• General Comments</li> </ul>	<p>Laboratory analysis of:</p> <ul style="list-style-type: none"> <li>• pH</li> <li>• EC</li> <li>• SO4 filtered</li> <li>• Fe total</li> <li>• Al total</li> <li>• Na filtered</li> <li>• K filtered</li> <li>• Ca filtered</li> <li>• Cl filtered</li> <li>• DOC</li> <li>• Al filtered</li> <li>• Pb filtered</li> <li>• Ni filtered</li> <li>• Zn filtered</li> <li>• Fe filtered</li> <li>• Mn filtered</li> <li>• As filtered</li> <li>• Br filtered</li> <li>• Cu filtered</li> <li>• I filtered</li> <li>• Se filtered</li> <li>• NOx-N</li> <li>• NH3-N</li> <li>• TKN</li> <li>• TP</li> <li>• TRP</li> <li>• TDS</li> <li>• CH4<sup>(2)</sup></li> <li>• Trace Phenols<sup>(2)</sup></li> <li>• Sulphide<sup>(2)</sup></li> </ul>
<p><b>1st and 2nd Order Watercourses</b></p> <ul style="list-style-type: none"> <li>• Lower Harris Creek (NR3)</li> <li>• Cataract River (NR5)</li> <li>• Elladale Creek (NR8)</li> <li>• Ousedale Creek (NR10)</li> <li>• Menangle Creek (NR40)</li> <li>• Upper Harris Creek (HC10)</li> <li>• Foot Onslow Creek (FO1)</li> <li>• Navigation Creek (NAV1)</li> </ul> <p>Refer Figure 1</p>	<p>Grab Sample and field measurements</p>	<ul style="list-style-type: none"> <li>• Prior to mining of longwall underlying watercourse or mining of any immediately adjacent longwall</li> <li>• Monthly detailed laboratory analysis during mining</li> <li>• Following the development of incremental subsidence for each longwall that will impact on the feature</li> </ul>		

<i>This document UNCONTROLLED once printed</i>				Page 7 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



MONITORING SITE	MONITORING TYPE	MONITORING FREQUENCY	PARAMETERS
<b>Water Level and Flow</b>			
<p><b>Nepean River</b> At benchmark sites and water pump sites:</p> <ul style="list-style-type: none"> <li>• NR110</li> <li>• NR0</li> <li>• NRL05</li> <li>• NRL10</li> <li>• NRL15</li> <li>• NR12</li> <li>• NR13</li> <li>• NRL20</li> <li>• Pump 1- NRL</li> <li>• Pump 2-NRL</li> </ul> <ul style="list-style-type: none"> <li>• NRL25</li> <li>• NRL30</li> <li>• NRL33</li> <li>• NRL35</li> <li>• NRL40</li> <li>• NRL45</li> <li>• NRL48</li> <li>• Pump 5-NRL</li> <li>• Pump 6-NRL</li> </ul> <p>WaterNSW flow monitoring sites:</p> <ul style="list-style-type: none"> <li>• Maldon Weir</li> <li>• Broughtons Pass Weir</li> <li>• Menangle Weir</li> </ul> <p><i>Refer Figure 1</i></p>	<ul style="list-style-type: none"> <li>• Water Level</li> <li>• Water flow (measured at WaterNSW weirs)</li> </ul>	<ul style="list-style-type: none"> <li>• Monthly baseline prior to mining (data has been recorded for most sites since 2007)</li> <li>• Monthly manual monitoring at benchmarks during mining<sup>(1)</sup></li> <li>• Flow monitoring at weirs (data supplied by WaterNSW)</li> <li>• Ongoing monthly monitoring for 2 years post mining (or as otherwise required/ approved)</li> </ul>	<ul style="list-style-type: none"> <li>• Areas of dry riverbed compared with baseline</li> <li>• Areas of flooded riverbed compared with baseline</li> <li>• Measurement of water level compared with baseline (where benchmark is available)</li> <li>• Photo points</li> </ul>
<p><b>1st and 2nd Order Watercourses</b></p> <ul style="list-style-type: none"> <li>• Lower Harris Creek (NR3)</li> <li>• Cataract River (NRL15)</li> <li>• Elladale Creek (NRL33)</li> <li>• Ousedale Creek (NRL50)</li> <li>• Menangle Creek (NR40)</li> <li>• Upper Harris Creek (HC10)</li> <li>• Foot Onslow Creek (F01)</li> <li>• Navigation Creek (NAV1)</li> </ul> <p><i>Refer Figure 1</i></p>	<p>Water Level</p>	<ul style="list-style-type: none"> <li>• Prior to mining of longwall underlying watercourse or mining of any immediately adjacent longwall</li> <li>• Following the development of incremental subsidence for each longwall that will impact on the feature</li> </ul>	<ul style="list-style-type: none"> <li>• Areas of dry riverbed compared with baseline</li> <li>• Areas of flooded riverbed compared with baseline</li> <li>• Measurement of water level compared with baseline (where benchmark is available)</li> <li>• Photo points</li> </ul>
<b>Appearance</b>			

<i>This document UNCONTROLLED once printed</i>				Page 8 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	





