

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 19 April 2020 had progressed 420m (Figure 1). During the most recent inspection, undertaken on 21 April 2020, soil cracking and rock fracturing were identified on an access track between *Lake Avon* and *Fire Road 6A*.

DA3B_LW16_003 Update (E288849, N6191590)

DA3B_LW16_003 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 21 March 2020. The impact was originally reported as two soil cracks. On the latest inspection, rock fracturing was identified adjacent to the previously identified soil cracking (Photo 1 and Photo 2). The rock fracturing has a maximum length of 5.1m, a maximum width of 0.05m and a maximum measurable depth of 8.8m.

DA3B_LW16_003 remains a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: *DA3B_LW16_003*, looking at a section of rock fracturing. Taken on 22/04/2020.



Photo 2: *DA3B_LW16_003*, looking at the width of the rock fracturing. Taken on 22/04/2020.

DA3B_LW16_005 (E288863, N6191503)

DA3B_LW16_005 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 27 March 2020. The impact is comprised soil cracking (Photo 3 to Photo 5). The soil cracking has a maximum length of 12.3m, a maximum width of 0.12m and a maximum measurable depth of 0.3m.

DA3B_LW16_005 is a Level 2 trigger as per the *Dendrobium Area 3B Landscape TARP* (Appendix A: Table 1), specifically:

- Crack or fracture between 10m and 50m in length.
- Crack or fracture between 100mm and 300mm in width.



Photo 3: DA3B_LW16_005, an overview of the soil cracking. Taken on 22/04/2020.



Photo 4: DA3B_LW16_004, looking at the width of the soil cracking. Taken on 22/04/2020.



Photo 5: DA3B_LW16_004, looking at the depth of the soil cracking. Taken on 22/04/2020.

DA3B_LW16_006 (E288975, N6191508)

DA3B_LW16_006 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 9 April 2020. The impact is comprised of soil cracking (Photo 6 and Photo 7). The soil cracking has a maximum length of 1.8m, a maximum width of 0.05m and a maximum measurable depth of 0.05m.

DA3B_LW16_006 is a Level 1 trigger as per the *Dendrobium Area 3B Landscape TARP* (Appendix A: Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 6: DA3B_LW16_006, looking at the soil cracking. Taken on 22/04/2020.

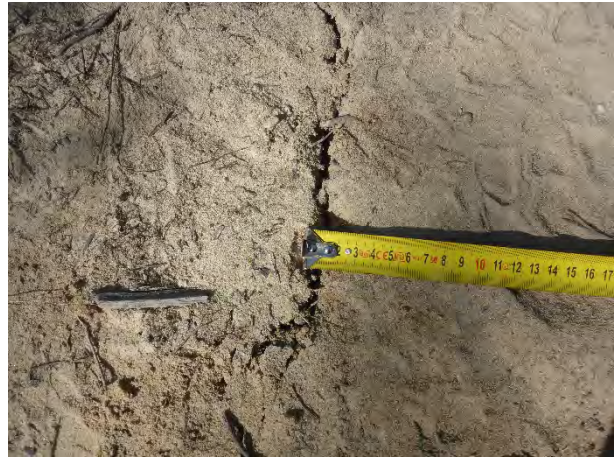


Photo 7: DA3B_LW16_006, looking at the width of the soil cracking. Taken on 22/04/2020.

DA3B_LW16_007 (E288997, N6191509)

DA3B_LW16_007 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 12 April 2020. The impact is comprised of soil cracking (Photo 8 and Photo 9). The soil cracking has a maximum length of 3.5m and a maximum width of 0.02m.

DA3B_LW16_007 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 8: DA3B_LW16_007, looking at the soil cracking. Taken on 22/04/2020.



Photo 9: DA3B_LW16_007, looking at the width of the soil cracking. Taken on 22/04/2020.

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the Dendrobium Area 3B SMP
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_001	16/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020
DA3B_LW16_002	16/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020
DA3B_LW16_003	16/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020
DA3B_LW16_004	16/04/2020	LW16	Rock Fracturing & Soil Cracking	1	Rock fracturing and soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020
DA3B_LW16_003 (Update)	16/04/2020 & 21/04/2020	LW16	Soil Cracking & Rock Fracturing	1	Rock fracturing identified adjacent to previously identified soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020 and This Report
DA3B_LW16_005	21/04/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_006	21/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_007	21/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report

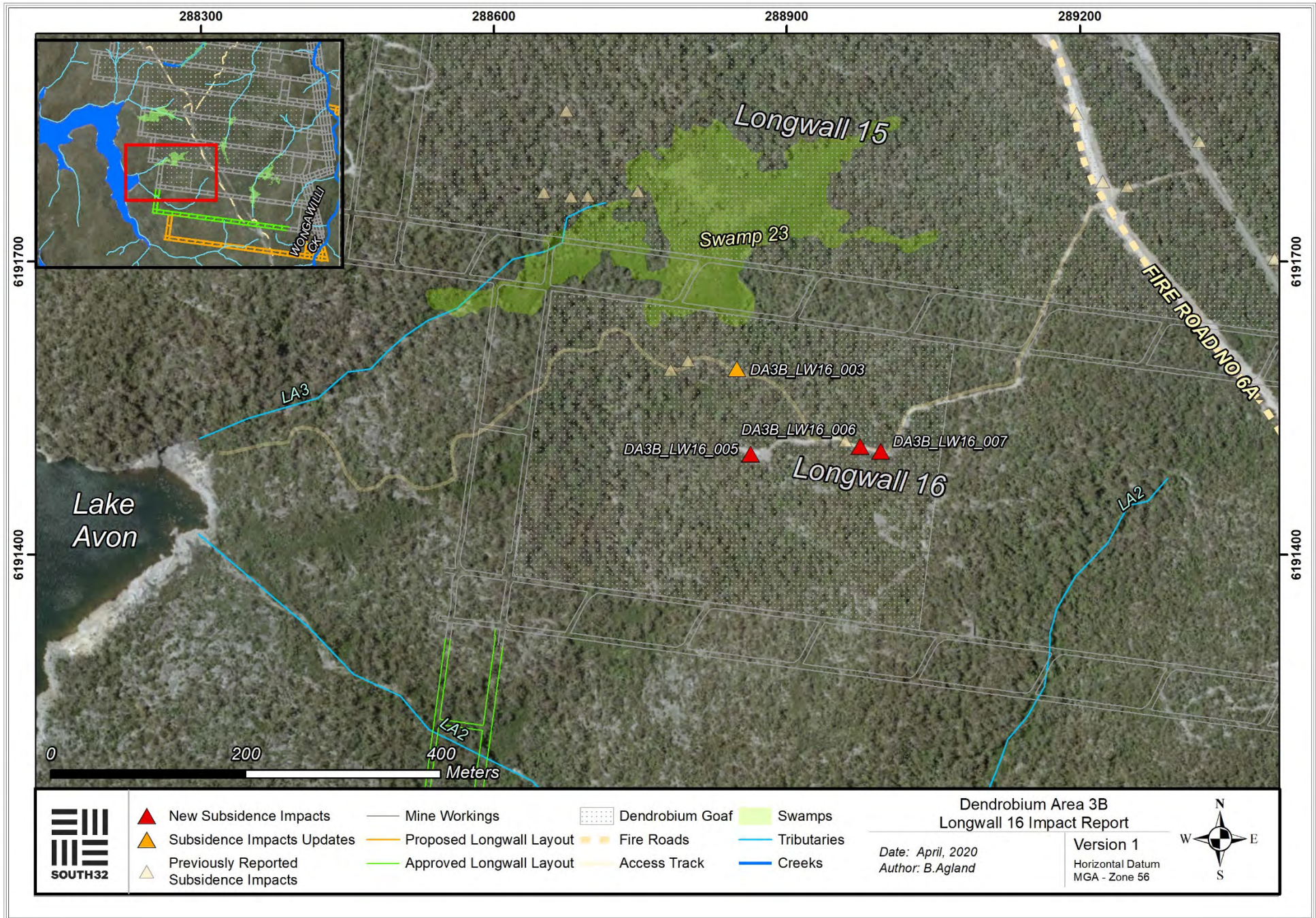


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations. Note- 'Access Track' drawn on map as not visible in latest aerial image.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP

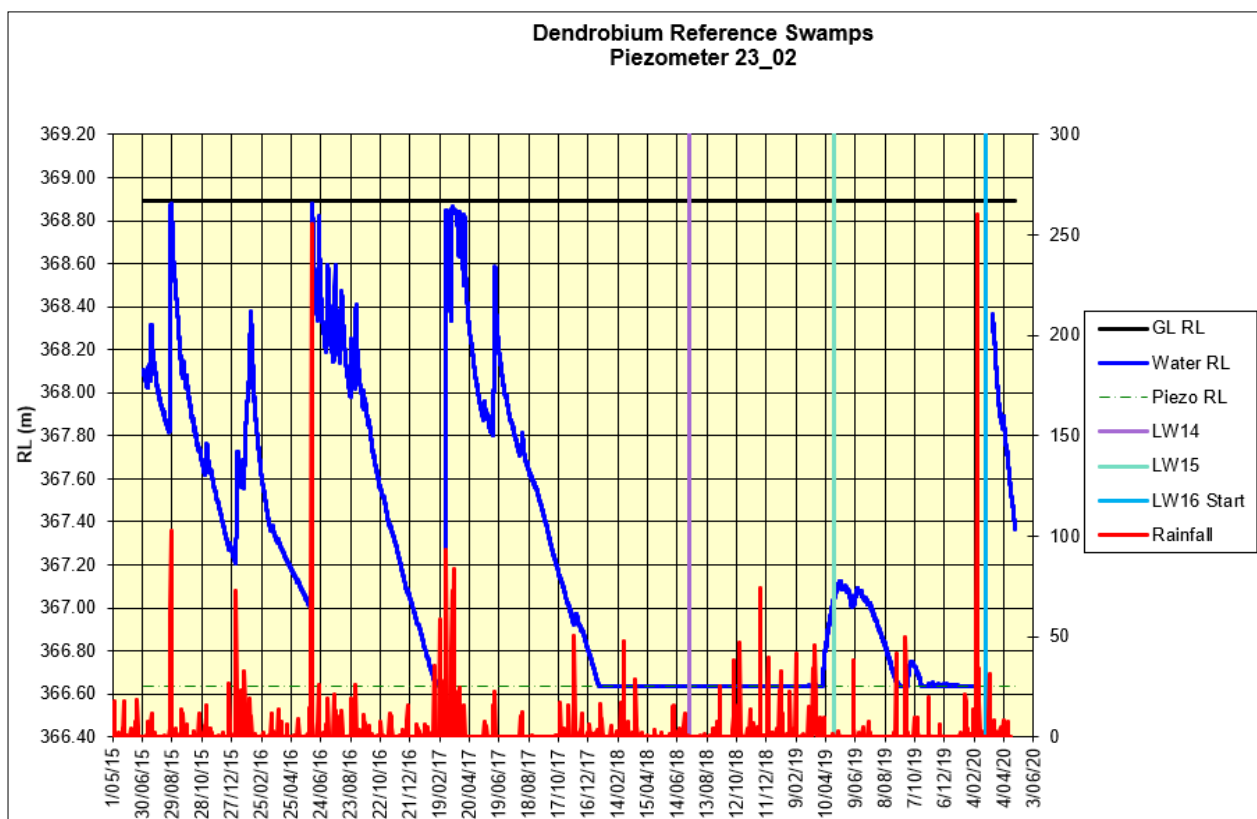
Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 28 April 2020 had progressed 515m (Figure 1). During the most recent inspections, undertaken on 27 and 28 April 2020, five new surface impacts were identified. This report also includes a shallow groundwater trigger identified in *Swamp 23* following analysis of recent data.

Swamp 23

A near-surface groundwater trigger was recorded at borehole 23_02 during recent analysis of piezometer data for *Swamp 23*. The borehole is located approximately 20m to the north of Longwall 16 (Figure 1). The recent rate of water level recession (0.94 mm/hour calculated between 04/04/2020 04:00 and 27/04/2020 09:00) has exceeded the rate recorded at the same depth interval before mining (0.73 mm/hour calculated between 13/02/2016 12:00 and 14/03/2016 16:00) (Graph 1). The rate of recession trigger for borehole 23_01 was reported on 03 May 2019 during Longwall 15 extraction therefore the current groundwater results at 23_02 contribute to a Level 3 trigger according to the Dendrobium Swamps TARP (Appendix A, Table 1), specifically:

- Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp.



Graph 1: Near-surface groundwater levels at 23_02, logged hourly, date range: 01/05/2015 to 27/04/2020.

DA3B_LW16_008 (E289034, N6191551)

DA3B_LW16_008 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 16 April 2020. The impact is comprised of eight soil cracks within an area of 10m by 2m (Photo 1 to Photo 3). The soil cracking has a maximum length of 3.6m, a maximum width of 0.03m and a maximum measurable depth of 0.25m.

DA3B_LW16_008 is a Level 1 trigger as per the *Dendrobium Area 3B Landscape TARP* (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: DA3B_LW16_008, an overview of the soil cracking. Taken on 27/04/2020.



Photo 2: DA3B_LW16_008, looking at the width of the soil cracking. Taken on 27/04/2020.



Photo 3: DA3B_LW16_008, looking at a section of the soil cracking. Taken on 27/04/2020.

DA3B_LW16_009 (E289061, N6191483)

DA3B_LW16_009 is situated on a rehabilitated seismic track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 20 April 2020. The impact is comprised of five soil cracks (Photo 4 and Photo 5). The soil cracking has a maximum length of 4.6m, a maximum width of 0.05m and a maximum measurable depth of 0.45m.

DA3B_LW16_009 is a Level 1 trigger as per the *Dendrobium Area 3B Landscape TARP* (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 4: DA3B_LW16_009, looking at a section of soil cracking. Taken on 27/04/2020.



Photo 5: DA3B_LW16_009, looking at the depth of the soil cracking. Taken on 27/04/2020.

DA3B_LW16_010 (E289001, N6191423)

DA3B_LW16_010 is situated on a rock outcrop between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 14 April 2020. The impact is comprised of rock fracturing (Photo 6 and Photo 7). The rock fracturing has a maximum length of 16m, a maximum width of 0.02m and a maximum measurable depth of 2m.

DA3B_LW16_010 is a Level 2 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture between 10m and 50m in length.



Photo 6: DA3B_LW16_010, an overview of the rock fracture. Taken on 27/04/2020.



Photo 7: DA3B_LW16_010, an overview of the rock fracture. Taken on 27/04/2020.

DA3B_LW16_011 (E289034, N6191253)

DA3B_LW16_011 is located at the base of a steep slope/step between *Lake Avon* and *Fire Road 6A* (Figure 1). The impact is situated approximately 70m south of Longwall 16 at its closest point. The impact is comprised of a small rock fall (Photo 8 and Photo 9). The largest rock fragment resulting from the rockfall has a length of 0.25m, a width of 0.2m and a height of 0.1m.

DA3B_LW16_011 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 2), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length) resulting in insignificant ground disturbance.



Photo 8: DA3B_LW16_011, overview of the rockfall.
Taken on 27/04/2020.



Photo 9: DA3B_LW16_011, overview of the rockfall.
Taken on 27/04/2020.

DA3B_LW16_012 (E289001, N6191423)

DA3B_LW16_012 is located at a steep slope/step between *Swamp 14* and *Fire Road 6P*, approximately 20m from SLMMP site *A3b-SS14* and 7m from cultural heritage site *DM21* (Figure 2). It is likely that this impact occurred during the extraction of Longwall 15, however access to the site was restricted during mining due to site safety concerns. The site was undermined by Longwall 15 on 31 October 2019. The impact is comprised of rock fracturing (Photo 10 to Photo 12). The rock fracturing has a maximum length of 2.75m, a maximum width of 0.037m and a maximum horizontal depth of 1.2m.

DA3B_LW16_012 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.

Detailed assessment of cultural heritage site *DM21* will be included in the Longwall 15 End of panel Report.



Photo 10: DA3B_LW16_012, looking at a section of rock fracturing. Taken on 28/04/2020.



Photo 11: DA3B_LW16_012, looking at the maximum width of the rock fracture. Taken on 28/04/2020.



Photo 12: DA3B_LW16_012, looking at a section of rock fracturing. Taken on 28/04/2020.

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the Dendrobium Area 3B SMP
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_003	16/04/2020 & 21/04/2020	LW16	Soil Cracking & Rock Fracturing	1	Rock fracturing identified adjacent to previously identified soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	17/04/2020 and 22/04/2020
DA3B_LW16_005	21/04/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	22/04/2020
DA3B_LW16_006	21/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	22/04/2020
DA3B_LW16_007	21/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	22/04/2020
23_02	27/04/2020	LW16	Groundwater Trigger	3	Near-surface groundwater trigger in Swamp 23 (recession rate)	This Report
DA3B_LW16_008	27/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_009	27/04/2020	LW16	Soil Cracking	1	Soil cracking on rehabilitated seismic track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_010	27/04/2020	LW16	Rock Fracturing	2	Rock fracturing to rock outcrop between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_011	27/04/2020	LW16	Rockfall	1	Small rock fall at steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_012	28/04/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Fire Road 6P</i> and <i>Swamp 14</i> .	This Report

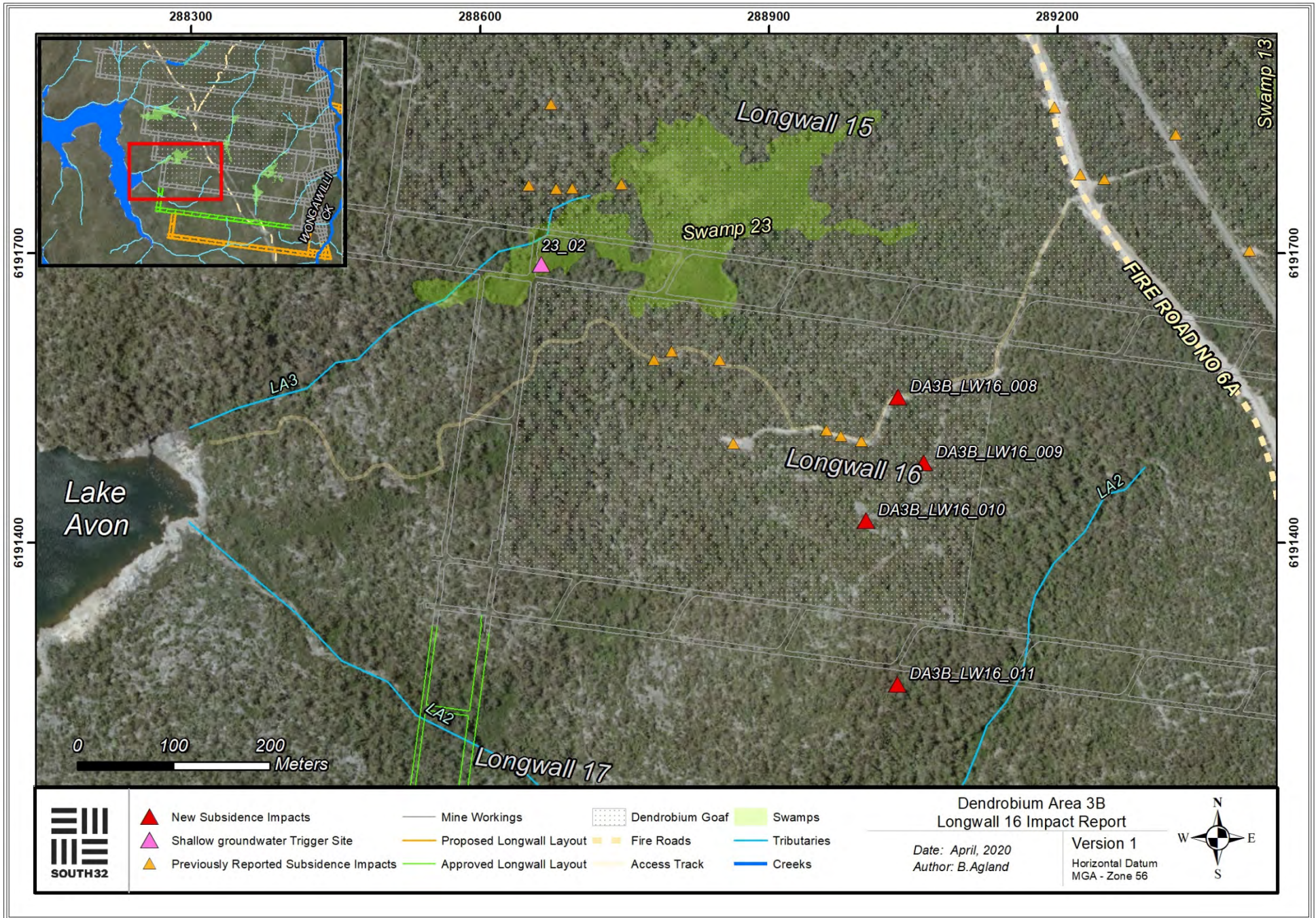


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations. Note- 'Access Track' drawn on map as not visible in latest aerial image.

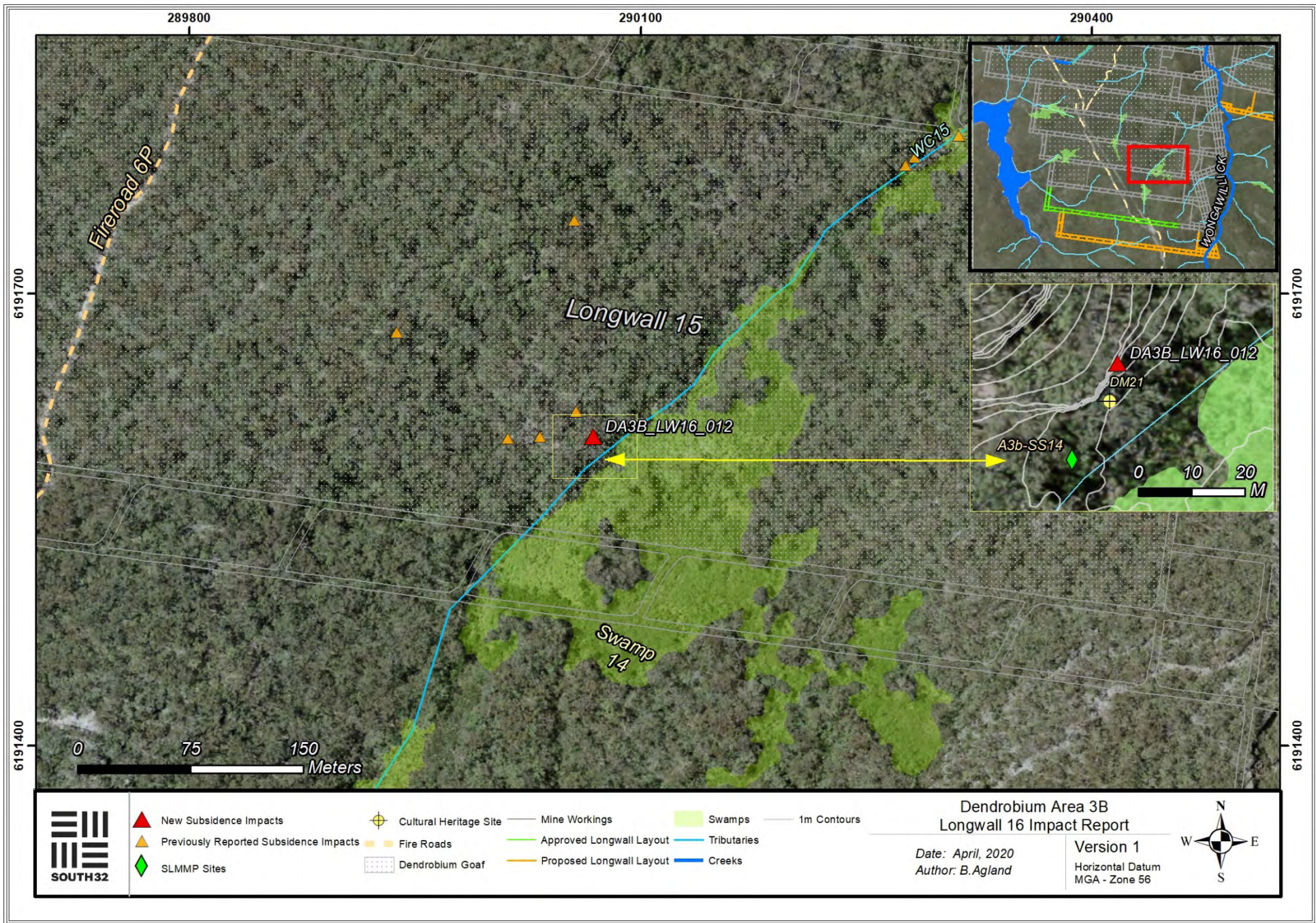


Figure 2: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Swamp TARP.

<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in surface or near-surface groundwater levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve).</p> <p><u>Level 2:</u> Groundwater level lower than baseline level at 50% of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a 50% of monitoring sites (within 400m of mining) within the swamp.</p> <p><u>Level 3:</u> Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>
<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in soil moisture levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Soil moisture level lower than baseline level at any monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 2:</u> Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 3:</u> Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p>	<ul style="list-style-type: none"> a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area <i>Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</i></p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p> <p>Fire Trails All mapped fire trails in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area <i>Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</i></p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify <u>D_oPJ</u>, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 10 May 2020, had progressed approximately 600m (Figure 1). During the most recent inspections, undertaken on 5 May 2020, 12 May 2020 and 15 May 2020, four new surface impacts and two updates to existing impacts were identified. This report also includes an update to shallow groundwater trigger in *Swamp 11*.

DA3B_LW16_013 (E289119, N6191571)

DA3B_LW16_013 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was mined beneath by Longwall 16 on 24 April 2020. The impact is comprised of multiple soil cracks spanning approximately 40m in length. The soil cracking has a maximum continuous length of approximately 25m, a maximum width of 0.09m and a maximum depth of 1.67m (Photo 1 to Photo 3).

DA3B_LW16_013 is a Level 2 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture between 10 and 50m length.

The crack will be filled as part of ongoing works to the track.

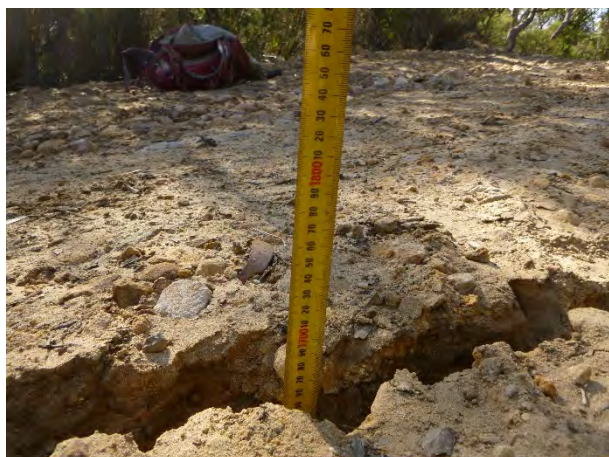


Photo 1: DA3B_LW16_013, looking at the depth of soil cracking. Taken on 12/05/2020.



Photo 2: DA3B_LW16_013, looking at the width of soil cracking. Taken on 12/05/2020.



Photo 3: *DA3B_LW16_013*, looking at a section of soil cracking. Taken on 12/05/2020.

DA3B_LW16_014 (E289141, N6191604)

DA3B_LW16_014 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 27 April 2020. The impact is comprised of 5 soil cracks (Photo 4 and Photo 5). The soil cracking has a maximum length of 1.5m, maximum width of 0.01m and maximum measurable depth of 0.12m.

DA3B_LW16_014 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 4: *DA3B_LW16_014*, looking at a section of soil cracking. Taken on 12/05/2020.



Photo 5: *DA3B_LW16_014*, looking at the width of soil cracking. Taken on 12/05/2020.

DA3B_LW15_002 Update (E288651, N6191771)

DA3B_LW15_002 is located on a 4m step adjacent to Swamp 23 (Figure 1). The site was undermined by Longwall 15 on 25 April 2019 and is located approximately 100m from the start of Longwall 16. The impact was previously reported as a rockfall. During a recent inspection additional rock fracturing was identified 5m from the rockfall (Photo 6 and Photo 7). The fracture likely occurred during Longwall 15 and has only now become visible. The rock fracturing has a maximum length of 1.3m, a maximum width of 0.005m and maximum measurable depth of 0.15m.

DA3B_LW15_002 remains a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.
- Rock fall from a cliff (step) which is left mostly intact (<10% length) resulting in insignificant ground disturbance.



Photo 6: DA3B_LW15_002, looking at a section of soil cracking. Taken on 05/05/2020.



Photo 7: DA3B_LW15_002, looking at the width of soil cracking. Taken on 05/05/2020.

DA3B_LW15_008 Update (E289221, N6191783)

Impact DA3B_LW15_008 consists of soil cracking and uplift along Fire Road 6A (Figure 1). DA3B_LW15_008 is situated above Longwall 15, approximately 185m from Longwall 16. The site was previously remediated during road re-surfacing. During a recent inspection, soil cracking and uplift was evident. Discontinuous cracking and uplift runs for approximately 15m, with the longest continuous section is approximately 8m in length. The soil cracking has a maximum width of 0.04m, a maximum measurable depth of 0.28m and an uplift of 0.05m (Photo 8 and Photo 9). The soil cracking and uplift appear to be stable and should self-remediate over time through natural processes. Monitoring will continue at the site to identify any changes.

DA3B_LW15_008 remains a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture less than 10m in length.
- Crack or fracture up to 100mm width.



Photo 8: DA3B_LW15_008, looking at a section of soil cracking and uplift. Taken on 12/05/2020.

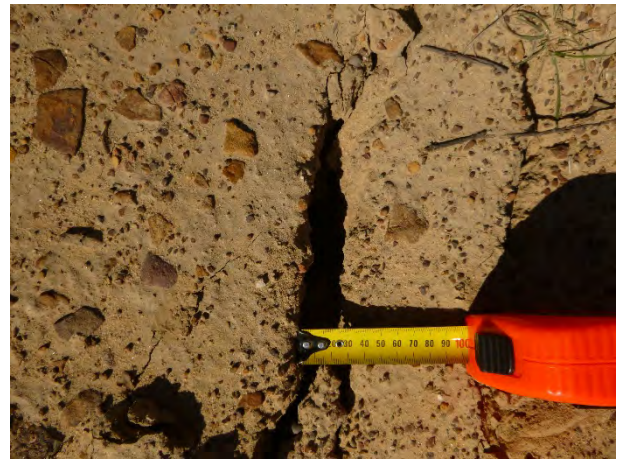


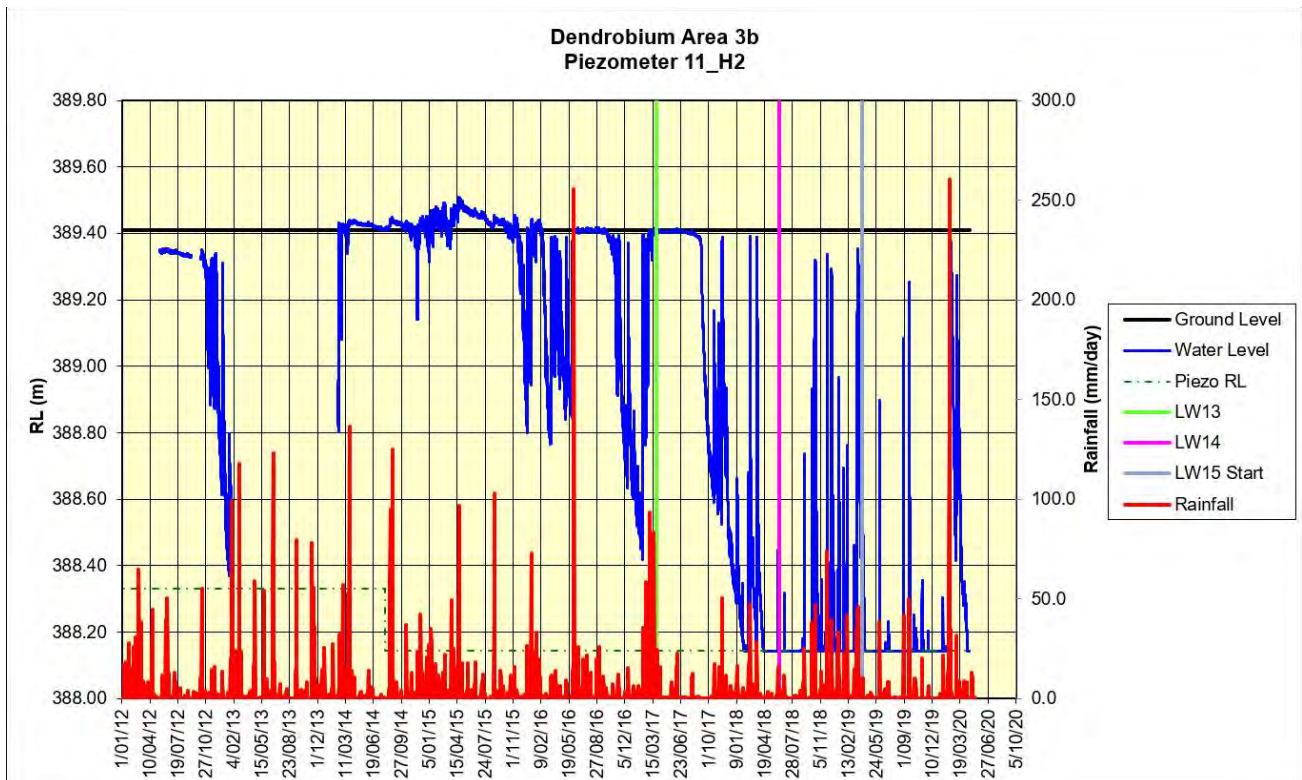
Photo 9: DA3B_LW15_008, looking at the width of soil cracking. Taken on 12/05/2020.

Swamp 11

A near-surface groundwater trigger was recorded at borehole 11_H2 during analysis of piezometer data for Swamp 11. Piezometer 11_H2 was mined beneath by Longwall 14 on 12 June 2018. Analysis of records at 11_H2 show the groundwater level being lower than the lowest data recorded during the baseline period (Graph 1). At that time water level recessing below the baseline was considered to be a result of a very low rainfall because this occurred nine months after longwall 13 passed the hole. A groundwater level trigger for borehole 11_H1 was reported on 20 July 2018 during the extraction of Longwall 13.

Groundwater results at 11_H1 and 11_H2 contribute to a Level 2 Trigger according to the Dendrobium Swamps Impacts, Triggers and Response (Appendix A, Table 1), specifically:

- Groundwater level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).



Graph 1: Near-surface groundwater levels at 11_H2, logged hourly, date range: 16/05/2012 to 20/04/2020.

DA3B_LW16_015 (E288719, N6191497)

DA3B_LW16_015 is located at the base of a steep slope/step between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 9 March 2020. The impact is comprised of rock fracturing (Photo 10 and Photo 11). The rock fracturing has a length of 1.2m, a width of 0.014m and a maximum measurable horizontal depth of 0.19m.

DA3B_LW16_015 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 10: DA3B_LW16_015, overview of the rock fracturing. Taken on 15/05/2020.



Photo 11: DA3B_LW16_015, looking at the width of rock fracturing. Taken on 15/05/2020.

DA3B_LW16_016 (E289183, N6191508)

DA3B_LW16_016 is located at a steep slope/step between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 1 May 2020. The impact is comprised of a rock fall and rock fracturing (Photo 12 to Photo 14). Four boulders were dislodged from the step with the largest boulder measuring 0.8m by 0.9m by 0.5m. The rock fracturing has a length of 2m and a width of 0.015m.

DA3B_LW16_016 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 2), specifically:

- Rockfall from a cliff (step) which is left mostly intact (<10% length) resulting in insignificant ground disturbance.
- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 12: DA3B_LW16_016, overview of the rockfall. Taken on 15/05/2020.



Photo 13: DA3B_LW16_016 looking at a section of rock fracturing. Taken on 15/05/2020.



Photo 14: DA DA3B_LW16_016 looking at a section of rock fracturing. Taken on 15/05/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.
- Review monitoring frequency.
- Notify relevant technical specialists and seek advice on any CMA required.

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_008	27/04/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	30/04/2020
DA3B_LW16_009	27/04/2020	LW16	Soil Cracking	1	Soil cracking on rehabilitated seismic track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	30/04/2020
DA3B_LW16_010	27/04/2020	LW16	Rock Fracturing	2	Rock fracturing to rock outcrop between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	30/04/2020
DA3B_LW16_011	27/04/2020	LW16	Rockfall	1	Small rock fall at steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	30/04/2020
DA3B_LW16_012	28/04/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Fire Road 6P</i> and <i>Swamp 14</i> .	30/04/2020
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to <i>Swamp 23</i> .	This Report
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across <i>Fire Road 6A</i> .	This Report
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in <i>Swamp 11</i> .	This Report
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report

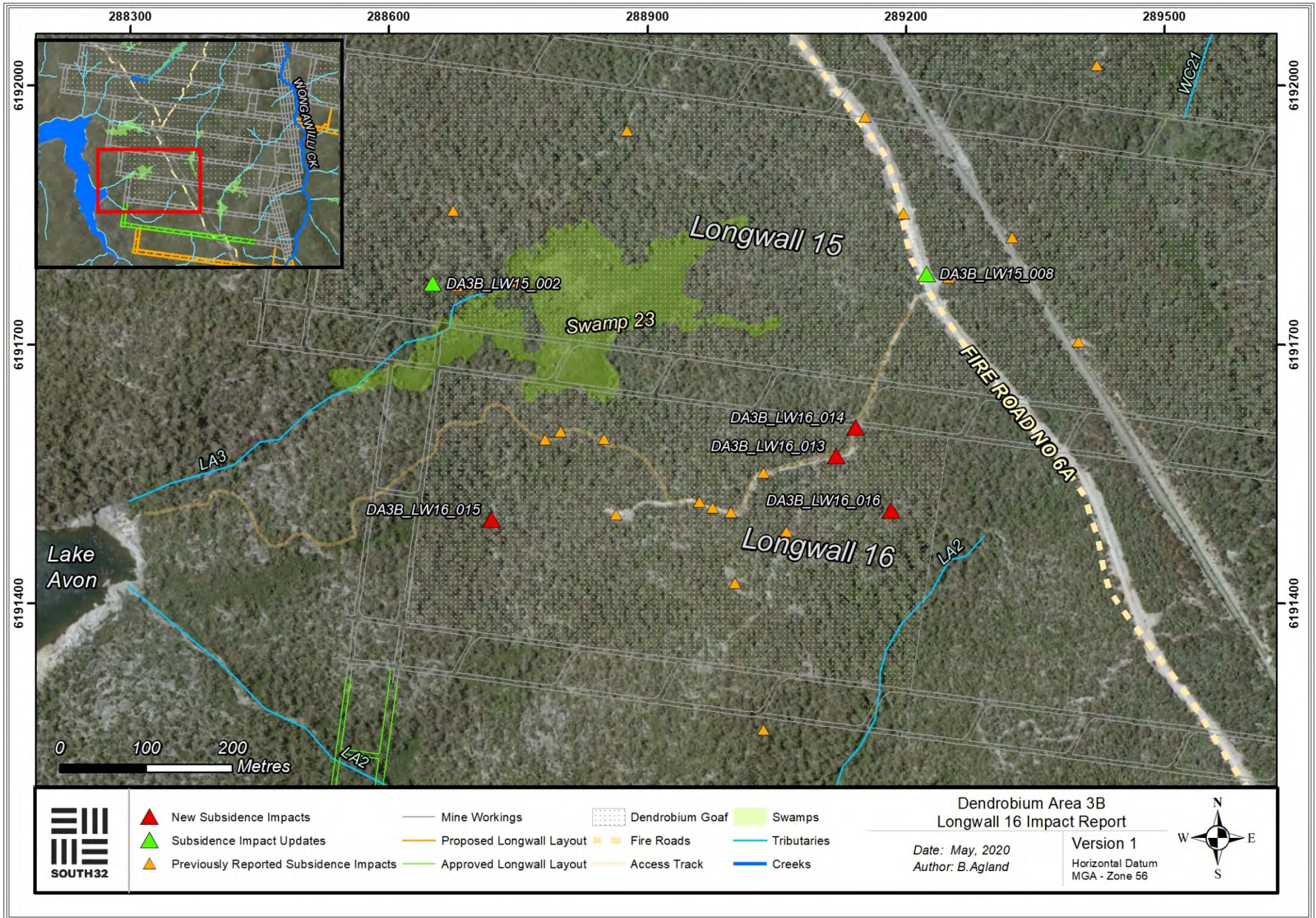


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations. Note- 'Access Track' drawn on map as not visible in latest aerial image.