MONITORING SITE	MONITORING TYPE	MONITORING FREQUENCY	PARAMETERS
<p><b>Nepean River</b> Observations along the length of the Nepean River within the active mining area</p>	<p>Observational and photographic monitoring</p>	<ul style="list-style-type: none"> <li>Monthly baseline prior to mining (data has been recorded for most sites since 2003)</li> <li>Monthly observations and field analysis during mining <sup>(1)</sup></li> <li>Monthly monitoring for 2 years post mining (or as otherwise required/approved)</li> <li>If required as a result of assessment of mining impacts</li> </ul>	<ul style="list-style-type: none"> <li>Iron or salinity staining (e.g. orange or white staining in water or on banks/seeps)</li> <li>Water cloudiness</li> <li>Evidence of springs in Nepean River</li> <li>Visual signs of impacts (e.g. cracking, vegetation changes, increased erosion, changes in water colour etc.)</li> <li>Impacts determined from comparing photo points taken prior to, during and post mining</li> <li>Erosion and/or sedimentation compared with baseline</li> </ul>
<p><b>1st and 2nd Order Watercourses</b></p> <ul style="list-style-type: none"> <li>Lower Harris Creek (NR3)</li> <li>Cataract River (NR5)</li> <li>Elladale Creek (NR8)</li> <li>Ousedale Creek (NR10)</li> <li>Menangle Creek (NR40)</li> <li>Upper Harris Creek (HC10)</li> <li>Foot Onslow Creek (FO1)</li> <li>Navigation Creek (NAV1)</li> </ul>	<p>Observational and photographic monitoring</p>	<ul style="list-style-type: none"> <li>Prior to mining of longwall underlying watercourse or mining of any immediately adjacent longwall</li> <li>Following the development of incremental subsidence for each longwall that will impact on the feature</li> </ul>	<ul style="list-style-type: none"> <li>Iron or salinity staining (e.g. orange or white staining in water or on banks/seeps)</li> <li>Water cloudiness</li> <li>Evidence of springs in Nepean River</li> <li>Visual signs of impacts (e.g. cracking, vegetation changes, increased erosion, changes in water colour etc.)</li> <li>Impacts determined from comparing photo points taken prior to, during and post mining</li> <li>Erosion and/or sedimentation compared with baseline</li> </ul>
<p><b>Water Pumps</b></p> <ul style="list-style-type: none"> <li>Pump 1 NRL</li> <li>Pump 2 NRL</li> <li>Pump 3</li> <li>Pump 4</li> <li>Pump 5 NRL</li> <li>Pump 6 NRL</li> </ul>	<p>Observational and photographic monitoring</p>	<ul style="list-style-type: none"> <li>Pre mining photographs</li> <li>Monthly visual inspection during mining</li> <li>If required as a result of assessment of mining impacts</li> </ul>	<p>Pump submergence and disturbance</p>
<p><b>Aquatic Ecology</b></p>			

<p><i>This document UNCONTROLLED once printed</i></p>				<p>Page 9 of 29</p>
<p><b>Document ID</b></p>		<p><b>Version</b></p>	<p>2.1</p>	
<p><b>Last Date Updated</b></p>	<p>August 2021</p>	<p><b>Next Review Date</b></p>	<p>August 2024</p>	



MONITORING SITE	MONITORING TYPE	MONITORING FREQUENCY	PARAMETERS
<p><b>Nepean River</b></p> <ul style="list-style-type: none"> <li>Sites 1 and 2</li> <li>Sites 5 and 6</li> <li>Sites 7 and 8</li> <li>Sites X3 and X4 (AA9 Monitoring)</li> <li>Sites X5 and X6</li> </ul> <p>Refer Figure 1</p>	<p>Quantitative and observational monitoring</p>	<ul style="list-style-type: none"> <li>Two Baseline monitoring campaigns prior to mining</li> <li>Annual monitoring campaigns (spring) during mining</li> <li>Two monitoring campaigns post mining</li> </ul>	<ul style="list-style-type: none"> <li>Photographic records</li> <li>Macro-invertebrate Assessment</li> <li>Fish sampling</li> <li>Water Quality</li> <li>Monitored in conjunction with:                             <ul style="list-style-type: none"> <li>Flow</li> <li>River Morphology</li> </ul> </li> <li>Dissolved oxygen- assessed in consultation with surface water specialist.</li> </ul>
<b>Groundwater</b>			
<p><b>Water Level</b></p> <p>IMC Monitoring Bores</p> <ul style="list-style-type: none"> <li>S1913 (EAW5)</li> <li>S1936 (EAW7)</li> </ul> <p>Additional Bulli Seam piezometers located throughout the mining area</p> <p>Refer Figure 1</p> <p>Private Bores (10 registered bores):</p> <ul style="list-style-type: none"> <li>GW104602</li> <li>GW105376</li> <li>GW105574</li> <li>GW105339</li> <li>GW072874</li> <li>GW104661</li> <li>GW105388</li> <li>GW101986</li> <li>GW106574</li> <li>GW105534</li> </ul> <p>Refer Figure 1</p>	<p>Groundwater level</p>	<p><b>IMC Bores</b></p> <ul style="list-style-type: none"> <li>Pre-mining</li> <li>Water level logged hourly</li> <li>Post-mining – following the development of incremental subsidence for each longwall that will potentially impact on the borehole</li> <li>Monitoring to continue for at least 12 months post mining depending on borehole functionality</li> </ul> <p><b>Private Bores</b></p> <ul style="list-style-type: none"> <li>Prior to mining of longwall underlying bore or mining of any immediately adjacent longwall (if in agreement with landholder)</li> <li>Post-mining – following the development of incremental subsidence for each longwall that will impact on the borehole (if in agreement with landholder)</li> </ul>	<p><b>Grouted monitoring holes</b></p> <ul style="list-style-type: none"> <li>Piezometric head in various strata</li> </ul> <p><b>Private bores</b></p> <ul style="list-style-type: none"> <li>Water level measured with dip meter (where access to property is available and in agreement with landholder)</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 10 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



MONITORING SITE	MONITORING TYPE	MONITORING FREQUENCY	PARAMETERS
		<ul style="list-style-type: none"> <li>As requested by landholder or if physical impacts to bore identified (landholder to observe during use of bore)</li> </ul>	
<b>Landscape Features</b>			
<p><b>Cliffs</b></p> <ul style="list-style-type: none"> <li>Along Nepean Gorge</li> </ul> <p><b>Steep Slopes</b></p> <ul style="list-style-type: none"> <li>Along Nepean Gorge, associated tributaries and above western end of the proposed longwalls</li> <li>Along Nepean River, near the finishing end of Longwall 708B<sup>(3)</sup></li> </ul> <p><i>Refer Figure 19.1 in LW705-710 SMP</i></p>	Observational and photographic monitoring	<ul style="list-style-type: none"> <li>Once prior to mining. Photographic records taken</li> <li>Monthly visual inspections</li> <li>Photographic monitoring to continue 6 monthly for 2 years following the completion of mining (or as otherwise required/approved)</li> <li>As required when specific impacts are identified or when concern is raised by a landowner</li> <li>As required, in accordance with Built Feature Management Plans and landholder agreement</li> </ul>	<ul style="list-style-type: none"> <li>Cliff and steep slopes will be observed for any instability (e.g. rock falls, mass movement) and seeps</li> </ul>
<b>Terrestrial Ecology</b>			
Monitored in conjunction with general observational monitoring for the Nepean River, watercourses and landscape		<ul style="list-style-type: none"> <li>Monthly observations during mining</li> <li>If required as a result of assessment of mining impacts</li> <li>General observation of active mining areas during all other monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation communities</li> <li>Vegetation condition</li> <li>Changes in vegetation</li> <li>Tree health</li> <li>Threatened species</li> </ul>
<b>Aboriginal Heritage</b>			
There are no applicable aboriginal archaeology sites on the AIHMS database within the Appin Longwalls 707 to 710 mining area.			Any sites identified during the mining period would be monitored as required by the Bulli Seam Operations Heritage Management Plan

<sup>1</sup> Fortnightly targeted monitoring of relevant sites when impacts are observed.

<i>This document UNCONTROLLED once printed</i>				Page 11 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



<sup>2</sup> Analytes tested at closest downstream sample site following Level 2 and above trigger for gas release.

<sup>3</sup> Photo point monitoring sites have been established near the steep slopes near the finishing end of Longwall 708B. These sites will be monitored on a monthly basis during mining, subject to site safety requirements.

**Table 3 Appin Longwalls 707 to 710 Trigger Action Response Plan**

MONITORING	TRIGGER	ACTION																																																				
<b>Water Quality</b>																																																						
<p><b>Nepean River</b> Impact monitoring sites adjacent to longwalls:</p> <ul style="list-style-type: none"> <li>NR12</li> <li>NR13</li> </ul> <p>Refer to Figure 1</p> <p>Notes: Baseline upriver site NR110 will be used for cross-checking upriver perturbations<sup>(3)</sup></p> <table border="1"> <thead> <tr> <th></th> <th>MEAN</th> <th>1 STDEV</th> <th>2 STDEV</th> </tr> </thead> <tbody> <tr> <td colspan="4"><b>Impact Site</b></td> </tr> <tr> <td><b>NR2</b></td> <td></td> <td></td> <td></td> </tr> <tr> <td>pH</td> <td>7.54</td> <td>0.34</td> <td>0.68</td> </tr> <tr> <td>DO (%)</td> <td>88.03</td> <td>10.62</td> <td>21.23</td> </tr> <tr> <td>SpC (uS.cm)</td> <td>180</td> <td>50</td> <td>100</td> </tr> <tr> <td>Tot Fe (mg/L)</td> <td>0.421</td> <td>0.135</td> <td>0.270</td> </tr> <tr> <td>Tot Mn (mg/L)</td> <td>0.034</td> <td>0.012</td> <td>0.0023</td> </tr> <tr> <td colspan="4"><b>NR13</b></td> </tr> <tr> <td>pH</td> <td>7.43</td> <td>0.35</td> <td>0.70</td> </tr> <tr> <td>DO (%)</td> <td>86.99</td> <td>12.82</td> <td>25.63</td> </tr> <tr> <td>SpC (uS.cm)</td> <td>180</td> <td>49</td> <td>98</td> </tr> <tr> <td>Tot Fe (mg/L)</td> <td>0.407</td> <td>0.129</td> <td>0.259</td> </tr> </tbody> </table>		MEAN	1 STDEV	2 STDEV	<b>Impact Site</b>				<b>NR2</b>				pH	7.54	0.34	0.68	DO (%)	88.03	10.62	21.23	SpC (uS.cm)	180	50	100	Tot Fe (mg/L)	0.421	0.135	0.270	Tot Mn (mg/L)	0.034	0.012	0.0023	<b>NR13</b>				pH	7.43	0.35	0.70	DO (%)	86.99	12.82	25.63	SpC (uS.cm)	180	49	98	Tot Fe (mg/L)	0.407	0.129	0.259	<p><b>Level 1<sup>(1)</sup></b> Impact monitoring sites:</p> <ul style="list-style-type: none"> <li>pH reduction greater than 1 standard deviation but less than 2 standard deviation from pre-mining mean resulting from the mining for two consecutive months</li> <li>DO reduction greater than 1 standard deviation but less than 2 standard deviation from pre-mining mean resulting from the mining for two consecutive months</li> <li>Identification of strata gas plume of flow rate &lt; 3000 L/min<sup>(2)</sup></li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
		MEAN	1 STDEV	2 STDEV																																																		
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pH	7.54	0.34	0.68																																																			
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Tot Mn (mg/L)	0.034	0.012	0.0023																																																			
<b>NR13</b>																																																						
pH	7.43	0.35	0.70																																																			
DO (%)	86.99	12.82	25.63																																																			
SpC (uS.cm)	180	49	98																																																			
Tot Fe (mg/L)	0.407	0.129	0.259																																																			
	<p><b>Level 2<sup>(1)</sup></b> Impact monitoring sites:</p> <ul style="list-style-type: none"> <li>pH reduction greater than 2 standard deviation from premining mean resulting from the mining for two consecutive months</li> <li>reduction greater than 2 standard deviation from premining mean resulting from the mining for two consecutive months</li> <li>EC, total Fe and total Mn increases greater than 2 standard deviation from pre-mining mean resulting from the mining for two consecutive months</li> <li>Identification of strata gas plume of flow rate &gt;3000 L/min<sup>(2)</sup></li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul> <p>Strata Gas Emission Plume:</p> <ul style="list-style-type: none"> <li>Estimate gas emission flow rates. Re-estimate should significant change be observed</li> <li>Take sample of plume (if possible) for:                             <ul style="list-style-type: none"> <li>- chemical composition</li> <li>- dissolved methane from exactly above gas plume and at established downriver monitoring sites</li> <li>- dissolved sulphide and total phenols from exactly above gas plume and at nearest downriver monitoring site(s)</li> </ul> </li> </ul>																																																				