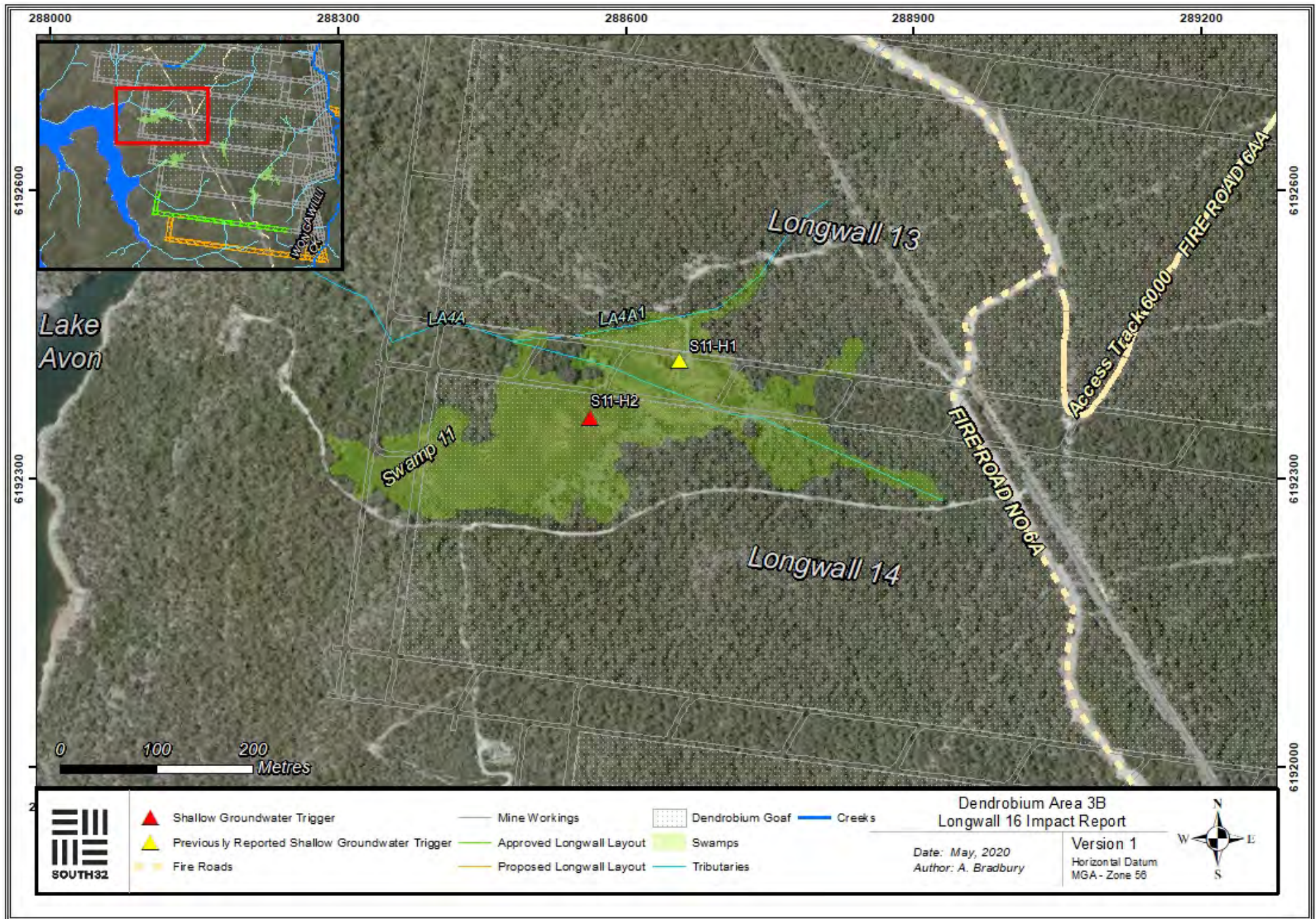


Figure 2: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Swamp TARP.

<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in surface or near-surface groundwater levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve).</p> <p><u>Level 2:</u> Groundwater level lower than baseline level at 50% of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a 50% of monitoring sites (within 400m of mining) within the swamp.</p> <p><u>Level 3:</u> Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>
<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in soil moisture levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Soil moisture level lower than baseline level at any monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 2:</u> Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 3:</u> Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p>	<ul style="list-style-type: none"> a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area <i>Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</i></p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p> <p>Fire Trails All mapped fire trails in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area <i>Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</i></p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify <u>D_oPJ</u>, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

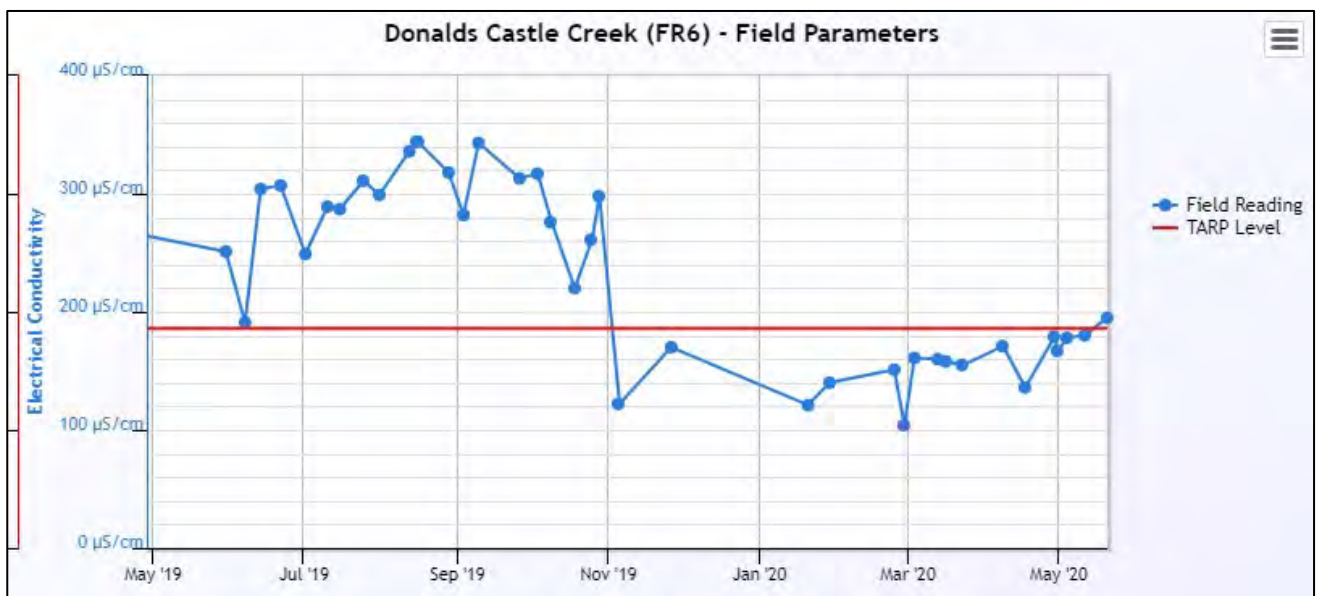
Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 25 May 2020, had progressed approximately 645m (Figure 1). During a recent inspection, a water quality trigger was identified in Donalds Castle Creek.

Donalds Castle Creek

Donalds Castle Creek runs northwards from DA3B. Its headwaters were mined beneath by early DA3B panels. During a recent inspection of Donalds Castle Ck (FR6), an electrical conductivity (EC) reading of 195 $\mu\text{S}/\text{cm}$ was recorded. This is above the trigger level of 185.8 $\mu\text{S}/\text{cm}$ (Graph 1). A Level 3 trigger was previously recorded at the site during Longwall 15 due to a period of inspections with EC above the trigger level. This latest observation constitutes a Level 1 trigger as per the DA3B Watercourse Impact, Monitoring Management and Contingency Plan (Table 2), specifically:

One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:

- pH 3.60
- **EC 185.8 $\mu\text{S}/\text{cm}$**
- DO 40.1%



Graph 1: Electrical conductivity results recorded at Donalds Castle Ck (FR6) over the past year.

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 24 May 2020, had progressed approximately 650 metres (m) (Figure 1). During the most recent inspection, undertaken on 28 May 2020, one update to an existing impact was identified.

DA3B_LW16_013 Update (E289119, N6191571)

DA3B_LW16_013 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was mined beneath by Longwall 16 on 24 April 2020. The impact was first identified on 12 May 2020, comprising of multiple soil cracks spanning approximately 40m in length. The soil cracking had a maximum continuous length of approximately 25m, a maximum width of 0.09m and a maximum measurable depth of 1.67m. During a recent inspection, it was observed that soil had washed in from the edges of the crack, widening the surface section up to 0.85m (Photo 2 and Photo 3). The actual width of the underlying fracture however was measured at 0.15m (Photo 1). This is likely due to a recent rainfall event (47.8 millimetres (mm) on 22 May 2020). Six additional soil cracks were evident on the access track, 15m from the original impact area. The soil cracking has a maximum length of 0.65m, maximum width of 0.02m, and maximum measurable depth of 0.27m (Photo 4).

DA3B_LW16_013 remains a Level 2 trigger as per the DA3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture between 10 and 50m length;
- Crack or fracture between 100 and 300mm width;
- Significant erosion at any site which is not likely to naturally stabilise within the monitoring period.

Access to the track has been restricted until remediation is completed.



Photo 1: DA3B_LW16_013, looking at the width of soil cracking. Taken on 28/05/2020.



Photo 2: DA3B_LW16_013, looking at the width of surface erosion. Taken on 28/05/2020.



Photo 3: DA3B_LW16_013, looking at a section of soil cracking. Taken on 28/05/2020.



Photo 4: DA3B_LW16_013, looking at a section of soil cracking. Taken on 28/05/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.
- Review monitoring frequency.
- Notify relevant technical specialists and seek advice on any CMA required.
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to <i>Swamp 23</i> .	18/05/2020
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across <i>Fire Road 6A</i> .	18/05/2020
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in <i>Swamp 11</i> .	18/05/2020
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report

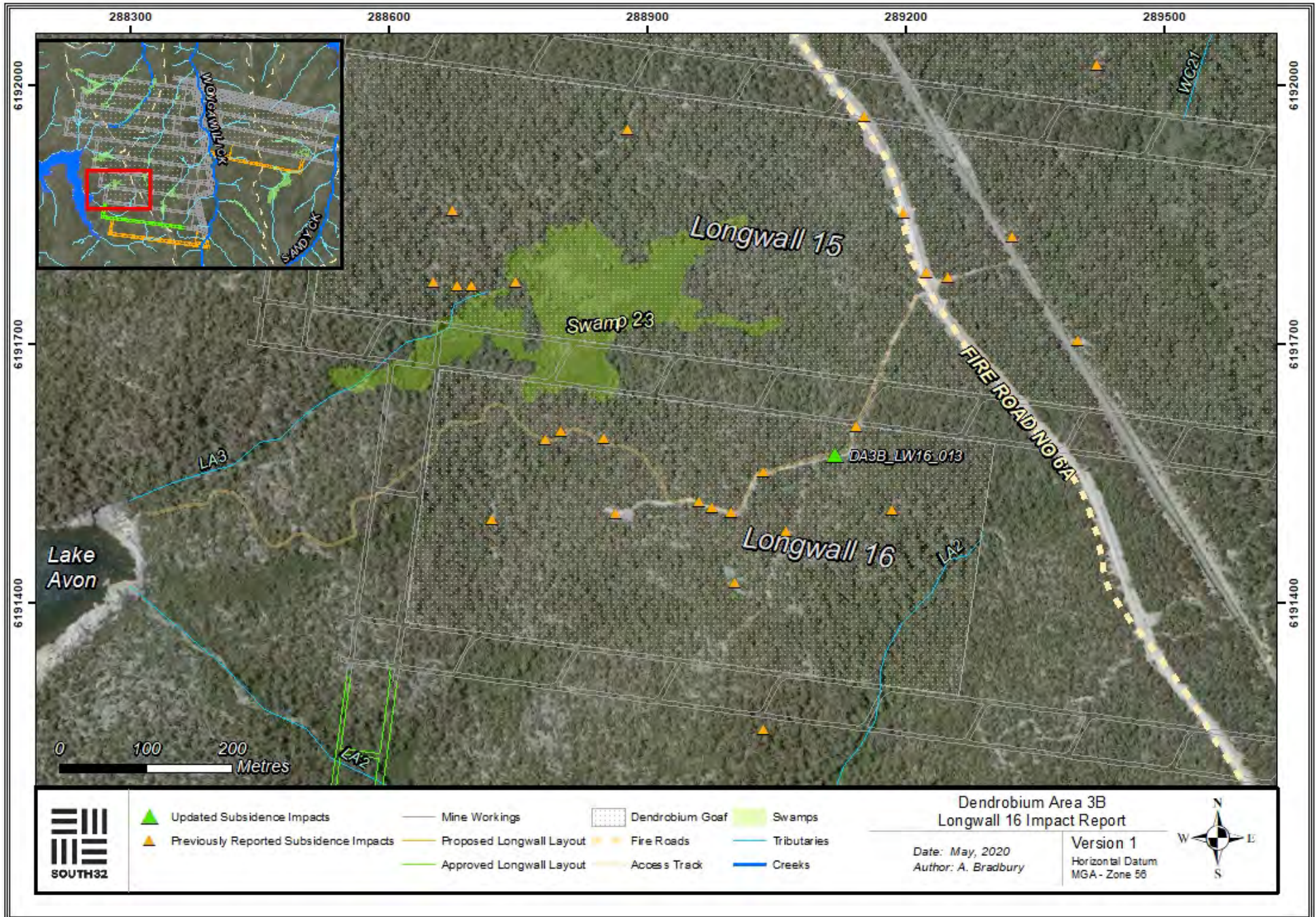


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations. Note- 'Access Track' drawn on map as not visible in latest aerial image.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 31 May 2020, had progressed approximately 711m (Figure 1). During a recent inspection, a water quality trigger was identified in Donalds Castle Creek.

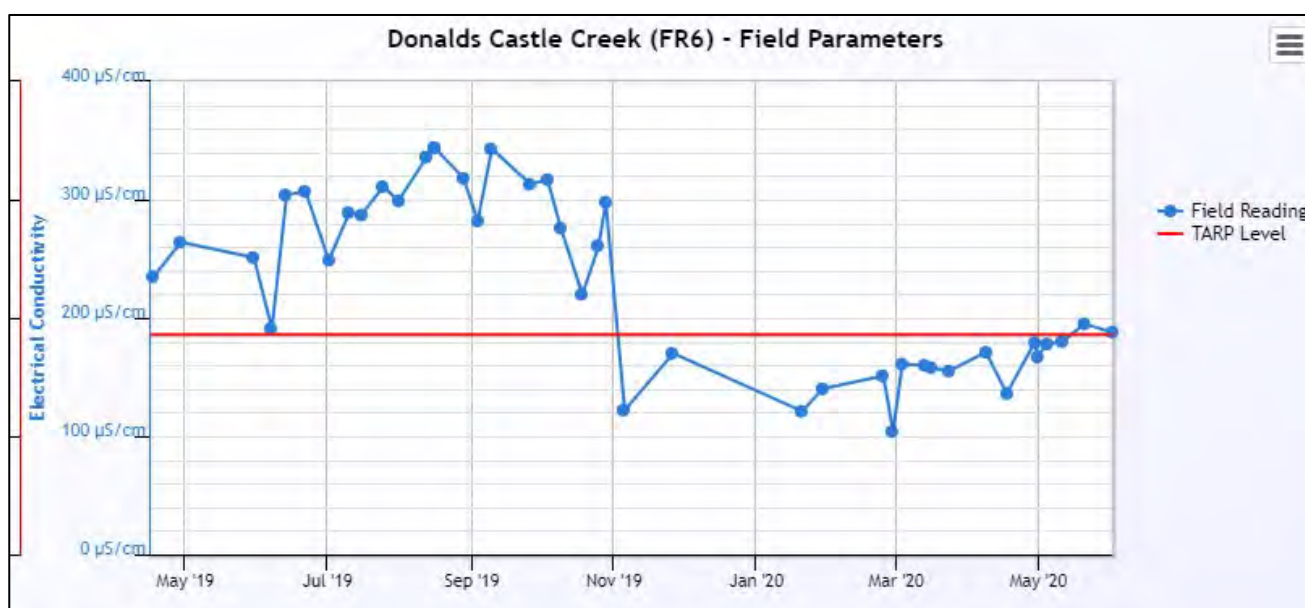
Donalds Castle Creek

Donalds Castle Creek runs northwards from DA3B. Its headwaters were mined beneath by early DA3B longwall panels. During the latest inspection of Donalds Castle Ck (FR6), an electrical conductivity (EC) reading of 188 $\mu\text{S}/\text{cm}$ was recorded. This is above the trigger level of 185.8 $\mu\text{S}/\text{cm}$ (Graph 1). This follows a reading of 195 $\mu\text{S}/\text{cm}$ recorded on the previous inspection. This latest observation constitutes a Level 2 trigger as per the DA3B Watercourse Impact, Monitoring Management and Contingency Plan (Table 2), specifically:

Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:

- pH 3.60
- **EC 185.8 $\mu\text{S}/\text{cm}$**
- DO 40.1%

Specialist advice on further actions is currently being sought.



Graph 1: Electrical conductivity results recorded at Donalds Castle Ck (FR6) over the past year.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.
- Review monitoring frequency.
- Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required.
- Implement agreed CMAs as approved (subject to agency feedback).

Table 1: Recent subsidence impact observations. Highlighted row indicates latest observation.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to Swamp 23.	18/05/2020
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across <i>Fire Road 6A</i> .	18/05/2020
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in Swamp 11.	18/05/2020
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	29/05/2020
Donalds Castle Ck (FR6) (Update)	1/06/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity	This Report

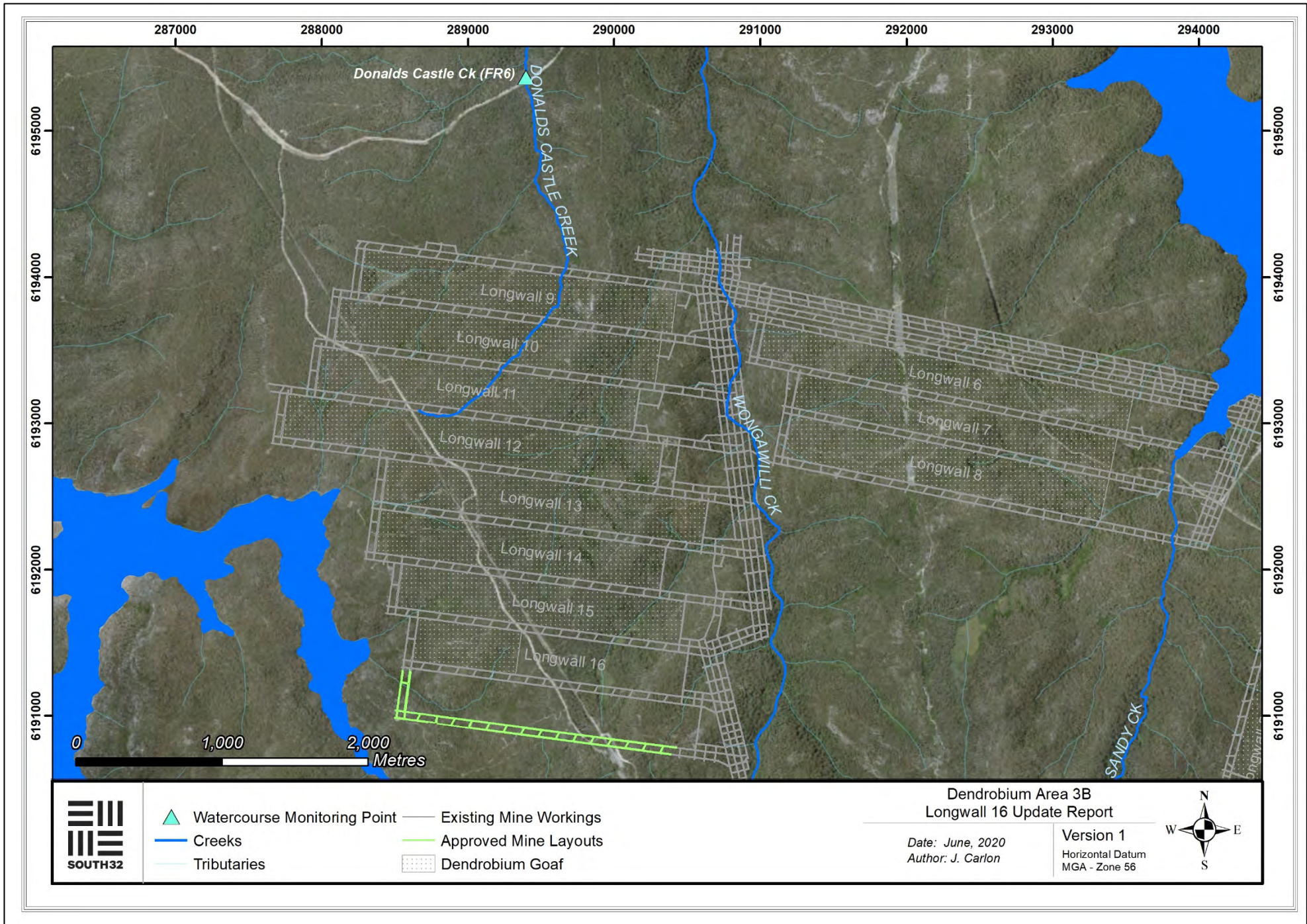


Figure 1: Map showing watercourse monitoring site Donalds Castle Ck (FR6) in relation to Dendrobium Area 3B mining operations.

Table 2: Extract from Dendrobium Area 3B Watercourse TARP.

WATER QUALITY		
<p>Donalds Castle Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Donalds Castle Creek - minor environmental consequences <p>Donalds Castle Creek (FR6)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> pH 5.41 EC 116.0 uS/cm DO 85.6% 	<p>Level 1</p> <ul style="list-style-type: none"> One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 3.60 EC 185.8 uS/cm DO 40.1% 	<ul style="list-style-type: none"> Continue monitoring program Submit an Impact Report to BCD, DPIE, DRG Water NSW Report in the End of Panel Report Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 3.60 EC 185.8 uS/cm DO 40.1% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 1</i> Review monitoring frequency Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 3.60 EC 185.8 uS/cm DO 40.1% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 2</i> Offer site visit with BCD, DPIE, DRG, Water NSW Implement additional monitoring or increase frequency if required Review relevant TARP and Management Plan in consultation with key agencies Collect laboratory samples and analyse for: <ul style="list-style-type: none"> pH, EC, major cations, major anions, Total Fe, Mn & Al Filterable suite of metals Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> Limestone emplacement to raise pH where it is appropriate to do so Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 3.60 EC 185.8 uS/cm DO 40.1% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 3</i> Investigate reasons for the exceedance Update future predictions based on the outcomes of the investigation Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 14 June 2020, had progressed approximately 830 metres (m) (Figure 1). During the most recent inspection, undertaken on 16 June 2020, two new impacts and one update to an existing impact were identified.

DA3B_LW16_017 (E289075, N6191396)

DA3B_LW16_017 is situated on a rock outcrop between *Swamp 23* and tributary *LA2* (Figure 1). The site was mined beneath by Longwall 16 on 22 April 2020. The impact is comprised of rock fracturing with a maximum length of 9m, a maximum width of 0.005m and a maximum measurable depth of 0.16m (Photo 1 and Photo 2).

DA3B_LW16_017 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m length;
- Crack or fracture up to 100mm width.



Photo 1: *DA3B_LW16_017*, looking at the length of rock fracturing. Taken on 16/06/2020.



Photo 2: *DA3B_LW16_017*, looking at width of rock fracturing. Taken on 16/06/2020.

DA3B_LW16_018 (E289206, N6191509)

DA3B_LW16_018 is situated at Subsidence, Landscape Monitoring and Management Plan (SLMMP) Site A3b-SS16, located between Swamp 23 and tributary LA2 (Figure 1). The site was mined beneath by Longwall 16 on 6 May 2020. The impact is comprised of two rock fractures and minor rock fragmentation (Photo 3 to Photo 5). The rock fracturing has a maximum continuous length of 4.5m, a maximum width of 0.004m and a maximum measurable depth of 0.21m. The rock fragmentation has a maximum length of 0.1m and a maximum width of 0.05m.

DA3B_LW16_018 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m length;
- Crack or fracture up to 100mm width.



Photo 3: DA3B_LW16_018, looking at a section of rock fracturing. Taken on 16/06/2020.



Photo 4: DA3B_LW16_018, looking at a section of rock fragmentation. Taken on 16/06/2020.



Photo 5: DA3B_LW16_018, looking at the width of rock fracturing. Taken on 16/06/2020.

DA3B_LW16_013 (E289119, N6191571)

DA3B_LW16_013 is situated on an access track between *Lake Avon* and *Fire Road 6A* (Figure 1). The site was mined beneath by Longwall 16 on 24 April 2020. The impact was first identified on 12 May 2020, comprising of multiple soil cracks spanning approximately 40m in length. The soil cracking had a maximum continuous length of approximately 25m, a maximum width of 0.09m and a maximum measurable depth of 1.67m. On 28 May 2020, the maximum width of soil cracking was identified to have increased to 0.15m, with a maximum surface erosion width of 0.85m (Photo 6). On 29 May 2020, soil cracking on the access track was remediated (Photo 7).



Photo 6: DA3B_LW16_013, looking at a section of soil cracking. Taken on 28/05/2020.



Photo 7: DA3B_LW16_013, looking at the remediated access track. Taken on 11/06/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to <i>Swamp 23</i> .	18/05/2020
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across <i>Fire Road 6A</i> .	18/05/2020
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in <i>Swamp 11</i> .	18/05/2020
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	29/05/2020
Donalds Castle Ck (FR6) (Update)	1/06/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity.	4/06/2020
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	This Report
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	This Report
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	This Report

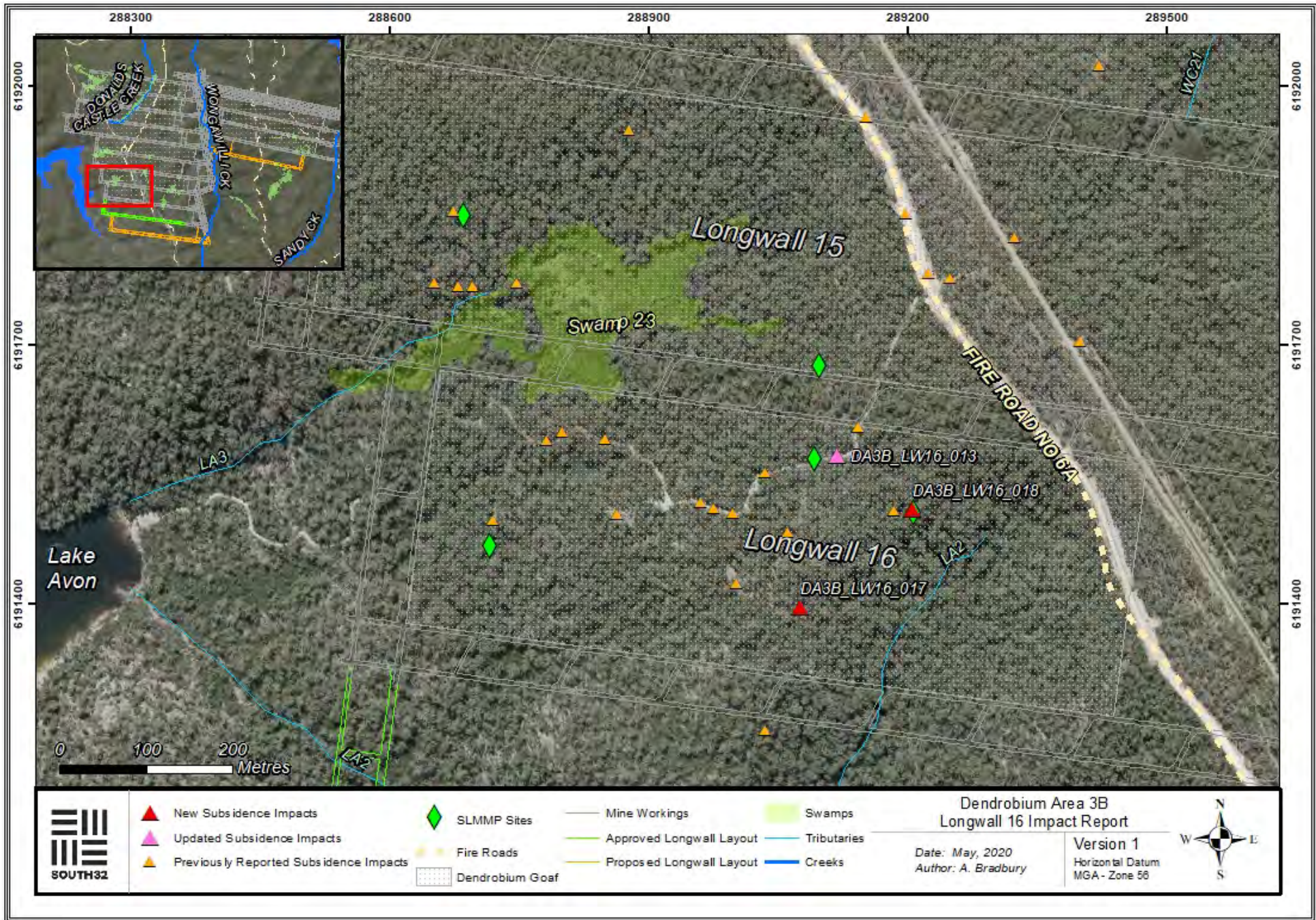


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 21 June 2020, had progressed approximately 880 metres (m) (Figure 1). During recent inspections, soil cracking was identified over Longwall 16.

DA3B_LW16_019 (E289436, N6191478)

DA3B_LW16_019 consists of soil cracking located on Fire Road 6A, over Longwall 16 (Figure 1). The site was mined beneath by Longwall 16 on 10 June 2020. The impact was initially observed on 19 June 2020, with a continuous length of 7.7m, a width up to 0.07m and a measurable depth of 1.2m (Photo 1). A follow-up inspection revealed changes to the cracking, now with a continuous length of approximately 19m, maximum width of 0.21m and measurable depth of 2.4m (Photo 2 to Photo 4). The crack extends either side of Fire Trail 6A with a total discontinuous length of approximately 50m. The widest part of the cracking is located adjacent to Fire Road 6A and should not impact vehicles using the road. Flagging and signage has been placed at the site and the cracking will be remediated in the coming days, pending approval from WaterNSW. The cracking will be monitored daily until remediation is complete, once remediation is complete, monitoring will return to a weekly basis as per the SMP.

DA3B_LW16_019 is a Level 2 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Appendix A: Table 1), specifically:

- Crack or fracture between 10m and 50m length; and
- Crack or fracture between 100mm and 300mm width.



Photo 1: DA3B_LW16_019, looking at the length of initial cracking. Taken on 19/06/2020.



Photo 2: DA3B_LW16_019, looking at width of rock fracturing. Taken on 23/06/2020.



Photo 3: DA3B_LW16_019, looking at width of cracking. Taken on 23/06/2020.



Photo 4: DA3B_LW16_019, looking at depth of cracking. Taken on 23/06/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP;
- Report impacts to key stakeholders;
- Summarise impacts and report in the End of Panel Report and Annual Environmental Management Report;
- Provide safety signage and barricades as appropriate;
- Implement approved repairs to ensure safety and serviceability on fire trails; and
- Implement approved CMS's as required.

Table 1: Recent subsidence impact observations. Highlighted row indicates latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to <i>Swamp 23</i> .	18/05/2020
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across <i>Fire Road 6A</i> .	18/05/2020
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in <i>Swamp 11</i> .	18/05/2020
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	29/05/2020
Donalds Castle Ck (FR6) (Update)	1/06/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity.	4/06/2020
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	19/06/2020
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	19/06/2020
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	19/06/2020
DA3B_LW16_019	19/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> .	24/06/2020

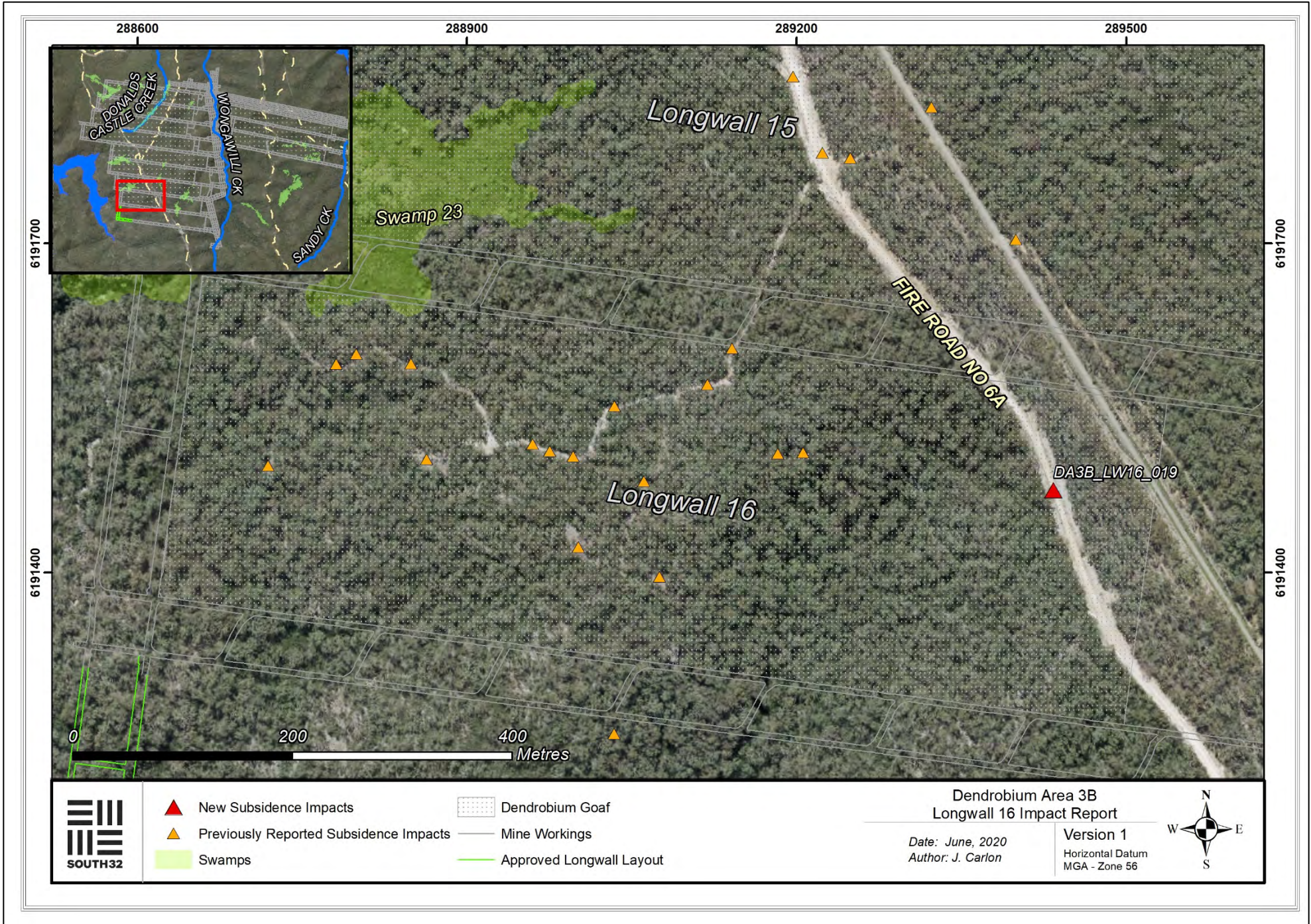


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 21 June 2020, had progressed approximately 880 metres (m) (Figure 1). During a recent inspection, an update to an existing impact was identified.

DA3B_LW16_019 Update (E289436, N6191478)

DA3B_LW16_019 consists of soil cracking located on Fire Road 6A, over Longwall 16 (Figure 1). The site was mined beneath by Longwall 16 on 10 June 2020. The impact was initially observed on 19 June 2020, with a continuous length of 7.7m, a width up to 0.07m and a maximum measurable depth of 1.2m. A follow-up inspection revealed changes to the cracking, with a continuous length of approximately 19m, maximum width of 0.21m and maximum measurable depth of 2.4m. The crack extends either side of Fire Trail 6A with a total discontinuous length of approximately 50m. On 25 June 2020, 8 additional soil cracks were identified 10m north of the initial cracking. The soil cracking has a maximum length of 2m, maximum width of 0.03m and maximum measurable depth of 0.4m (Photo 1 to Photo 3). *DA3B_LW16_019* was remediated on 29 June 2020 following approval from Water NSW (Photo 4 and Photo 5). Monitoring will continue a weekly basis as per the DA3B SMP.