<i>This document UNCONTROLLED once printed</i>			
<b>Document ID</b>		<b>Version</b>	2.1
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024
			Page 12 of 29



Tot Mn (mg/L)	0.034	0.013	0.026	<p><b>Level 3<sup>(1)</sup></b> Impact monitoring sites:</p> <ul style="list-style-type: none"> <li>Level 2-type reduction in water quality resulting from the mining observed for six consecutive months</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>Notify BCD, DPIE, Resources Regulator and WaterNSW and any other relevant specialist.</li> <li>Consultation with stakeholders.</li> <li>Collect laboratory samples and analyse for:                             <ul style="list-style-type: none"> <li>pH, EC, Total Fe and Mn</li> <li>Suite of Filterable metals</li> <li>Dissolved methane, sulphide and total phenols (if relevant)</li> </ul> </li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and management plan in consultation with key stakeholders</li> </ul>
<p><b>Control Site NR111</b></p>					
pH	7.90	0.42	0.84		
DO (%)	84.19	15.22	30.44		
SpC (uS.cm)	240	92	184		
Tot Fe (mg/L)	0.328	0.131	0.262		
Tot Mn (mg/L)	0.025	0.015	0.031		
<p><b>Exceeding Prediction</b></p> <ul style="list-style-type: none"> <li>More than negligible gas releases</li> </ul>				<p><i>Actions as stated for Level 3</i></p> <ul style="list-style-type: none"> <li>Investigate reasons for the exceedance</li> <li>Update future predictions based on the outcomes of the investigation</li> </ul>	
<p><b>Water Level and Flow</b></p>					
<p><b>Nepean River</b> Visual observations along the Nepean River within the active mining area</p>				<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Observation of areas of dry and/or flooded riverbed in comparison to baseline observations and flows, for less than two consecutive months</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
				<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Observation of areas of dry and/or flooded riverbed in comparison to baseline observations and flows, for more than two consecutive months</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>

<p><i>This document UNCONTROLLED once printed</i></p>				<p>Page 13 of 29</p>
<p><b>Document ID</b></p>		<p><b>Version</b></p>	<p>2.1</p>	
<p><b>Last Date Updated</b></p>	<p>August 2021</p>	<p><b>Next Review Date</b></p>	<p>August 2024</p>	



	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Observation of areas of dry and/or flooded riverbed in comparison to baseline observations and flows, for six consecutive months</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>• Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>• Site visits with stakeholders if required</li> <li>• Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>• Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
<p><b>Appearance</b></p>		
<p><b>Nepean River</b> Observations along the Nepean River within the active mining area</p>	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Iron staining resulting from the mining for two consecutive months</li> <li>• Water cloudiness resulting from the mining for two consecutive months</li> </ul>	<ul style="list-style-type: none"> <li>• Continue monitoring program</li> <li>• Report impacts to key stakeholders</li> <li>• Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Iron staining greater than baseline monitoring resulting from the mining for two consecutive months</li> <li>• Water cloudiness greater than baseline monitoring resulting from the mining for two consecutive months</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>• Review monitoring program</li> <li>• Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Iron staining greater than baseline monitoring resulting from the mining for six consecutive months</li> <li>• Water cloudiness greater than baseline monitoring resulting from the mining for six consecutive months</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>• Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>• Site visits with stakeholders if required</li> <li>• Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>• Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>

<p><i>This document UNCONTROLLED once printed</i></p>				<p>Page 14 of 29</p>
<p><b>Document ID</b></p>		<p><b>Version</b></p>	<p>2.1</p>	
<p><b>Last Date Updated</b></p>	<p>August 2021</p>	<p><b>Next Review Date</b></p>	<p>August 2024</p>	



	<p><b>Exceeding Prediction</b></p> <ul style="list-style-type: none"> <li>• More than negligible iron staining resulting from the mining</li> <li>• More than negligible increase in water cloudiness resulting from the mining</li> </ul>	<p><i>Actions as stated for Level 3</i></p> <ul style="list-style-type: none"> <li>• Investigate reasons for the exceedance</li> <li>• Update future predictions based on the outcomes of the investigation</li> </ul>
<p><b>1st and 2nd Order Watercourses</b></p> <ul style="list-style-type: none"> <li>• Upper Harris Creek (HC10)</li> <li>• Foot Onslow Creek (FO1)</li> <li>• Navigation Creek (NAV1)</li> </ul>	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Fracturing with no observable loss of surface water flow</li> <li>• Fracturing with no reduction in pool water level when compared to baseline period</li> <li>• Increase in turbidity, iron staining, algal growth, or other visible water quality parameters resulting from the mining for two consecutive months determined by comparing baseline photos with photos during the mining period</li> </ul>	<ul style="list-style-type: none"> <li>• Continue monitoring program</li> <li>• Report impacts to key stakeholders</li> <li>• Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Fracturing resulting in loss of surface flow in some creeks or tributary</li> <li>• Fracturing resulting in water loss from some permanent pools</li> <li>• Reduced water retention time in pools</li> <li>• Increase in turbidity, iron staining, algal growth, or other visible water quality parameters resulting from the mining for two consecutive months determined by comparing baseline photos with photos during the mining period</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>• Review monitoring program</li> <li>• Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>• Iron staining greater than baseline monitoring resulting from the mining for six consecutive months</li> <li>• Water cloudiness greater than baseline monitoring resulting from the mining for six consecutive months</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>• Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>• Site visits with stakeholders if required</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 15 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