DA3B_LW16_019 is a Level 2 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Appendix A: Table 1), specifically:

- Crack or fracture between 10m and 50m length; and
- Crack or fracture between 100mm and 300mm width.
(now remediated)



Photo 1: DA3B_LW16_019, looking at the depth of recent soil cracking. Taken on 25/06/2020.



Photo 2: DA3B_LW16_019, looking at the width of recent soil cracking. Taken on 25/06/2020.



Photo 3: DA3B_LW16_019, looking at a section of soil cracking. Taken on 25/06/2020.



Photo 4: DA3B_LW16_019, looking along the remediated soil cracking. Taken on 29/06/2020.



Photo 5: DA3B_LW16_019, looking at the remediated soil cracking. Taken on 29/06/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP;
- Report impacts to key stakeholders;
- Summarise impacts and report in the End of Panel Report and Annual Environmental Management Report;
- Provide safety signage and barricades as appropriate;
- Implement approved repairs to ensure safety and serviceability on fire trails; and
- Implement approved CMS's as required.

Table 1: Recent subsidence impact observations. Highlighted row indicates latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> (now remediated).	29/05/2020
Donalds Castle Ck (FR6) (Update)	1/06/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity.	4/06/2020
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	19/06/2020
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	19/06/2020
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	19/06/2020
DA3B_LW16_019	19/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> .	24/06/2020
DA3B_LW16_019 Update	25/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> (now remediated).	29/06/2020

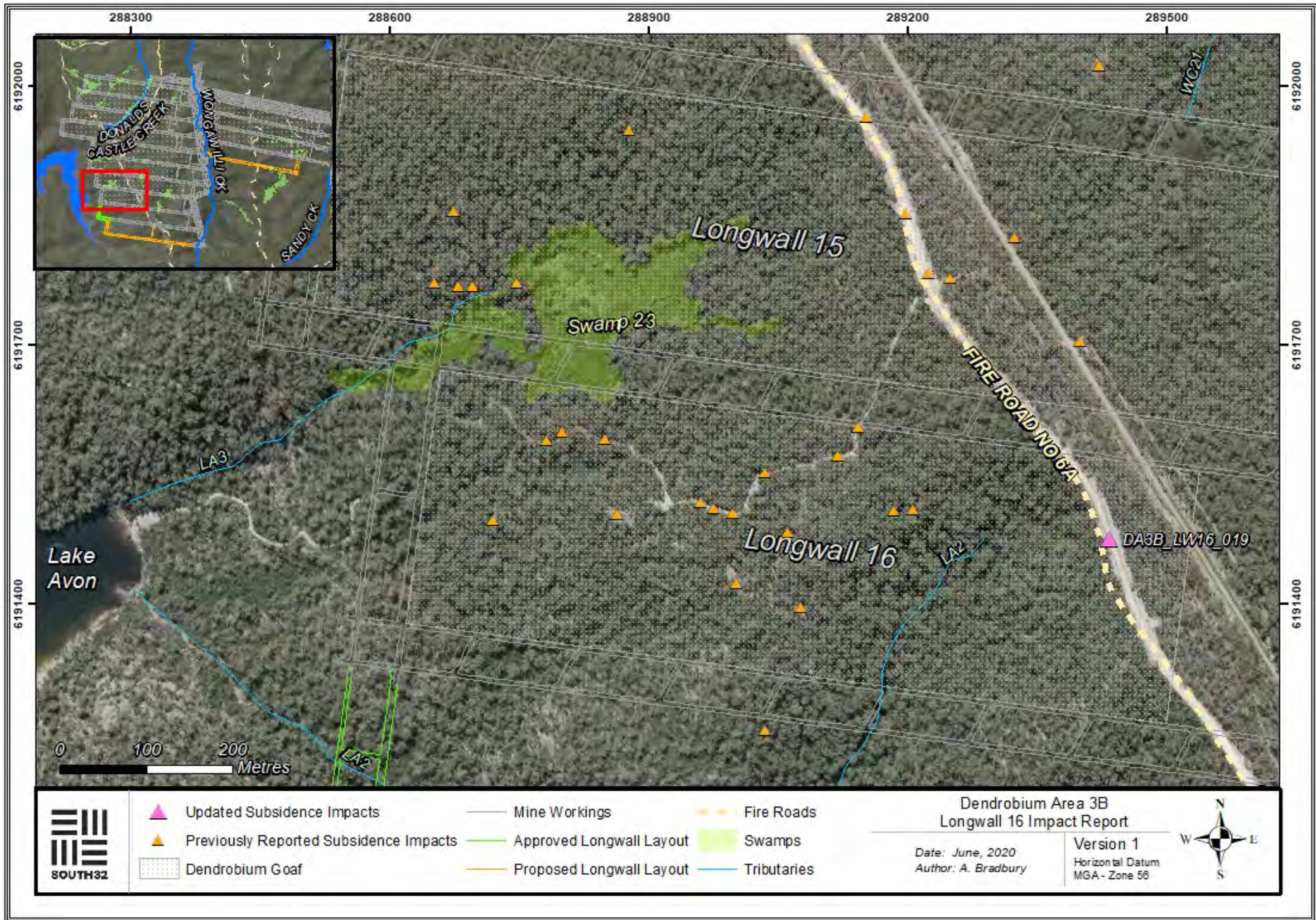


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 28 June 2020, had progressed approximately 960 metres (m) (Figure 1). During recent inspections, surface impacts were observed, and a water quality trigger was recorded.

DA3B_LW16_020 (E289469, N6191376)

DA3B_LW16_020 consists of a series of soil cracks across Fire Road 6A, over Longwall 16 (Figure 1). The site was mined beneath by Longwall 16 on 15 June 2020. The soil cracks are up to 0.008m wide and 4m long with a measurable depth of up to 0.7m (Photo 1 to Photo 3). The cracking does not currently impede traffic or cause safety issues to field personnel walking in the area. The site will be monitored on a sub-weekly basis to identify any potential changes to the cracks.

DA3B_LW16_020 is a Level 1 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m length; and
- Crack or fracture up to 100mm width.



Photo 1: *DA3B_LW16_020*, looking at the cracking across fire road. Taken on 30/06/2020.



Photo 2: *DA3B_LW16_020*, looking at the cracking across fire road. Taken on 30/06/2020.



Photo 3: *DA3B_LW16_020*, looking at width of cracking across fire road. Taken on 30/06/2020.

DA3B_LW16_021 (E289366, N6191418)

DA3B_LW16_021 consists of rock fracturing and small rockfall to a 2m high step over Longwall 16 (Figure 1). The fracture is approximately 2m long, 0.12m wide and has a measurable depth of approximately 1m (Photo 4 and Photo 5). The largest rock fragment fallen from step is 0.35m long, with several smaller pieces also observed (Photo 6).

DA3B_LW16_021 is a Level 2 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Appendix A, Table 1), specifically:

- Crack or fracture between 100mm and 300mm width.



Photo 4: *DA3B_LW16_021*, looking at fracture down step. Taken on 30/06/2020.

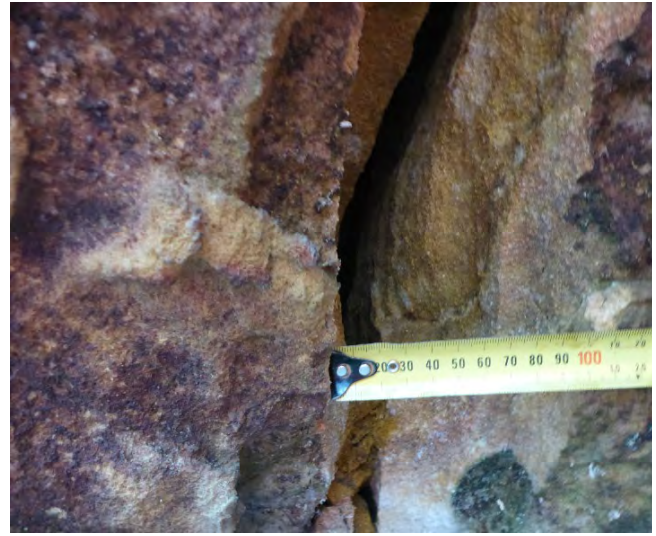


Photo 5: *DA3B_LW16_021*, looking at width of fracture on step. Taken on 30/06/2020.



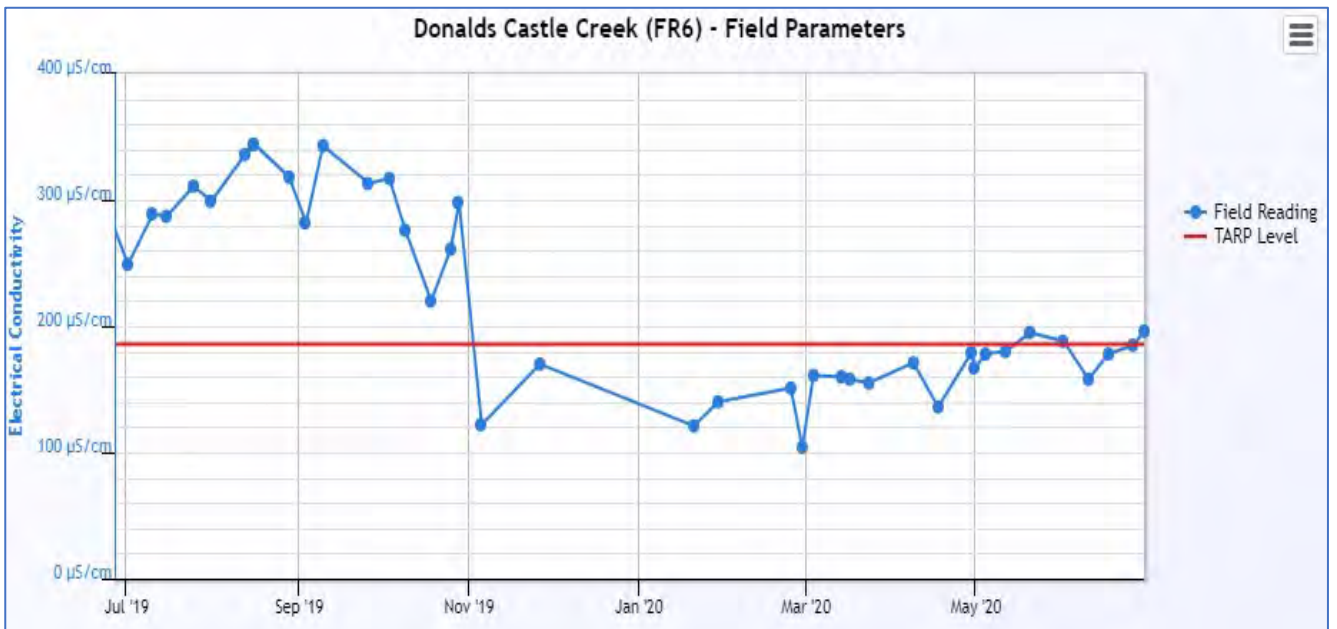
Photo 6: *DA3B_LW16_021*, looking at small rock fragments fallen from step. Taken on 30/06/2020.

Donalds Castle Creek

Donalds Castle Creek runs northwards from DA3B. Its headwaters were mined beneath by early DA3B longwall panels. During the latest inspection of Donalds Castle Ck (FR6), an electrical conductivity (EC) reading of 196 $\mu\text{S}/\text{cm}$ was recorded. This is above the trigger level of 185.8 $\mu\text{S}/\text{cm}$ (Graph 1). This latest observation constitutes a Level 3 trigger as per the DA3B Watercourse Impact Monitoring, Management and Contingency Plan (Appendix A, Table 2), specifically:

Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:

- pH 3.60
- **EC 185.8 $\mu\text{S}/\text{cm}$**
- DO 40.1%



Graph 1: Electrical conductivity results recorded at Donalds Castle Ck (FR6) over the past 12 months.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP;
- Report impacts to key stakeholders;
- Summarise impacts and report in the End of Panel Report and Annual Environmental Management Report;
- Provide safety signage and barricades as appropriate;
- Implement approved repairs to ensure safety and serviceability on fire trails;
- Implement approved CMA's as required;
- Offer site visit with BCD, DPIE, DRG, WaterNSW;
- Implement additional monitoring or increase frequency if required;
- Review relevant TARP and Management Plan in consultation with key agencies;
- Collect laboratory samples and analyse for pH, EC, major cations, major anions, Total Fe, Mn & Al and filterable suite of metals;
- Develop site CMA (subject to agency feedback). This may include limestone emplacement to raise pH where it is appropriate to do so; and
- Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success.

Table 1: Recent subsidence impacts and triggers. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity.	26/05/2020
DA3B_LW16_013 Update	12/05/2020 & 28/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> (now remediated).	29/05/2020
Donalds Castle Ck (FR6) (Update)	1/06/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity.	4/06/2020
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	19/06/2020
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	19/06/2020
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	19/06/2020
DA3B_LW16_019	19/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> .	24/06/2020
DA3B_LW16_019 Update	25/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> (now remediated).	29/06/2020
DA3B_LW16_020	30/06/2020	LW16	Soil Cracking	1	Soil cracking across <i>Fire Road 6A</i> .	This Report
DA3B_LW16_021	30/06/2020	LW16	Rock Fracturing	2	Rock fracturing to step with small rockfall	This Report
Donalds Castle Ck (FR6) (Update)	30/06/2020	LW16	Water Quality Trigger	3	Trigger for electrical conductivity.	This Report

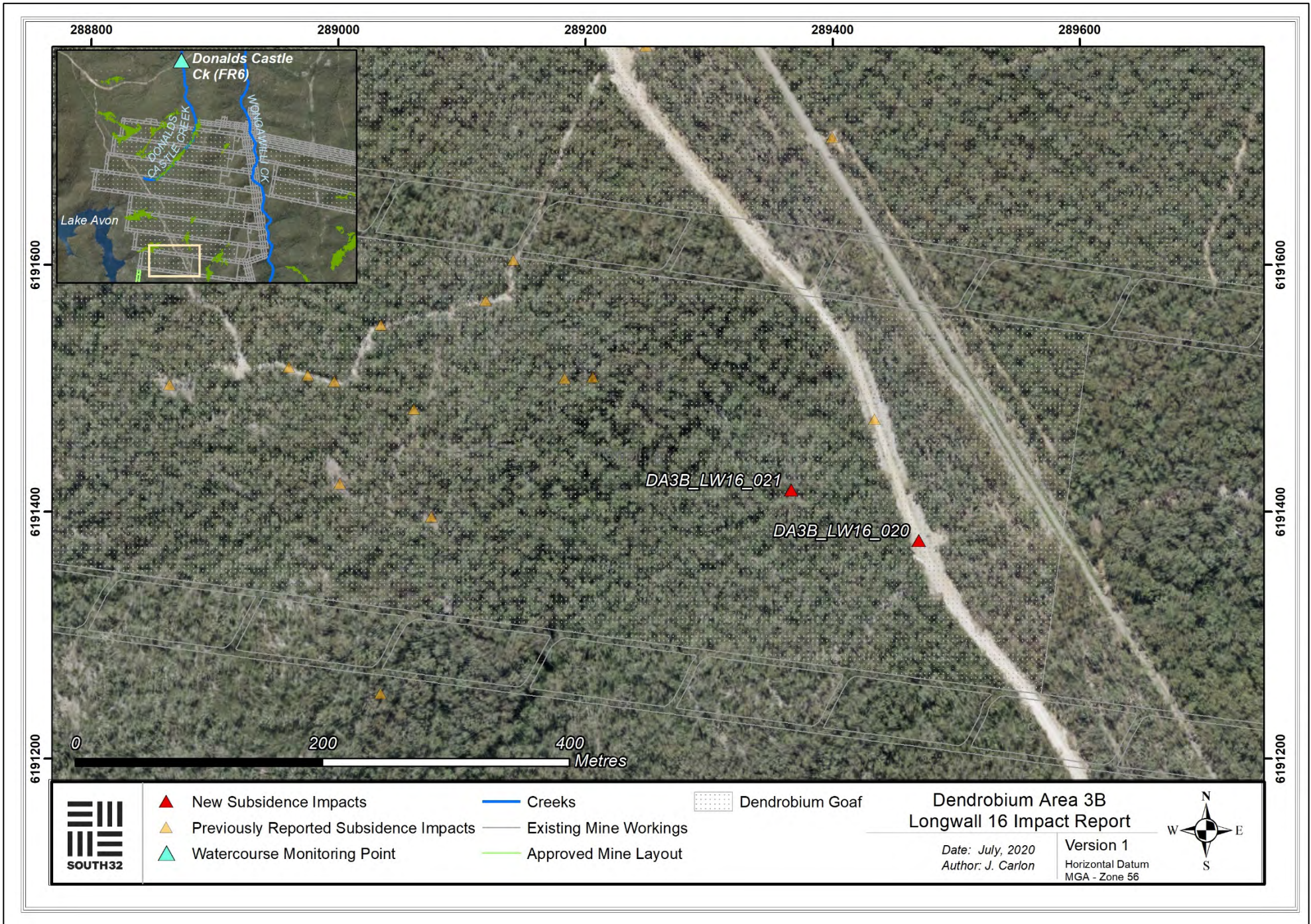


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Table 2: Extract from Dendrobium Area 3B Watercourse TARP.

WATER QUALITY		
<p>Donalds Castle Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Donalds Castle Creek - minor environmental consequences <p>Donalds Castle Creek (FR6)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> • pH 5.41 • EC 116.0 uS/cm • DO 85.6% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPIE, DRG Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPIE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key agencies • Collect laboratory samples and analyse for: <ul style="list-style-type: none"> – pH, EC, major cations, major anions, Total Fe, Mn & Al – Filterable suite of metals • Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> – Limestone emplacement to raise pH where it is appropriate to do so • Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 5 July 2020, had progressed approximately 1010 metres (m) (Figure 1). During the latest inspection, new surface impacts were observed.

DA3B_LW16_022 (E289564, N6191418)

DA3B_LW16_022 is comprised of three rock fractures running up the face of a cut through which forms part of the Maldon Dombarton railway corridor adjacent to Fire Road 6A (Figure 1). Two of the fractures are on the eastern side of the corridor with the longest up to 15m in length, with a width of approximately 0.08m and a measurable depth of 1.53m (Photo 1 to Photo 4). The fracture on the western side of the corridor is up to 6m long, 0.07m wide and has a measurable depth of 2.9m (Photo 5 to Photo 7). This section of corridor has been barricaded until subsidence movements cease to prevent people driving past the fractured rock face.

DA3B_LW16_022 is a Level 2 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Appendix A: Table 1), specifically:

- Crack or fracture between 10m and 50m in length



Photo 1: DA3B_LW16_022- fracturing down face of cut-through. Taken on 7/07/2020.



Photo 2: DA3B_LW16_022- fracturing fracture to top of cut-through. Taken on 7/07/2020.



Photo 3: DA3B_LW16_022- fracturing down face of cut-through. Taken on 7/07/2020.



Photo 4: DA3B_LW16_022- fracturing down face of cut-through. Taken on 7/07/2020.



Photo 5: DA3B_LW16_022- fracturing down face of cut-through. Taken on 7/07/2020.

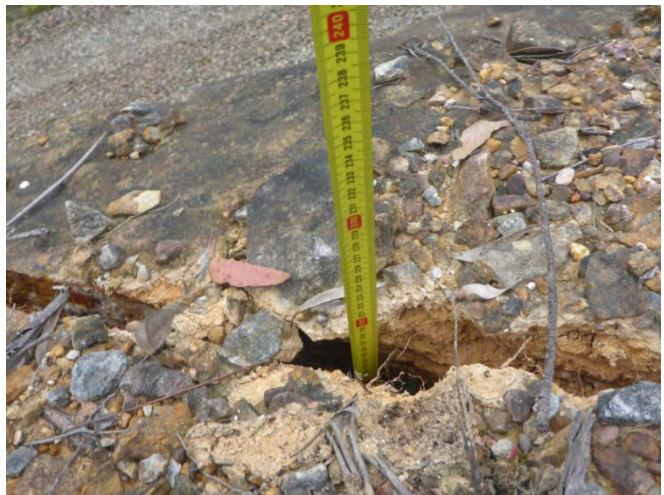


Photo 6: DA3B_LW16_022- fracturing fracture to top of cut-through. Taken on 7/07/2020.



Photo 7: DA3B_LW16_022- fracturing down face of cut-through. Taken on 7/07/2020.

DA3B_LW16_023 (E289499, N6191327)

DA3B_LW16_023 is comprised of two adjacent soil cracks across Fire Road 6A (Figure 1). The longest continuous crack is 4.2m long, with a maximum width of up to 0.02m and a measurable depth of 0.1m (Photo 8 to Photo 10). The cracks do not pose a safety issue to vehicles using the fire road.

DA3B_LW16_023 is a Level 1 trigger as per the DA3B Landscape TARP (Appendix A, Table 1), specifically:

- Crack or fracture up to 10m length



Photo 8: DA3B_LW16_023- cracking across Fire Road 6A. Taken on 7/07/2020.



Photo 9: DA3B_LW16_023- cracking adjacent to Fire Road 6A. Taken on 7/07/2020.

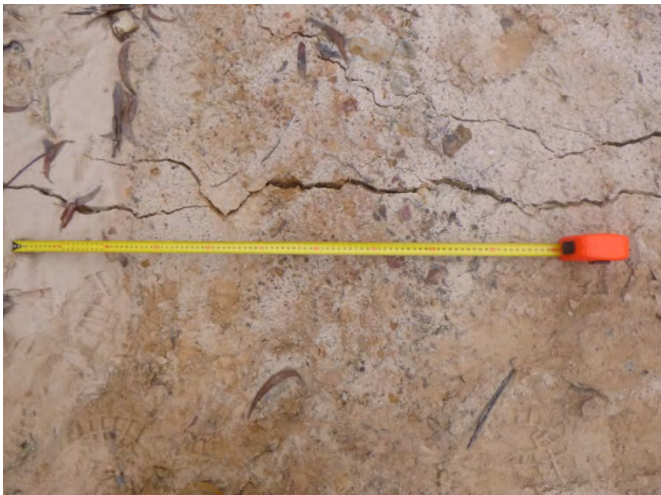


Photo10: DA3B_LW16_023- cracking on Fire Road 6A. Taken on 7/07/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP;
- Report impacts to key stakeholders;
- Summarise impacts and report in the End of Panel Report and Annual Environmental Management Report;
- Provide safety signage and barricades as appropriate;
- Implement approved repairs to ensure safety and serviceability on fire trails; and
- Implement approved CMA's as required.

Table 1: Recent subsidence impacts and triggers. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	19/06/2020
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	19/06/2020
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	19/06/2020
DA3B_LW16_019	19/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> .	24/06/2020
DA3B_LW16_019 Update	25/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> (now remediated).	29/06/2020
DA3B_LW16_020	30/06/2020	LW16	Soil Cracking	1	Soil cracking across <i>Fire Road 6A</i> .	2/07/2020
DA3B_LW16_021	30/06/2020	LW16	Rock Fracturing	2	Rock fracturing to step with small rockfall	2/07/2020
Donalds Castle Ck (FR6) (Update)	30/06/2020	LW16	Water Quality Trigger	3	Trigger for electrical conductivity.	2/07/2020
DA3B_LW16_022	7/07/2020	LW16	Rock Fracturing	2	Rock fracturing to cut-through of railway corridor	This report
DA3B_LW16_023	7/07/2020	LW16	Soil Cracking	1	Soil cracking across <i>Fire Road 6A</i>	This report

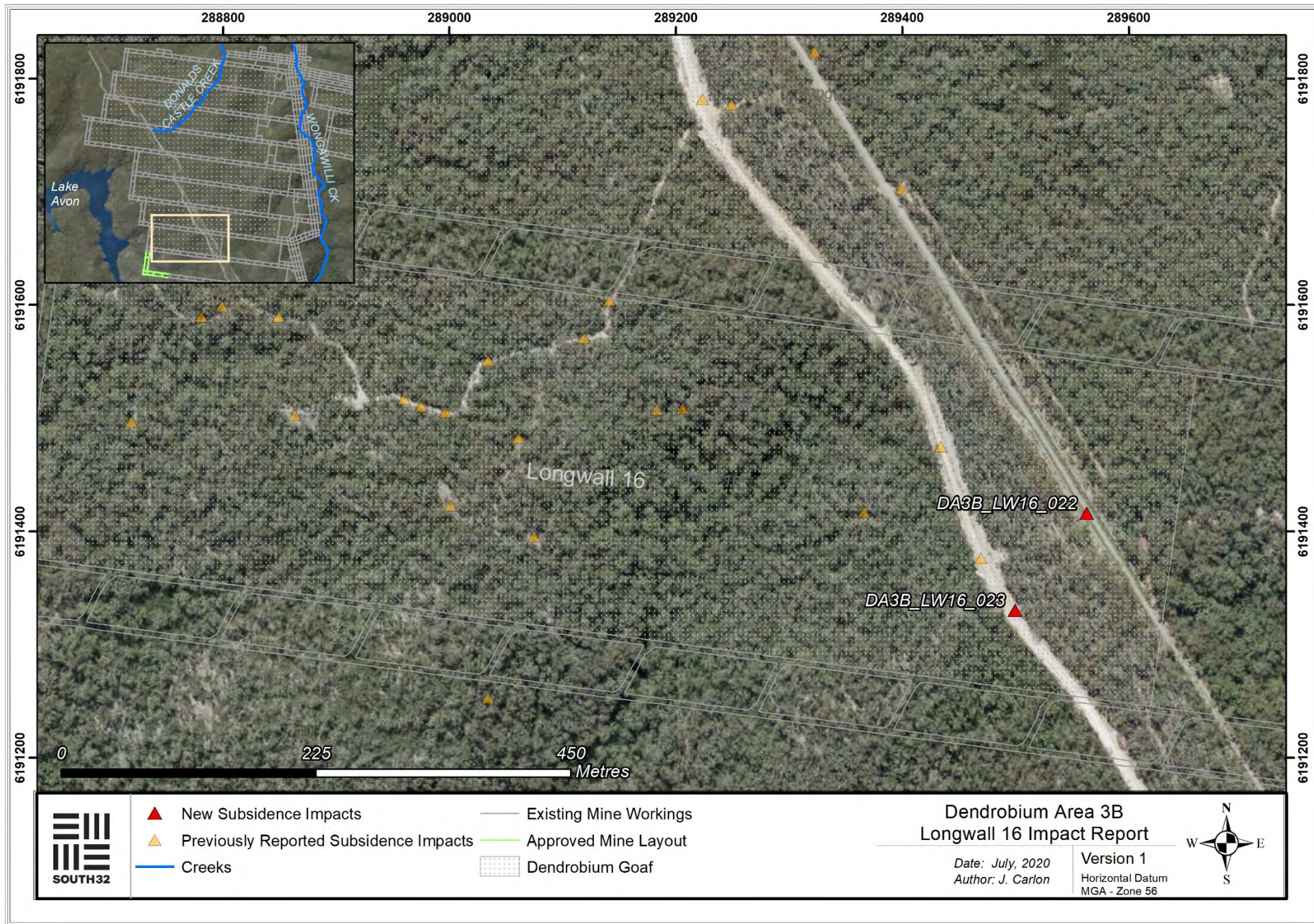


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 26 July 2020 had progressed approximately 1,165m (Figure 1). During a recent inspection, a water quality trigger was identified in tributary LA4.

LA4

LA4 is a small tributary of Lake Avon that flows southward from DA3B mining operations (Figure 1). The LA4 sub catchment was mined beneath by Longwall 12 in April 2016 and Longwall 13 in March 2017. Rock fracturing and subsequent flow diversion was recorded in the tributary following extraction of Longwall 12 and 13. This led to a reduction of surface water at the site. As a result, water sampling was unable to be undertaken at the site since mid-2017. On the latest inspection of LA4, surface water was observed at the site. This was following 160 mm of rainfall, as recorded at Cordeaux Colliery, in the previous 7-day period. Water quality parameters were recorded at LA4_S1, with latest results reaching the TARP level for dissolved oxygen, electrical conductivity, and pH, as shown in Table 1 and presented in Graph 1 to Graph 3. During this latest inspection, some surface flow was observed entering the site; however, flow is then diverted subsurface directly downstream through existing surface fractures (Photo 1 and Photo 2).

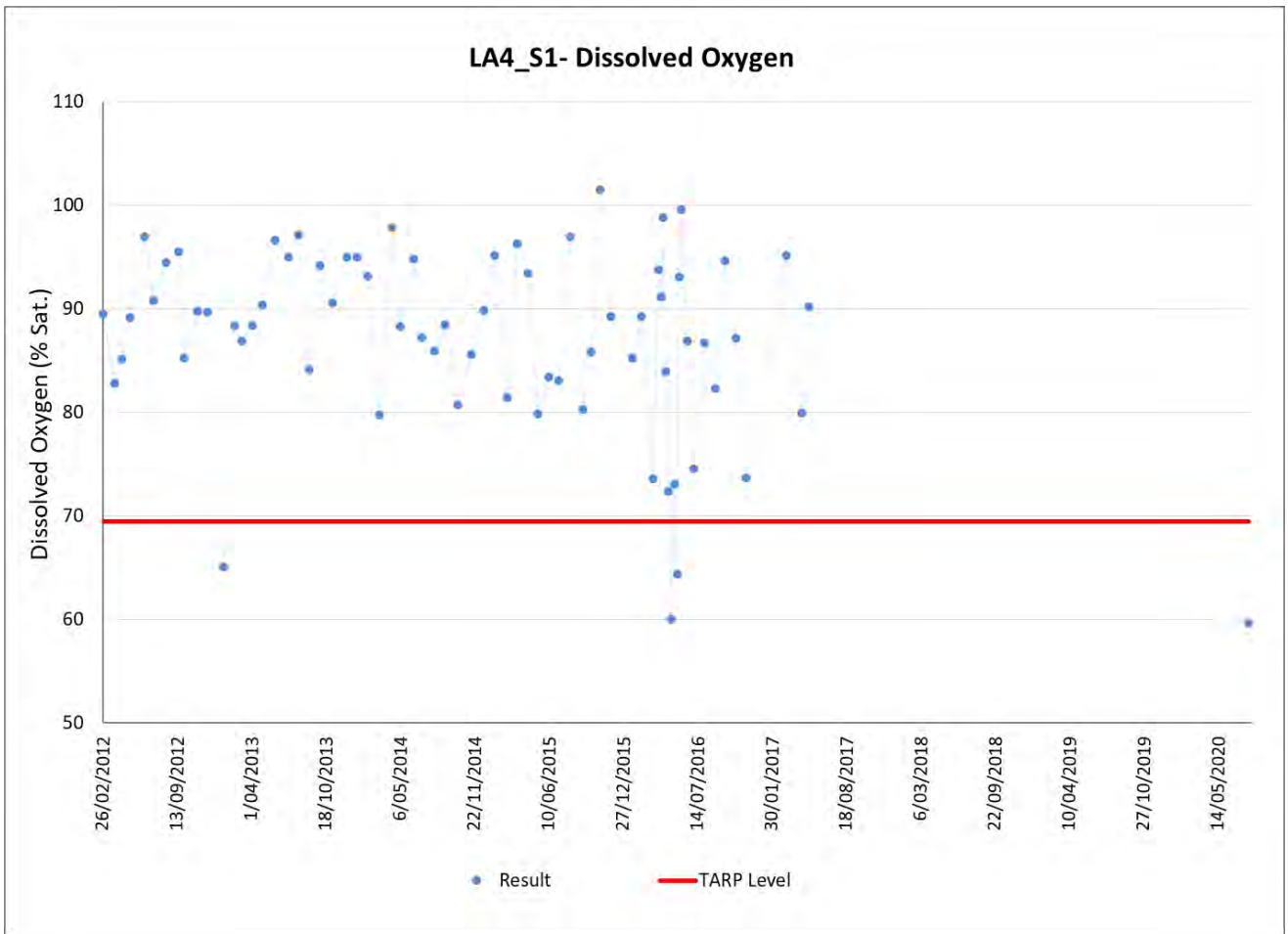
Table 1: Latest water quality results and associated TARP levels for LA4_S1, on Lake Avon tributary LA4.

Site	Water Quality Parameter	Result on 3/08/2020	TARP Level
LA4_S1	Dissolved Oxygen (% Saturation)	59.7	Below 69.5
	Electrical Conductivity ($\mu\text{S}/\text{cm}$)	233	Above 129.8
	pH (pH Units)	4	Below 4.9

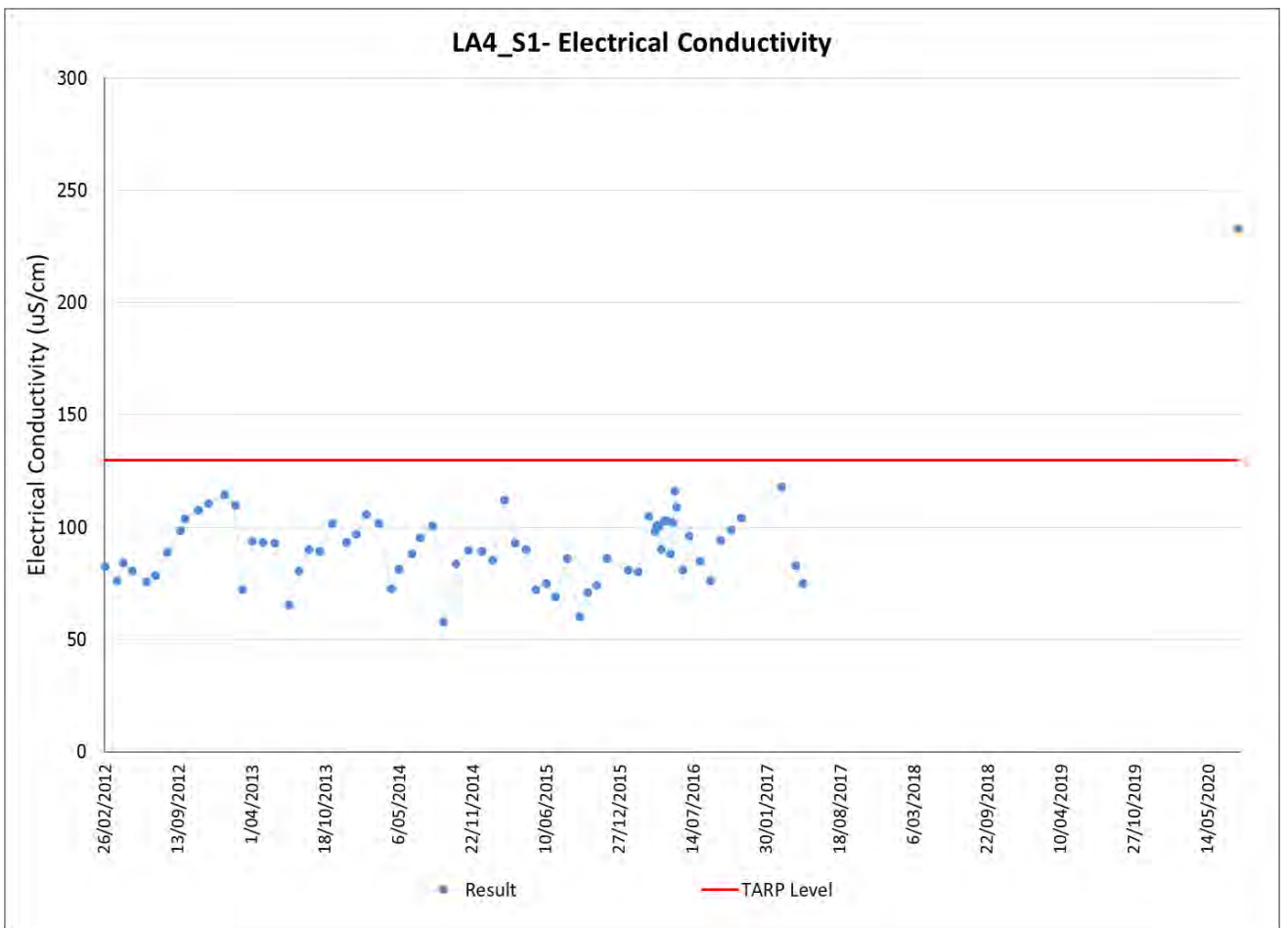
These observations constitute a Level 1 trigger as per the DA3B Watercourse Impact, Monitoring Management and Contingency Plan (Table 3), specifically:

One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:

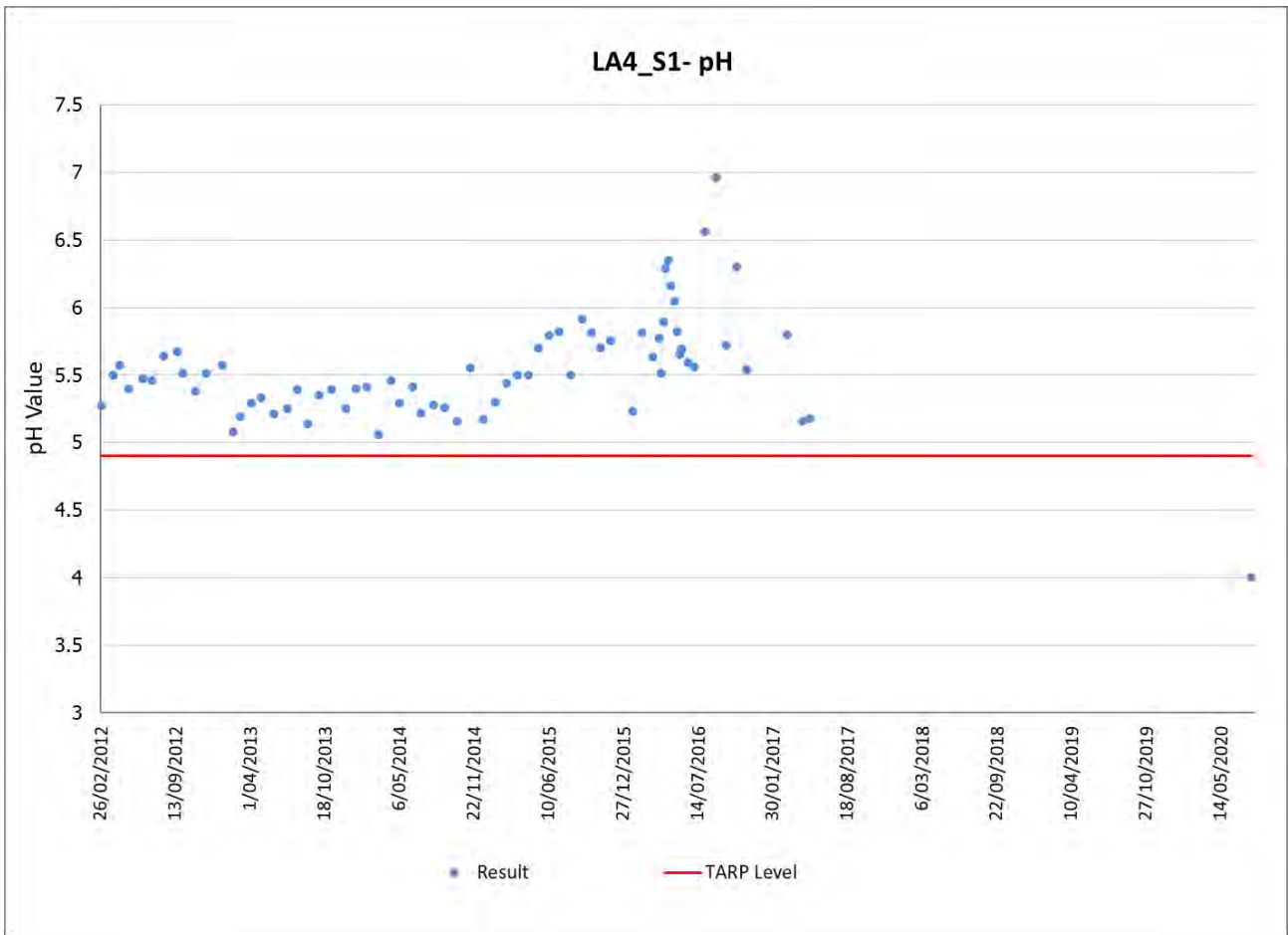
- pH 4.90
- EC 129.8 $\mu\text{S}/\text{cm}$
- DO 69.5%



Graph 1: Dissolved oxygen results recorded at LA4_S1, a water quality monitoring site on Lake Avon tributary LA4.



Graph 2: Electrical conductivity results recorded at LA4_S1, a water quality monitoring site on Lake Avon tributary LA4.



Graph 3: pH results recorded at LA4_S1, a water quality monitoring site on Lake Avon tributary LA4.



Photo 1: LA4_S1, looking upstream. Taken on 3/08/2020.



Photo 2: LA4_S1, looking downstream. Taken on 3/08/2020.

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.

Table 2: Recent subsidence impacts and triggers. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_017	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to outcrop between <i>Swamp 23</i> and <i>LA2</i> .	19/06/2020
DA3B_LW16_018	16/06/2020	LW16	Rock Fracturing	1	Rock fracturing to SLMMP site <i>A3b-SS16</i> .	19/06/2020
DA3B_LW16_013 (Update)	11/06/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	19/06/2020
DA3B_LW16_019	19/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> .	24/06/2020
DA3B_LW16_019 Update	25/06/2020	LW16	Soil Cracking	2	Soil cracking across <i>Fire Road 6A</i> (now remediated).	29/06/2020
DA3B_LW16_020	30/06/2020	LW16	Soil Cracking	1	Soil cracking across <i>Fire Road 6A</i> .	2/07/2020
DA3B_LW16_021	30/06/2020	LW16	Rock Fracturing	2	Rock fracturing to step with small rockfall	2/07/2020
Donalds Castle Ck (FR6) (Update)	30/06/2020	LW16	Water Quality Trigger	3	Trigger for electrical conductivity.	2/07/2020
DA3B_LW16_022	7/07/2020	LW16	Rock Fracturing	2	Rock fracturing to cut-through of railway corridor	10/07/2020
DA3B_LW16_023	7/07/2020	LW16	Soil Cracking	1	Soil cracking across <i>Fire Road 6A</i>	10/07/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for dissolved oxygen at LA4_S1.	This Report
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity at LA4_S1.	This Report
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for pH at LA4_S1.	This Report

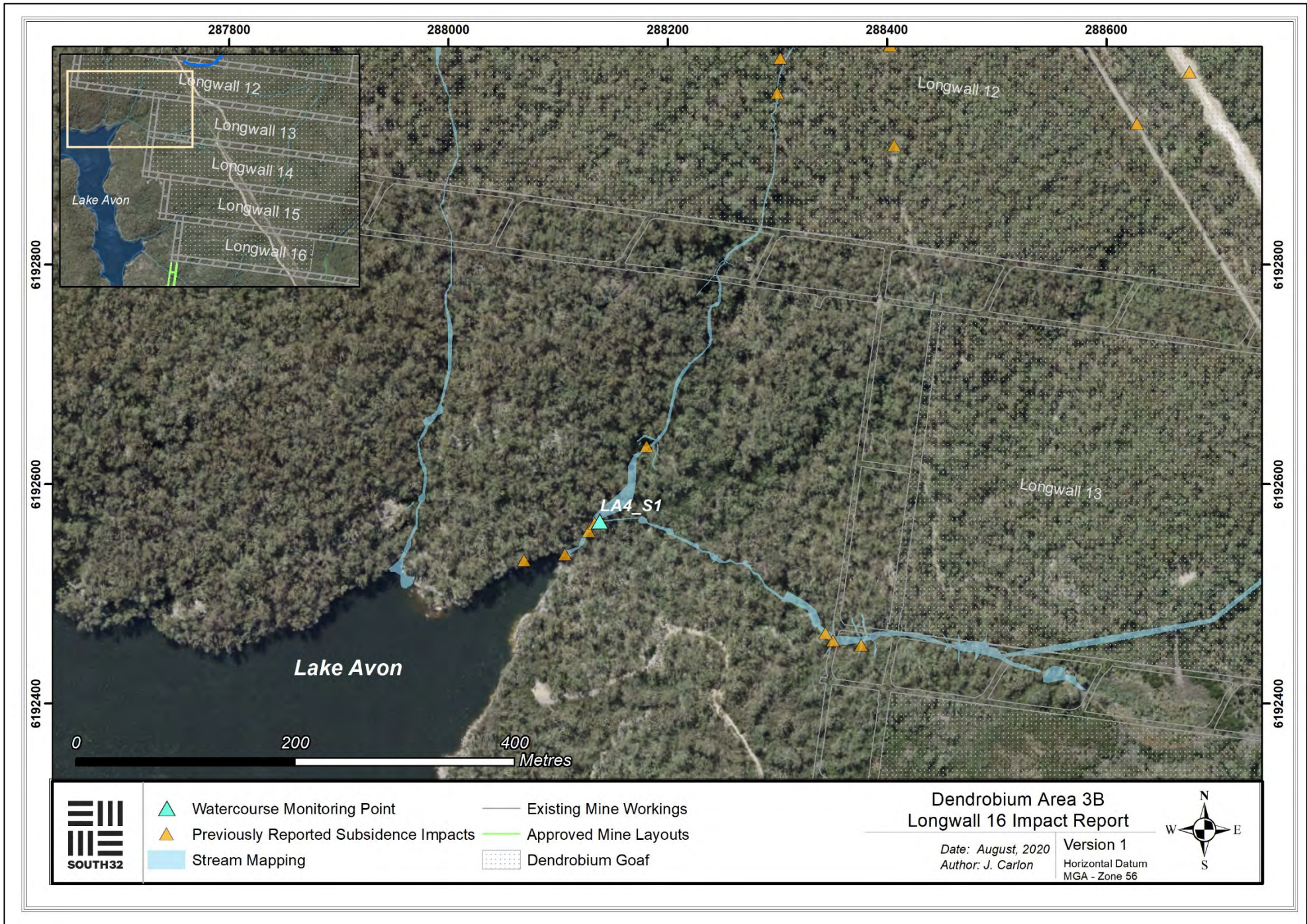


Figure 1: Map showing watercourse monitoring site LA4_S1 in relation to Dendrobium Area 3B mining operations.

Table 3: Extract from Dendrobium Area 3B Watercourse TARP.

WATER QUALITY		
<p>Lake Avon</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Lake Avon - negligible reduction in the quality of surface water inflows to Lake Avon <p>Lake Avon tributary (LA4_S1)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> pH 5.38 EC 90.8 uS/cm DO 89.9% 	<p>Level 1</p> <ul style="list-style-type: none"> One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.90 EC 129.8 uS/cm DO 69.5% 	<ul style="list-style-type: none"> Continue monitoring program Submit an Impact Report to BCD, DPIE, DRG, Water NSW Report in the End of Panel Report Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.90 EC 129.8 uS/cm DO 69.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 1</i> Review monitoring frequency Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.45 EC 154.1 uS/cm DO 50.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 2</i> Offer site visit with BCD, DPIE, DRG, Water NSW Implement additional monitoring or increase frequency if required Review relevant TARP and Management Plan in consultation with key agencies Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> Limestone emplacement to raise pH where it is appropriate to do so Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.45 EC 154.1 uS/cm DO 50.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 3</i> Investigate reasons for the exceedance Update future predictions based on the outcomes of the investigation Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 2 August 2020 had progressed 1240m (Figure 1). During a recent inspection, three new surface impacts were identified. This report also provides an update to an existing impact.

DA3B_LW16_022 Update (E289564, N6191418)

DA3B_LW16_022 consists of rock fracturing to the face of a cut through which forms part of the Maldon Dombarton railway corridor adjacent to Fire Road 6A (Figure 1). The impact was initially observed on 7 July 2020, with a continuous length of 15m, a width up to 0.08m and a maximum measurable depth of 2.9m. A follow-up inspection identified multiple small rockfalls and changes to the fracturing (Photo 1 to Photo 8). The fracturing is now largely continuous on both the eastern and western side of the corridor for a distance of approximately 190m (Figure 1). Maximum values relating to the fracturing width and depth didn't change from the original inspection. The largest fragment resulting from the rockfall was 0.3m x 0.3m x 0.05m. This section of corridor has been barricaded until subsidence movements cease to prevent people driving past the fractured rock face. photo locations are displayed in Figure 1.

DA3B_LW16_022 is now a Level 3 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP) (Table 2), specifically:

- Crack or fracture over 50m length

DA3B_LW16_024 (E289620, N6191348)

DA3B_LW16_024 is situated on a rehabilitated access track between *Swamp 14* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 1 July 2020. The impact is comprised of rock fracturing and soil cracking (Photo 9 to Photo 11). The impact has a maximum length of 3.2m, a maximum width of 0.03m and a maximum depth of 0.45m.

DA3B_LW16_024 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.

DA3B_LW16_025 (E289732, N6191382)

DA3B_LW16_025 is situated at a steep slope/step between *Swamp 14* and *Fire Road 6A* (Figure 1). The site was undermined by Longwall 16 on 15 July 2020. The impact is comprised of multiple rock fractures (Photo 12 to Photo 14). The rock fracturing has a maximum length of 2.5m, a maximum width of 0.035m and a maximum depth of 0.34m.

DA3B_LW16_025 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.

DA3B_LW16_026 (E289839, N6191445)

DA3B_LW16_026 is situated at a steep slope/step between *Swamp 14* and *Fire Road 6P* (Figure 1). The site was undermined by Longwall 16 on 30 July 2020. The impact is comprised of multiple rock fractures (Photo 15 and Photo 16). The rock fracturing has a maximum length of 2m and a maximum width of 0.02m.

DA3B_LW16_026 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: *DA3B_LW16_022*, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 2: *DA3B_LW16_022*, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 3: DA3B_LW16_022, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 4: DA3B_LW16_022, looking at a rockfall. Taken on 6/08/2020.



Photo 5: DA3B_LW16_022, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 6: DA3B_LW16_022, looking at a section of rock fracturing and rockfall. Taken on 6/08/2020.



Photo 7: DA3B_LW16_022, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 8: DA3B_LW16_022, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 9: DA3B_LW16_024, looking at the rock fracturing and soil cracking. Taken on 6/08/2020.



Photo 10: DA3B_LW16_024, looking at the width of the rock fracture. Taken on 6/08/2020.



Photo 11: DA3B_LW16_024, looking at the depth of the rock fracture. Taken on 6/08/2020.



Photo 12: DA3B_LW16_025, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 13: DA3B_LW16_025, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 14: DA3B_LW16_025, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 15: *DA3B_LW16_026*, looking at a section of rock fracturing. Taken on 6/08/2020.



Photo 16: *DA3B_LW16_026*, looking at a section of rock fracturing. Taken on 6/08/2020.

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the Dendrobium Area 3B SMP
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement approved repairs to ensure safety and serviceability on fire trails
- Implement agreed CMAs as approved
- Immediately notify DPIE, DRG, WaterNSW, resource managers and relevant technical specialists and seek advice on any CMA required
- Site visits with stakeholders if required
- Review monitoring program and modify if necessary within 1 month
- Implement increased monitoring if required within 2 weeks
- Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals
- Completion of works following approvals
- Issue CMA report within 1 month of works completion
- Conduct initial follow up monitoring & reporting within 2 months of CMA completion
- Review the relevant TARP and Management Plan in consultation with key stakeholders

Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_022	7/07/2020	LW16	Rock Fracturing	2	Rock fracturing to cut-through of railway corridor.	10/07/2020
DA3B_LW16_023	7/07/2020	LW16	Soil Cracking	1	Soil cracking across Fire Road 6A.	10/07/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for dissolved oxygen at LA4_S1.	5/8/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity at LA4_S1.	5/8/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for dissolved oxygen at LA4_S1.	5/8/2020
DA3B_LW16_022 (Update)	6/08/2020	LW16	Rock Fracturing & Rockfall	3	Rock fracturing and rockfalls to cut-through of railway corridor.	This Report
DA3B_LW16_024	6/08/2020	LW16	Rock Fracturing & Soil Cracking	1	Rock fracturing and soil cracking to rehabilitated access track between Swamp 14 and Fire Road 6A.	This Report
DA3B_LW16_025	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6A.	This Report
DA3B_LW16_026	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6P.	This Report

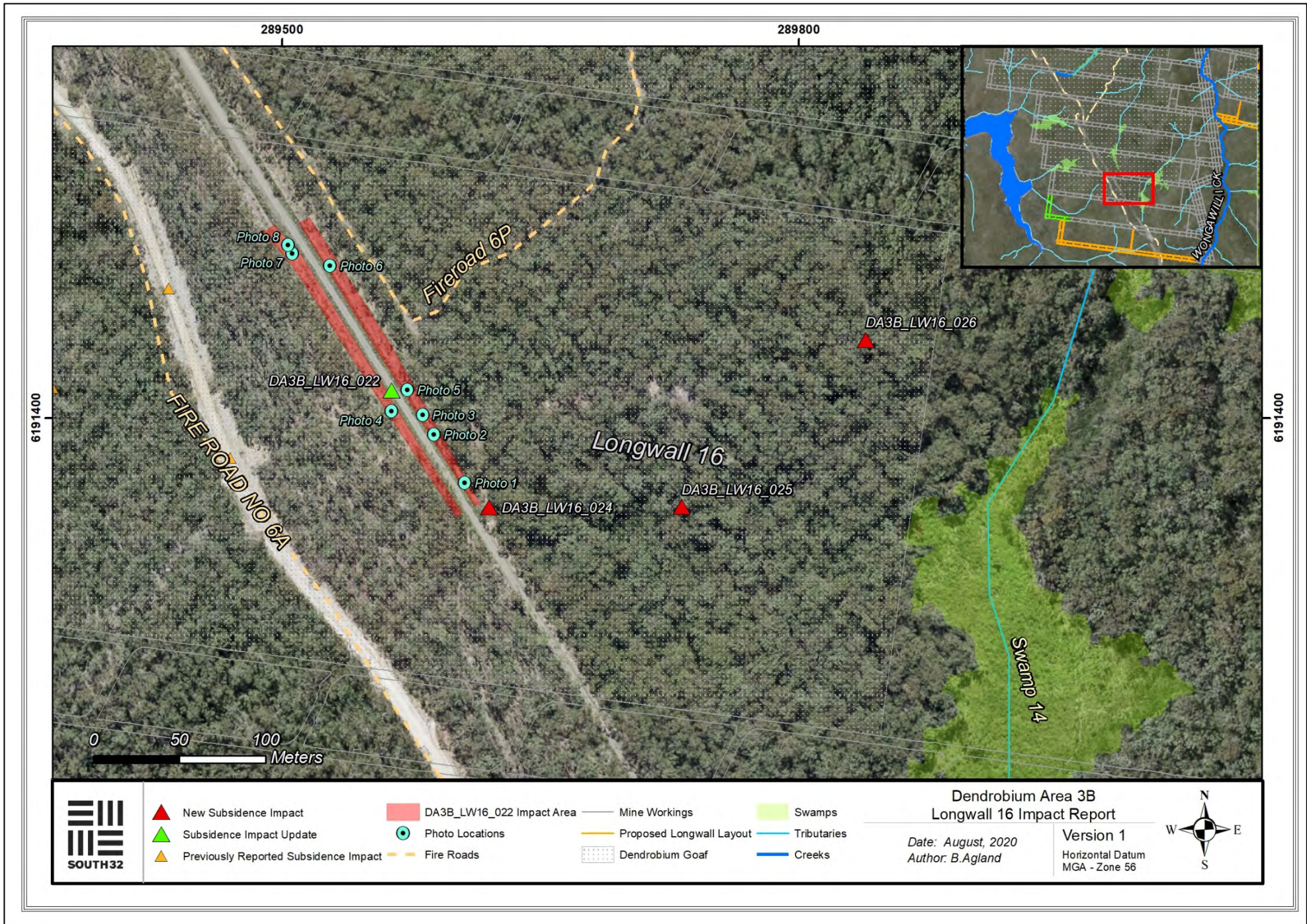


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Monitoring	Trigger	Action
	<p>disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 23 August 2020, had progressed approximately 1430m (Figure 1). During a recent inspection, new surface cracking was identified, as well as an update to previously reported rock fracturing.

DA3B_LW16_027 (E289641, N6191508)

DA3B_LW16_027 consists of a series of soil cracks on Fire Road 6P (Figure 1). The site was mined beneath by Longwall 16 on approximately 4 July 2020. The largest soil crack is 3.1m long and 0.1m wide with a measurable depth of up to 0.84m (Photo 1 to Photo 3). Other cracks are generally hairline of nature, up to 0.01m wide in sections (Photo 4 and Photo 5). The cracking appears stable and should not cause issues to vehicles using the track. Signage has been placed to the entry of the track.

DA3B_LW16_027 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.

DA3B_LW15_026 Update (E289839, N6191445)

DA3B_LW15_026 is an impact site located at SLMMP monitoring location *A3b-SS13*, situated at a steep slope/step between *Swamp 14* and *Fire Road 6P* (Figure 1). Impacts were originally identified on 21 January 2020 after being mined beneath by Longwall 15. During the latest subsidence inspection, an update to the rock fracturing was observed. An additional fracture was observed, up to 1.6m long and 0.005m wide, with the fracture extending under a slight overhang (Photo 6 and Photo 7). A second fracture to a boulder/outcrop was also observed and is approximately 0.02m wide and 0.65m long, extending 0.25m in to the boulder (Photo 8 and Photo 9)

DA3B_LW15_026 remains a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: DA3B_LW16_027, looking along track. Taken on 21/08/2020.



Photo 2: DA3B_LW16_027, showing depth of crack. Taken on 21/08/2020.



Photo 3: DA3B_LW16_027, looking down at cracking. Taken on 21/08/2020.



Photo 4: DA3B_LW16_027, showing narrower section of cracking. Taken on 21/08/2020.



Photo 5: DA3B_LW16_027, looking along track, showing narrower section of cracking. Taken on 21/08/2020.



Photo 6: DA3B_LW15_026, looking at rock face. Taken on 24/08/2020.



Photo 7: DA3B_LW15_026, showing fracture extending below ledge. Taken on 24/08/2020.



Photo 8: DA3B_LW15_026, showing fracture to boulder. Taken on 24/08/2020.



Photo 9: DA3B_LW15_026, showing fracture to boulder. Taken on 24/08/2020.

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the Dendrobium Area 3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_022	7/07/2020	LW16	Rock Fracturing	2	Rock fracturing to cut-through of railway corridor.	10/07/2020
DA3B_LW16_023	7/07/2020	LW16	Soil Cracking	1	Soil cracking across Fire Road 6A.	10/07/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for dissolved oxygen at LA4_S1.	5/8/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity at LA4_S1.	5/8/2020
LA4_S1	3/08/2020	LW16	Water Quality Trigger	1	Trigger for dissolved oxygen at LA4_S1.	5/8/2020
DA3B_LW16_022 (Update)	6/08/2020	LW16	Rock Fracturing & Rockfall	3	Rock fracturing and rockfalls to cut-through of railway corridor.	10/08/2020
DA3B_LW16_024	6/08/2020	LW16	Rock Fracturing & Soil Cracking	1	Rock fracturing and soil cracking to rehabilitated access track between Swamp 14 and Fire Road 6A.	10/08/2020
DA3B_LW16_025	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6A.	10/08/2020
DA3B_LW16_026	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6P.	10/08/2020
DA3B_LW16_027	21/08/2020	LW16	Soil Cracking	1	Soil cracking to Fire Road 6P.	This Report
DA3B_LW15_026 (Update)	24/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6P.	This Report

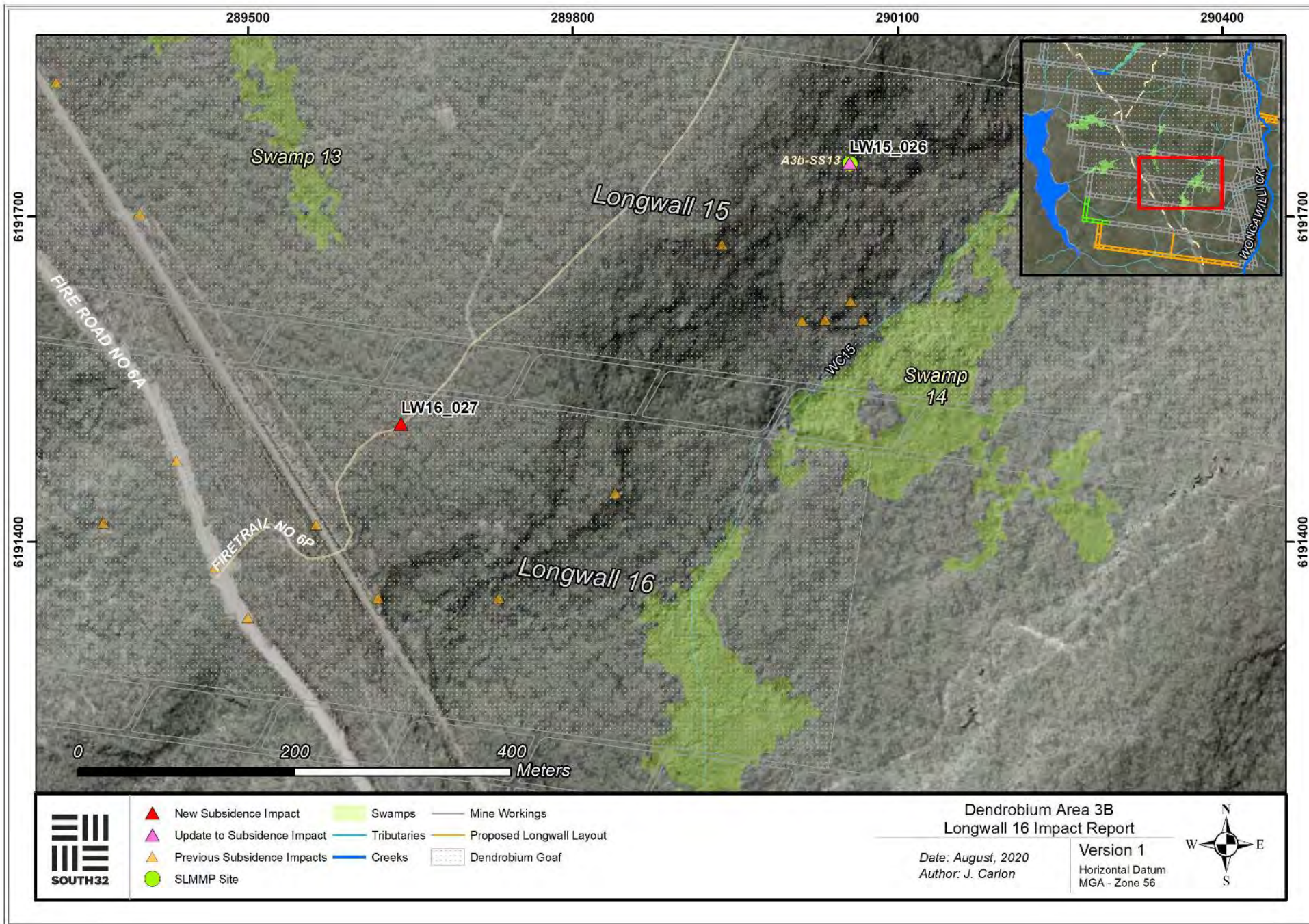


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations. Hill shade used to better display surface contours.

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance Surface movement or rock displacement with negligible soil surface exposed Crack at the surface, which should not result in any significant erosion or further ground movement Crack in a fire trail which should not result in erosion or impede access Crack or fracture up to 100mm width Crack or fracture up to 10m length Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance Surface movement or rock displacement that has exposed significant areas of soil A crack at the surface, which could result in significant erosion or movement at the surface A crack at the surface with potential risk to safety and/or fauna entrapment A crack in the fire trail, which could result in significant erosion or impede vehicle access Crack or fracture between 100 and 300mm width Crack or fracture between 10 and 50m length Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Provide safety signage and barricades as appropriate Implement approved repairs to ensure safety and serviceability on fire trails Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Monitoring	Trigger	Action
	<p>disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B). Extraction of Longwall 16 began on 26 February 2020 and as of 30 August 2020, had progressed approximately 1475m (Figure 1). During a recent inspection, new subsidence impacts were identified.

DA3B_LW16_028 (E289985, N6191502)

DA3B_LW16_028 consists of rock fracturing to a rockbar on tributary WC15, directly upstream from Pool 34 (Figure 1). The fracture is approximately 2.1m long and 0.01m wide (Photo 1 and Photo 2). There was a noticeable reduction in surface flow on the rockbar since the previous week, with some surface seepage diverting in to the fracture. Pool 34, directly downstream, was also observed to be dry, with only surface seepage entering the pool from beneath the upstream step (Photo 3 to Photo 5). While Pool 34 has been observed to be dry during the baseline period, the rate of recession for this latest drying event is the fastest recorded and coincides with the passing of Longwall 16, approximately 10m at the closet horizontal offset distance (Graph 1).

DA3B_LW16_028 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Table 2), specifically:

- Crack or fracture that results in observable loss of surface water or erosion.



Photo 1: DA3B_LW16_028- rock fracture in foreground and edge of dry step and Pool 34 in background. Taken on 31/08/2020.



Photo 2: DA3B_LW16_028- rock fracture across rockbar. Taken on 31/08/2020.



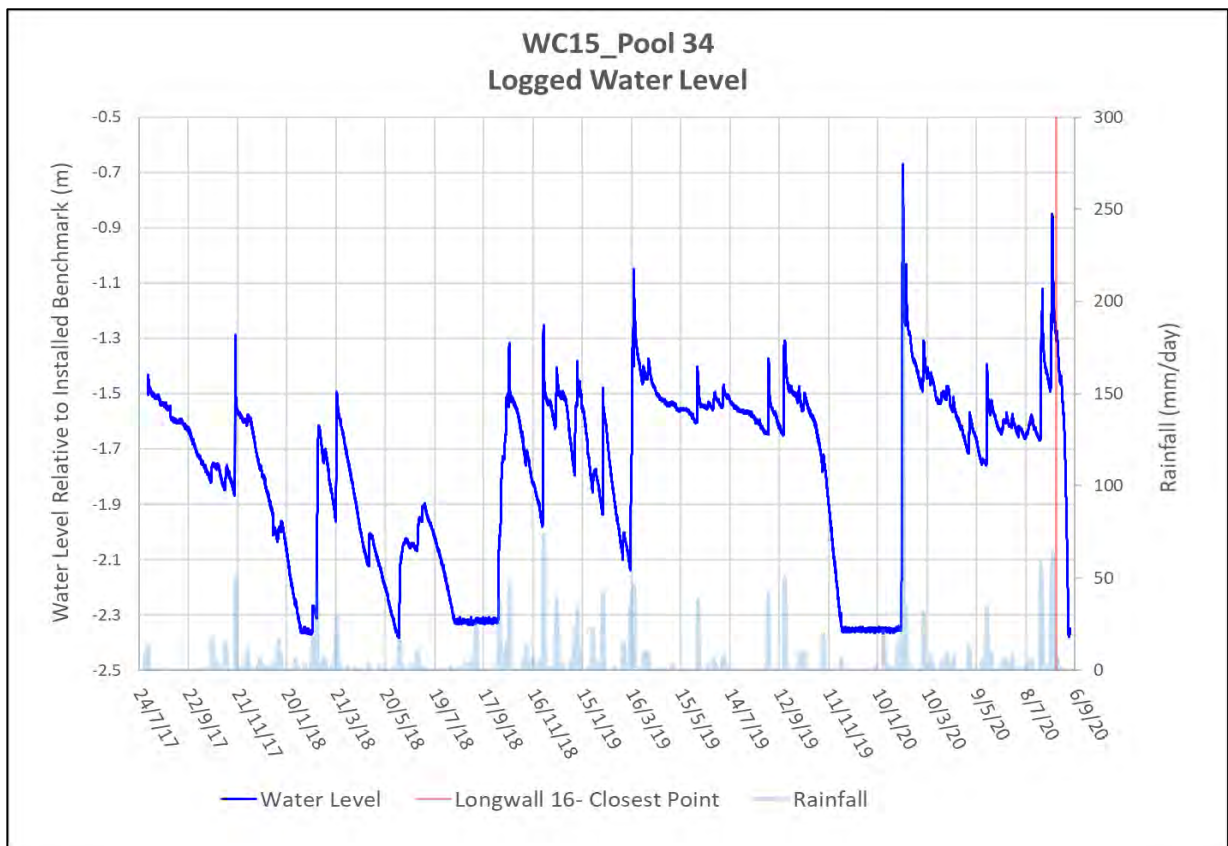
Photo 3: WC15_Pool 34, looking downstream over step. Taken on 31/08/2020.



Photo 4: WC15_Pool 34, looking downstream over step. Taken on 24/08/2020.



Photo 5: WC15_Pool 34, taken standing in pool, looking upstream towards step. Taken on 31/08/2020.



Graph 1: Logged water levels recorded at WC15_Pool 34.

DA3B_LW16_029 (E290169, N6191756)

DA3B_LW16_029 consists of a rockfall from a step on the western slope of the WC15 valley (Figure 1). The rockfall is primarily made up of one large rock fragment, approximately 5m³ in volume (Photo 6), with some smaller broken rock fragments in the path of the fall (Photo 7). The site appears stable.

DA3B_LW16_029 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 3), specifically:

- Rock fall from a cliff (step) which is left mostly intact (<10% length), resulting in insignificant ground disturbance.



Photo 6: DA3B_LW16_029- rockfall from step, looking at main large rock fragment. Taken on 31/08/2020.



Photo 7: DA3B_LW16_029- rockfall from step, looking at top of step where fragment originated. Taken on 31/08/2020.

DA3B_LW16_030 (E290215, N6191727)

DA3B_LW16_030 consists of some localised erosion on tributary WC15 (Figure 1). The erosion has formed a hole in the soil and root matter in a section of the tributary which has displayed surface and subsurface flow during the baseline period. The hole has a length of 1.8m, a width of 0.5m and a measurable depth of 1.1m (Photo 8 to Photo 11). There is no evidence of subsidence cracking or fracturing associated with the erosion. The hole has been flagged for safety reasons and will be monitored to identify any potential changes.

DA3B_LW16_030 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 3), specifically:

- Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring



Photo 8: DA3B_LW16_030- localised erosion observed on tributary WC15. Taken on 31/08/2020.



Photo 9: DA3B_LW16_030- localised erosion, looking at length. Taken on 31/08/2020.



Photo 10: DA3B_LW16_030- localised erosion, looking at width. Taken on 31/08/2020.



Photo 11: DA3B_LW16_030- localised erosion, looking at measurable depth. Taken on 31/08/2020.

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Submit an Impact Report to BCD, DPIE, DRG, Water NSW
- Report in the End of Panel Report
- Summarise actions and monitoring in AEMR
- Review monitoring frequency
- Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required
- Implement agreed CMAs as approved (subject to agency feedback)

Table 1: Recent subsidence impact observations. Highlighted rows indicate latest observations.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_022 (Update)	6/08/2020	LW16	Rock Fracturing & Rockfall	3	Rock fracturing and rockfalls to cut-through of railway corridor.	10/08/2020
DA3B_LW16_024	6/08/2020	LW16	Rock Fracturing & Soil Cracking	1	Rock fracturing and soil cracking to rehabilitated access track between Swamp 14 and Fire Road 6A.	10/08/2020
DA3B_LW16_025	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6A.	10/08/2020
DA3B_LW16_026	6/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6P.	10/08/2020
DA3B_LW16_027	21/08/2020	LW16	Soil Cracking	1	Soil cracking to Fire Road 6P.	27/08/2020
DA3B_LW15_026 (Update)	24/08/2020	LW16	Rock Fracturing	1	Rock fracturing to steep slope between Swamp 14 and Fire Road 6P.	27/08/2020
DA3B_LW16_028	31/08/2020	LW16	Rock Fracturing	2	Rock fracture to rockbar/step above WC15_Pool 34.	1/09/2020
DA3B_LW16_029	31/08/2020	LW16	Rockfall	1	Rockfall to step on western slope of WC15 valley.	1/09/2020
DA3B_LW16_030	31/08/2020	LW16	Erosion	1	Localised erosion on tributary WC15.	1/09/2020

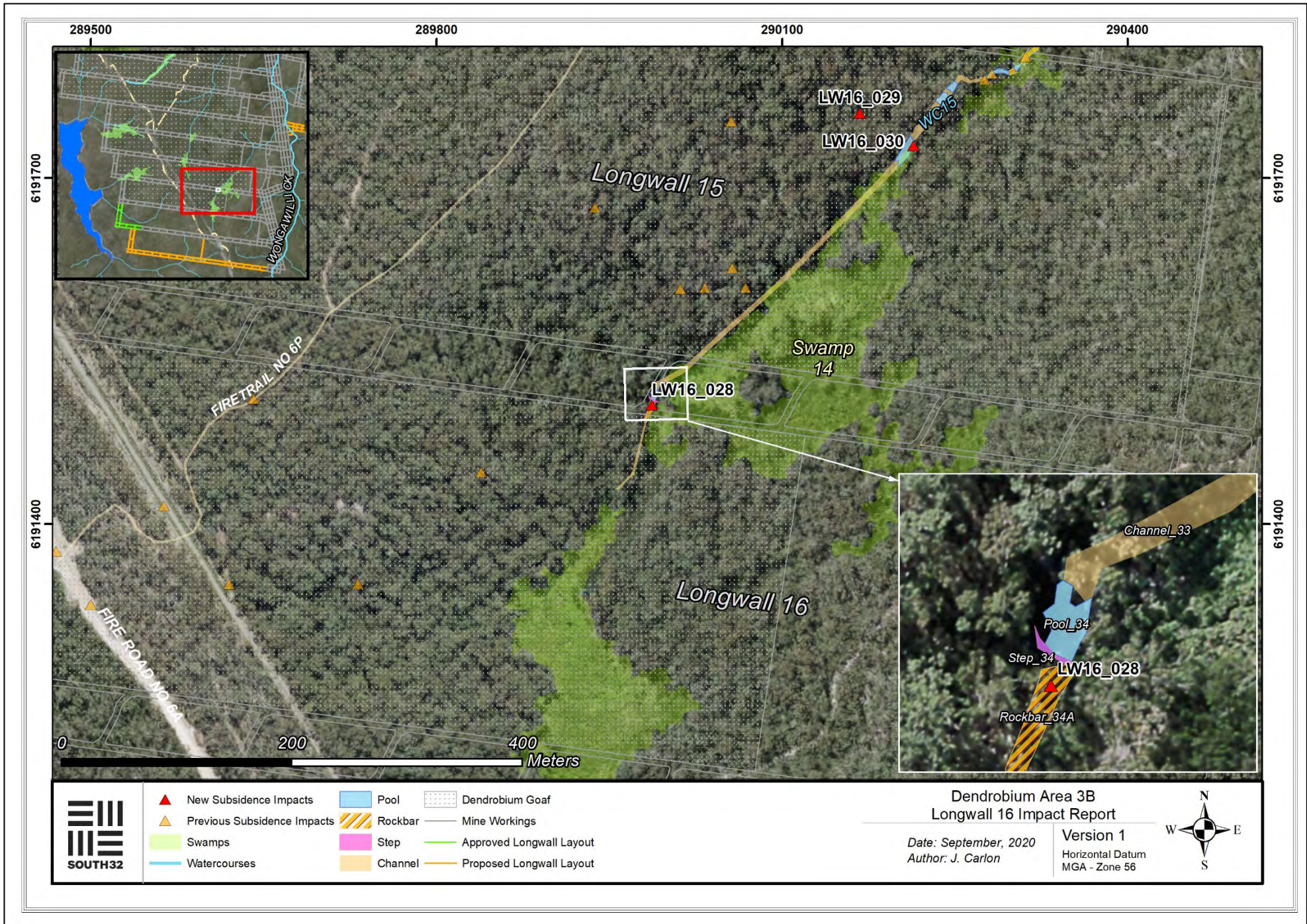


Figure 1: Map showing latest subsidence impacts relevant to DA3B mining operations.

Table 2: Extract from Dendrobium Area 3B Watercourse TARP.

OBSERVATIONAL-MONITORING		
<p>Native Dog Creek, DC13, WC21, WC15, LA2, LA3, LA4, LA5, ND1, WC6, WC7, WC8, WC9, WC12, WC16 and WC18</p> <p>General observation of streams in active mining areas when longwall is within 400m</p>	<p>Level 1</p> <ul style="list-style-type: none"> • Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion • Crack or fracture up to 10m length with no observable loss of surface water or erosion • Erosion in a localised area (not associated with cracking or fracturing) which would be expected to naturally stabilise without CMA and within the period of monitoring • Observable release of strata gas at the surface • Observable increase in iron staining within the mining area 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPIE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Crack or fracture between 100 and 300mm width at its widest point or any fracture which results in observable loss of surface water or erosion • Crack or fracture between 10 and 50m length • Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention • Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width at its widest point • Crack or fracture over 50m length • Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water • Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention • Gas release results in vegetation dieback, mortality or loss of aquatic habitat • Observable increase in iron staining within the mining area continues more than 600m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPIE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to agency feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with BCD, DPIE, DRG, Water NSW • Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success • Review relevant TARP and Management Plan in consultation with key agencies

Table 3: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required • Review monitoring program and modify if necessary within 1 month

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and as of 6 September 2020 the longwall had progressed approximately 1520m (Figure 1). Analysis of recent shallow groundwater data and water quality data show triggers in Swamp 14 and tributary LA4, respectively. This report also includes an update on three existing impacts.