		<ul style="list-style-type: none"> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
<b>Water Pumps</b> <ul style="list-style-type: none"> <li>Pump 1</li> <li>Pump 2</li> <li>Pump 3</li> <li>Pump 4</li> <li>Pump 5</li> <li>Pump 6</li> </ul>	Pump not functioning due to water level changes or physical disturbance from subsidence	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> <li>Develop and implement CMA (if required) in consultation with key stakeholders</li> </ul>
<b>Aquatic Ecology</b>		
<b>Nepean River</b> <ul style="list-style-type: none"> <li>Sites 5 and 6</li> <li>Sites 7 and 8</li> </ul>	<b>Level 1<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Reduction in aquatic habitat resulting from mining (when comparing to baseline conditions) for 1 year</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<b>Level 2<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Reduction in aquatic habitat resulting from mining (when comparing to baseline conditions) for 2 consecutive years</li> </ul>	<i>Actions as stated for Level 1</i> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<b>Level 3<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Reduction in aquatic habitat resulting from the mining (when comparing to baseline conditions) for &gt; 2 consecutive years or complete loss of habitat</li> </ul>	<i>Actions as stated for Level 2</i> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
	<b>Exceeding Prediction</b>	<i>Actions as stated for Level 3</i> <ul style="list-style-type: none"> <li>Investigate reasons for the exceedance</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 16 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	





	<ul style="list-style-type: none"> <li>More than negligible environmental consequences for a threatened species, threatened population or endangered ecological community</li> </ul>	<ul style="list-style-type: none"> <li>Update future predictions based on the outcomes of the investigation</li> </ul>
<b>Groundwater</b>		
<p><b>Water Level</b></p> <p>IMC monitoring bores:</p> <ul style="list-style-type: none"> <li>EAW5</li> <li>EAW7</li> </ul> <p>Private Bores (10 registered bores- where accessible)</p> <p><b>Notes:</b> <i>Impact monitoring data during longwall mining is compared to predicted groundwater levels from the BSOP (or later updates) groundwater model, during preparation of the End of Panel Report. Privately owned water supplies are monitored as agreed with landowners in the Built Feature Management Plans</i></p> <p>Refer Figure 1</p>	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>5.0 – 7.5m reduction greater than predicted standing water level or pressure in the Hawkesbury Sandstone (outside of pumping influences in private bores) over a minimum 2 month period</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Between 7.5m and 10m additional reduction from the predicted standing water level or pressure in Hawkesbury Sandstone (outside of pumping influences) over 2 consecutive months</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Greater than 10m of additional reduction from the predicted standing water level or pressure in the Hawkesbury Sandstone (outside of pumping influences) over 2 consecutive months</li> <li>Mining results in private groundwater bores unsafe, unserviceable or damaged</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 17 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



<b>Mine Water Inflows</b>	<b>Level 1<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Abnormal rise in water flow from the goaf between 2.7 and 3ML/day (over 20 day average)Fracturing with no observable loss of surface water flow</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<b>Level 2<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Abnormal rise in water flow from the goaf between 3 and 3.4ML/day (over 20 day average)</li> </ul>	<i>Actions as stated for Level 1</i> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<b>Level 3<sup>(1)</sup></b> <ul style="list-style-type: none"> <li>Abnormal rise in water flow from the goaf &gt;3.4ML/day (over 20 day average)</li> </ul>	<i>Actions as stated for Level 2</i> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
<b>Water Pumps</b> <ul style="list-style-type: none"> <li>Pump 1</li> <li>Pump 2</li> <li>Pump 3</li> <li>Pump 4</li> <li>Pump 5</li> <li>Pump 6</li> </ul>	Pump not functioning due to water level changes or physical disturbance from subsidence	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> <li>Develop and implement CMA (if required) in consultation with key stakeholders</li> </ul>
<b>Landscape Features</b>		

<i>This document UNCONTROLLED once printed</i>				Page 18 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



<p><b>Cliffs</b></p> <ul style="list-style-type: none"> <li>Along Nepean Gorge</li> </ul> <p><b>Steep Slopes</b></p> <ul style="list-style-type: none"> <li>Along Nepean Gorge, associated tributaries and above western end of the proposed longwalls</li> </ul> <p><i>Refer Figure 19.1 in LW705-710 SMP</i></p>	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Any rock fall, displacement, dislodgement of boulders or slabs or fracturing of a cliff line flanking the Nepean River resulting from mining</li> <li>Erosion resulting from mining localised to a small area that should naturally stabilise within the monitoring period</li> <li>Surface movement resulting from mining with no more than negligible soil surface exposed</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Any rock falls, displacements, dislodgements of boulders or slabs or fracturing of a cliff line(s) flanking the Nepean River resulting from mining that in total impacts 0.3% of the total cliff line face area of the mining domain</li> <li>Erosion resulting from mining likely to naturally stabilise within the monitoring period</li> <li>Surface movement or rock displacement resulting from mining with no more than minor soil surface exposed</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Any rock falls, displacements, dislodgements of boulders or slabs or fracturing of a cliff line(s) flanking the Nepean River resulting from mining that in total impacts up to 0.5% of the total cliffline face area of the mining domain</li> <li>Any rock falls, displacements, dislodgements of boulders or slabs or fracturing of a cliffline(s) flanking the Nepean River resulting from mining that in total impacts 0.4% of the total cliffline face area of the mining domain after 1 longwall</li> <li>Mass movement of a slope causing large areas of exposed soil</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 19 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



	<ul style="list-style-type: none"> <li>Any form of rockfall or erosion that poses a threat to public safety</li> </ul>	
Cliffs flanking the Nepean River	<p><b>Exceeding Prediction</b></p> <ul style="list-style-type: none"> <li>More than negligible environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing, that in total impacts more than 0.5% of the total face area of such cliffs within the longwall mining domain)</li> <li>Rockfall or erosion that poses more than a negligible increased risk to public safety</li> </ul>	<p><i>Actions as stated for Level 3</i></p> <ul style="list-style-type: none"> <li>Investigate reasons for the exceedance</li> <li>Update future predictions based on the outcomes of the investigation</li> </ul>
<b>Terrestrial Ecology</b>		
Monitored in conjunction with observational monitoring for the Nepean River, 1st and 2nd Order watercourses and active mining area	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Vegetation impacted by mining (by rockfalls, soil slippage, gas emissions) that is likely to naturally regenerate within the monitoring period</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Vegetation impacted by mining (by rockfalls, soil slippage, gas emissions) that is unlikely to naturally regenerate within the monitoring period</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Vegetation impacted by mining that is not responding to CMAs</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
	<p><b>Exceeding Prediction</b></p>	<p><i>Actions as stated for Level 3</i></p> <ul style="list-style-type: none"> <li>Investigate reasons for the exceedance</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 20 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



	<ul style="list-style-type: none"> <li>More than negligible environmental consequences on threatened species, threatened populations, or endangered ecological communities</li> </ul>	<ul style="list-style-type: none"> <li>Update future predictions based on the outcomes of the investigation</li> </ul>
<b>Aboriginal Archaeology</b>		
<p>No sites currently applicable Any other newly identified Aboriginal Archaeology sites <i>Refer to Figure 5-22 of Bulli Seam Operations EA and Figure 3 Bulli Seam Operations Appendix G (Aboriginal Cultural Heritage Assessment)</i></p>	<p><b>Level 1<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Change in shelter conditions not attributable to natural weathering or preservation – mineral growth or microorganism growth (as observed by comparing pre-mining photographs with post-subsidence/mining photographs)</li> <li>Changes external to the shelter that affect the site context – ground cracking, boulder slumping, rock and/or tree falls</li> </ul>	<ul style="list-style-type: none"> <li>Continue monitoring program</li> <li>Report impacts to key stakeholders</li> <li>Summarise impacts and record</li> </ul>
	<p><b>Level 2<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Change in shelter conditions not attributable to natural weathering or preservation – change in drip line or seepage, cracking or exfoliation of overhang or shelter, movement or opening of existing planes and joints at panel, block fall within shelter or overhang</li> </ul>	<p><i>Actions as stated for Level 1</i></p> <ul style="list-style-type: none"> <li>Review monitoring program</li> <li>Notify relevant specialists (South32 IMC) and develop and implement remedial action if necessary</li> </ul>
	<p><b>Level 3<sup>(1)</sup></b></p> <ul style="list-style-type: none"> <li>Shelter or overhang collapse not attributable to natural weathering</li> <li>Level 2 impacts at greater frequency than predicted</li> <li>Level 2 impacts attributable to mining remote from the mining area</li> </ul>	<p><i>Actions as stated for Level 2</i></p> <ul style="list-style-type: none"> <li>Notify relevant government agencies, other resource managers and relevant technical specialists and seek advice on any CMA required.</li> <li>Site visits with stakeholders if required</li> <li>Develop any site management measures as soon as practically possible (pending stakeholder availability) and seek any approvals required to implement</li> <li>Review the relevant TARP and Management Plan in consultation with key stakeholders</li> </ul>
<p>Sites determined to hold high or moderate significance as a result of studies required for Extraction Plans</p>	<p><b>Exceeding Prediction</b></p>	<p><i>Actions as stated for Level 3</i></p> <ul style="list-style-type: none"> <li>Investigate reasons for the exceedance</li> </ul>

<i>This document UNCONTROLLED once printed</i>				Page 21 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



	<ul style="list-style-type: none"> <li>More than negligible environmental consequences on threatened species, threatened populations, or endangered ecological communities</li> </ul>	<ul style="list-style-type: none"> <li>Update future predictions based on the outcomes of the investigation</li> </ul>
Other Aboriginal heritage sites	<ul style="list-style-type: none"> <li>Less than 10% of such sites (or 1 such site, whichever is the greater) within any longwall mining domain are/is affected by subsidence impacts (other than minor impacts or environmental consequence)</li> </ul>	

(1) These may be revised in consultation with DPE and other key stakeholders

(2) If strata gas emission plumes are detected – particularly coinciding with low river flow and significant gas evolution

(3) Baseline upriver sites for cross-checking for upriver perturbations impacting Area 7 monitoring sites:

- NR110 - possible upstream perturbations (>2 standard deviations)
- Checks at Upriver sites NR4, NR5 and NR6 for possible Cataract River-based perturbations (>2 standard deviation)

*Current Values*

Level 1		Upstream check	Level 2 and 3		Upstream check
NR12	NR13	NR110	NR12	NR13	NR110
pH>	pH>	pH>	pH>	pH>	pH>
DO>	DO>	DO>	DO>	DO>	DO>
			EC>280 µS/cm	EC>279 µS/cm	EC<424 µS/cm
			Total Fe >0.691 mg/L	Total Fe >0.666 mg/L	Total Fe <0.590 mg/L
			Total Mn >0.057 mg/L	Total Mn >0.060 mg/L	Total Mn <0.056 mg/L

<i>This document UNCONTROLLED once printed</i>				Page 22 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



### 1.3 Reporting Framework

IMC has developed a reporting framework for the SMP based on the nature of the predicted subsidence impacts and consequences and streamlining of reporting requirements.

**Table 4** provides a summary of the proposed reporting framework, including which stakeholders will receive reports and the distribution method. The subsections below provide further detail on each reporting mechanism.

#### 1.3.1 Incident Report

An incident is defined as a set of circumstances that has caused, or threatens to cause, material harm to the environment.

The reporting of incidents will be conducted in accordance with Condition 7, Schedule 6 of the BSO Approval. IMC will notify the Secretary of the DPIE, the Resource Regulator and any other relevant agencies of any incident associated with the BSO as soon as practicable after IMC becomes aware of the incident. Within seven days of the date of the incident, IMC will provide the Secretary of the DPIE and relevant agencies with a detailed report on the incident.

An Incident Report will include the following:

- details on the nature of the incident (including survey results, photographs and date of the incident);
- results of investigation(s) to identify/evaluate the contributing factors to the incident;
- proposed course of action and development of contingency measures; and
- relevant IMC contact details to obtain further information on the incident.

<i>This document UNCONTROLLED once printed</i>				Page 23 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



**Table 4 Summary of Reporting Framework**

Report	Frequency	Distribution	Distribution Method	Responsibility for Data Collation and Preparation	Responsibility for Submission
Incident Report	As required	DPIE (Secretary of the DPIE, c/- Executive Director) MEG and Resources Regulator (Manager and Principal Inspector, Environment) Other regulators as specified in management plans	Email and via upload to the DPIE Major Projects Portal	Environment Coordinator and Survey Coordinator	Principal Approvals
End of Panel	Four months after longwalls are completed	DPIE (Secretary of the DPIE, c/- Executive Director) MEG and Resources Regulator (Manager and Principal Inspector, Environment) Other regulators as specified in management plans	Upload to the DPIE Major Projects Portal and South32 Website	Environmental Field Team Coordinator and Survey Coordinator	Environmental Field Team Coordinator or Principal Approvals
Annual Review	Annually	DPIE (Secretary of the DPIE, c/- Executive Director) MEG and Resources Regulator (Manager and Principal Inspector, Environment) Other regulators as specified in management plans	Upload to the DPIE Major Projects Portal and South32 Website	Environmental Field Team Coordinator and Superintendent Environment	Superintendent Environment

<i>This document UNCONTROLLED once printed</i>				Page 24 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	





## 1.4 Avoidance, Mitigation and Contingency Response

In the event subsidence impacts or consequences are greater than those predicted or authorised by the BSO Approval, IMC will implement the Contingency Plan which includes the following:

- IMC will report the exceedance to DPIE, Resources Regulator, relevant agencies and stakeholders as soon as practicable after IMC becomes aware of the exceedance.
- IMC will conduct an investigation to evaluate the potential contributing factors.
- IMC will identify an appropriate course of action with respect to the identified impact(s), in consultation with specialists, relevant agencies and relevant stakeholders as necessary. For example:
  - proposed management and/or mitigation measures;
  - a program to review the effectiveness of the management and/or mitigation measures; and
  - consideration of offsets or adaptive management.
- Contingency measures will be developed in consideration of the specific circumstances of the exceedance and the assessment of environmental consequences.
- IMC will submit the proposed course of action to the Resources Regulator for approval.
- IMC will implement the approved course of action to the satisfaction of the Resources Regulator.

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 of DPIE in accordance with the BSO Approval Conditions 2 and 4, Schedule 3.

A summary of avoidance, mitigation and contingency measures proposed to manage impacts where predicted impacts are exceeded is detailed in **Table 5**.

**Table 5 Avoidance, Mitigation and Contingency Measures**

Feature	Avoidance, Mitigation and Contingency Measures
Nepean River	<p><b>Avoidance and Mitigation</b></p> <p>Nepean River not mined directly beneath. Longwalls are offset by at least 180 m from edge of Nepean River to avoid major fracturing and loss of surface flow.</p> <p>Nepean River will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p><b>Contingency Measures</b></p> <p>Grouting and repair of surface water controlling features and the beds of streams where major fracturing is evident.</p>



	<p>Investigate possible remediation measures for impacts to water quality resulting from subsidence.</p> <p>All works will be carried out in consultation with relevant stakeholders.</p>
Ephemeral watercourses	<p>Watercourses will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p><b>Contingency Measures</b></p> <p>Grouting and repair of surface water controlling features and the beds of streams where major fracturing is evident.</p> <p>Investigate possible remediation measures for impacts to water quality resulting from subsidence.</p> <p>All works will be carried out in consultation with relevant stakeholders.</p>
Groundwater Levels and Quality	<p><b>Avoidance and Mitigation</b></p> <p>Groundwater level and quality will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p><b>Contingency Measures</b></p> <p>Redrilling of bores and lowering of pumps in order to reach suitable groundwater supplies.</p> <p>All works will be carried out in consultation with relevant stakeholders.</p>
Cliffs	<p><b>Avoidance and Mitigation</b></p> <p>Cliffs will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p>Signage and fencing erected and stakeholders informed where there is a safety risk.</p> <p><b>Contingency Measures</b></p> <p>Scaling rocks loosened by subsidence where they present safety risks.</p> <p>Minor civil/earthworks to prevent erosions such as overland flow diversion works, establishment of banks, smoothing and recontouring where this is practical.</p> <p>Revegetation works such as planting, seeding, mulching, weed control and plant maintenance, where this is practical.</p>
Steep Slopes and Surface of the Land	<p><b>Avoidance and Mitigation</b></p> <p>Steep slopes and surfaces will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p>Signage and fencing erected and stakeholders informed where there is a safety risk.</p> <p><b>Contingency Measures</b></p>

<i>This document UNCONTROLLED once printed</i>				Page 26 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



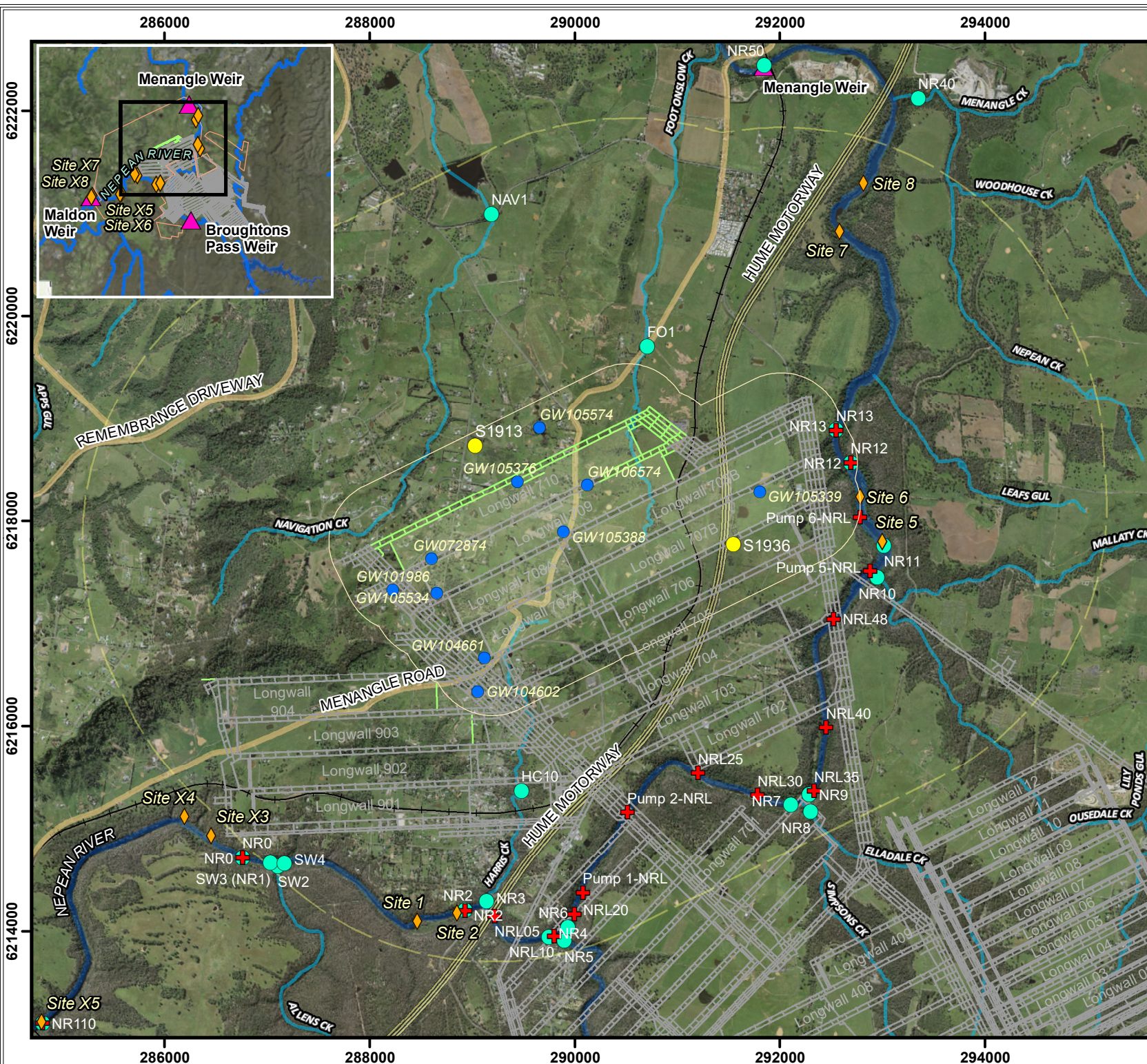
	<p>Minor civil/earthworks to prevent erosions such as overland flow diversion works, establishment of banks, smoothing and recontouring where this is practical.</p> <p>Revegetation works such as planting, seeding, mulching, weed control and plant maintenance, where this is practical.</p> <p>Installation of erosion and sediment where appropriate.</p>
<p>Aquatic Flora and Fauna</p>	<p><b>Avoidance and Mitigation</b></p> <p>Nepean River not mined directly beneath. Longwalls are offset by at least 180 m from edge of Nepean River to avoid major fracturing and loss of surface flow.</p> <p>Aquatic flora and fauna will be monitored regularly during mining to facilitate early detection and minimisation of effects.</p> <p><b>Contingency Measures</b></p> <p>Grouting and repair of significant surface water controlling features where it is appropriate to do so in consultation with relevant agencies.</p> <p>Active preservation of life such as relocation of stranded fish.</p> <p>Temporary ecosystem maintenance such as watering aquatic plants until fish rehabilitation completed, where this is practical.</p> <p>Investigate possible remediation measures for impacts to water quality resulting from subsidence.</p>
<p>Terrestrial Flora and Fauna including EECs</p>	<p><b>Avoidance and Mitigation</b></p> <p>Monthly monitoring during subsidence. Increased to weekly during critical periods as part of the landscape monitoring.</p> <p><b>Contingency Measures</b></p> <p>Site rehabilitation to reinstate habitat values – increased monitoring until habitat is returned to former condition.</p> <p>Remediation of subsidence related fracturing or dilation within creek beds and surface cracks where it is appropriate to do so.</p> <p>Minor civil/earthworks to prevent erosions such as overland flow diversion works, establishment of banks, smoothing and recontouring where this is practical.</p> <p>Revegetation works such as planting, seeding, mulching, weed control and plant maintenance, where this is practical.</p> <p>Active preservation of life such as relocation of stranded fauna and watering of exposed vegetation where this is practical.</p> <p>Temporary ecosystem maintenance such as watering plants until rehabilitation completed, where this is practical.</p> <p>All works will be carried out in consultation with relevant stakeholders.</p>


<i>This document UNCONTROLLED once printed</i>				Page 27 of 29
<b>Document ID</b>		<b>Version</b>	2.1	
<b>Last Date Updated</b>	August 2021	<b>Next Review Date</b>	August 2024	



<p>Aboriginal Sites</p>	<p><b>Avoidance and Mitigation</b></p> <p>Baseline, active subsidence and post mining monitoring.</p> <p><b>Contingency Measures</b></p> <p>Site and event specific mitigation and rehabilitation will be developed with appropriate Aboriginal representatives and HeritageNSW.</p> <p>Techniques may involve installing artificial drip lines, detailed recording of art, stabilising and clean rock faces.</p>
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<p><i>This document UNCONTROLLED once printed</i></p>				<p>Page 28 of 29</p>
<p><b>Document ID</b></p>		<p><b>Version</b></p>	<p>2.1</p>	
<p><b>Last Date Updated</b></p>	<p>August 2021</p>	<p><b>Next Review Date</b></p>	<p>August 2024</p>	





Illawarra  
Metallurgical  
Coal

## Appin Area 7 Longwall 707 to 710 Environmental Management Plan

Figure 1

**Legend**


- + Surface Water Level Site
- Surface Water Quality Site
- ▲ Flow Monitoring Station
- ◆ Aquatic Ecology Site
- Private Groundwater Bores
- IMC Groundwater Monitoring
- 600m Study Area
- 3km Boundary from Mining
- Longwall Panels 707 to 710
- Existing Mine Workings - Appin
- Approved Mine Layout
- Highways
- Main Roads
- Railway Lines
- Rivers
- Creeks

**Inset**

- BSO Approved Mining Area

*Date: August, 2021*  
*Author: J. Carlon*

**Version 1**  
 Horizontal Datum  
 MGA - Zone 56



Kilometers