LA4

LA4 is a small tributary of Lake Avon that flows southward from DA3B mining operations (Figure 1). The LA4 sub catchment was mined beneath by Longwall 12 in April 2016 and Longwall 13 in March 2017. Rock fracturing and subsequent flow diversion was recorded in the tributary following extraction of Longwall 12 and 13. On 3 August 2020, water quality parameters exceeded the TARP level for dissolved oxygen, electrical conductivity, and pH. During the latest inspection, on 1/09/2020, water quality parameters exceeded the TARP level for electrical conductivity and pH, as shown in Table 1 and presented in Graph 1 and Graph 2. During the latest inspection, some surface flow was observed entering the site; however, flow is then diverted subsurface directly downstream through existing surface fractures (Photo 1 and Photo 2).

Table 1: Latest water quality results and associated TARP levels for LA4_S1, on Lake Avon tributary LA4.

Site	Water Quality Parameter	Result on 1/09/2020	TARP Level
LA4_S1	Dissolved Oxygen (% Saturation)	70.2	Below 69.5
	Electrical Conductivity ($\mu\text{S}/\text{cm}$)	177	Above 129.8
	pH (pH Units)	3.95	Below 4.9

These observations constitute a Level 2 trigger as per the DA3B Watercourse Impact, Monitoring Management and Contingency Plan (Table 3), specifically:

- Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months:
 - pH 4.90
 - EC 129.8 $\mu\text{S}/\text{cm}$



Photo 1: LA4_S1, looking upstream. Taken on 1/09/2020.



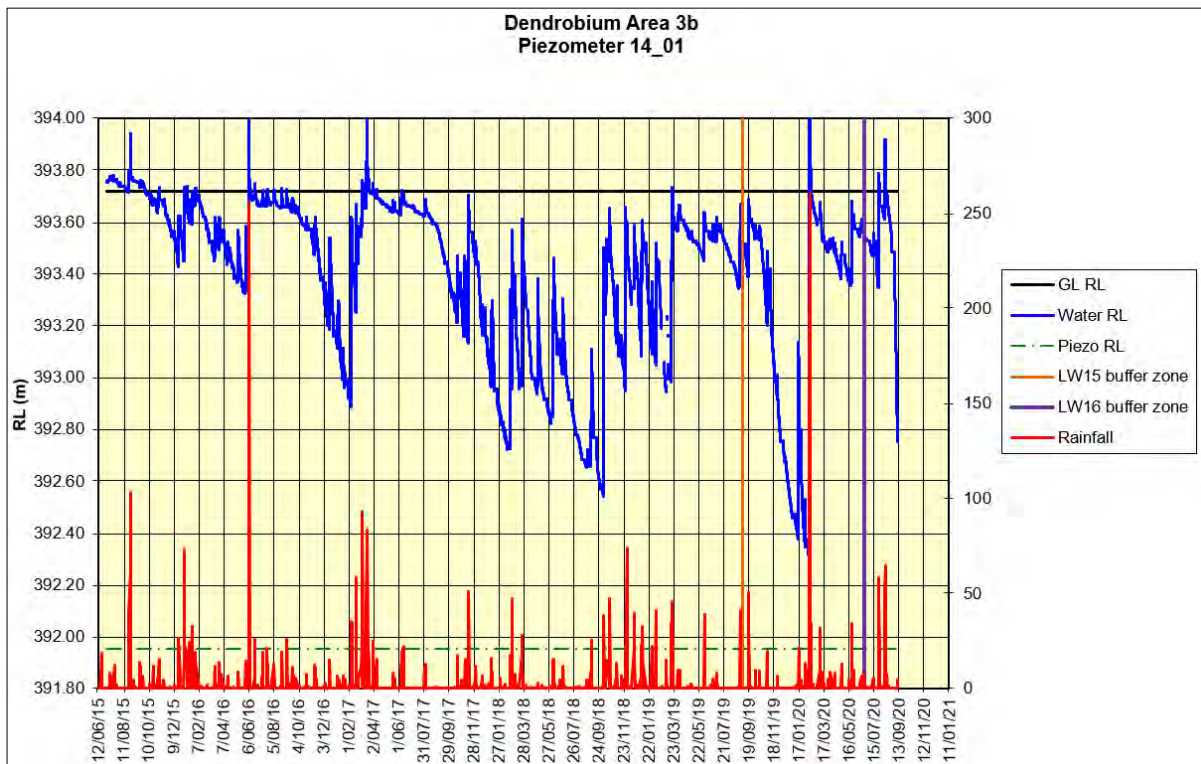
Photo 2: LA4_S1, looking downstream. Taken on 1/09/2020.

Swamp 14

A near-surface groundwater trigger was recorded at borehole 14_01 during recent analysis of piezometer data for Swamp 14 (Figure 1). Longwall 15 triggers for water level and soil moisture were reported on 16 January 2020. On 21 June 2020, the site entered the 400m buffer zone of Longwall 16 and on 8 August 2020 was mined under by Longwall 16. Both water level and soil moisture fully recovered following the August rainfall. Following the recovery, the rate of water level recession (3.37 mm/hour calculated between 5/09/20 0:00 and 9/09/20 9:00) has exceeded the rate recorded at the same depth interval before mining (1.96 mm/hour calculated between 8/09/18 7:00 and 15/09/18 19:00) (Graph 3).

The rate of recession trigger for borehole 14_02 was reported on 08 November 2019 during Longwall 15 extraction, therefore the current groundwater results at 14_01 contribute to a Level 3 trigger according to the Dendrobium Swamps Impacts, Triggers and Response (Table 4), specifically:

- Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400m of mining) within the swamp.



Graph 3: Near-surface groundwater levels at 14_01, logged hourly, date range: 02/07/2015 to 09/09/2020.

DA3B_LW14_017 Update (E290276, N6191786)

DA3B_LW14_017 is located on WC15, a tributary to Wongawilli Creek. The impacted feature is WC15_Channel 30 which is situated approximately 325m north of Longwall 16 at its closest point (Figure 1). The impact was originally comprised of two rock fractures (Photo 3). The original rock fracturing had a measurable length of 0.8m, a width of 0.025m and a maximum measurable depth of 0.17m. An additional rock fracture and associated rock fragmentation were identified during the latest inspection. The new 1m rock fracture has resulted in the displacement of a 0.25m x 0.03m x 0.07m rock fragment (Photo 4).

DA3B_LW14_017 remains a Level 2 trigger as per the DA3B Watercourse TARP (Table 5), specifically:

- Crack or fracture that results in observable loss of surface water or erosion.



Photo 3: DA3B_LW14_017, looking at the original rock fracturing. Taken 20/02/2019.



Photo 4: DA3B_LW14_017, looking at the rock fracturing and displacement. Taken on 9/09/2020.

DA3B_LW14_019 Update (E290312, N6191805)

DA3B_LW14_019 is located near WC15, a tributary to Wongawilli Creek. The Impacted feature is situated approximately 350m north of Longwall 16 at its closest point (Figure 1). The impact was originally comprised of rock fracturing and uplift. The original rock fracturing had a measurable length of 4.5m, a width of 0.05m, a maximum measurable depth of 0.7m. Additional rock fracturing, uplift and rock displacement were identified during the latest inspection within a 10m by 10m area (Photo 5 to Photo 8). The fracturing now has a length of 6.8m, a width of 0.1m and a maximum measurable depth of 0.4m. The largest rock fragment displaced is 2m by 2m and uplift was measured up to 0.2m.

DA3B_LW14_019 is now a Level 2 trigger as per the DA3B Watercourse TARP (Table 5), specifically:

- Crack or fracture **between 100 and 300mm width at its widest point** or any fracture which results in observable loss of surface water or erosion.



Photo 5: DA3B_LW14_019, looking at a section of rock fracturing and uplift. Taken on 9/09/2020.



Photo 6: DA3B_LW14_019, looking at a section of rock fracturing. Taken on 9/09/2020.



Photo 7: DA3B_LW14_019, looking at a section of rock fracturing and displacement. Taken on 9/09/2020.



Photo 8: DA3B_LW14_019, looking at a section of rock fracturing and uplift. Taken on 9/09/2020.

DA3B_LW16_030 Update (E290215, N6191727)

DA3B_LW16_030 consists of some localised erosion on tributary WC15 (Figure 1). The erosion has formed a hole in the soil and root matter in a section of the tributary which has displayed surface and subsurface flow during the baseline period. The hole was originally reported as having a length of 1.8m, a width of 0.5m and a measurable depth of 1.1m (Photo 9). Slight increase in the size of the hole was identified during the latest inspection (Photo 10). The hole now has a width of 0.7m and a measurable depth of 1.2m. The length of the hole has not changed. There is no evidence of subsidence cracking or fracturing associated with the erosion. The hole has been flagged for safety reasons and will be monitored to identify any further changes.

DA3B_LW16_030 remains a Level 1 trigger as per the DA3B Landscape TARP (Table 6) specifically:

- Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring.



Photo 9: DA3B_LW16_030, localised erosion observed on tributary WC15. Taken on 31/08/2020.



Photo 10: DA3B_LW16_030, localised erosion observed on tributary WC15. Taken on 09/09/2020.

Table 2: Recent subsidence impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_028	31/08/2020	LW16	Rock Fracturing	2	Rock fracture to rockbar/step above WC15_Pool 34.	1/09/2020
DA3B_LW16_029	31/08/2020	LW16	Rockfall	1	Rockfall to step on western slope of WC15 valley.	1/09/2020
DA3B_LW16_030	31/08/2020	LW16	Erosion	1	Localised erosion on tributary WC15.	1/09/2020
LA4_S1	1/09/2020	LW16	Water Quality Trigger	2	Trigger for electrical conductivity at LA4_S1.	This Report
LA4_S1	1/09/2020	LW16	Water Quality Trigger	2	Trigger for pH at LA4_S1.	This Report
14_01	09/09/2020	LW16	Shallow Groundwater Trigger	3	Rate of recession groundwater trigger in Swamp 14.	This Report
DA3B_LW14_017 Update	09/09/2020	LW16	Rock Fracturing & Displacement	2	Additional rock fracturing and displacement on tributary WC15.	This Report
DA3B_LW14_019 Update	09/09/2020	LW16	Rock Fracturing, Uplift & Displacement	2	Additional rock fracturing, uplift and displacement near tributary WC15.	This Report
DA3B_LW16_030 Update	09/09/2020	LW16	Erosion	1	Changes to localised erosion on tributary WC15.	This Report

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Submit an Impact Report to BCD, DPIE, DRG, Water NSW
- Report in the End of Panel Report
- Summarise actions and monitoring in AEMR
- Review monitoring frequency
- Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required
- Implement agreed CMAs as approved (subject to agency feedback)

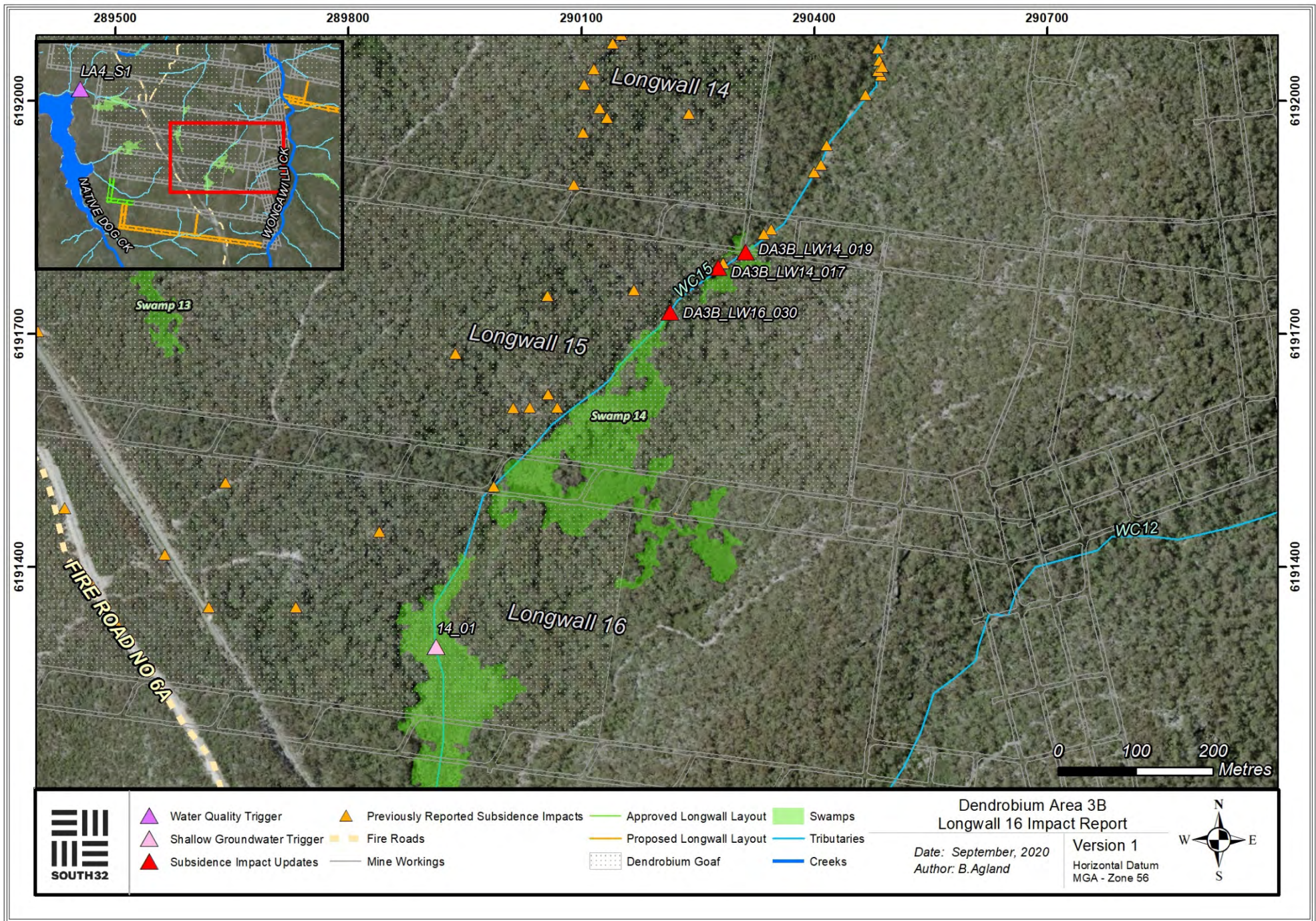


Figure 1: Map showing latest subsidence impacts and triggers relevant to DA3B mining operations.

Table 3: Excerpt from Dendrobium Swamps Impacts, Triggers and Response

WATER QUALITY		
<p>Lake Avon</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Lake Avon - negligible reduction in the quality of surface water inflows to Lake Avon <p>Lake Avon tributary (LA4_S1)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> pH 5.38 EC 90.8 uS/cm DO 89.9% 	<p>Level 1</p> <ul style="list-style-type: none"> One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.90 EC 129.8 uS/cm DO 69.5% 	<ul style="list-style-type: none"> Continue monitoring program Submit an Impact Report to BCD, DPIE, DRG, Water NSW Report in the End of Panel Report Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.90 EC 129.8 uS/cm DO 69.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 1</i> Review monitoring frequency Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.45 EC 154.1 uS/cm DO 50.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 2</i> Offer site visit with BCD, DPIE, DRG, Water NSW Implement additional monitoring or increase frequency if required Review relevant TARP and Management Plan in consultation with key agencies Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> Limestone emplacement to raise pH where it is appropriate to do so Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> pH 4.45 EC 154.1 uS/cm DO 50.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 3</i> Investigate reasons for the exceedance Update future predictions based on the outcomes of the investigation Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

Table 4: Excerpt from Dendrobium Swamps Impacts, Triggers and Response.

<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in surface or near-surface groundwater levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve).</p> <p><u>Level 2:</u> Groundwater level lower than baseline level at 50% of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a 50% of monitoring sites (within 400m of mining) within the swamp.</p> <p><u>Level 3:</u> Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>
<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in soil moisture levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Soil moisture level lower than baseline level at any monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 2:</u> Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 3:</u> Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p>	<ul style="list-style-type: none"> a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>

Table 5: Extract from Dendrobium Area 3B Watercourse TARP.

OBSERVATIONAL-MONITORING		
<p>Native Dog Creek, DC13, WC21, WC15, LA2, LA3, LA4, LA5, ND1, WC6, WC7, WC8, WC9, WC12, WC16 and WC18</p> <p>General observation of streams in active mining areas when longwall is within 400m</p>	<p>Level 1</p> <ul style="list-style-type: none"> • Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion • Crack or fracture up to 10m length with no observable loss of surface water or erosion • Erosion in a localised area (not associated with cracking or fracturing) which would be expected to naturally stabilise without CMA and within the period of monitoring • Observable release of strata gas at the surface • Observable increase in iron staining within the mining area 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPIE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Crack or fracture between 100 and 300mm width at its widest point or any fracture which results in observable loss of surface water or erosion • Crack or fracture between 10 and 50m length • Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention • Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width at its widest point • Crack or fracture over 50m length • Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water • Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention • Gas release results in vegetation dieback, mortality or loss of aquatic habitat • Observable increase in iron staining within the mining area continues more than 600m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPIE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to agency feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with BCD, DPIE, DRG, Water NSW • Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success • Review relevant TARP and Management Plan in consultation with key agencies

Table 6: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crininite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required

Monitoring	Trigger	Action
<p>All mapped cliff sites in subsidence area <i>Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</i></p>	<p>disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Site visits with stakeholders if required • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and as of 6 September 2020, the longwall had progressed approximately 1520m (Figure 1). During recent inspections, eight new landscape impacts were identified.

DA3B_LW16_031 (E290041, N6191714)

DA3B_LW16_031 is located on a step to the north-west of *WC15*, a tributary to *Wongawilli Creek* (Figure 1). The impact is comprised of two vertical rock fractures and a rockfall. The largest rock fracture has an approximate length of 1.5m and approximate maximum width 0.005m. The rockfall consists of 10 pieces with an average volume of approximately 0.1m x 0.2m x 0.1m. The impact appears to be from a previous longwall, likely Longwall 15.

DA3B_LW16_031 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Rockfall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance
- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 1: *DA3B_LW16_031*, looking at the rock fracturing. Taken 28/09/2020.



Photo 2: *DA3B_LW16_031*, looking at the rockfall. Taken on 28/09/2020.

DA3B_LW16_032 (E290071, N6191701)

DA3B_LW16_032 is located approximately 220m north of Longwall 16 and to the north-west of *WC15*, a tributary to *Wongawilli Creek* (Figure 1). The impact is comprised of three separate soil cracks within a 10m length. The largest soil crack has a maximum length of 0.55m, a maximum width of 0.095m and a maximum measurable depth of 0.48m.

DA3B_LW16_032 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 3: DA3B_LW16_032, looking at the length of soil cracking. Taken 28/09/2020.



Photo 4: DA3B_LW16_032, looking at the width of soil cracking. Taken on 28/09/2020.

DA3B_LW16_033 (E290194, N6191325)

DA3B_LW16_033 is located on an access track running parallel to WC15 and was mined beneath by Longwall 16 on 13 September 2020 (Figure 1). The impact is comprised of multiple soil cracks spanning over a 60m length of the access track. The largest soil crack has a maximum continuous length of 8m, a maximum width of 0.075m, and a maximum measurable depth of 0.54m.

DA3B_LW16_033 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 5: DA3B_LW16_033, looking at a length of soil cracking. Taken 28/09/2020.



Photo 6: DA3B_LW16_033 looking at an overview of soil cracking. Taken on 28/09/2020.

DA3B_LW16_034 (E290144, N6191257)

DA3B_LW16_034 is located on an access track running parallel to WC15 and was mined beneath by Longwall 16 on 8 September 2020 (Figure 1). The impact is comprised of three separate soil cracks spanning over a 25m length of the access track. The largest soil crack has a maximum continuous length of 9m, a maximum width of 0.03m and a maximum measurable depth of 0.45m.

DA3B_LW16_034 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 7: DA3B_LW16_034, looking at the length of soil cracking. Taken 28/09/2020.



Photo 8: DA3B_LW16_034 looking at the width of soil cracking. Taken on 28/09/2020.

DA3B_LW16_035 (E290172, N6191282)

DA3B_LW16_035 is located approximately 15m from SLMMP site A3B-SS17 and was mined beneath by Longwall 16 on 11 September 2020 (Figure 1). The impact is comprised of soil cracking and displacement underneath a boulder. The soil cracking has an approximate length of 1m and an approximate width of 0.015m. The rock displacement has an approximate width of 0.015m. Measurements have been approximated due to safety concerns accessing beneath a step during active subsidence.

DA3B_LW16_035 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length
- Surface movement or rock displacement with negligible soil surface exposed

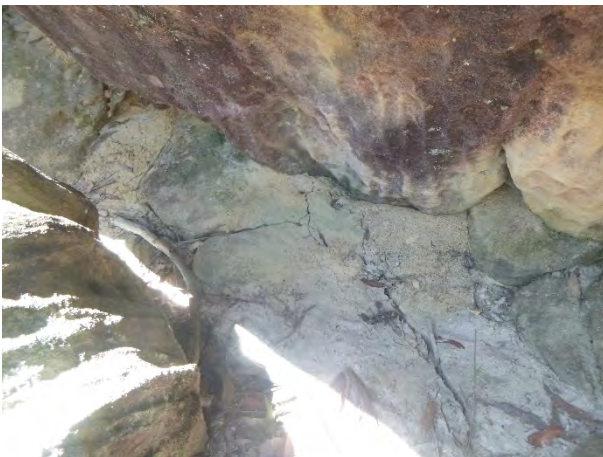


Photo 9: DA3B_LW16_035, looking at a section of soil cracking. Taken 28/09/2020.



Photo 10: DA3B_LW16_035, looking at a section of displacement. Taken on 28/09/2020.

DA3B_LW16_036 (E290164, N6191269)

DA3B_LW16_036 is located at SLMMP site A3B-SS17 and was mined beneath by Longwall 16 on 11 September 2020 (Figure 1). The impact is comprised of a rock fracture to the base of a 2.5m step. The rock fracture has an approximate length of 1m and approximate width of 0.04m. Measurements have been approximated due to safety concerns accessing beneath a step during active subsidence.

DA3B_LW16_036 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 11: DA3B_LW16_036, looking at a section of rock fracturing. Taken 28/09/2020.

DA3B_LW16_037 (E290137, N6191224)

DA3B_LW16_037 is located at SLMMP site AT5-SLMMP and was mined beneath by Longwall 16 on 7 September 2020 (Figure 1). The impact is comprised of five separate soil cracks within a 35m length of an access track. The soil cracking has a maximum continuous length of 1.4m, a maximum width of 0.01m and a maximum measurable depth of 0.29m.

DA3B_LW16_037 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 12: DA3B_LW16_037, overview of soil cracking. Taken 28/09/2020.



Photo 13: DA3B_LW16_037, looking at the width of soil cracking. Taken on 28/09/2020.

DA3B_LW16_038 (E289169, N6191319)

DA3B_LW16_038 consists of iron staining observed in tributary LA2 following the passing of Longwall 16 (Figure 1). The impacted site, Pool 34, was mined beneath by Longwall 16 on 5 May 2020. Throughout the monitoring period the pool has generally been ephemeral, responding to rainfall events. Following a recent rainfall event, iron staining was observed for the first time. The iron staining is localised to this pool and does not extend downstream.

DA3B_LW16_038 is a Level 1 trigger as per the DA3B Watercourse TARP (Table 2), specifically:

- Observable increase in iron staining within the mining area.



Photo 14: LA2_Pool 34, looking upstream. Taken on 24/03/2020, prior to identification of the iron staining.



Photo 15: DA3B_LW16_038- iron staining at LA2_Pool 34, looking upstream. Taken on 14/09/2020.

Table 1: Recent subsidence impacts and triggers. Highlighted rows indicate impacts featured in this report.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_017 Update	09/09/2020	LW16	Rock Fracturing & Displacement	2	Additional rock fracturing and displacement on tributary WC15.	14/09/2020
DA3B_LW14_019 Update	09/09/2020	LW16	Rock Fracturing, Uplift & Displacement	2	Additional rock fracturing, uplift and displacement near tributary WC15.	14/09/2020
DA3B_LW16_030 Update	09/09/2020	LW16	Erosion	1	Changes to localised erosion on tributary WC15.	14/09/2020
DA3B_LW16_031	14/09/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing on cliff line to the north-west of WC15.	This Report
DA3B_LW16_032	28/09/2020	LW16	Soil Cracking	1	Soil cracking to the north-west of WC15.	This Report
DA3B_LW16_033	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	This Report
DA3B_LW16_034	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	This Report
DA3B_LW16_035	28/09/2020	LW16	Soil Cracking and Displacement	1	Soil cracking and displacement near SLMMP site A3B-SS17.	This Report
DA3B_LW16_036	28/09/2020	LW16	Rock Fracturing	1	Rock fracturing to a cliff line at SLMMP site A3B-SS17.	This Report
DA3B_LW16_037	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	This Report
DA3B_LW16_038	14/09/2020	LW16	Iron Staining	1	Ironing staining present at LA2_Pool/34	This Report

Corrective Management Actions (CMAs)

In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR

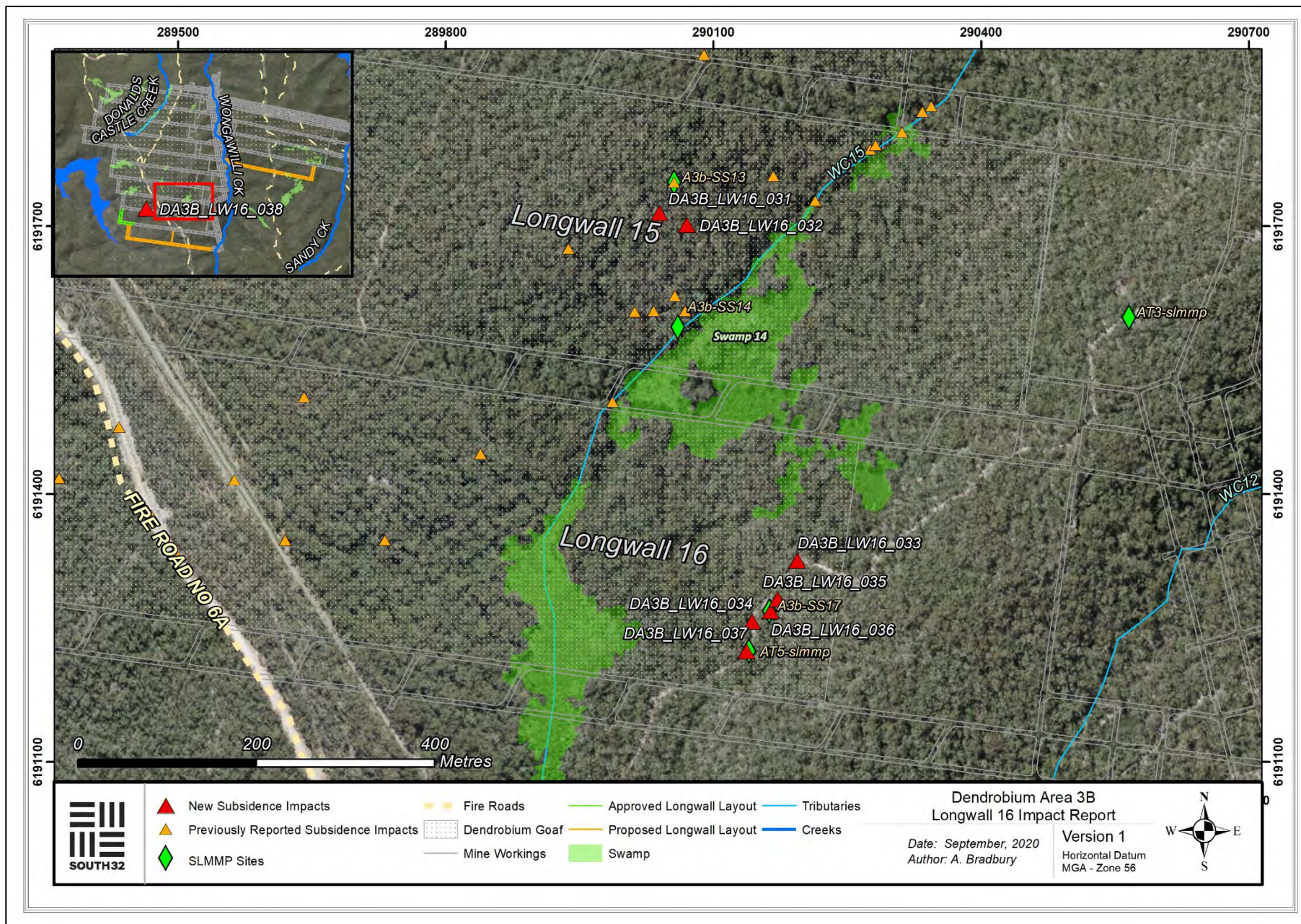


Figure 1: Map showing latest subsidence impacts and triggers relevant to DA3B mining operations.

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		

Monitoring	Trigger	Action
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 1 • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period • Crack or fracture over 300mm width 	<ul style="list-style-type: none"> • Actions as stated for Level 2 • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Table 3: Extract from Dendrobium Area 3B Landscape TARP.

OBSERVATIONAL-MONITORING		
<p>Native Dog Creek, DC13, WC21, WC15, LA2, LA3, LA4, LA5, ND1, WC6, WC7, WC8, WC9, WC12, WC16 and WC18</p> <p>General observation of streams in active mining areas when longwall is within 400m</p>	<p>Level 1</p> <ul style="list-style-type: none"> • Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion • Crack or fracture up to 10m length with no observable loss of surface water or erosion • Erosion in a localised area (not associated with cracking or fracturing) which would be expected to naturally stabilise without CMA and within the period of monitoring • Observable release of strata gas at the surface • Observable increase in iron staining within the mining area 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPIE, DRG, Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Crack or fracture between 100 and 300mm width at its widest point or any fracture which results in observable loss of surface water or erosion • Crack or fracture between 10 and 50m length • Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention • Observable increase in iron staining within the mining area continues to outside the mining area i.e. 400m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width at its widest point • Crack or fracture over 50m length • Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water • Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention • Gas release results in vegetation dieback, mortality or loss of aquatic habitat • Observable increase in iron staining within the mining area continues more than 600m from the longwall 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPIE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to agency feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with BCD, DPIE, DRG, Water NSW • Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success • Review relevant TARP and Management Plan in consultation with key agencies

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and as of 11 October 2020, the longwall had progressed approximately 1730m (Figure 1). During the latest inspection, new soil cracks were identified on an access track.

DA3B_LW16_039 (E290335, N6191371)

DA3B_LW16_039 consists of a series of soil cracks on an access track to the east of Swamp 14 (Figure 1). The cracks are up to 1.8m long, with a maximum width of 0.01m and measurable depth of 0.16m (Photo 1 and Photo 2).

DA3B_LW16_039 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 1: DA3B_LW16_039 soil cracking to access track. Taken on 7/10/2020.



Photo 2: DA3B_LW16_039 soil cracking to access track. Taken on 7/10/2020.

DA3B_LW16_040 (E290300, N6191345)

DA3B_LW16_040 consists of a group of discontinuous soil cracks on an access track to the east of Swamp 14 (Figure 1). The cracking extends for approximately 15m, with the largest continuous crack up to 4m long and 0.015m wide, with a measurable depth of 0.2m (Photo 3 and Photo 4).

DA3B_LW16_040 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 3: *DA3B_LW16_040*- soil cracking to access track. Taken on 7/10/2020.



Photo 4: *DA3B_LW16_040*- soil cracking to access track. Taken on 7/10/2020.

DA3B_LW16_041 (E290275, N6191318)

DA3B_LW16_041 consists of a group of discontinuous soil cracks and slight displacement of soil from rock outcrop on access track to the east of Swamp 14 (Figure 1). The zone extends for approximately 20m, with the largest continuous crack up to 4m long and 0.02m wide, with a measurable depth of 0.15m (Photo 5 to Photo 7). Displacement of soil from a rock outcrop was also observed (Photo 8).

DA3B_LW16_041 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 5: DA3B_LW16_041- soil cracking to access track. Taken on 7/10/2020.



Photo 6: DA3B_LW16_041- soil cracking to access track. Taken on 7/10/2020.



Photo 7: DA3B_LW16_041- soil cracking and displacement on access track. Taken on 7/10/2020.



Photo 8: DA3B_LW16_041- displacement of soil from rock outcrop. Taken on 7/10/2020.

DA3B_LW16_042 (E 290245, N6191310)

DA3B_LW16_042 consists of a group of discontinuous soil cracks to a steep section of access track to the east of Swamp 14 (Figure 1). The zone extends for approximately 30m, with the largest continuous crack up to 5.5m long and 0.04m wide, with a measurable depth of 0.75m (Photo 9 to Photo 12).

DA3B_LW16_041 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length



Photo 9: DA3B_LW16_042- looking down slope of access track. Taken on 7/10/2020.



Photo 10: DA3B_LW16_042- soil cracking to access track. Taken on 7/10/2020.



Photo 11: DA3B_LW16_042- soil cracking to access track. Taken on 7/10/2020.



Photo 12: DA3B_LW16_042- depth measurement of soil cracking. Taken on 7/10/2020.

DA3B_LW16_043 (E290443, N6191240)

DA3B_LW16_043 consists of multiple discontinuous soil cracks to an access to the east of Swamp 14 (Figure 1). The largest continuous crack is up to 1.1m long and 0.02m wide, with a measurable depth of 0.35m (Photo 13 to Photo 15).

DA3B_LW16_043 is a Level 1 trigger as per the DA3B Landscape TARP (Table 2), specifically:

- Crack or fracture up to 100mm width
- Crack or fracture up to 10m length

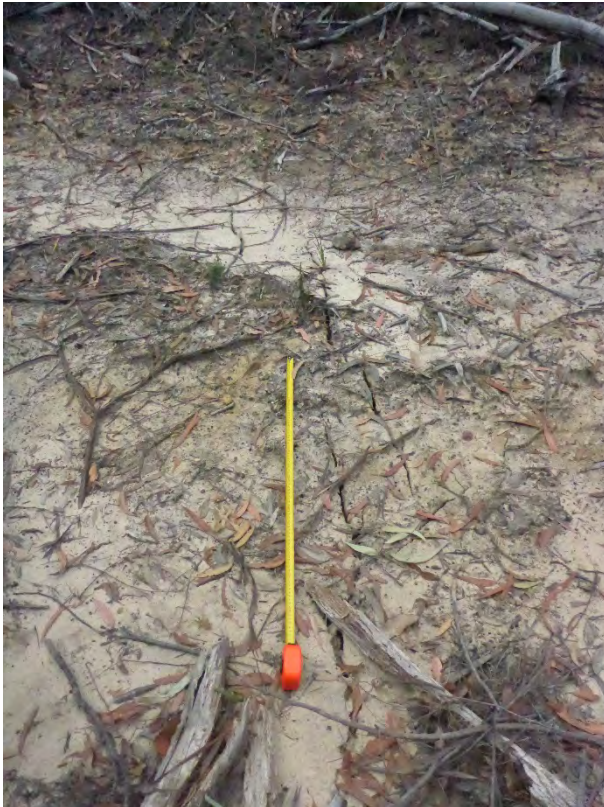


Photo 13: DA3B_LW16_043- soil cracking to access track.
Taken on 7/10/2020.



Photo 14: DA3B_LW16_043- depth measurement of soil cracking.
Taken on 7/10/2020.



Photo 15: DA3B_LW16_043- soil cracking to access track.
Taken on 7/10/2020.

Table 1: Recent subsidence impacts. Highlighted rows indicate impacts featured in this report.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_031	14/09/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing on cliff line to the north-west of WC15.	30/09/2020
DA3B_LW16_032	28/09/2020	LW16	Soil Cracking	1	Soil cracking to the north-west of WC15.	30/09/2020
DA3B_LW16_033	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	30/09/2020
DA3B_LW16_034	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	30/09/2020
DA3B_LW16_035	28/09/2020	LW16	Soil Cracking and Displacement	1	Soil cracking and displacement near SLMMP site A3B-SS17.	30/09/2020
DA3B_LW16_036	28/09/2020	LW16	Rock Fracturing	1	Rock fracturing to a cliff line at SLMMP site A3B-SS17.	30/09/2020
DA3B_LW16_037	28/09/2020	LW16	Soil Cracking	1	Soil cracking on an access track parallel to WC15.	30/09/2020
DA3B_LW16_038	14/09/2020	LW16	Iron Staining	1	Ironing staining present at LA2_Pool/34	30/09/2020
DA3B_LW16_039	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	This report
DA3B_LW16_040	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	This report
DA3B_LW16_041	7/10/2020	LW16	Soil Cracking and displacement	1	Soil cracking to access track, east of Swamp 14.	This report
DA3B_LW16_042	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	This report
DA3B_LW16_043	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	This report

Corrective Management Actions (CMAs)

The cracking appears stable with no signs of erosion. In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR

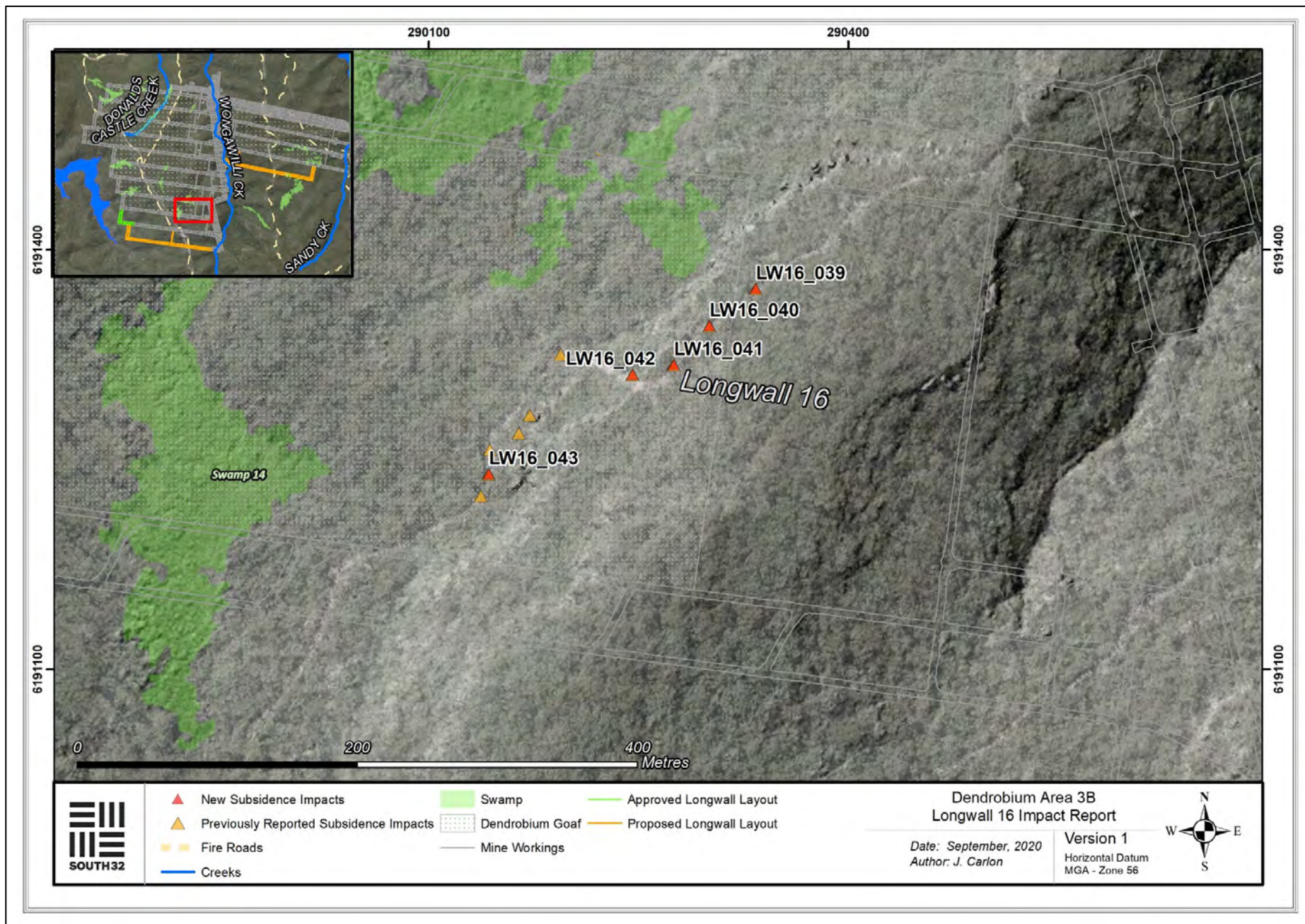


Figure 1: Latest subsidence impacts and triggers relevant to DA3B mining operations.

Table 2: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		

Monitoring	Trigger	Action
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area <i>Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</i></p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p> <p>Fire Trails All mapped fire trails in subsidence area <i>Refer to Dendrobium Area 3A SMP Figure 19.3</i></p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area <i>Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</i></p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period • Crack or fracture over 300mm width 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the approved Subsidence Management Plan (SMP) for Dendrobium Area 3 (DA3). During recent inspections, an increase in iron staining was observed in *Sandy Creek*.

DA3_LW8_158 Update (E293300, N6192455)

DA3_LW8_158 Update consists of iron staining in *Sandy Creek*. Iron staining was first reported in *SC10C*, a tributary in the *Sandy Creek* sub-catchment, on 11 March 2013 following the extraction of Longwall 8 (Figure 1). Photo 1 displays *SC10C_Pool 3* which is the furthest upstream location where iron staining has been identified. Iron staining was also observed downstream of the *SC10* and *SC10C* confluence following the extraction of Longwall 8. Photo 2 displays *SC10_Rockbar 3* during the latest inspection. During recent inspections the iron staining was observed to have extended downstream into *Sandy Creek*. The increase in iron staining is evident between the *Sandy Creek* and *SC10* confluence and the *Sandy Creek* and *Cordeaux Dam* confluence (Photo 3 and Photo 4). It is likely that the increase of iron staining in *Sandy Creek* is associated with the outflow from *SC10C*. No iron staining was observed within *Cordeaux Dam* during the latest inspection of *Sandy Creek Arm*. (Photo 5).

DA3_LW8_158 is now a Level 2 trigger as per the Dendrobium Area 3A Watercourse TARP (Appendix A: Table 2), specifically:

- Increase in iron staining, algal growth, or other observed changes, for >2 consecutive months in *Sandy Creek*, determined by comparing baseline photos with photos during the mining period.



Photo 1 *SC10C_Pool 3*, looking upstream at the furthest upstream location of the iron staining. Taken: 3/09/2020.



Photo 2: *SC10_Rockbar 3*, looking upstream during the latest inspection. Taken: 14/10/2020.



Photo 3: *SCK_Rockbar 5*, looking upstream prior to observed changes in stream appearance. Taken: 19/08/2020.



Photo 4: *SCK_Rockbar 5*, looking upstream at the increase in iron staining. Taken: 14/10/2020.



Photo 5: *Sandy Creek Arm*, looking upstream towards *Sandy Creek*. Taken: 15/10/2020.

Table 1: Recent subsidence impact observations. Highlighted rows indicate impacts featured in this report.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_039	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	12/10/2020
DA3B_LW16_040	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	12/10/2020
DA3B_LW16_041	7/10/2020	LW16	Soil Cracking and displacement	1	Soil cracking to access track, east of Swamp 14.	12/10/2020
DA3B_LW16_042	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	12/10/2020
DA3B_LW16_043	7/10/2020	LW16	Soil Cracking	1	Soil cracking to access track, east of Swamp 14.	12/10/2020
DA3_LW8_158 (Update)	14/10/2020	LW8	Iron Staining	2	Increase in iron staining for >2 consecutive months in Sandy Creek.	This Report

Corrective Management Actions (CMAs)

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR

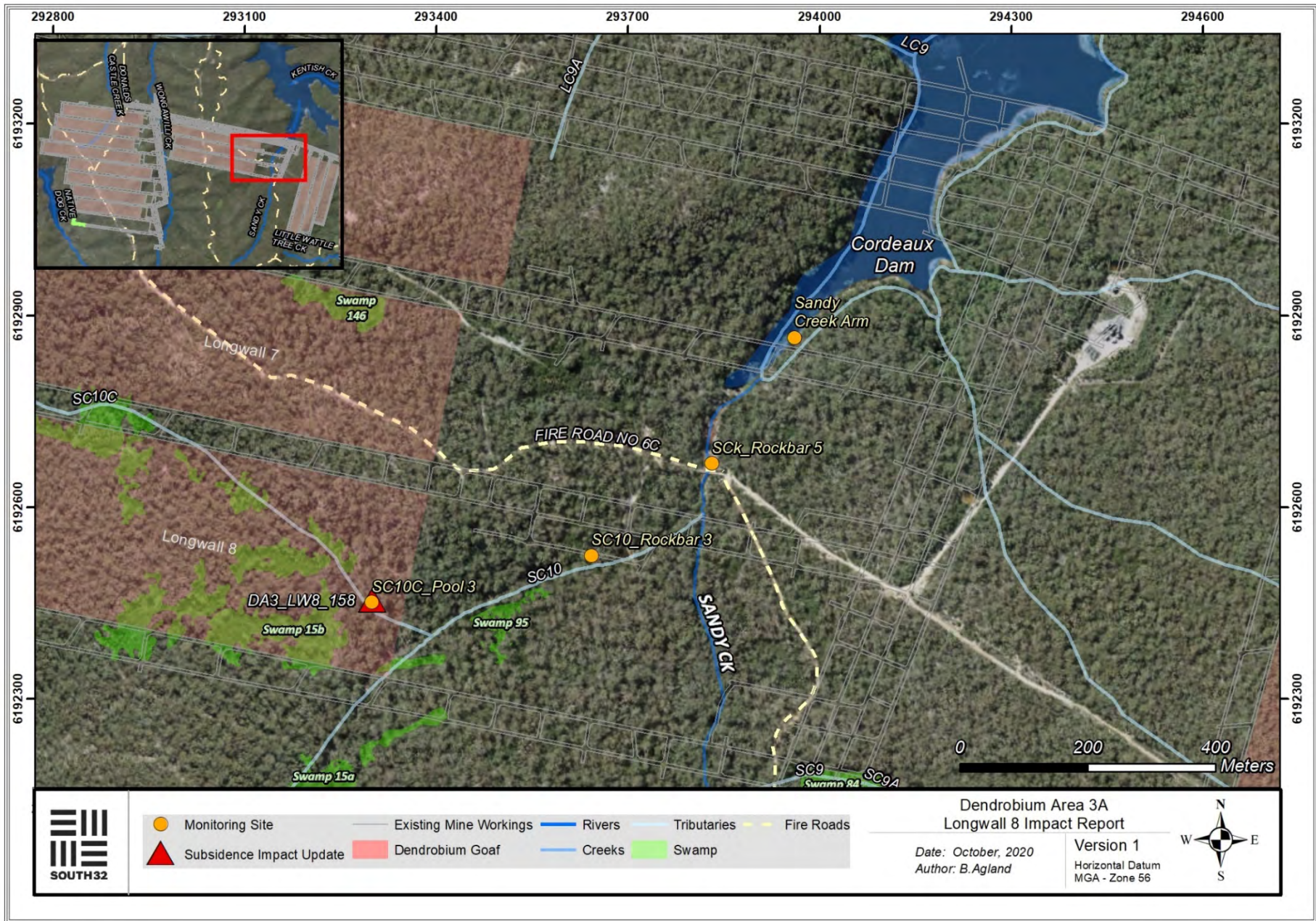


Figure 1: Map showing latest subsidence impacts relevant to DA3A mining operations.

Appendix A

Table 2: Extract from Dendrobium Area 3A Watercourse TARP.

APPEARANCE		
Wongawilli Creek and Sandy Creek	<p>Level 1 *</p> <ul style="list-style-type: none"> • Increase in iron staining, algal growth, or other observed changes, for no more than 2 consecutive months, determined by comparing baseline photos with photos during the mining period. • Isolated (at less than 10% of mapped pools) fracturing resulting in no pool water level loss 	<ul style="list-style-type: none"> • Continue monitoring program. • Report impacts to key stakeholders • Summarise impacts and report in the End of Panel Report and AEMR
	<p>Level 2 *</p> <ul style="list-style-type: none"> • Increase in iron staining, algal growth, or other observed changes, for > 2 consecutive months, determined by comparing baseline photos with photos during the mining period • Fracturing (at greater than 10% of mapped pools) resulting in no pool water level loss 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring program • Notify relevant technical specialists and seek advice on any CMA required • Implement agreed CMAs as approved
	<p>Level 3 *</p> <ul style="list-style-type: none"> • Fracturing in Wongawilli or Sandy Creeks resulting in pool water level loss 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Immediately notify OEH, DoPI, DPI, SCA, other resource managers and relevant technical specialists and seek advice on any CMA required. • Site visits with stakeholders if required • Develop site CMA in consultation with key stakeholders within 1 month These may include: <ul style="list-style-type: none"> – Grouting and repair of surface water controlling features and the beds of streams where fracturing is evident where it is appropriate to do so in consultation with OEH, DoPI, DPI, SCA, and other stakeholders • Completion of works following approvals • Conduct initial follow up monitoring & reporting within 2 months of CMA completion if required • Review the relevant TARP and Management Plan in consultation with key stakeholders

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) monthly prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and was completed on 4 November 2020 (Figure 1). During the latest inspection, two new impacts were identified consisting of soil cracking, rock fracturing and displacement. An update to an existing shallow groundwater in Swamp 14 was also identified.

DA3B_LW16_044 (E290234, N6191201)

DA3B_LW16_044 consists of approximately 20m of discontinuous soil cracking, rock fracturing and rock-soil displacement along a steep slope, to the east of Swamp 14 (Figure 1). The site was undermined by Longwall 16 on 21 September 2020. The longest single crack or fracture is 2m, with a maximum width of 0.15m and a maximum measurable depth of up to 0.6m (Photo 1 to Photo 3). The rock displacement is up to 0.05m wide (Photo 4).

DA3B_LW16_044 is a Level 2 trigger as per the DA3B Landscape TARP (Table 1), specifically:

- Crack or fracture between 100mm and 300mm width.



Photo 1: DA3B_LW16_044, looking at length of soil cracking. Crack runs in orientation of tape measure. Taken on 10/11/2020.

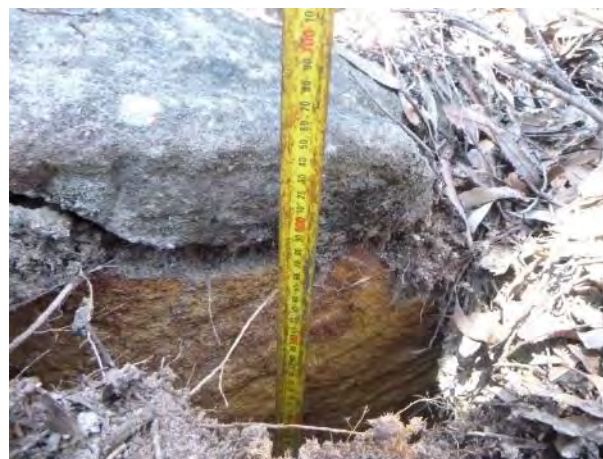


Photo 2: DA3B_LW16_044, looking at depth of rock fracturing. Taken on 10/11/2020.

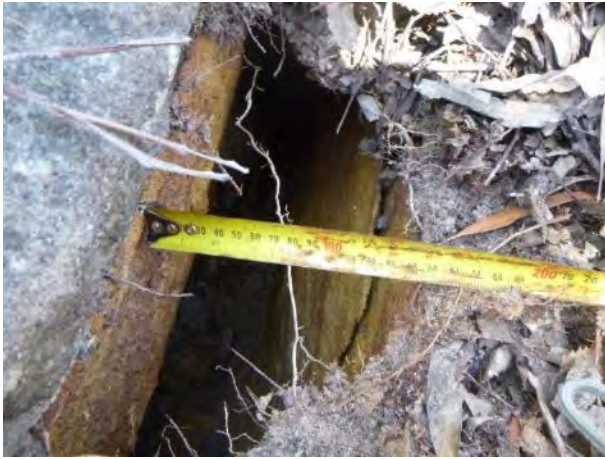


Photo 3: *DA3B_LW16_044*, looking at width of rock fracturing. Taken on 10/11/2020.



Photo 4: *DA3B_LW16_044*, looking at rock displacement from soil. Taken on 10/11/2020.

DA3B_LW16_045 (E290204, N6191177)

DA3B_LW16_045 consists of rock fracturing to a steep slope east of Swamp 14 (Figure 1). The site was undermined by Longwall 16 on 17 September 2020. The rock fracturing has a maximum length of 2m, a maximum width of 0.06m and a maximum measurable depth of 1.1m (Photo 5 to Photo 7).

DA3B_LW16_045 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 5: *DA3B_LW16_045*, looking at depth of rock fracturing. Taken on 10/11/2020.



Photo 6: *DA3B_LW16_045*, looking at length of rock fracturing. Taken on 10/11/2020.

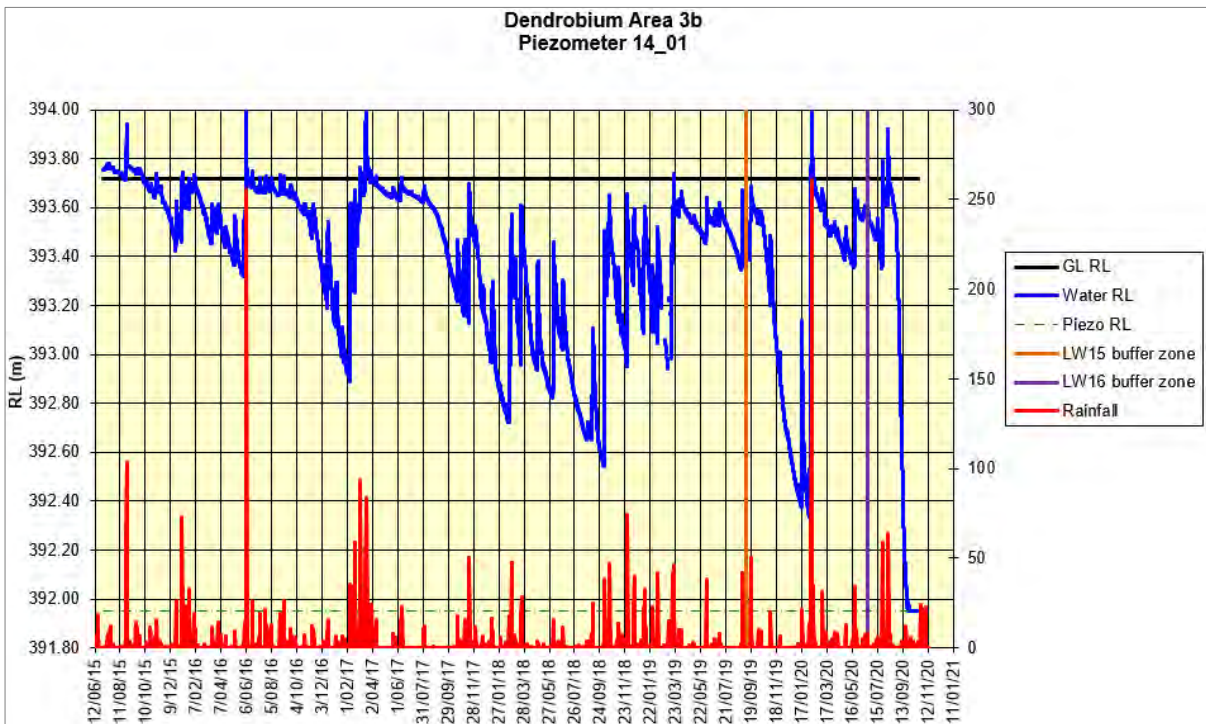


Photo 7: DA3B_LW16_045, looking at width of rock fracturing. Taken on 10/11/2020.

Swamp 14 (Update)

Longwall 15 triggers for water level and soil moisture at the site 14_01 were reported on 16 January 2020. On 8 August 2020, the site was mined beneath by Longwall 16. A trigger for rate of recession was subsequently reported on 11 September 2020 in accordance with the SIMMCP. Groundwater level at the site continued to recede and on 27 September 2020, the borehole was observed to be dry (Graph 1). This is the first time the borehole has been observed as dry since the monitoring started at the site.

Corrective Management Actions were initiated in accordance with the Dendrobium Area 3B Subsidence Management Plan. Site 14_01 remains a Level 3 trigger in accordance with the Dendrobium Swamp Impact Monitoring, Management and Congincy Plan (Table 2).



Graph 1: Near-surface groundwater levels at Swamp 14 site 14_01, logged hourly. Date range: 02/07/2015 to 20/10/2020.

The abovementioned impacts and triggers are tabulated at the end of this report, along with all Level 2 or higher impacts and triggers for Longwall 16 (APPENDIX A, Table 1).

Corrective Management Actions (CMAs)

The cracking appears stable with no signs of erosion. In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required

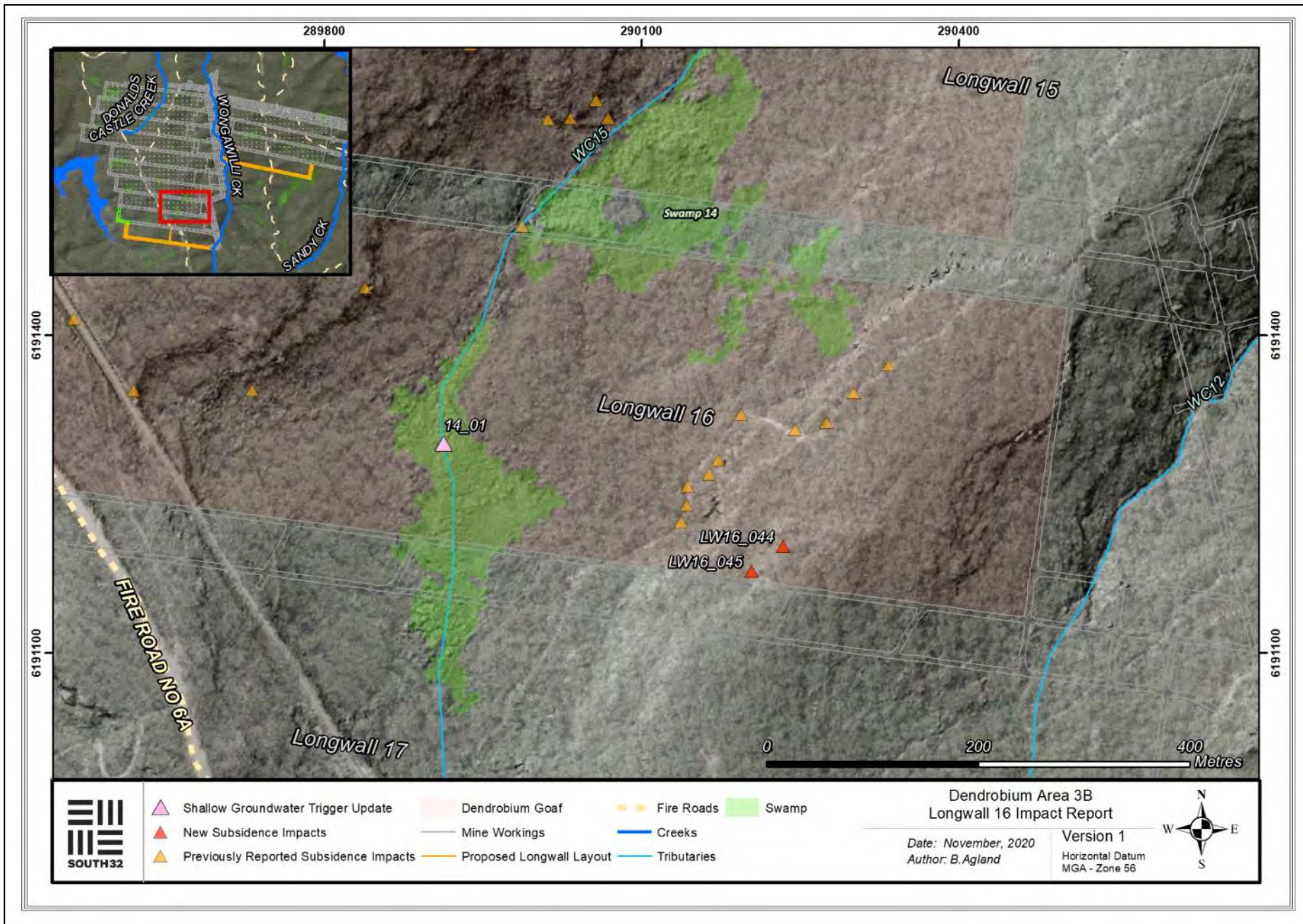


Figure 1: Latest subsidence impacts and triggers relevant to DA3B mining operations.

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 1 • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 2 • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Table 2: Extract from Dendrobium Area 3B Swamp TARP.

<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in surface or near-surface groundwater levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at any monitoring site (measured as average mm/day during the recession curve).</p> <p><u>Level 2:</u> Groundwater level lower than baseline level at 50% of monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at a 50% of monitoring sites (within 400m of mining) within the swamp.</p> <p><u>Level 3:</u> Groundwater level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps); and/or</p> <p>Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at >80% of monitoring sites (within 400 m of mining) within the swamp.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>
<p>Minor changes in the ecosystem functionality of the swamps</p>	<p>Falls in soil moisture levels in swamps</p> <p><i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i></p>	<p><u>Level 1:</u> Soil moisture level lower than baseline level at any monitoring sites (within 400 m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 2:</u> Soil moisture level lower than baseline level at 50% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p> <p><u>Level 3:</u> Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).</p>	<ul style="list-style-type: none"> a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions 		<p>Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars</p>

APPENDIX A,

Table 1: Summary of Longwall 16 Level 2 and 3 impacts and triggers. Highlighted rows include all impacts featured in this report, regardless of TARP level.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3B_LW16_005	Soil Cracking	Access Track	21/04/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	22/04/2020
DA3B_LW16_010	Rock Fracturing	Rock Outcrop	27/04/2020	2	Rock fracturing to rock outcrop between Lake Avon and Fire Road 6A.	30/04/2020
DA3B_LW16_013 (Update)	Soil Cracking	Access Track	12/05/2020 & 28/05/2020 & 11/06/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	18/05/2020 & 29/05/2020 & 19/06/2020
DA3B_LW16_019 (Update)	Soil Cracking	Fire Road 6A	19/06/2020 & 25/06/2020	2	Soil cracking across Fire Road 6A (now remediated).	24/06/2020 & 30/06/2020
DA3B_LW16_021	Rock Fracturing	Steep Slope/ Step	30/06/2020	2	Rock fracturing to step with small rockfall.	2/07/2020
DA3B_LW16_022 (Update)	Rock Fracturing	Railway Corridor	7/07/2020 & 6/08/2020	3	Rock fracturing to cut-through of railway corridor.	10/07/2020 & 10/08/2020
DA3B_LW16_028	Rock Fracturing	WC15	31/08/2020	2	Rock fracture to rockbar/step above WC15_Pool 34.	1/09/2020
DA3B_LW14_017 Update	Rock Fracturing & Displacement	WC15	9/09/2020	2	Additional rock fracturing and displacement on tributary WC15.	14/09/2020
DA3B_LW14_019 Update	Rock Fracturing, Uplift & Displacement	WC15	9/09/2020	2	Additional rock fracturing, uplift and displacement near tributary WC15.	14/09/2020
DA3_LW8_158 (Update)	Iron Staining	Sandy Creek	14/10/2020	2	Increase in iron staining for >2 consecutive months in Sandy Creek.	19/10/2020
14_01	Shallow Groundwater Trigger	Swamp 14	9/09/2020	3	Rate of recession groundwater trigger in Swamp 14.	14/09/2020
23_02	Groundwater trigger	Swamp 23	27/04/2020	3	Near-surface groundwater trigger in Swamp 23 (recession rate).	30/04/2020
11_H2	Groundwater Trigger	Swamp 11	13/05/2020	2	Near-surface groundwater trigger in Swamp 11.	18/05/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for electrical conductivity at LA4_S1.	5/08/20//20 & 14/09/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for pH at LA4_S1.	5/08/2020 & 14/09/2020

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	1/06/2020	2	Trigger for electrical conductivity.	4/06/2020
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	30/06/2020	3	Trigger for electrical conductivity.	2/07/2020
<i>DA3B_LW16_044</i>	Soil Cracking, Rock Fracturing & Displacement	<i>Steep Slope</i>	10/11/2020	2	Soil cracking, rock fracturing and displacement on steep slope east of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_045</i>	Rock Fracturing	<i>Steep Slope</i>	10/11/2020	1	Rock fracturing to a steep slope east of <i>Swamp 14</i> .	This Report
<i>14_01 (Update)</i>	Shallow Groundwater	Swamp 14	9/09/2020	3	Rate of recession groundwater trigger in <i>Swamp 14</i> .	14/09/2020 & This Report

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and was completed on 4 November 2020 (Figure 1). During the latest inspection, one new impact was identified.

DA3B_LW16_046 (E290173, N6191245)

DA3B_LW16_046 consists of a rock fracture on a steep slope/step east of Swamp 14 (Figure 1). The site was undermined by Longwall 16 on 10 September 2020. The rock fracture has a length of 1.8m, a maximum width of 0.01m and a maximum measurable horizontal depth of 0.5m (Photo 1 to Photo 2).

DA3B_LW16_046 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: *DA3B_LW16_046*, looking at the rock fracture. Taken on 25/11/2020.



Photo 2: DA3B_LW16_046, looking at the rock fracture. Taken on 25/11/2020.

Corrective Management Actions (CMAs)

The fracture appears stable with no signs of erosion. In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required

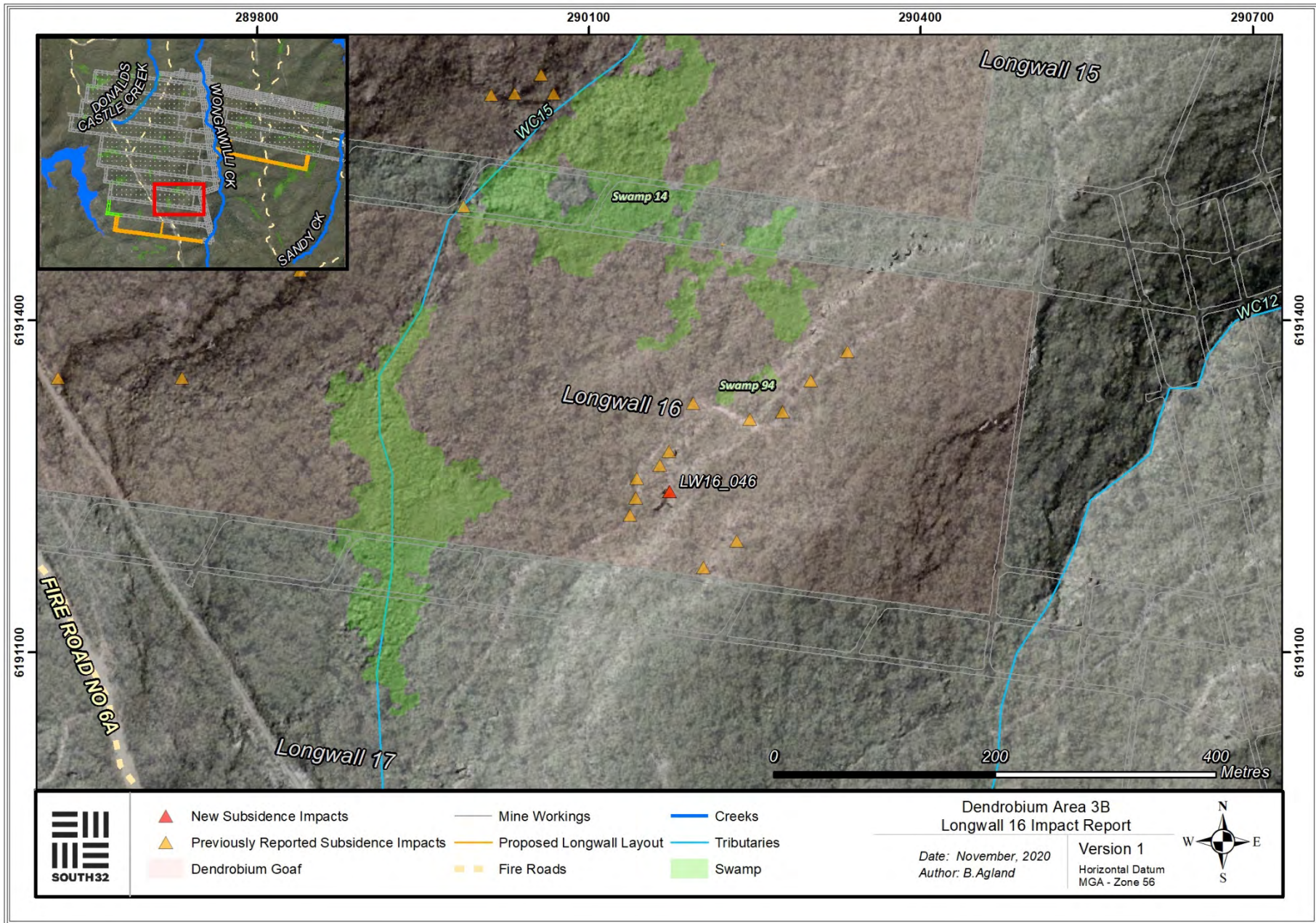


Figure 1: Latest subsidence impacts relevant to DA3B mining operations.

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 1 • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs All mapped cliff sites in subsidence area Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 2 • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required • Site visits with stakeholders if required

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

APPENDIX A,

Table 2: Summary of Longwall 16 Level 2 and 3 impacts and triggers. Highlighted rows include all impacts featured in this report, regardless of TARP level.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3B_LW16_005	Soil Cracking	Access Track	21/04/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	22/04/2020
DA3B_LW16_010	Rock Fracturing	Rock Outcrop	27/04/2020	2	Rock fracturing to rock outcrop between Lake Avon and Fire Road 6A.	30/04/2020
DA3B_LW16_013 (Update)	Soil Cracking	Access Track	12/05/2020 & 28/05/2020 & 11/06/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	18/05/2020 & 29/05/2020 & 19/06/2020
DA3B_LW16_019 (Update)	Soil Cracking	Fire Road 6A	19/06/2020 & 25/06/2020	2	Soil cracking across Fire Road 6A (now remediated).	24/06/2020 & 30/06/2020
DA3B_LW16_021	Rock Fracturing	Steep Slope/ Step	30/06/2020	2	Rock fracturing to step with small rockfall.	2/07/2020
DA3B_LW16_022 (Update)	Rock Fracturing	Railway Corridor	7/07/2020 & 6/08/2020	3	Rock fracturing to cut-through of railway corridor.	10/07/2020 & 10/08/2020
DA3B_LW16_028	Rock Fracturing	WC15	31/08/2020	2	Rock fracture to rockbar/step above WC15_Pool 34.	1/09/2020
DA3B_LW14_017 Update	Rock Fracturing & Displacement	WC15	9/09/2020	2	Additional rock fracturing and displacement on tributary WC15.	14/09/2020
DA3B_LW14_019 Update	Rock Fracturing, Uplift & Displacement	WC15	9/09/2020	2	Additional rock fracturing, uplift and displacement near tributary WC15.	14/09/2020
DA3_LW8_158 (Update)	Iron Staining	Sandy Creek	14/10/2020	2	Increase in iron staining for >2 consecutive months in Sandy Creek.	19/10/2020
14_01	Shallow Groundwater Trigger	Swamp 14	9/09/2020	3	Rate of recession groundwater trigger in Swamp 14.	14/09/2020
23_02	Groundwater trigger	Swamp 23	27/04/2020	3	Near-surface groundwater trigger in Swamp 23 (recession rate).	30/04/2020
11_H2	Groundwater Trigger	Swamp 11	13/05/2020	2	Near-surface groundwater trigger in Swamp 11.	18/05/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for electrical conductivity at LA4_S1.	5/08/2020 & 14/09/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for pH at LA4_S1.	5/08/2020 & 14/09/2020

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	1/06/2020	2	Trigger for electrical conductivity.	4/06/2020
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	30/06/2020	3	Trigger for electrical conductivity.	2/07/2020
<i>DA3B_LW16_044</i>	Soil Cracking, Rock Fracturing & Displacement	<i>Steep Slope</i>	10/11/2020	2	Soil cracking, rock fracturing and displacement on steep slope east of <i>Swamp 14</i> .	16/11/2020
<i>14_01 (Update)</i>	Shallow Groundwater	<i>Swamp 14</i>	9/09/2020	3	Rate of recession groundwater trigger in <i>Swamp 14</i> .	14/09/2020 & 16/11/2020
<i>DA3B_LW16_046</i>	Rock Fracturing	<i>Steep Slope/ Step</i>	25/11/2020	1	Rock fracture on steep slope/step east of <i>Swamp 14</i> .	This Report

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT) on a monthly basis prior to mining and weekly during mining. Monitoring is conducted in accordance with the Dendrobium Area 3B (DA3B) Subsidence Management Plan (SMP). Extraction of Longwall 16 began on 26 February 2020 and was completed on 4 November 2020 (Figure 1). During recent inspections, six new impacts were identified.

DA3B_LW16_047 (E290168, N6191200)

DA3B_LW16_047 consists of three rock fractures on a steep slope/step to the east of Swamp 14 (Figure 1). The site was mined beneath by Longwall 16 on 11 September 2020. The rock fracturing has a maximum length of 1.2m, a maximum width of 0.005m and a maximum measurable depth of 0.11m (Photo 1 and Photo 2).

DA3B_LW16_047 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 1: *DA3B_LW16_047*, looking at a section of the rock fracturing. Taken on 30/11/2020.



Photo 2: *DA3B_LW16_047*, looking at the width of the rock fracturing. Taken on 30/11/2020.

DA3B_LW16_048 (E289783, N6191423)

DA3B_LW16_048 consists of a rock fracture to a rock outcrop to the west of Swamp 14 (Figure 1). The site was mined beneath by Longwall 16 on 22 July 2020. The rock fracture has a maximum length of 5.3m, a maximum width of 0.035m and a maximum measurable depth of 0.76m (Photo 3 and Photo 4).

DA3B_LW16_048 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 3: *DA3B_LW16_048*, looking at the length of rock fracturing. Taken on 30/11/2020.



Photo 4: *DA3B_LW16_048*, looking at the width of rock fracturing. Taken on 30/11/2020.

DA3B_LW16_049 (E289755, N6191395)

DA3B_LW16_049 consists of five rock fractures and associated fragmentation to a steep slope/step to the west of Swamp 14 (Figure 1). The site was mined beneath by Longwall 16 on 18 July 2020. The rock fracturing has a maximum continuous length of 12m and a maximum width of 0.004m. The rock fragmentation has maximum dimensions of 0.15m x 0.05m x 0.02m (Photo 5 and Photo 6).

DA3B_LW16_049 is a Level 2 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically: a crack or fracture between 10 and 50m length.



Photo 5: *DA3B_LW16_049*, looking at a section of rock fracturing. Taken on 30/11/2020.



Photo 6: *DA3B_LW16_049*, looking at the rock fragmentation. Taken on 30/11/2020.

DA3B_LW16_050 (E289800, N6191455)

DA3B_LW16_050 consists of a rock fracture to a steep slope/step to the west of Swamp 14 (Figure 1). The site was mined beneath by Longwall 16 on 24 July 2020. The rock fracture has a maximum length of 2.5m, a maximum width of 0.055m and a maximum measurable depth of 0.56m (Photo 7 and Photo 8).

DA3B_LW16_050 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 7: *DA3B_LW16_050*, looking at the length of the rock fracture. Taken on 30/11/2020.

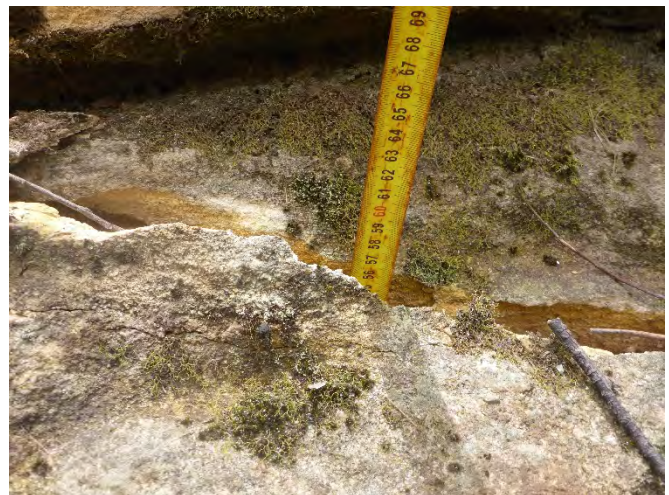


Photo 8: *DA3B_LW16_050*, looking at the depth of the rock fracture. Taken on 30/11/2020.

DA3B_LW16_051 (E289758, N6191471)

DA3B_LW16_051 consists of 32m of discontinuous soil cracking, rock fracturing and rock movement to a rock outcrop and bushland to the west of Swamp 14 (Figure 1). The site was mined beneath by Longwall 16 on 17 July 2020. The impact has a maximum continuous length of 20m, maximum width of 0.2m and a maximum measurable depth of 0.93m (Photo 9 to Photo 11). The cracking has been flagged with caution tape to highlight the cracking to anyone walking in the area.

DA3B_LW16_051 is a Level 2 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture between 100 and 300mm width.
- Crack or fracture between 10 and 50m length.



Photo 9: DA3B_LW16_051, looking at a section of soil cracking and rock fracturing. Taken on 30/11/2020.



Photo 10: DA3B_LW16_051, looking at the maximum depth. Taken on 30/11/2020.



Photo 11: DA3B_LW16_051, looking at the maximum width. Taken on 30/11/2020.

DA3B_LW16_052 (E289916, N6191759)

DA3B_LW16_052 consists of 4.7m of discontinuous soil cracking in bushland to the west of Swamp 14 (Figure 1). The site was mined beneath by Longwall 15 on 8 October 2019. The impact has a maximum continuous length of 1.3m, maximum width of 0.09m and a maximum measurable depth of 0.2m (Photo 12 and Photo 13).

DA3B_LW16_052 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Table 1), specifically:

- Crack or fracture up to 100mm width.
- Crack or fracture up to 10m length.



Photo 12: DA3B_LW16_052, looking at a section of soil cracking. Taken on 1/12/2020.



Photo 13: DA3B_LW16_052, looking at the maximum width. Taken on 1/12/2020.

Corrective Management Actions (CMAs)

The impacts described above appear stable with no signs of erosion. In accordance with the Dendrobium Area 3B SMP, the following actions have been initiated:

- Continue monitoring program
- Report impacts to key stakeholders
- Summarise impacts and report in the End of Panel Report and AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required

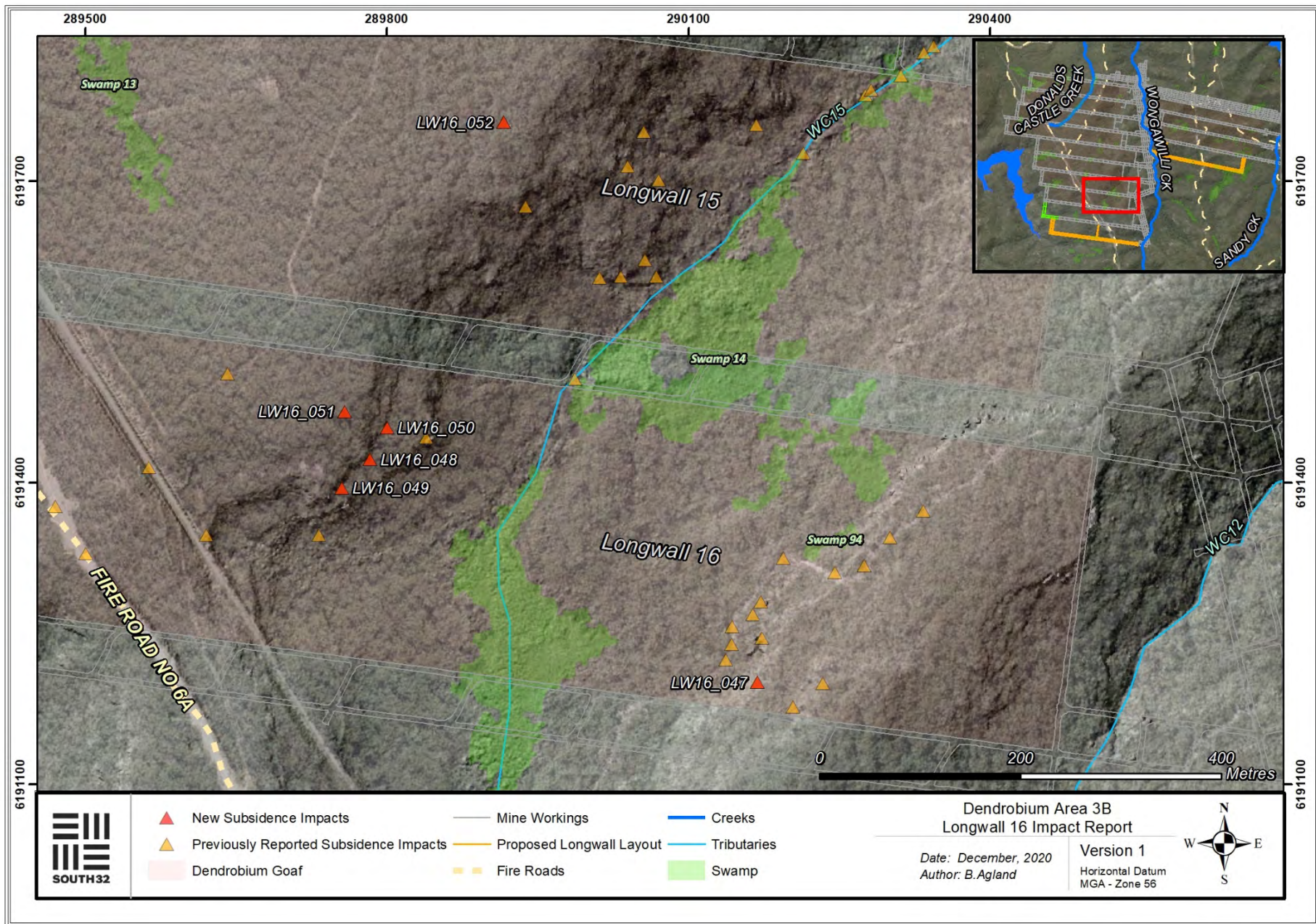


Figure 1: Latest subsidence impacts relevant to DA3B mining operations.

Table 1: Extract from Dendrobium Area 3B Landscape TARP.

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2</p> <p>Cliffs A2-CL1 (above LW4)</p> <p>Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5)</p> <p>Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5)</p> <p>Swamp A2-SW1 (above LWs 4 & 5)</p> <p>4WD Track A2-FT1 (above LWs 4 & 5)</p> <p>Crinanite Surface Extent A2-CN1 & A2-CN2 (above LWs 3 & 4)</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Rock fall from a cliff which is left mostly intact (<10% length), resulting in insignificant ground disturbance • Surface movement or rock displacement with negligible soil surface exposed • Crack at the surface, which should not result in any significant erosion or further ground movement • Crack in a fire trail which should not result in erosion or impede access • Crack or fracture up to 100mm width • Crack or fracture up to 10m length • Erosion in a localised area which would be expected to naturally stabilise without CMA and within the period of monitoring 	<ul style="list-style-type: none"> • Continue monitoring program • Report impacts to key stakeholders • Summarise impacts and Report in the End of Panel Report and AEMR
<p>AREA 3A</p> <p>Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites)</p> <p>Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites</p> <p>Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p> <p>Fire Trails All mapped fire trails in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3</p>	<p>Level 2 *</p> <ul style="list-style-type: none"> • Rock fall or overhang collapse at a cliff site, where characteristics of the cliff have changed, and there has been significant ground disturbance • Surface movement or rock displacement that has exposed significant areas of soil • A crack at the surface, which could result in significant erosion or movement at the surface • A crack at the surface with potential risk to safety and/or fauna entrapment • A crack in the fire trail, which could result in significant erosion or impede vehicle access • Crack or fracture between 100 and 300mm width • Crack or fracture between 10 and 50m length • Significant erosion at any location, which is not likely to naturally stabilise within the period of monitoring, or is located in a sensitive area e.g. swamps, creek, lake shore, and may result in increased sediment transport to Cordeaux Dam, or has been previously identified as Level 1, but is not likely to naturally stabilise within the monitoring period 	<ul style="list-style-type: none"> • Actions as stated for Level 1 • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>
<p>AREA 3B</p> <p>Cliffs</p>	<p>Level 3 *</p> <ul style="list-style-type: none"> • Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground 	<ul style="list-style-type: none"> • Actions as stated for Level 2 • Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required

Monitoring	Trigger	Action
<p>All mapped cliff sites in subsidence area <i>Refer to Dendrobium Area 3B SMP Figures 18.1 for location of sites</i></p>	<p>disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 	<ul style="list-style-type: none"> • Site visits with stakeholders if required • Review monitoring program and modify if necessary within 1 month • Implement increased monitoring if required within 2 weeks • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals • Completion of works following approvals • Issue CMA report within 1 month of works completion • Conduct initial follow up monitoring & reporting within 2 months of CMA completion • Review the relevant TARP and Management Plan in consultation with key stakeholders <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Table 2: Summary of Longwall 16 Level 2 and 3 impacts and triggers. Highlighted rows include all impacts featured in this report, regardless of TARP level.

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
DA3B_LW16_005	Soil Cracking	Access Track	21/04/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	22/04/2020
DA3B_LW16_010	Rock Fracturing	Rock Outcrop	27/04/2020	2	Rock fracturing to rock outcrop between Lake Avon and Fire Road 6A.	30/04/2020
DA3B_LW16_013 (Update)	Soil Cracking	Access Track	12/05/2020 & 28/05/2020 & 11/06/2020	2	Soil cracking on access track between Lake Avon and Fire Road 6A.	18/05/2020 & 29/05/2020 & 19/06/2020
DA3B_LW16_019 (Update)	Soil Cracking	Fire Road 6A	19/06/2020 & 25/06/2020	2	Soil cracking across Fire Road 6A (now remediated).	24/06/2020 & 30/06/2020
DA3B_LW16_021	Rock Fracturing	Steep Slope/ Step	30/06/2020	2	Rock fracturing to step with small rockfall.	2/07/2020
DA3B_LW16_022 (Update)	Rock Fracturing	Railway Corridor	7/07/2020 & 6/08/2020	3	Rock fracturing to cut-through of railway corridor.	10/07/2020 & 10/08/2020
DA3B_LW16_028	Rock Fracturing	WC15	31/08/2020	2	Rock fracture to rockbar/step above WC15_Pool 34.	1/09/2020
DA3B_LW14_017 Update	Rock Fracturing & Displacement	WC15	9/09/2020	2	Additional rock fracturing and displacement on tributary WC15.	14/09/2020
DA3B_LW14_019 Update	Rock Fracturing, Uplift & Displacement	WC15	9/09/2020	2	Additional rock fracturing, uplift and displacement near tributary WC15.	14/09/2020
DA3_LW8_158 (Update)	Iron Staining	Sandy Creek	14/10/2020	2	Increase in iron staining for >2 consecutive months in Sandy Creek.	19/10/2020
14_01	Shallow Groundwater Trigger	Swamp 14	9/09/2020	3	Rate of recession groundwater trigger in Swamp 14.	14/09/2020
23_02	Groundwater trigger	Swamp 23	27/04/2020	3	Near-surface groundwater trigger in Swamp 23 (recession rate).	30/04/2020
11_H2	Groundwater Trigger	Swamp 11	13/05/2020	2	Near-surface groundwater trigger in Swamp 11.	18/05/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for electrical conductivity at LA4_S1.	5/08/20//20 & 14/09/2020
LA4_S1	Water Quality Trigger	LA4	3/08/2020 & 1/09/2020	2	Trigger for pH at LA4_S1.	5/08/2020 & 14/09/2020

Site ID	Impact Type	Feature Affected	Identification Date	Trigger Level	Description	Refer to Impact Report/s Dated
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	1/06/2020	2	Trigger for electrical conductivity.	4/06/2020
<i>Donalds Castle Creek (FR6) (Update)</i>	Water Quality Trigger	<i>Donalds Castle Creek</i>	30/06/2020	3	Trigger for electrical conductivity.	2/07/2020
<i>DA3B_LW16_044</i>	Soil Cracking, Rock Fracturing & Displacement	<i>Steep Slope</i>	10/11/2020	2	Soil cracking, rock fracturing and displacement on steep slope east of <i>Swamp 14</i> .	16/11/2020
<i>14_01 (Update)</i>	Shallow Groundwater	<i>Swamp 14</i>	9/09/2020	3	Rate of recession groundwater trigger in <i>Swamp 14</i> .	14/09/2020 & 16/11/2020
<i>DA3B_LW16_047</i>	Rock Fracturing	<i>Steep Slope/ Step</i>	30/11/2020	1	Rock fracturing to steep slope east of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_048</i>	Rock Fracturing	<i>Rock Outcrop</i>	30/11/2020	1	Rock fracture to rock outcrop west of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_049</i>	Rock Fracturing & Fragmentation	<i>Steep Slope/ Step</i>	30/11/2020	2	Rock fracturing and fragmentation to steep slope west of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_050</i>	Rock Fracturing	<i>Steep Slope/ Step</i>	30/11/2020	1	Rock fracture to steep slope west of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_051</i>	Rock Fracturing and Soil Cracking	<i>Rock Outcrop & Bushland</i>	30/11/2020	2	Rock fracturing and soil cracking to rock outcrop and bushland west of <i>Swamp 14</i> .	This Report
<i>DA3B_LW16_052</i>	Soil Cracking	<i>Bushland</i>	1/12/2020	1	Soil cracking in bushland to the west of <i>Swamp 14</i> .	This Report

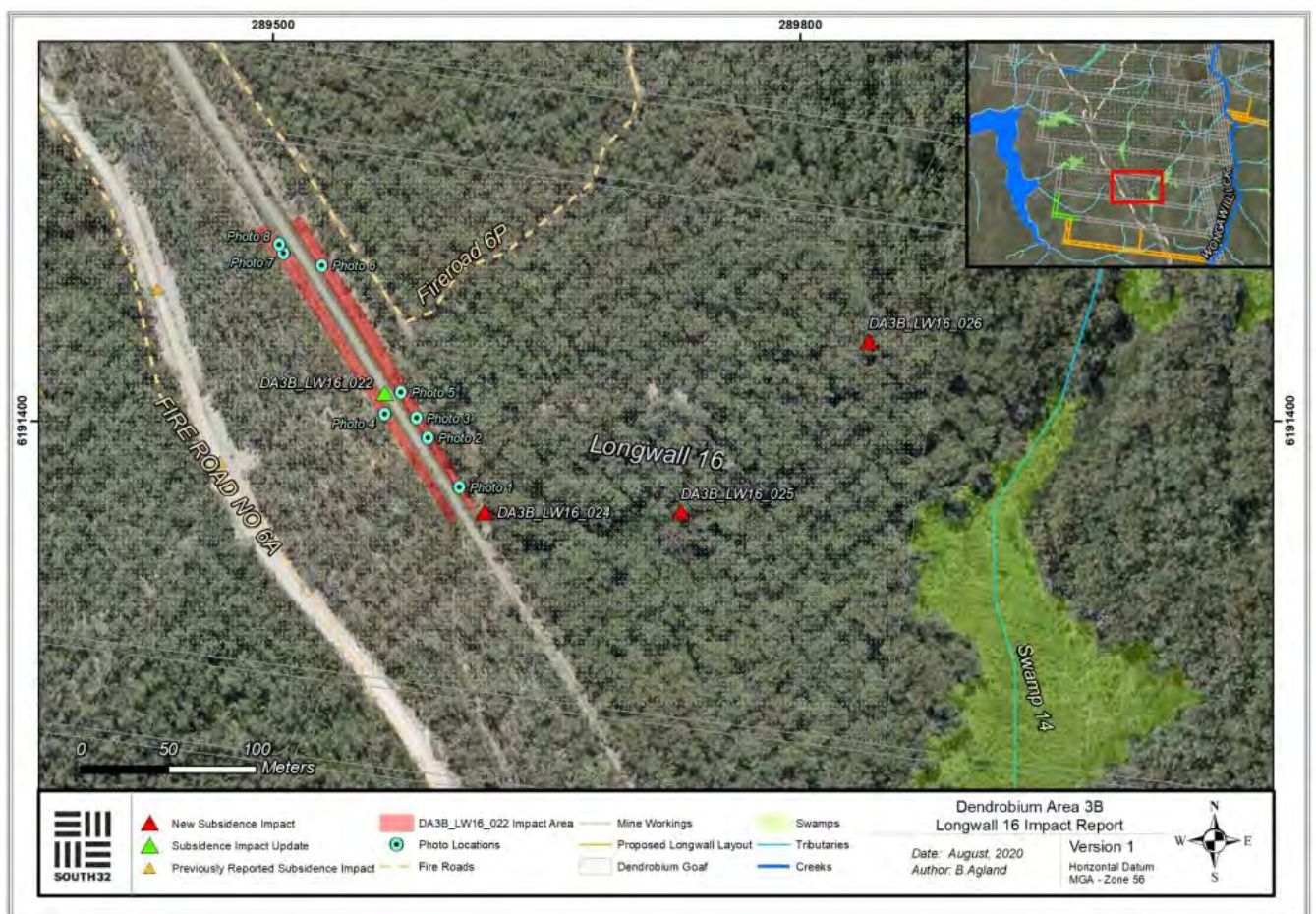
3 Background Information

DA3B_LW16_022 exhibits a range of rock mass characteristics, including natural discontinuities and fracture induced features, visible on both faces of the rail cutting. The changes were initially observed on 7 July 2020 during routine monitoring by the Illawarra Metallurgical Coal Environmental Field Team (IMCEFT), identifying a feature with a continuous length of 15 m, a width up to 0.08 m and a maximum measurable depth of 2.9 m. The initially observed fracturing was a level 2 trigger as per the DA3B Landscape Trigger Action Response Plan (TARP).

A follow-up inspection by the IMCEFT identified multiple small rockfalls and changes to the fracturing. The fracturing is now largely continuous on both the eastern and western side of the corridor for a distance of approximately 190m. Following the increase in fracture extent DA3B_LW16_022 was escalated to a level 3 trigger as per the DA3B Landscape TARP (i.e. crack or fracture length exceeding 50 m).

In accordance with the Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B) and DA3B Landscape TARP, South32 require a geotechnical assessment of the cutting to assess the nature of the impact and assess its suitability for current use, including recommendations for remedial work (if required).

Figure 1 DA3B_LW16_022 Location (reproduced from South32 Impact Report 200810)



3.1 Subsidence Impacts

The Mine Subsidence Engineering Consultants (MSEC) subsidence predictions and impact assessments for the Dendrobium Mine Area 3B¹, for Longwall 16 indicate a maximum predicted conventional subsidence, tilt and curvature of 2450 mm, 30 mm/m, 0.60 km⁻¹ (hogging) and 0.70 km⁻¹ (sagging), respectively.

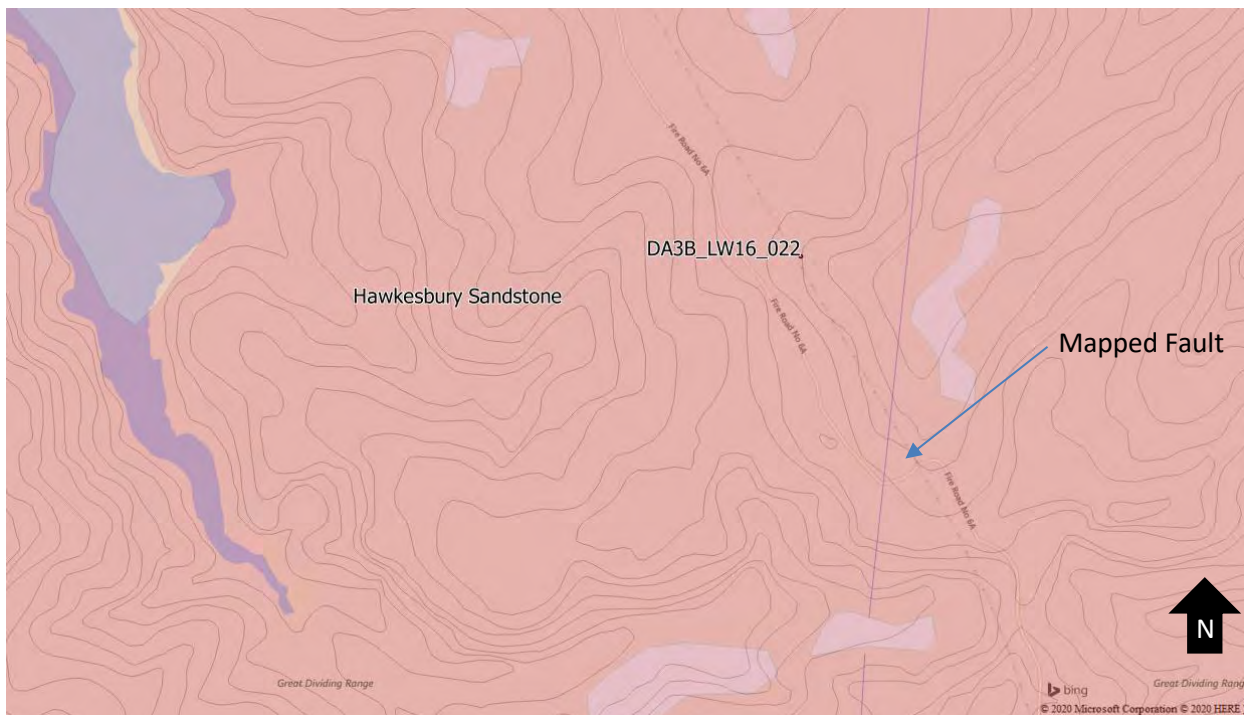
Survey of monitoring sites in the vicinity of the cutting on the 3rd September 2020 indicate horizontal movement of up to 265 mm (DA3B-57) and vertical subsidence of up to 1981 mm (DA3B-48) has occurred due to mining.

4 Site Definition

4.1 Geology

Reference to the Wollongong-Port Hacking 1:100,00 Geological Map² indicates the site lies within the Wianamatta Group rocks, consisting of Hawkesbury Sandstone which consists of medium to coarse grained quartz sandstone, with minor shale and laminite lenses. A north south striking fault is indicated to lie approximately 300 m to the east of the rail cutting (**Figure 2**).

Figure 2 Near Surface Bedrock Geology



¹ Mine Subsidence Engineering Consultants, 2017. Dendrobium Mine Area 3B – The Effects of the Proposed Modified Commencing Ends of Longwalls 15 to 18 in Area 3B at Dendrobium Mine on the Subsidence Predictions and Impact Assessments. Report Number: MSEC914 Revision A.

² Stroud W.J., Sherwin L., Roy H.N. and Baker C.J., 1985, Wollongong - Port Hacking 1:100 000 Geological Sheet 9029-9129, 1st edition. Geological Survey of New South Wales, Sydney

5 Site Observations

5.1 General

A Principal Engineering Geologist and Associate Engineering Geologist from SLR attended the site on Tuesday 25 August 2020 to inspect the cutting and surrounds, observe the extent and nature of the subsidence induced cracking and assess the potential slope failure mechanisms (which may present a risk to users of the rail corridor).

The rail cutting appears to have been formed by drill and blast along a south east trending section of the rail corridor where it transects a shallow west trending ridgeline. The cutting consists of a double-sided cut batter, approximately 10 m high, with a narrow (1.5 m to 2.0 m wide) catch bench halfway up the cutting which separates the upper and lower batters, which dip at approximately 75 degrees.

The original ballast formation, which is assumed to have been placed during the initial construction of the rail corridor in the 1990s prior to abandonment, remains in place and currently forms the basis of the access road along the corridor. The rail corridor cess is approximately 3.0 m wide and approximately 1.0 m deep, and acts as a swale drain, although is significantly overgrown with scrubby vegetation.

5.2 Rock Mass Features

The cutting has been formed within Hawkesbury Sandstone of the Wianamatta Group Rocks. The Hawkesbury Sandstone exposed in the cutting appears typical to that which can be seen in numerous other similar road and rail cuttings in the region.

The Sandstone is characterised by brown yellow colouration with patchy black surface staining and appears to be moderately to slightly weathered and is likely of medium to high strength, based on visual tactile observations.

The rock mass is characterised by shallow north dipping and undulating, interbedded massive and cross bedded facies, spaced at approximately 0.5 to 3.0 m, and is typical of the Hawkesbury Sandstone unit. The cross-bedding dips at approximately 25° and represents channel structures, characteristic of the rock's fluvial depositional environment.

The predominant geological structures (discontinuities) observed within the rock mass include shallow dipping bedding partings, including some apparent shearing along bedding surfaces, which are cross-cut by a dominant, pervasive, high angle joint set spaced at approximately 1.0 to 4.0 m, which dip at approximately 80 to 85 degrees to the southwest. A number of discrete lower angle joints were also observed which intersect at various orientations to form a blocky appearance in the cut batter.

Weathering of the crest region of the cut batter is resulting in loosening of small cobble sized particles from the crest which is accumulating on the middle catch berm. Very little to no soil cover was noted to overlying the rock in the vicinity of the cutting.

A shallow earth drain is located behind the crest of the north east facing cut batter whilst an access track runs parallel, approximately 15 m behind the crest of the south west facing cut batter.

5.2.1 Observed Subsidence Induced Impacts

The apparent subsidence induced impacts observed included deformation (movement) of the rock mass along bedding planes of up to approximately 200 mm (consistent with horizontal movements noted in survey monitoring) which has created a narrow overhang within the cutting face (**Figure 3**), and appears to indicate the top unit moving broadly north west and/or south east relative to the bottom unit in a bending fashion.

Associated with the deformation along bedding planes, significant dilation of the predominant high angle joint set by up to 80 mm has occurred (**Figure 4**). In a number of locations, the dilation of joints had propagated through to the surface and were observed to extend approximately 3.0 m behind the crest of the slope (**Figure 5**).

In some instances, 'new' fracturing through the rock mass has occurred, with pervasive, irregular fracturing occurring at a high angle, with an aperture of generally less than 50 mm (**Figure 6**).

Evidence of recent, small wedge style block falls were observed, which appeared to have been associated with dilation on joint surfaces. The largest fallen blocks observed were approximately 0.3 m x 0.3 m x 0.05 (**Figure 7**).

Three distinctive possible failure mechanisms were identified, as illustrated in the below figures and detailed in the following sections.

Figure 3 Movement along bedding parting (looking north west)

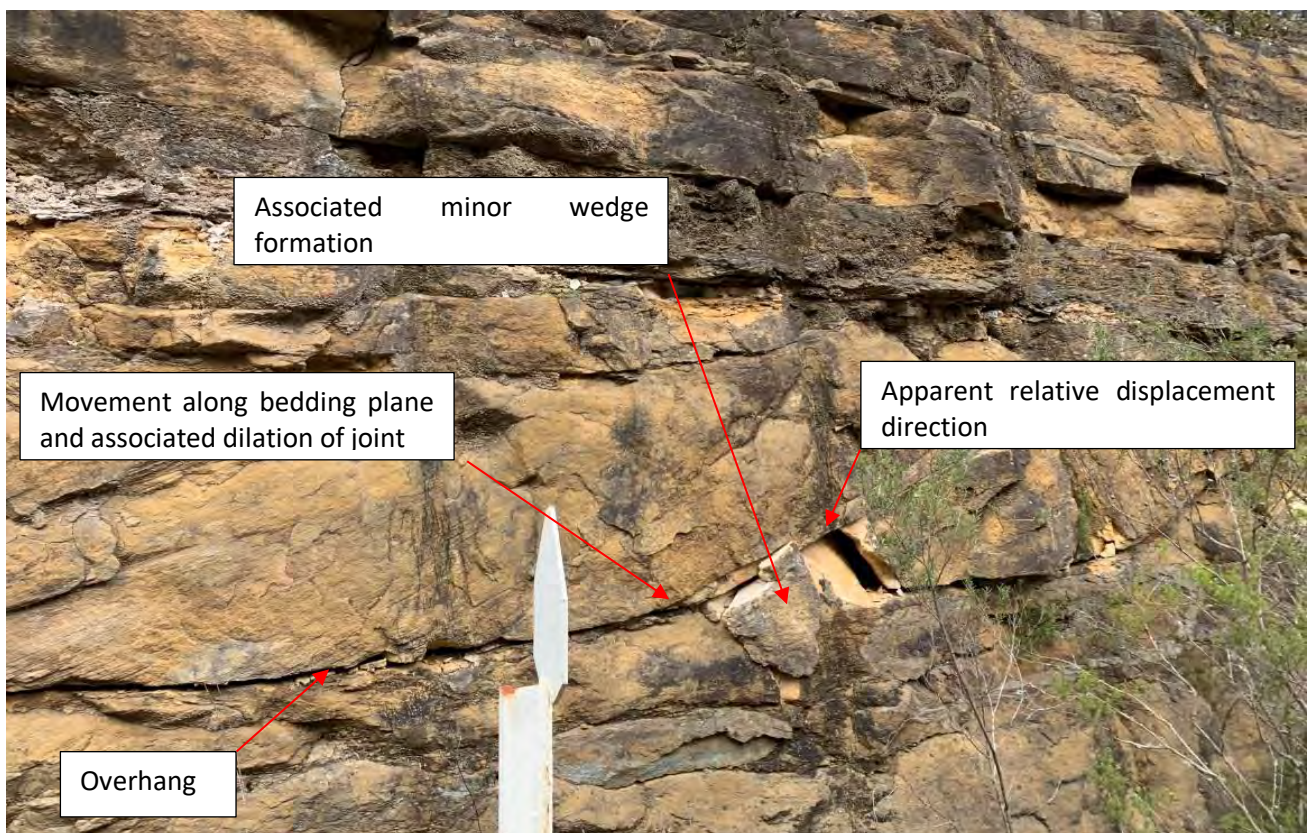


Figure 4 Dilation along dominant joint set (looking south)



Figure 5 Propagation of joint set behind slope crest (looking south west)



Figure 6 New fracturing through rock mass between bedding parting displacement (south west facing cut)



Figure 7 Recent wedge instability (intersection of bedding plane with high angle joint in southwest facing cut)



6 Slope Stability Assessment

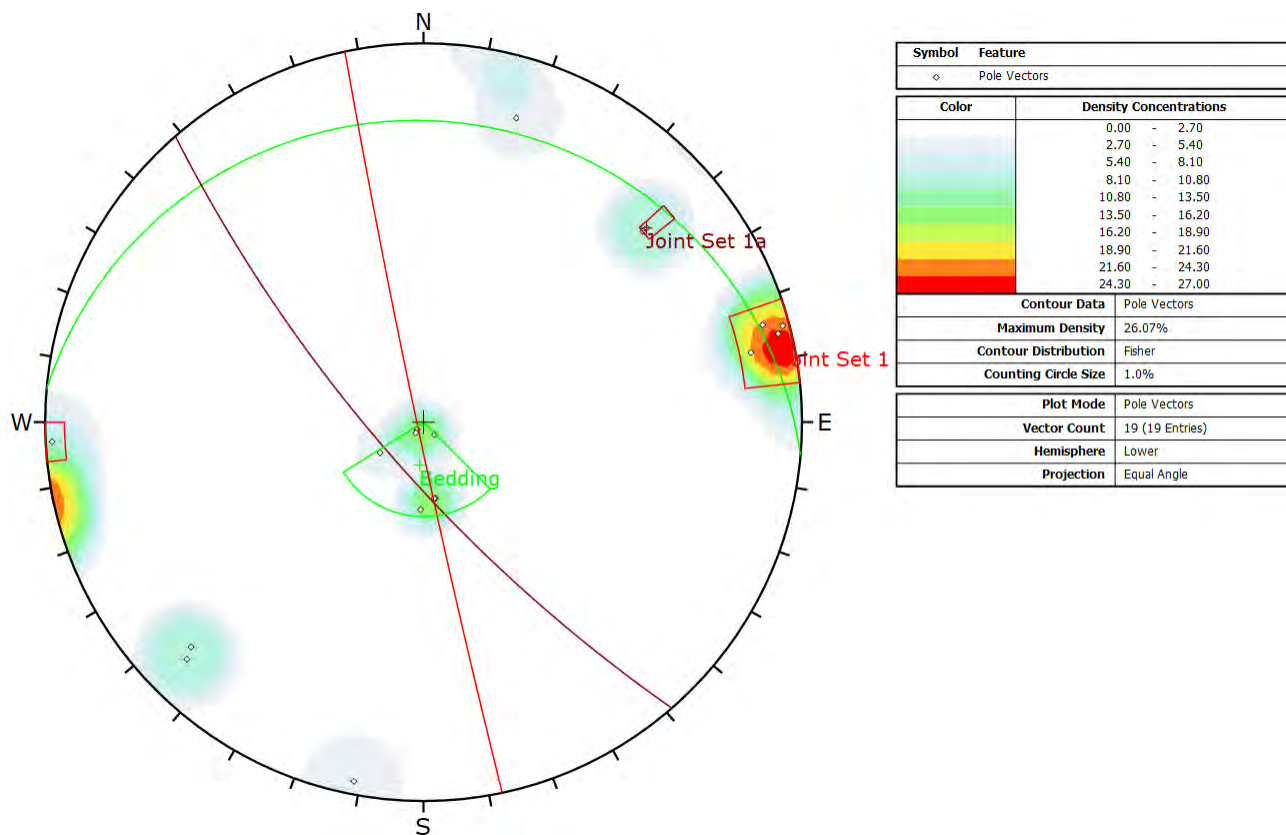
A brief kinematic analysis is included in the assessment to assess the likelihood of kinematic instability within the cutting. Discontinuities identified for the site are based on site observations (performed on 25 August 2020) of rock outcropping within both cut batters at approximately eye level. Discontinuity characteristics recorded include joint and bedding inclination (dips), orientation (dip direction), spacing, shape, roughness, persistence, aperture and infilling.

6.1 Kinematic Analysis

The measured defect data was entered into the Rocscience software Dips 7.0 to allow for identification of the main defect sets and facilitate kinematic analysis. The development of stereo-plots using the Dips software to identify the major and minor joint sets and discontinuities (as shown in **Figure 8**), including:

- Poles
- Defect type (i.e. joints / bedding / shear zone)
- Contour – pole density Concentrations
- Assign mean sets

Figure 8 Pole Plot of Discontinuity Data for Hawkesbury Sandstone



A summary of the main joint sets (+/- 20°) measured during the site visit and identified from the “Dips” analysis is included in **Table 1**.

Table 1 Main Discontinuity Sets

Name	Dip	Dip Direction	Type	Condition	Design Friction Angle*	Spacing (m)
Joint Set 1	50° - 90°	220° - 260°	Joint	Slightly Rough to Rough, Slightly Weathered	35° - 45° (Tight) 30° - 35° (1mm) 20° - 25° (5mm to 50mm)	1.00 to 4.00m
Discrete Joint Sets	50° - 90°	Varies	Joint	Slightly Rough to Rough, Slightly Weathered, tight	35° - 45° (Tight) 30° - 35° (1mm)	Varies
Bedding	0° - 20°	320° - 055°	Bedding	Rough, slightly weathered, <5 mm, little to no fill	35° - 45° (Tight) 30° - 35° (1mm) 20° - 25° (5mm to 5mm)	0.5 to 3.0 m
Sheet Facies	20° - 30°	Varies	Fabric	Rough, closed.	35° - 45° (Tight)	0.01 to 0.10m

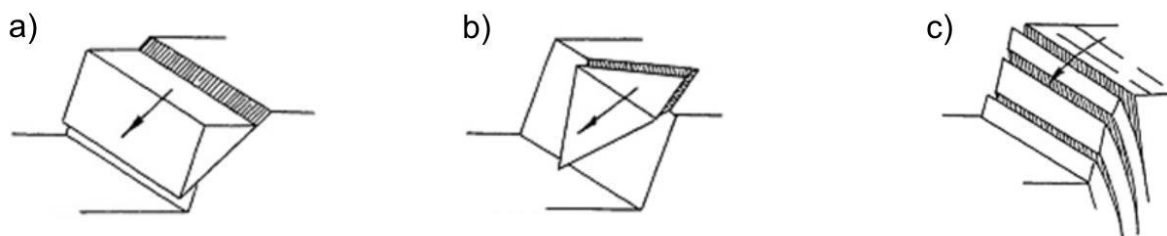
Notes:
[*]: Angles taken from Bertuzzi and Pells (Bertuzzi & Pells, 2002)

The main defect sets are used to characterise geotechnical domains related to structural features to be analysed within various aspects of the cut batter geometry by kinematic analysis, whereby the stability within the Hawkesbury Sandstone is governed by structural features, due to its high strength.

Kinematic analysis of the “Dips” data is used to identify potential rock block fall-out mechanisms in relation to cutting geometry. Identification of the potential rock blocks and inferred shear strength characteristics of the rock mass from reference laboratory test data are used to determine the likely failure mechanisms (see **Figure 9** below):

- (a) Planar
- (b) Wedge
- (c) Toppling

Figure 9 Failure Mechanism Types



The analyses take into consideration the likely failure mechanisms in relation to the cut batter geometry.

Generally, structurally controlled instability is expected within the competent rock mass units whereby potential slope failure occurs along unfavourably orientated defects (and/or fabric).

6.2 Kinematic Analysis

Kinematic analysis of a both cut batters i.e. south west (255°) and north east facing (075°) cutting slope dipping at 80° has been performed to assess the likely failure mechanisms. Outputs are shown in the Attachments.

6.2.1 Kinematic Results

Kinematic analysis indicates two of the three main kinematic failure modes are feasible based on available information due to intersection of the discrete joint sets (wedge failure), and potentially unfavourable orientation (toppling failure) of Joint Set 1. Outputs from the analysis are presented in the Attachments.

Defect spacing observed for the dominant discontinuity sets is generally less than 3.0 m, although the typical loosened block size is expected to be limited to smaller blocks of <0.5 m diameter, where closer spaced joints intersect with an intersection line (release plane) which daylight from the cutting face. A summary of the typical failure blocks is included below:

- Wedge: Due to the intersection of bedding with discrete joint sets, blocks generally <0.5m³ size and controlled by joint set spacing; and
- Toppling (Flexural and Base Plane): Discrete blocks may form as a result of tensile failure of unfavourably orientated high angle Joint Set 1, which may be exasperated by subsidence induced dilation. Blocks may be very large due to joint spacing although the driving force required to loosen a large block is likely to be significantly less than the resisting force due to the weight of the block and shallow basal plane (e.g. bedding) orientation.

No evidence of large pervasive and unfavourably orientated structures (i.e. shear zones or faults) were observed.

7 Slope Risk Analysis

7.1 Methodology

A slope risk assessment has been undertaken in general accordance with RMS guide to slope risk analysis³ to document the condition of the cutting and determine the risk in a standardised approach, which is useful for future inspections, risk analysis and monitoring. The procedure analyses the risk associated with actual or potential failure mechanisms which have been identified for the slope, using a series of defined ratings, which are combined through a risk matrix to generate an Assessed Risk Level (ARL) for the slope.

The risk analysis has been completed considering static conditions, based on the existing slope condition, with the assumption the majority of subsidence movements induced by LW16 have occurred. The potential estimated continued subsidence induced instability effects are discussed in **Section 7.3.1**.

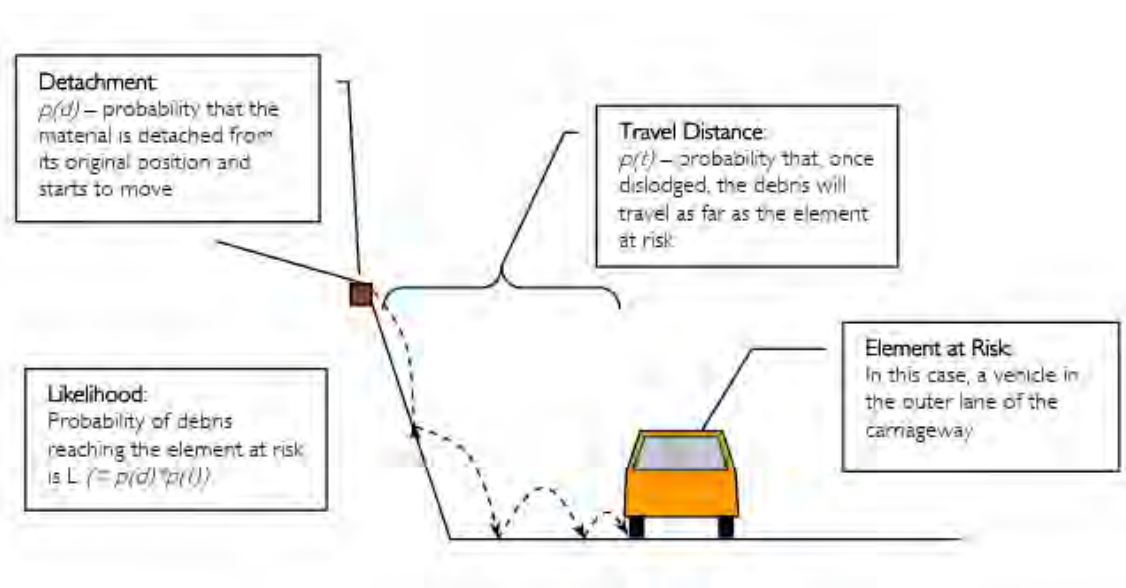
The ratings are correlated to conditional probabilities for the likelihood and consequences of failure. Risk to life and economic risk are both analysed. The key components as illustrated in **Figure 10**, assessed within the procedure include:

- Slope description including detailed sketches, photography, evidence of failure and degradation mechanisms. This will be referred to for future inspection and deterioration assessment;

³ RMS Guide to Slope Risk Analysis. Version 4. July 2011, Road Pavements and Geotechnical Engineering Section Engineering Technology Services Branch Network Services, Roads and Maritime Services, New South Wales.

- Likelihood of rock blocks/falls reaching the road, considered as the product of detachment and travel distance probabilities with relation to road shoulder width. Consideration will be given to the possibilities of slope deterioration over time, especially with respect to subsidence effects;
- Temporal probability that if event occurs a person (vehicle) will be present (passing) which may be impacted; and
- Vulnerability of persons most at risk.

Figure 10 Key Components of the Slope Risk Analysis (reproduced from RMS Guide to SRA V4³)



The risk analysis allows for sufficient discrimination in risk levels to set reasonable priorities for slope risk management based on current risk and the anticipated risk of potential subsidence induced instability. Five categories are used, as the best balance between provision of adequate discrimination and increasing complexity.

Typically, RMS adopt a staged management for each increased Assessed Risk Level, comprising:

- ARL5 – (Best) Expectation of a new road. No action taken. Observe as part of annual maintenance
- ARL4 – Minimum expectation of a new road. Observe / Inspection as part of annual maintenance
- ARL3 – Hazards present that have potential to develop. Routine observation / potential investigation and monitoring program considered and often applied. Some remedial treatment applied. Review SRA regularly.
- ARL2 – Under close watch and on a priority list for formal remedial treatment to reduce ARL to 4 or better
- ARL1 – (Worst) Requires immediate remediation


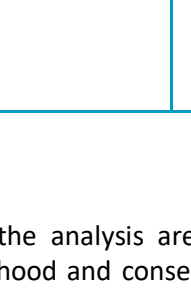

7.2 Failure Mechanisms & Hazard Identification

During data collection, as the first step in identifying potential hazards, all the main possible failure mechanisms are to be recognised. In assessing the possible failure mechanisms, it is also necessary to consider what the potential preparatory and triggering events(s) might be.

For each failure mechanism, the potential scale of failure must be estimated and the “zone of influence” the instability could affect must be established. Each identified potential failure mechanism is then treated as a hazard.

The trigger is commonly a discrete event (e.g. a rain event of a given magnitude, subsidence movements or an earthquake). Where the failure mechanism involves the progression of a time-dependent process that operates continually (e.g., undercutting of a large joint block by fretting of an erodible bed, or root wedging of blocks), the nature or magnitude of the trigger may change with time. The main possible failure mechanisms identified based on the kinematic analysis are summarised in **Table 2**.

Table 2 Summary of Main Failure Mechanisms

Mechanism	Description	Schematic Illustration ⁴	Triggering Mechanism
Rock Fall	Prior to failure the block is supported at the top and/or rear surfaces and fails in tension., In practice, includes other initial failure types where the travel path is relatively long and the debris can go into trajectory over part of the distance.		Pore pressure rise, under-cutting by weathering, dilation due to subsidence
Rock Topple -	Tensile failure of block controlled along intersection of non-pervasive orthogonal joint sets and bedding planes. Prior to failure the block is supported on its basal surface and rotates about its front lower edge or an axis on the basal surface. Includes cases of undercutting where the debris cannot go into trajectory.		Pore pressure rise, under-cutting by weathering, dilation due to subsidence
Slide – Translational (Wedge & Plane)	Plane and wedge failures in rock. Controlled by intersection of larger pervasive joint / shear zone		Pore pressure rise, under-cutting or loosening by weathering, dilation due to subsidence

7.3 Assessed Risk Level

The risk assessment parameters used in the analysis are summarised in **Table 3** below. The parameters determined are used to estimate the likelihood and consequence ratings, which are combined to derive an Assessed Risk Level (ARL). Where consequence class ratings for loss of life and property damage differ the higher (lower number) of the two is used to derive the ARL. The results are summarised in **Table 3**. For a detailed explanation on the procedure refer to the RMS guideline document.

⁴ Table 1, Page 13, RMS Guide to Slope Risk Analysis. Version 4. July 2011, Road Pavements and Geotechnical Engineering Section Engineering Technology Services Branch Network Services, Roads and Maritime Services, New South Wales.

Table 3 Summary of Risk Analysis Parameters

Failure Mechanism / Hazard Type	Likelihood Analysis			Consequence Class Ratings				Assessed Risk Level
	Detachment Probability $p(d)$	Travel Probability $p(t)$	Likelihood $p(d) \times p(t)$	Temporal Probability	Vulnerability	Consequence Loss of Life	Consequence Property Damage	
Rock Fall	1	0.01	0.01 (L3)	T5	V3	C5	C5	ARL5
Slide – Translation al (Wedge)	1	0.01	0.01 (L3)	T5	V3	C5	C5	ARL5
Rock Topple	0.1	0.01	0.001 (L4)	T5	V1	C4	C5	ARL5

The results indicate an equivalent ARL 5 for all identified potential failure mechanisms, i.e. in accordance with the typical RMS management strategy this is equivalent to the expectation of a new road, with no action required other than typical observation as part of annual maintenance.

The key drivers for the favourable ARL score are due to the very low expected road usage (i.e. low temporal probability) and relatively large shoulder width, which reduces the overall likelihood, even where conservative (i.e. high likelihood) detachment probability is used.

7.3.1 Continued Subsidence Impacts

The majority of the observed cliff instabilities in the Southern Coalfield due to mining have occurred after the cliffs have been directly mined underneath and therefore, have been located over the goaf⁵. As shown in **Figure 1**, the cutting is located directly above LW16 which has recently been mined in the vicinity underlying the cutting.

Recent monitoring completed by South32 in the vicinity of the cutting suggests the majority of the subsidence impact from LW16 should have occurred and hence the extent of the impact should not significantly increase.

It should be noted however that the stability of the cutting may be still be affected by continued longwall mining due to the exasperated differential movements that may still occur as a result of extraction of adjacent longwall panels prior to stabilisation post mining.

In this case, the effects of subsidence may be considered to increase the detachment probability, $p(d)$, although, the magnitude of increase is difficult to predict. Nonetheless, considering the effects of subsidence, it is considered an increase in the likelihood (L) of failure may be possible.

Paying consideration to the estimated detachment probability, $p(d)$, outlined in **Table 3**, a detachment probability of 1.0 for a rock fall and sliding mechanism, given that the slope shows evidence of recent failure of this type means that considering the influence of subsidence on rock fall will not increase the ARL as the most probable outcome is already being used in the analysis.

Considering the toppling mechanisms, which have $p(d) < 1$, an increase in the detachment probability would be expected to increase the assessed risk level, although, even if a $p(d)$ of 1.0 is applied a worst case ARL 4 would be expected, which is typically tolerable.

⁵ Appin Mine, Nepean River Cliff and Steep Slope Management Plan, Appin Area 7 Longwalls 701 - 706

8 Risk Mitigation Recommendations

The slope risk analysis results presented in **Section 7** indicate that subsidence impacts imparted on the cutting are likely to increase the likelihood of kinematic instability, with recent evidence of small rock falls observed associated with dilation of discontinuities as a result.

However, the expected, very low traffic volume within the corridor whilst it is used as an access track, coupled with the low overall likelihood that even in the event rock fall occurs that the block would reach the trafficable lane results in an overall very-low Assessed Risk Level.

Considering the potential stresses induced by continued subsidence, this level of risk may only be marginally higher in the short term if mine subsidence movements are exasperated by mining of adjacent longwall panels, and subsequently prior to their stabilisation post mining.

As such, we consider that continued usage of the rail corridor in its current state is acceptable, provided the monitoring by the IMCEFT team continues on a weekly basis during the mining period and/or until the subsidence movements appear to stabilise.

As per the Subsidence Management Plan (SMP) for Dendrobium Area 3B (DA3B) weekly inspections of the cutting are recommended to assess the level of risk to road users by recording observations on the following:

- Deterioration of the cutting;
- Evidence of continued or increased subsidence movements;
- Evidence of increased failures; and/or
- Potentially imminent failures.

Should adverse impacts be noted during the monitoring then usage of access through the rail corridor should cease until a follow up assessment by a suitably qualified geotechnical consultant is completed.

9 Summary and Conclusion

SLR has undertaken data collation, review, site visit and completed a slope risk analysis for the Rail Cutting indicated within the Maldon Dombarton Rail Corridor.

The assessment identified the key potential hazards which have been influenced by subsidence induced movements, including:

- Rock Fall
- Rock Topple
- Slide – Translational (Wedge)

Based on our assessment in accordance with the RMS Guideline, the risk profile is low, at a worst case of ARL4, which is typically a tolerable level of risk.

Whilst the influence of mining has the potential to exacerbate occurrence of hazards, we consider that it will not significantly increase the overall risk and consequences.

As a conservative risk mitigation measure, we recommend that continued weekly monitoring and visual inspection of the cutting continue until subsidence movements in the vicinity of the cutting stabilise.

10 Closure

We trust this submission meets your requirements. We are happy to discuss our recommendations with you further and work collaboratively with you to develop management procedures required. Lastly, we draw your attention to our standard limitations below which provides some further information in relation to the content of this report.

Checked/ Authorised by: CDM

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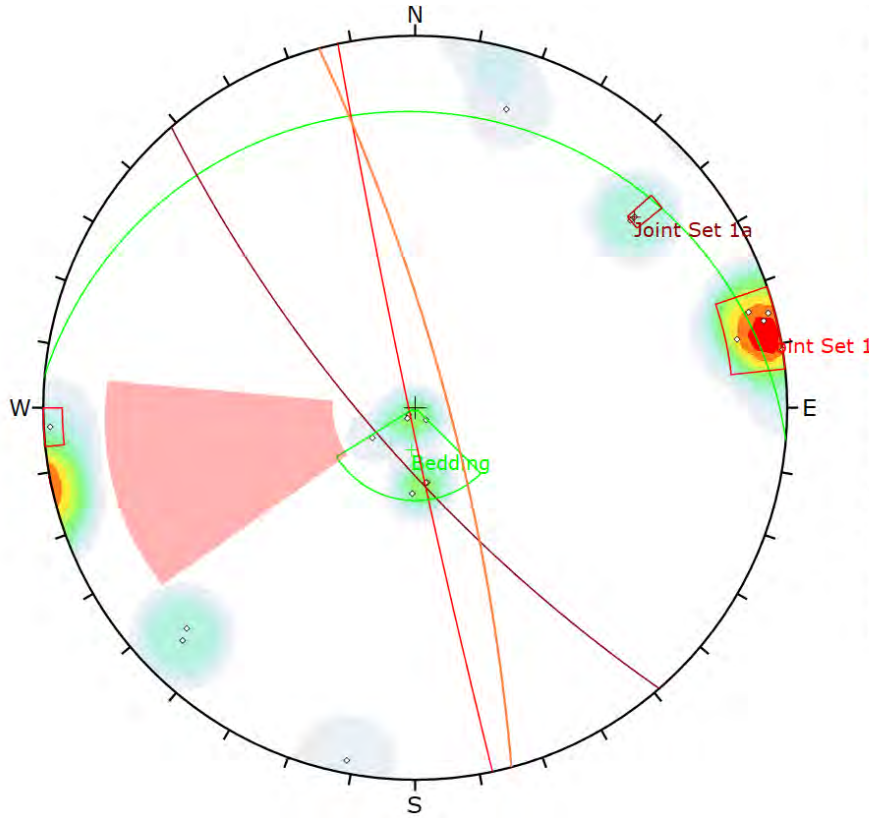
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12 Attachments

North East Facing Cutting



Symbol	Feature
◊	Pole Vectors

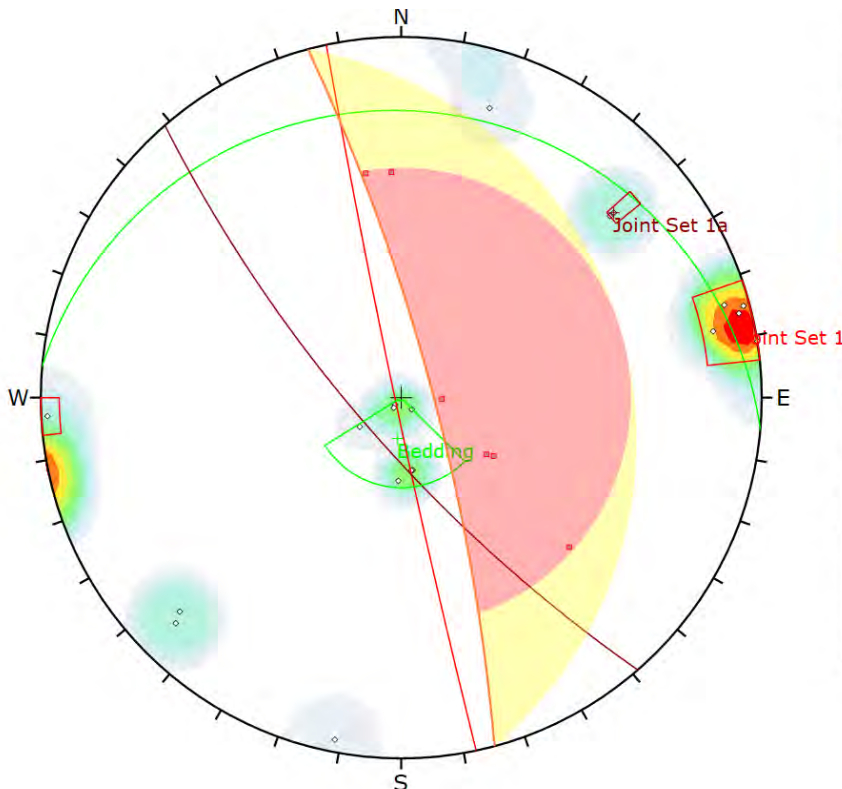
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	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data		Pole Vectors
Maximum Density	26.07%	
Contour Distribution	Fisher	
Counting Circle Size	1.0%	

Kinematic Analysis	
Planar Sliding	
Slope Dip	80
Slope Dip Direction	75
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	0	19	0.00%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
◊	Pole Vectors
■	Critical Intersection

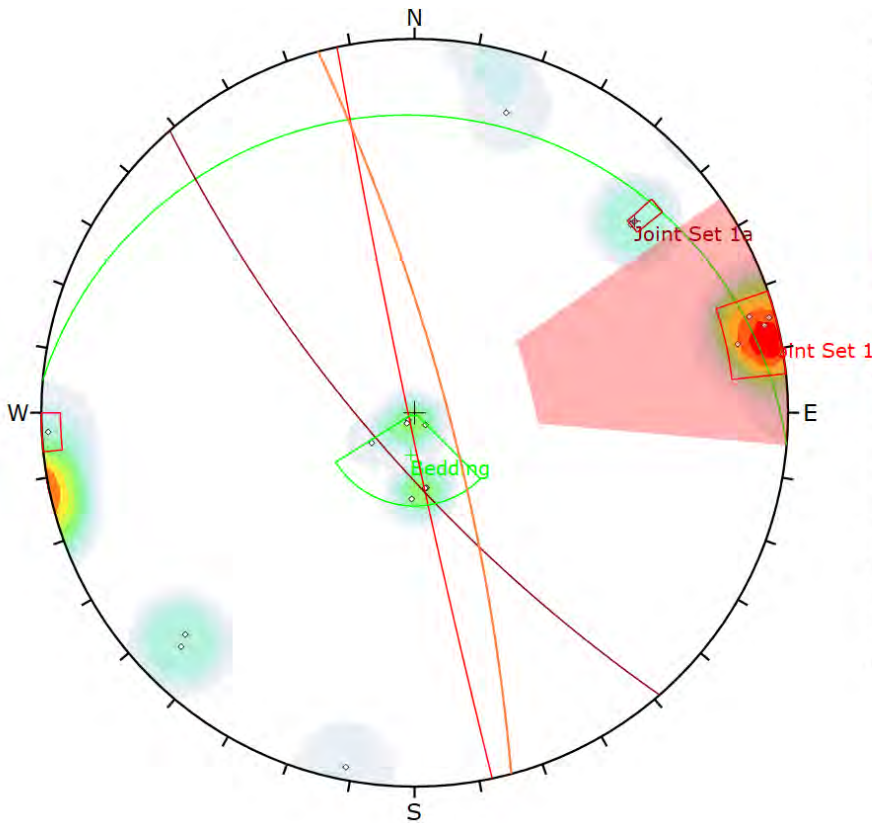
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	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data		Pole Vectors
Maximum Density	26.07%	
Contour Distribution	Fisher	
Counting Circle Size	1.0%	

Kinematic Analysis	
Wedge Sliding	
Slope Dip	80
Slope Dip Direction	75
Friction Angle	25°

	Critical	Total	%
Wedge Sliding	6	171	3.51%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	171
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
○	Pole Vectors

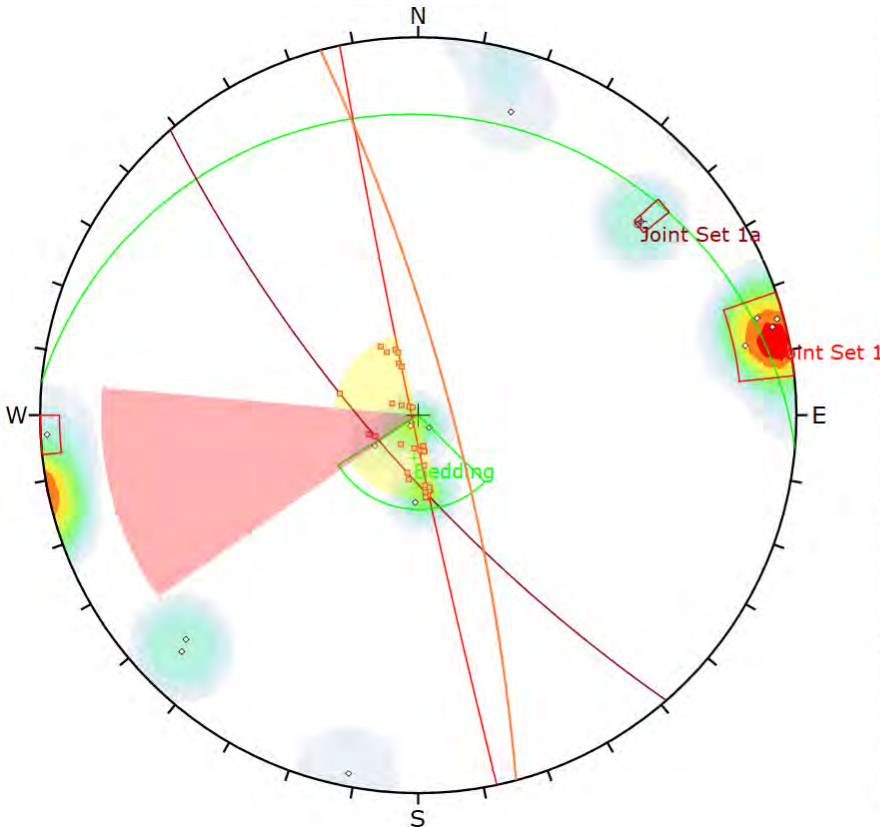
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	2.70 - 5.40
	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Flexural Toppling
Slope Dip	80
Slope Dip Direction	75
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Flexural Toppling (All)	5	19	26.32%
Flexural Toppling (Set 2: Joint Set 1)	5	6	83.33%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
○	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.70
	2.70 - 5.40
	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

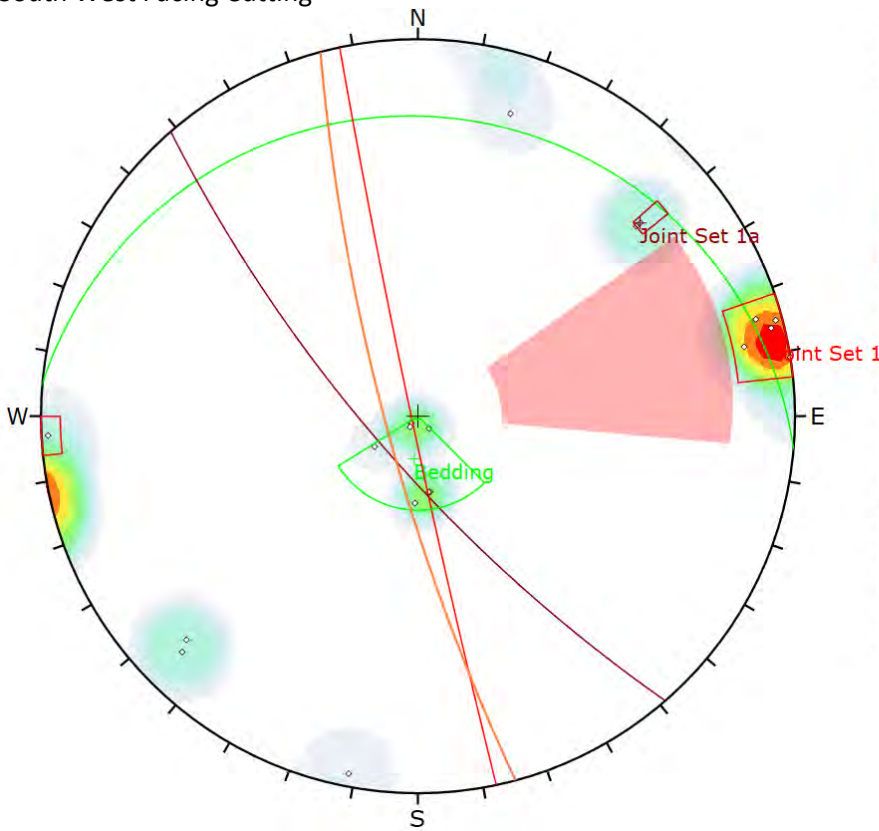
Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	80
Slope Dip Direction	75
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Direct Toppling (Intersection)	2	171	1.17%
Oblique Toppling (Intersection)	28	171	16.37%
Base Plane (All)	5	19	26.32%
Base Plane (Set 1: Bedding)	5	7	71.43%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	171
Hemisphere	Lower
Projection	Equal Angle

South West Facing Cutting



Symbol	Feature
◊	Pole Vectors

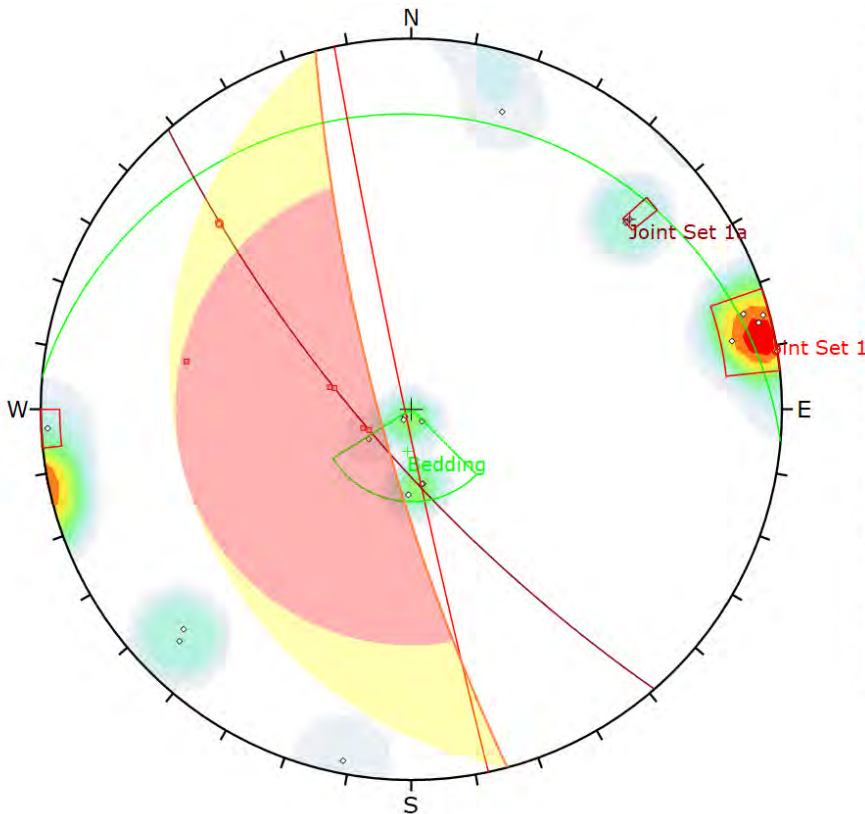
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	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Planar Sliding
Slope Dip	80
Slope Dip Direction	255
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Planar Sliding (All)	0	19	0.00%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
◊	Pole Vectors
■	Critical Intersection

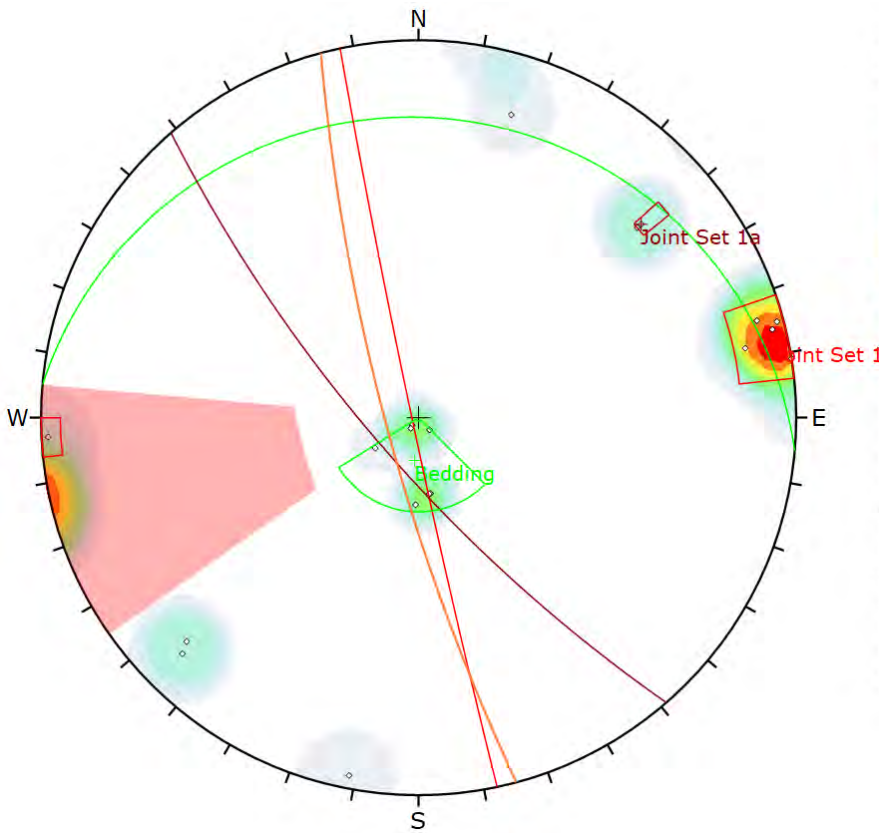
Color	Density Concentrations
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	2.70 - 5.40
	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Wedge Sliding
Slope Dip	80
Slope Dip Direction	255
Friction Angle	25°

	Critical	Total	%
Wedge Sliding	11	171	6.43%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	171
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
○	Pole Vectors

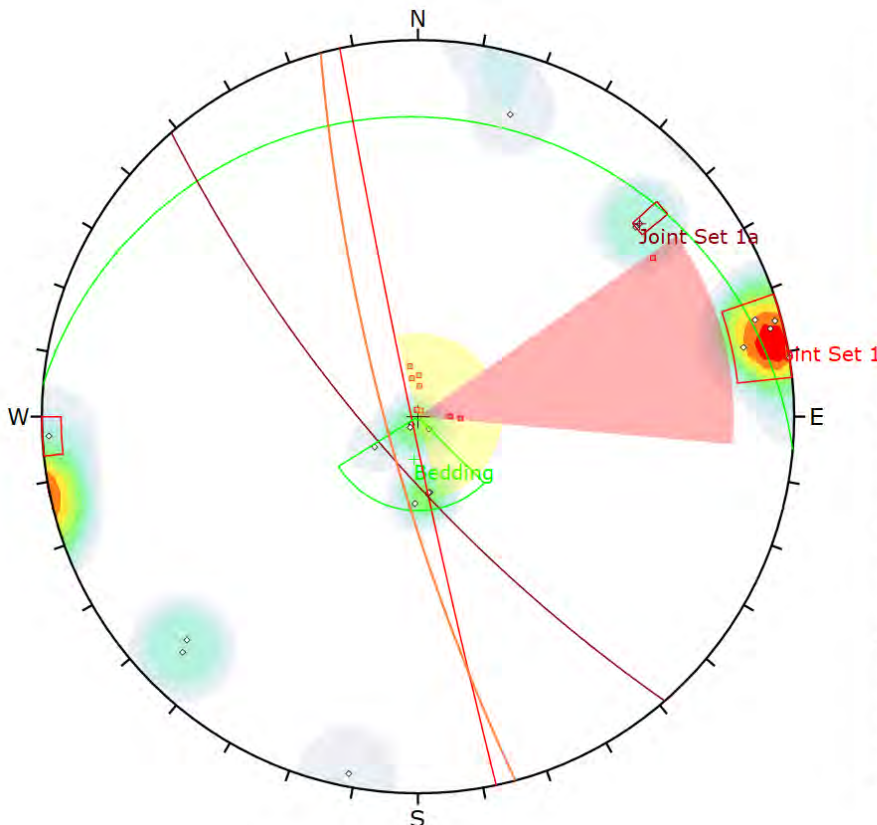
Color	Density Concentrations
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	2.70 - 5.40
	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Flexural Toppling
Slope Dip	80
Slope Dip Direction	255
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Flexural Toppling (All)	1	19	5.26%
Flexural Toppling (Set 2: Joint Set 1)	1	6	16.67%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Hemisphere	Lower
Projection	Equal Angle



Symbol	Feature
○	Pole Vectors
■	Critical Intersection

Color	Density Concentrations
	0.00 - 2.70
	2.70 - 5.40
	5.40 - 8.10
	8.10 - 10.80
	10.80 - 13.50
	13.50 - 16.20
	16.20 - 18.90
	18.90 - 21.60
	21.60 - 24.30
	24.30 - 27.00

Contour Data	Pole Vectors
Maximum Density	26.07%
Contour Distribution	Fisher
Counting Circle Size	1.0%

Kinematic Analysis	Direct Toppling
Slope Dip	80
Slope Dip Direction	255
Friction Angle	25°
Lateral Limits	20°

	Critical	Total	%
Direct Toppling (Intersection)	3	171	1.75%
Oblique Toppling (Intersection)	6	171	3.51%
Base Plane (All)	1	19	5.26%
Base Plane (Set 1: Bedding)	1	7	14.29%

Plot Mode	Pole Vectors
Vector Count	19 (19 Entries)
Intersection Mode	Grid Data Planes
Intersections Count	171
Hemisphere	Lower
Projection	Equal Angle

Corrective Management Actions (CMAs)

In accordance with the DA3B SMP, the following actions have been initiated:

- Continue monitoring program as required in the DA3B SMP.
- Report impacts to key stakeholders.
- Summarise impacts and report in the End of Panel Report and AEMR.

Table 1: Recent subsidence impact observations. Highlighted row indicates latest observation.

Site	Identification Date	Active Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW16_013	12/05/2020	LW16	Soil Cracking	2	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_014	12/05/2020	LW16	Soil Cracking	1	Soil cracking on access track between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW15_002 Update	05/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at step adjacent to Swamp 23.	18/05/2020
DA3B_LW15_008 Update	12/05/2020	LW16	Soil Cracking and Uplift	1	Soil cracking and uplift across Fire Road 6A.	18/05/2020
11_H2	13/05/2020	LW16	Groundwater Trigger	2	Near-surface groundwater trigger in Swamp 11.	18/05/2020
DA3B_LW16_015	15/05/2020	LW16	Rock Fracturing	1	Rock fracturing at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
DA3B_LW16_016	15/05/2020	LW16	Rock Fracturing and Rockfall	1	Rock fracturing and rockfall at a steep slope/step between <i>Lake Avon</i> and <i>Fire Road 6A</i> .	18/05/2020
Donalds Castle Ck (FR6)	20/05/2020	LW16	Water Quality Trigger	1	Trigger for electrical conductivity	This Report

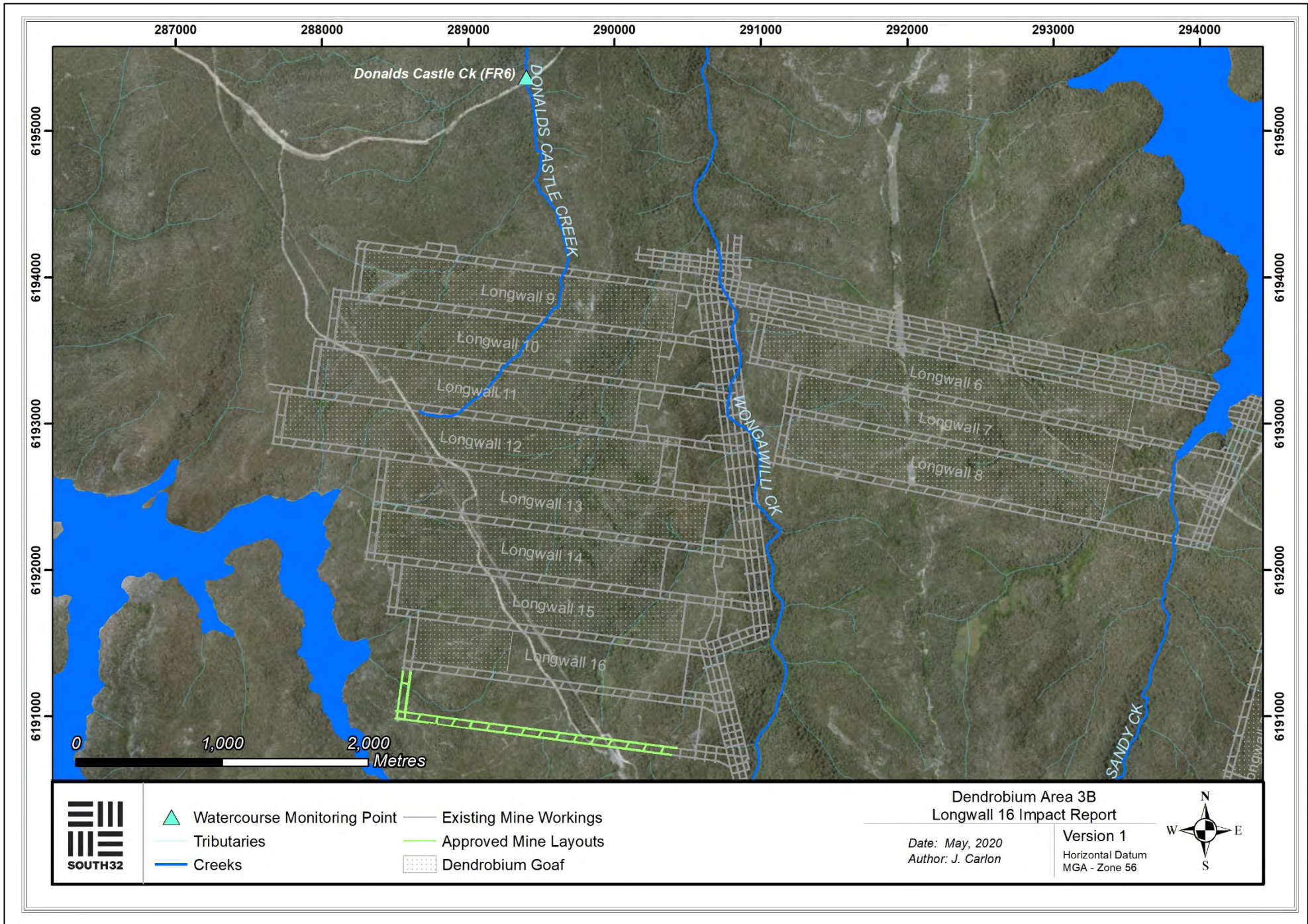


Figure 1: Map showing watercourse monitoring site Donalds Castle Ck (FR6) in relation to Dendrobium Area 3B mining operations.

Table 2: Extract from Dendrobium Area 3B Watercourse TARP.

WATER QUALITY		
<p>Donalds Castle Creek</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Donalds Castle Creek - minor environmental consequences <p>Donalds Castle Creek (FR6)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> • pH 5.41 • EC 116.0 uS/cm • DO 85.6% 	<p>Level 1</p> <ul style="list-style-type: none"> • One exceedance of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to BCD, DPIE, DRG Water NSW • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2</p> <ul style="list-style-type: none"> • Two non-consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Submit letter report to DPIE, DRG and Water NSW and seek advice on any CMA required • Implement agreed CMAs as approved (subject to agency feedback)
	<p>Level 3</p> <ul style="list-style-type: none"> • Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Offer site visit with BCD, DPIE, DRG, Water NSW • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key agencies • Collect laboratory samples and analyse for: <ul style="list-style-type: none"> – pH, EC, major cations, major anions, Total Fe, Mn & Al – Filterable suite of metals • Develop site CMA (subject to agency feedback). This may include: <ul style="list-style-type: none"> – Limestone emplacement to raise pH where it is appropriate to do so • Completion of works following approvals and at a time agreed between S32, DPIE, DRG and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Mining results in two consecutive exceedances or three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean within six months: <ul style="list-style-type: none"> – pH 3.60 – EC 185.8 uS/cm – DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent