

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018. During the most recent inspection, carried out on the 3rd of July, 2018, one new impact was identified.

DA3B_LW14_001 (288584 E, 6192249 N)

Impact DA3B_LW14_001 is located on Fire Trail 6N adjacent to Swamp 11 (Figure 1) and comprises soil cracking. The soil cracking was found to occur within an area of approximately 34m² on the Fire Trail. The largest crack is approximately 4.6m long, 0.005m wide and 0.09m at its deepest measurable point (Photo 1 and Photo 2). Impact DA3B_LW14_001 does not impede access along the track and is a Level 1 impact as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access

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
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement agreed CMAs as approved
- Review monitoring frequency



Photo 1: Impact DA3b_LW14_001, largest crack length. Taken on 3/7/18.



Photo 2: Impact DA3B_LW14_001, largest crack width. Taken on 3/7/18.

Table 1: Recent subsidence impact observations for Longwall 14. Highlighted rows indicate impacts featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_001	03/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on access track adjacent to Swamp 11	This Report

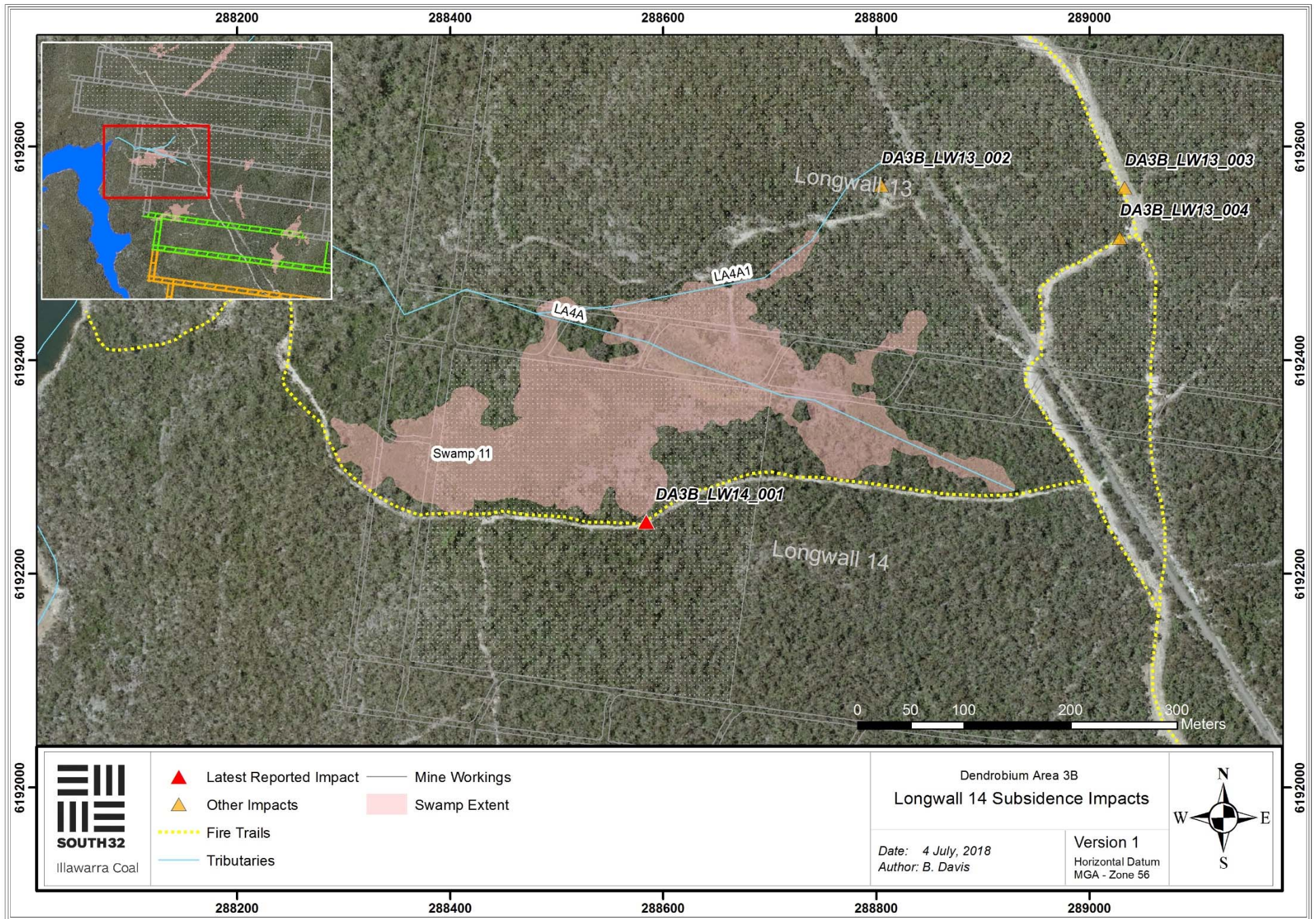


Figure 1: Map showing the latest subsidence impact relevant to Longwall 13.

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 Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018. Recent inspections identified impacts from Longwall 14 as well as previously unidentified impacts from Longwall 13.

DA3B_LW14_002 (E 288653, N 6192281)

Impact DA3B_LW14_002 consists of five soil cracks along a 30m section of Fire Trail 6N adjacent to Swamp 11 (Figure 1). The largest crack is approximately 3m long, 0.01m wide and 0.01m at the deepest measurable point (Photo 1 and 2). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 1: Impact DA3b_LW14_002. Taken on 7/07/18.



Photo 2: Impact DA3B_LW14_002. Taken on 7/07/18.

DA3B_LW14_003 (E 288849, N 6192272)

Impact DA3B_LW14_002 consists of four soil cracks along a 70m section of Fire Trail 6N adjacent to Swamp 11 (Figure 1). The largest crack is approximately 4.5m long, 0.03m wide and 0.23m at the deepest measurable point (Photo 3 and 4). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 3: Impact DA3b_LW14_003. Taken on 7/07/18.



Photo 4: Impact DA3b_LW14_003. Taken on 7/07/18.

DA3B_LW13_044 (E 288180, N 6192634)

Impact DA3B_LW13_044 consists of rock fracturing to the base of a step on tributary LA4B (Figure 1). The fracturing likely occurred as a result of Longwall 13 but was only recently identified due to thick vegetation and safety concerns accessing this step during active subsidence. The fracturing has a maximum length of approximately 1.7m, with a horizontal depth of 1.05m at its deepest measurable point. The width of the fracturing is approximately 0.1m (Photo 5 and 6). The fracture has been recorded as a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 2), specifically:

- Crack or fracture between 100mm and 300mm width



Photo 5: Impact DA3b_LW13_044. Taken on 26/07/18.



Photo 6: Impact DA3b_LW13_044. Taken on 26/07/18.

DA3B_LW13_045 (E 290819, N 6192330)

Impact DA3B_LW14_004 consists of a rock fracture across Rockbar 5 on tributary WC15 (Figure 2). The fracture is approximately 0.3m long, 0.03m wide and 0.03m at the deepest measurable point (Photo 7 and 8). No flow diversion could be observed at the site however the fracture is across the main flow path and flow diversion is possible during higher flow conditions at the site. The fracture has been recorded as a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 2), specifically:

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



Photo 7: Impact DA3b_LW13_045, site overview. Taken on 8/07/18.



Photo 8: Impact DA3b_LW13_045. Taken on 8/07/18.

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
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement agreed CMAs as approved
- Review monitoring frequency

Table 1: Recent subsidence impact observations for Longwalls 13 and 14. Highlighted rows indicate impacts in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_001	3/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on access track adjacent to Swamp 11	4/07/2018
DA3B_LW14_002	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on access track adjacent to Swamp 11	This Report
DA3B_LW14_003	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on access track adjacent to Swamp 11	This Report
DA3B_LW13_044	26/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing to base of step on tributary LA4B	This Report
DA3B_LW13_045	8/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing across Rockbar 5 on tributary WC15	This Report

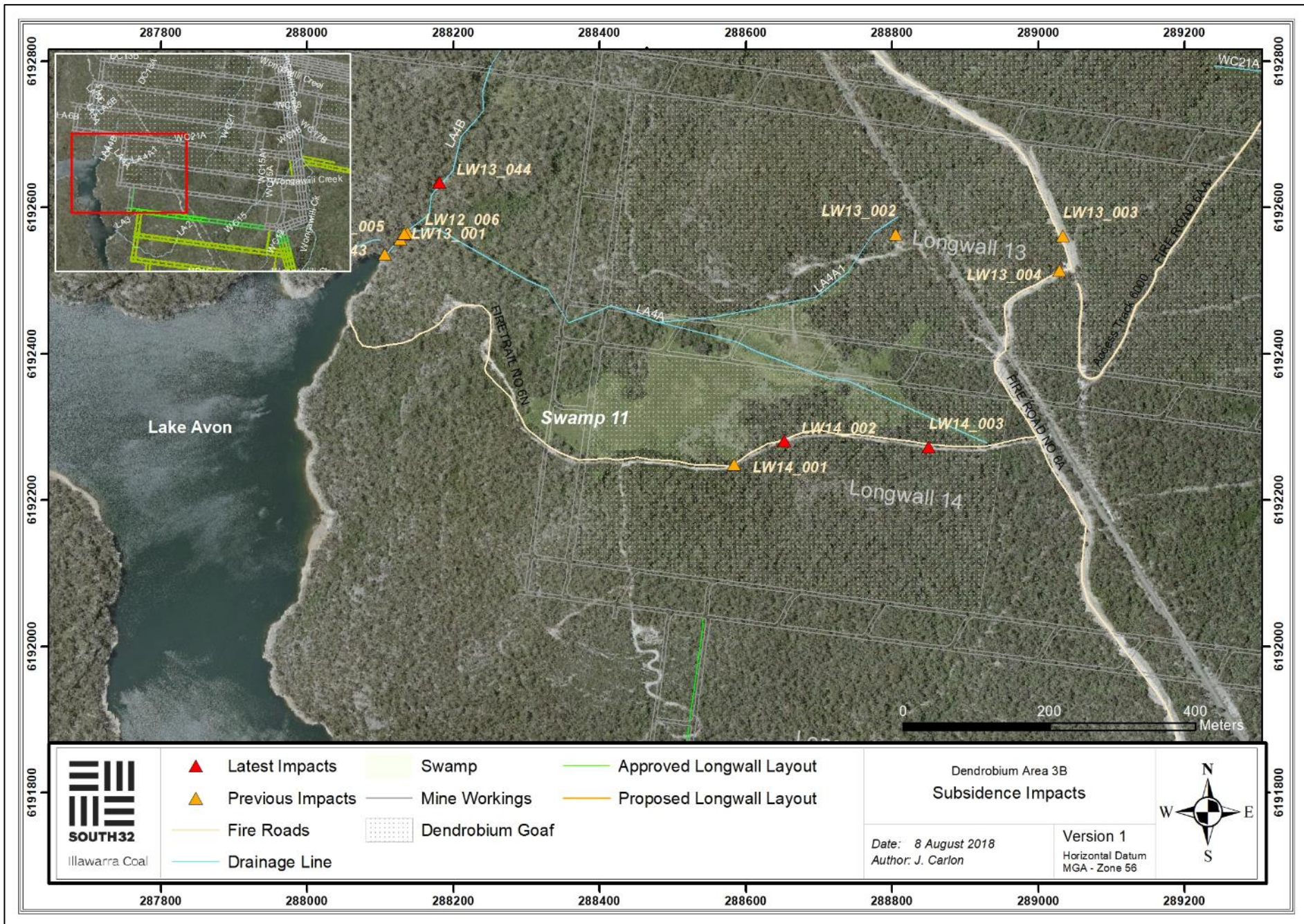


Figure 1: Map showing the latest subsidence impacts relevant to mining.

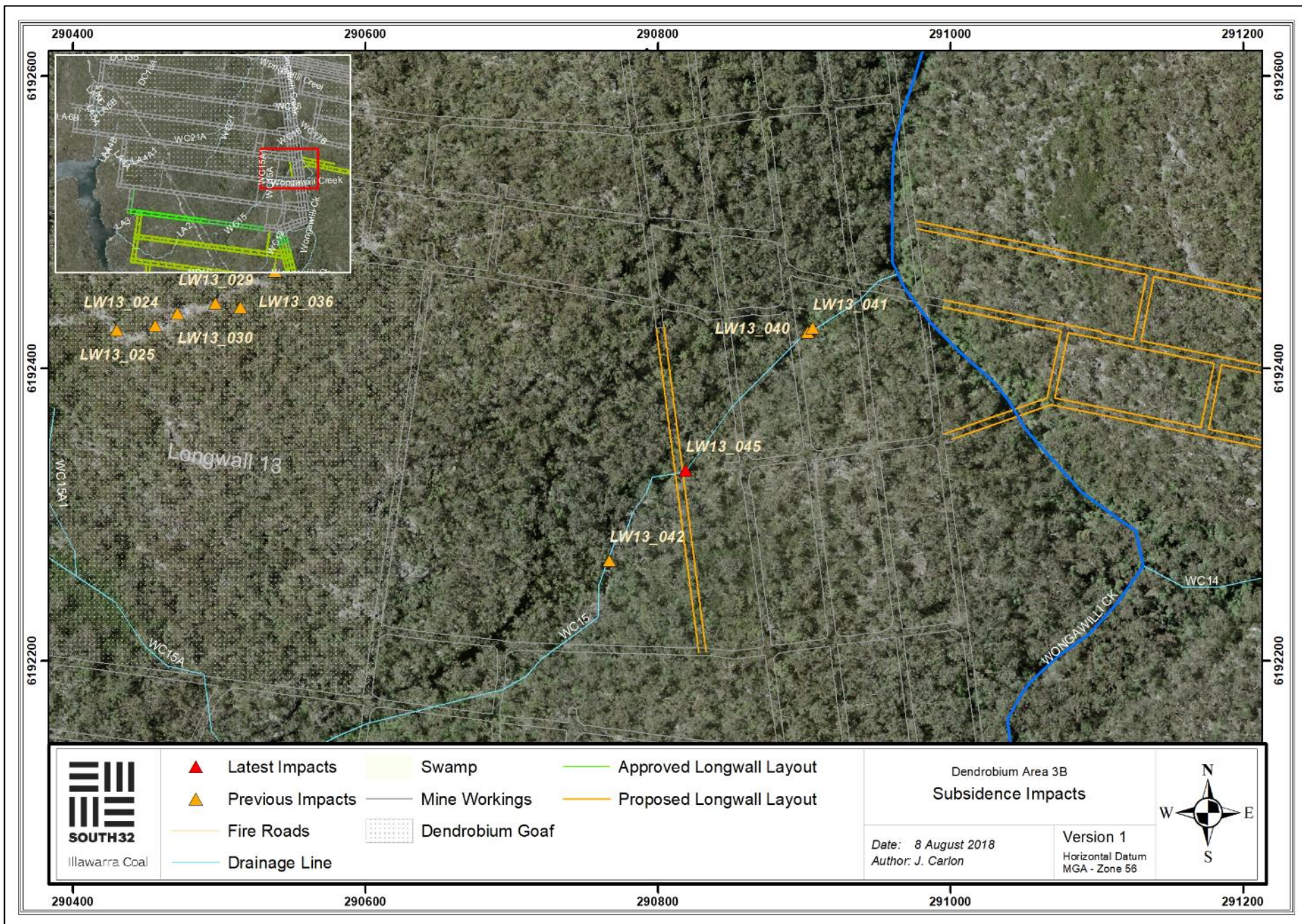


Figure 2: Map showing the latest subsidence impact relevant to mining.

Appendix A

Table 1- Extract from Dendrobium Area 3B Landscape TARP

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2 Cliffs A2-CL1 (above LW4) Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5) Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) Swamp A2-SW1 (above LWs 4 & 5) 4WD Track A2-FT1 (above LWs 4 & 5) 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 Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3 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 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

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Wongawilli Creek - minor environmental consequences Donalds Castle Creek - minor environmental consequences Waterfall WC-WF54 – negligible environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers 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"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Implement agreed CMAs as approved (subject to stakeholder 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"> Actions as stated for Level 2 Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) Implement additional monitoring or increase frequency if required Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period Gas release results in vegetation dieback that does not 	<ul style="list-style-type: none"> Actions as stated for Level 3 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

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018.

Recent inspections identified surface impacts over Longwall 14 (Figure 1). Low pool water levels were also observed in Wongawilli Creek (Figure 2).

DA3B_LW14_004 (E 288944, N 6192270)

Impact DA3B_LW14_004 consists of five soil cracks along 40 m of Fire Trail 6N, adjacent to Swamp 11 (Figure 1). The largest crack is approximately 5 m long, 0.025m wide and 0.122 m at the deepest measurable point (Photo 1 and 2). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 1: Impact DA3B_LW14_004. Taken on 13/08/18.



Photo 2: Impact DA3B_LW14_004. Taken on 13/08/18.

DA3B_LW14_005 (E 289060, N 6192478)

Impact DA3B_LW14_005 consists of two soil cracks along a 10 m section of Fire Road 6AA (Figure 1). The largest crack is approximately 3.3 m long, 0.007 m wide and 0.066 m at the deepest measurable point (Photo 3 and 4). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 3: Impact DA3B_LW14_005. Taken on 13/08/18.



Photo 4: Impact DA3B_LW14_005. Taken on 13/08/18.

DA3B_LW14_006 (E 288908, N 6192429)

Impact DA3B_LW14_006 consists of two soil cracks along a 10 m section on a minor track adjacent to Fire Road 6A (Figure 1). The largest crack is approximately 2.1 m long and 0.01 m wide (Photo 5 and 6). The depth was not measurable. The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 5: Impact DA3B_LW14_006. Taken on 19/08/18.



Photo 6: Impact DA3B_LW14_006. Taken on 19/08/18.

DA3B_LW14_007 (E 289061, N 6192371)

Impact DA3B_LW14_007 consists of a singular soil crack on Fire Road 6AA (Figure 1). The soil crack is approximately 3 m long, 0.01 m wide and 0.07 m at the deepest measurable point (Photo 7 and 8). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 7: Impact DA3B_LW14_007. Taken on 28/08/18.



Photo 8: Impact DA3B_LW14_007. Taken on 28/08/18.

DA3B_LW14_008 (E 288998, N 6192286)

Impact DA3B_LW14_008 consists of two soil cracks along a 20 m section of Fire Road 6A at the entrance to Fire Trail 6N (Figure 1). The largest soil crack is approximately 4.5 m long, 0.02 m wide and 0.15 m at the deepest measurable point (Photo 9 and 10). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 9: Impact DA3B_LW14_008. Taken on 28/08/18.



Photo 10: Impact DA3B_LW14_008. Taken on 28/08/18.

Wongawilli Creek

A decrease in pool water levels has been observed in Wongawilli Creek (Photo 11 to Photo 16). The length of Wongawilli Creek now displaying dry creek bed or minimal pooling is 1,543m (Figure 2).



Photo 11: WC_Photo Point 1, looking upstream. Taken on 29/08/2018.



Photo 12: WC_Photo Point 1, looking downstream, towards WC_Pool 43a. Taken on 29/08/2018.



Photo 13: Wongawilli Creek at confluence with WC18, looking upstream. Taken on 29/08/2018.

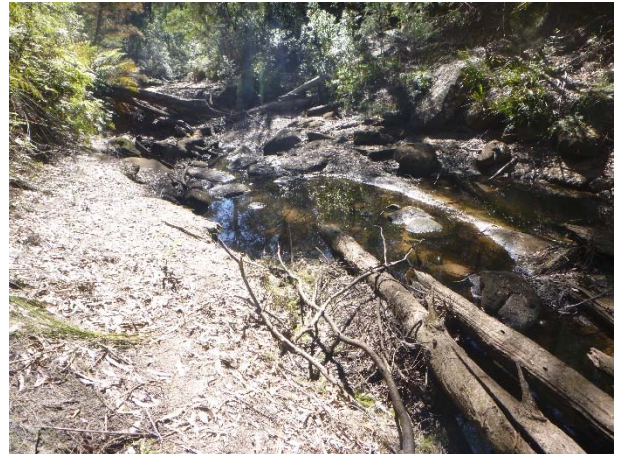


Photo 14: Wongawilli Creek at confluence with WC18, looking downstream. Taken on 29/08/2018.



Photo 15: WC_Photo Point 8, looking downstream. Taken on 29/08/2018.



Photo 16: WC_Pool 45, looking upstream. Taken on 29/08/2018.

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
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement agreed CMAs as approved
- Review monitoring frequency

Table 1: Recent subsidence impact observations for Longwalls 13 and 14. Highlighted rows indicate impacts in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_001	3/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	4/07/2018
DA3B_LW14_002	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	8/08/2018
DA3B_LW14_003	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	8/08/2018
DA3B_LW13_044	26/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing to base of step on tributary LA4B	8/08/2018
DA3B_LW13_045	8/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing across Rockbar 5 on tributary WC15	8/08/2018
DA3B_LW14_004	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	This Report
DA3B_LW14_005	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	This Report
DA3B_LW14_006	19/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on minor track adjacent to Fire Road 6A	This Report
DA3B_LW14_007	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	This Report
DA3B_LW14_008	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A at entrance to Fire Trail 6N	This Report
Wongawilli Creek (Update)	29/08/2018 (Update)	LW14	Pool Water Level	Level 3	Reduction in surface pooling	This Report

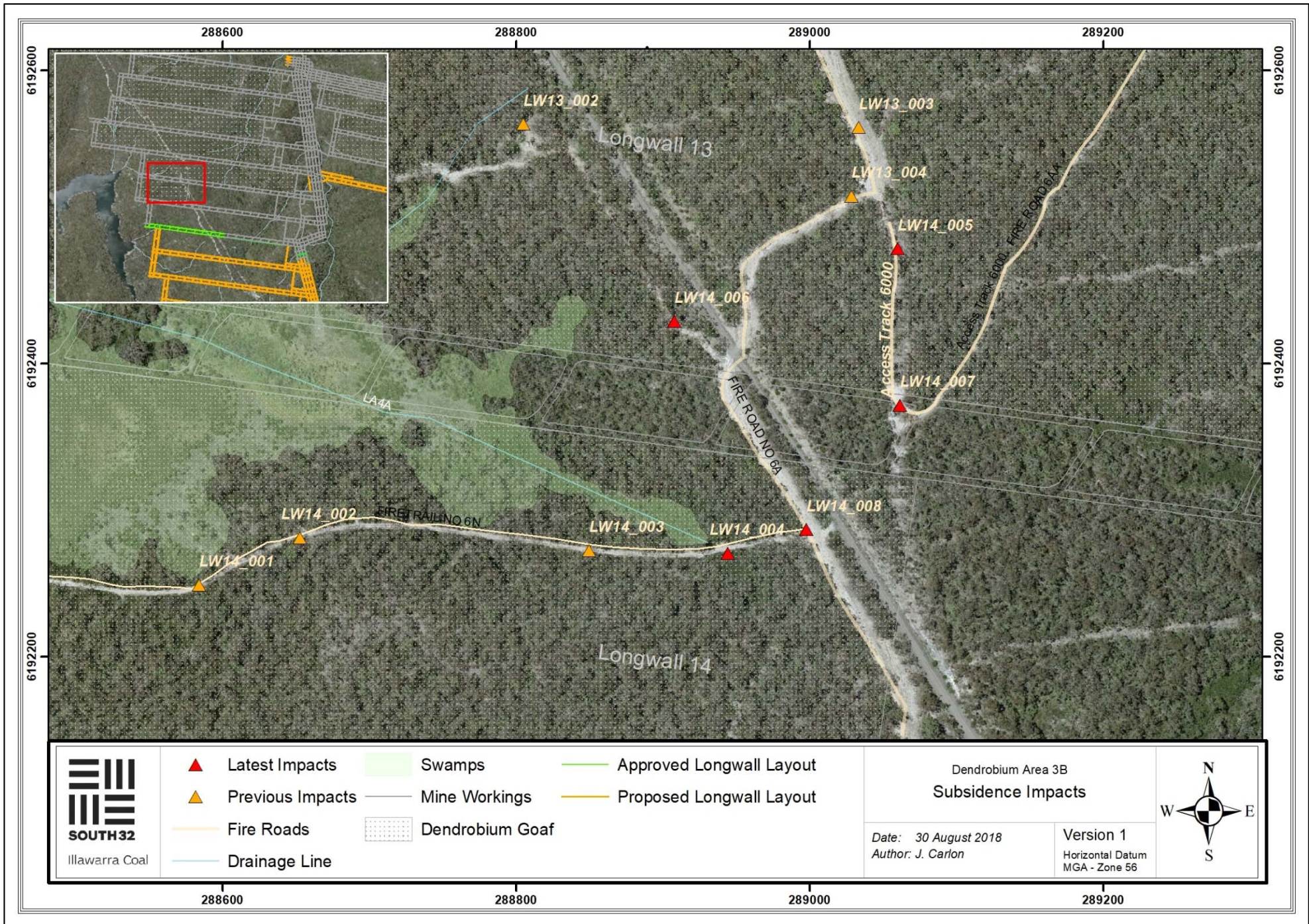


Figure 1: Latest subsidence impacts relevant to Longwall 14.

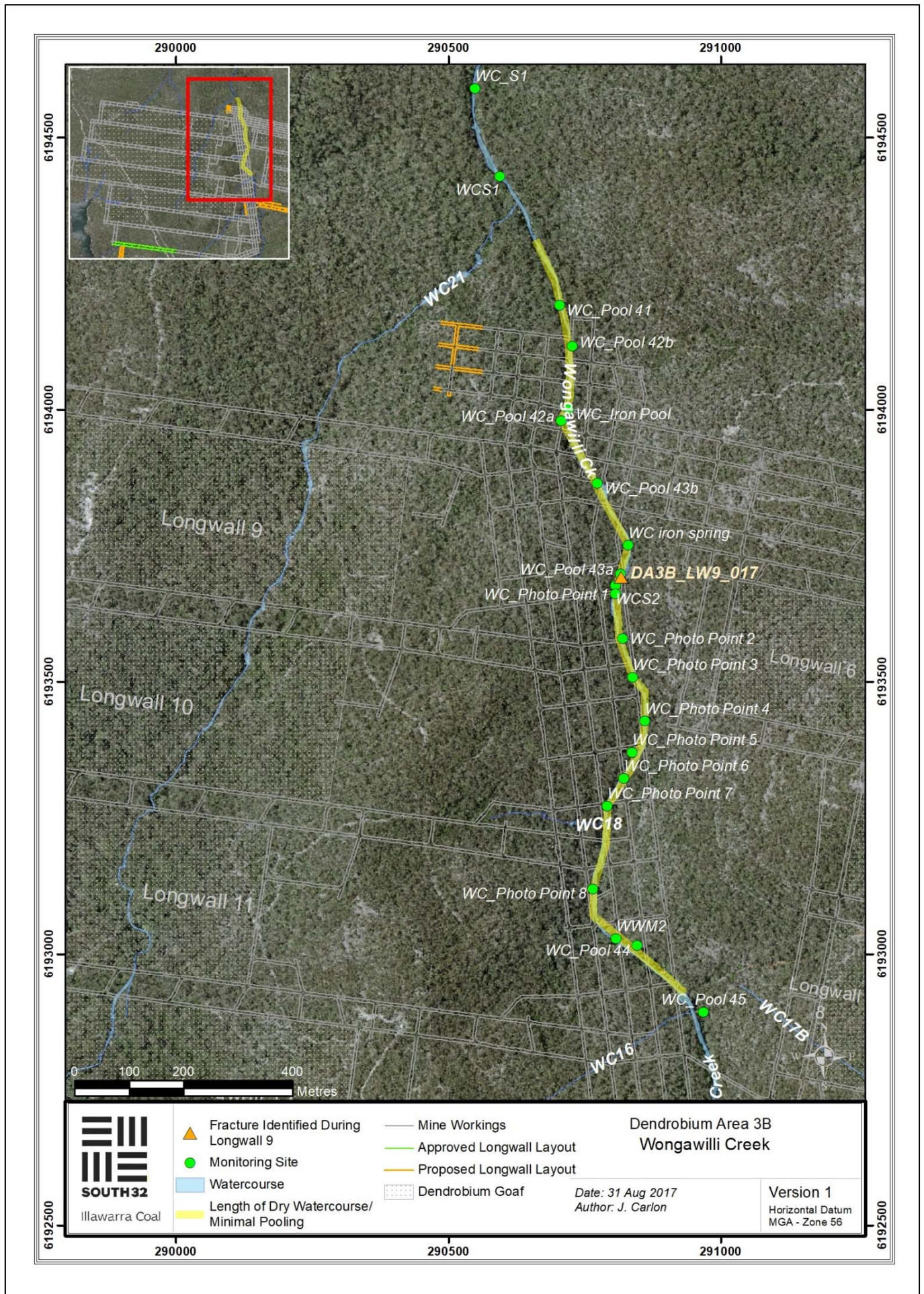


Figure 2: Length of Wongawilli Creek with observable drying and minimal pooling.

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

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Wongawilli Creek - minor environmental consequences Donalds Castle Creek - minor environmental consequences Waterfall WC-WF54 – negligible environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers 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"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Implement agreed CMAs as approved (subject to stakeholder 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"> Actions as stated for Level 2 Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) Implement additional monitoring or increase frequency if required Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period Gas release results in vegetation dieback that does not 	<ul style="list-style-type: none"> Actions as stated for Level 3 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

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018.

Recent inspections identified surface impacts over Longwall 14 (Figure 1).

DA3B_LW14_009 (E 289022, N 6192242)

Impact DA3B_LW14_009 consists of three soil cracks along 20 m of Fire Road 6A, adjacent to the intersection with Fire Trail 6N (Figure 1). The largest continuous crack is approximately 5 m long, 0.02 m wide and 0.4 m at the deepest measurable point (Photo 1 and 2). The cracking does not impede access along the track and is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length and 100mm width
- Crack in a fire trail that should not result in erosion or impede access



Photo 1: Impact DA3B_LW14_009. Taken on 03/09/18.



Photo 2: Impact DA3B_LW14_009. Taken on 03/09/18.

Corrective Management Actions

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 row indicates latest impact.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_001	3/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	4/07/2018
DA3B_LW14_002	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	8/08/2018
DA3B_LW14_003	7/07/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	8/08/2018
DA3B_LW13_044	26/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing to base of step on tributary LA4B	8/08/2018
DA3B_LW13_045	8/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing across Rockbar 5 on tributary WC15	8/08/2018
DA3B_LW14_004	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	29/08/2018
DA3B_LW14_005	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	29/08/2018
DA3B_LW14_006	19/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on minor track adjacent to Fire Road 6A	29/08/2018
DA3B_LW14_007	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	29/08/2018
DA3B_LW14_008	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A at entrance to Fire Trail 6N	29/08/2018
Wongawilli Creek (Update)	29/08/2018 (Update)	LW14	Pool Water Level	Level 3	Reduction in surface pooling	29/08/2018
DA3B_LW14_009	03/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A near entrance to Fire Trail 6N	This Report

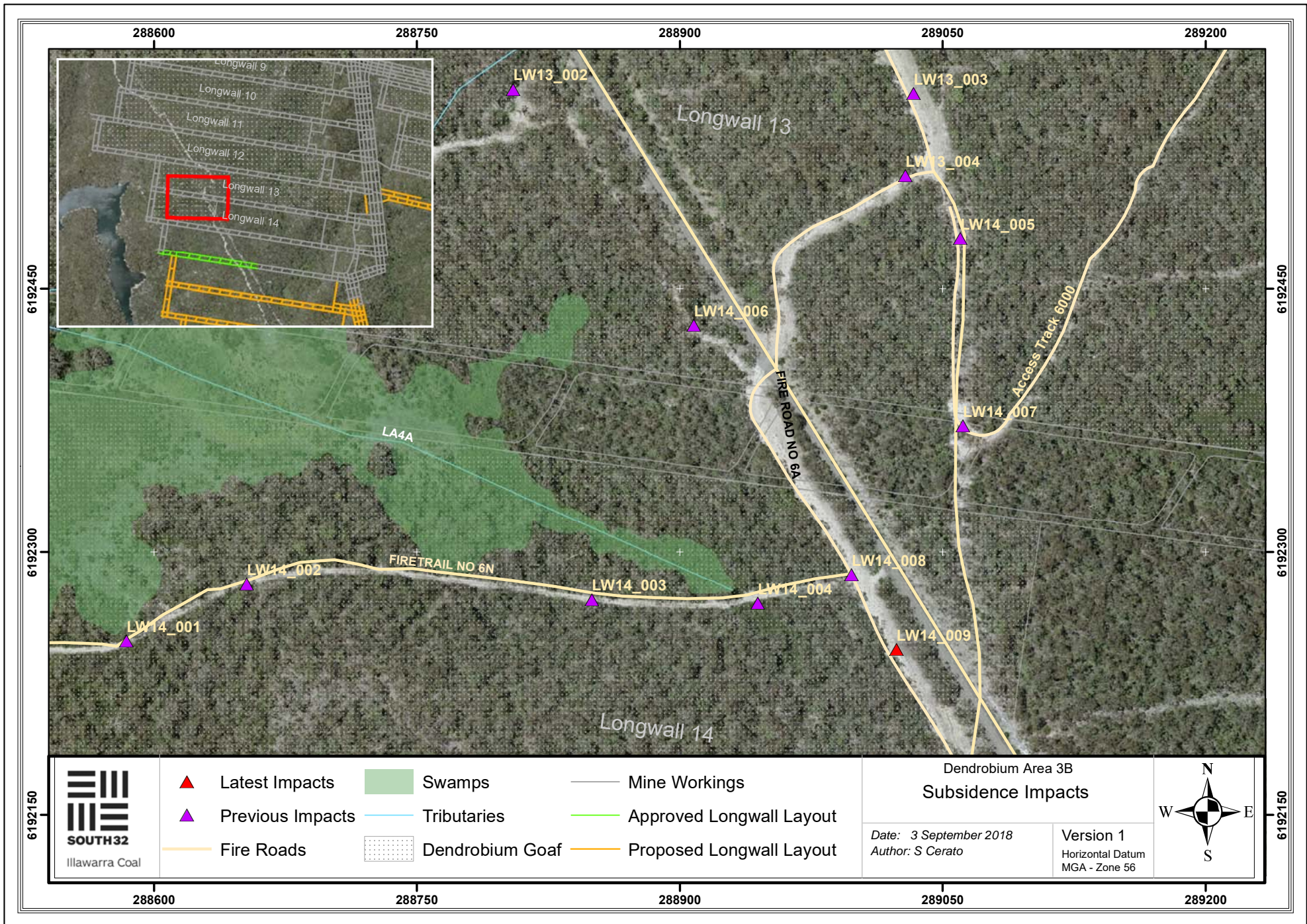


Figure 1: Latest subsidence impacts relevant to Longwall 14.

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 Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018.

Recent inspections identified surface impacts over Longwall 14 (Figure 2).

DA3B_LW14_010 (E 289038, N 6192227)

Impact DA3B_LW14_010 consists of a continuous soil crack and uplift along Fire Trail 6A (Figure 2). The crack is approximately 12m long, 0.05m wide with a maximum uplift of 0.03m and 0.26m at the deepest measurable point (Photo 1 and 2). The cracking does not impede access along the track and 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



Photo 1: Impact DA3B_LW14_010. Taken on 10/09/18.



Photo 2: Impact DA3B_LW14_010. Taken on 10/09/18.

DA3B_LW14_011 (E 289065, N 6192240)

Impact DA3B_LW14_011 consists of a rock fracture with a continuous soil crack and uplift across an unused rail corridor adjacent to Fire Trail 6A (Figure 2). The combined length of the fracture and cracking is approximately 5m, with the fracture measuring approximately 0.25m. Maximum width of this impact is 0.03m and 0.1m at the deepest measurable point (Photos 3 and 4). Uplift across the rail corridor has caused a bump in the ballast approximately 0.05m high. The movement appears stable and should not result in erosion. It does

not pose a risk to vehicles and does not impede access. This impact is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

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



Photo 3: Impact DA3B_LW14_011. Taken on 16/09/18.



Photo 4: Impact DA3B_LW14_011. Taken on 16/09/18.

DA3B_LW14_012 (E 289062, N 6192097)

Impact DA3B_LW14_012 consists of multiple soil cracks along Fire Trail 6A (Figure 2). The cracks are within a 20m section and run perpendicular to the trail, with the longest crack measuring approximately 9m long, 0.01m wide and 0.03m deep (Photo 5 and 6). The cracking should not result in erosion and does not impede access, and are expected to self-remediate. This impact is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m in length
- Crack in a fire trail which should not result in erosion or impede access



Photo 5: Impact DA3B_LW14_012. Taken on 16/09/18.



Photo 6: Impact DA3B_LW14_012. Taken on 16/09/18.

Swamp 23

A soil moisture trigger was measured at site 23_02 during recent analysis of Swamp 23 soil moisture data. The site was established in July 2015, in a hand-augured hole. The site was passed by Longwall 14 on 8/7/18. Recent data indicates that soil moisture levels at this site have dropped below baseline levels, and is a Level 1 trigger as per the Dendrobium Area 3B Swamp TARP (Appendix A, Table 2), specifically:

- Soil moisture level lower than baseline level at any monitoring sites (within 400m of mining) within a swamp

S23_02 Moisture Probe
Soil Moisture Profile (Average)

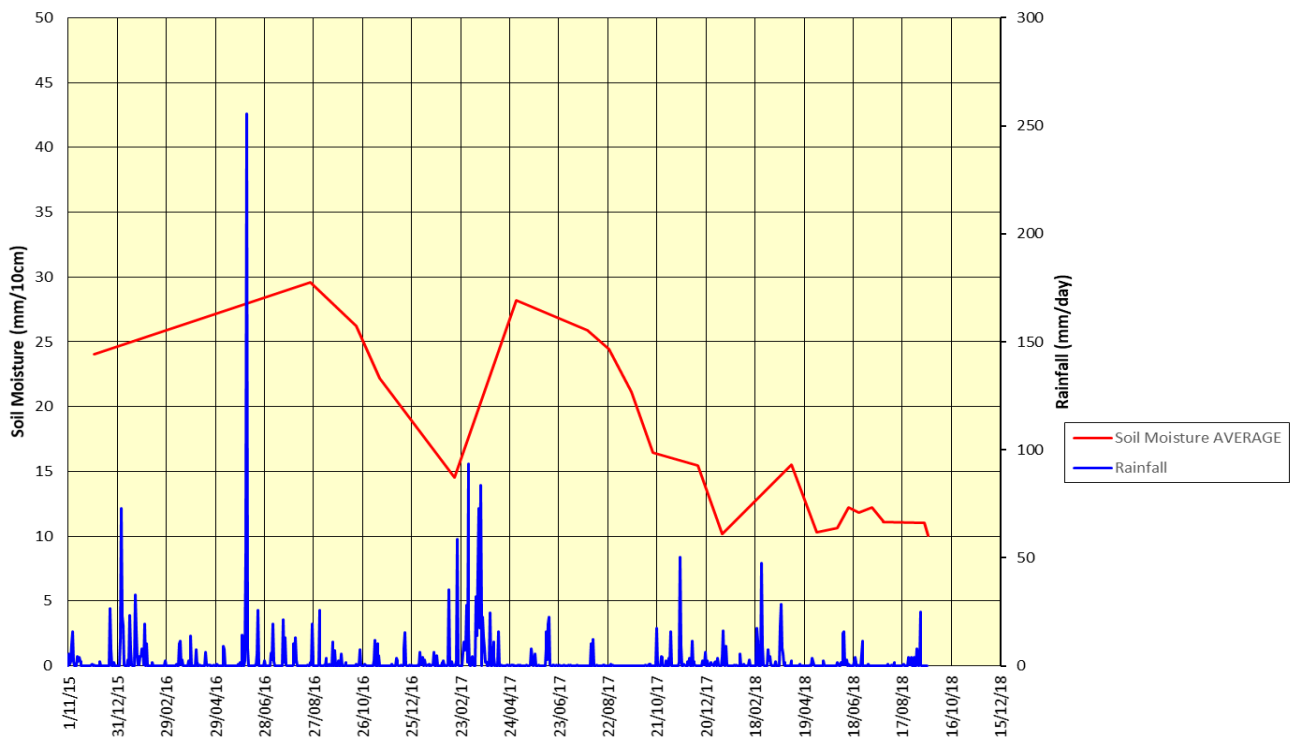


Figure 1: Soil moisture levels at 23_02, date range 3/12/15 – 17/09/18

Corrective Management Actions

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
- Increase frequency of vegetation monitoring within Swamp 23
- 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 impact.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW13_045	8/07/2018	LW13	Rock fracturing	Level 2	Rock fracturing across Rockbar 5 on tributary WC15	8/08/2018
DA3B_LW14_004	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Trail 6N adjacent to Swamp 11	29/08/2018
DA3B_LW14_005	13/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	29/08/2018
DA3B_LW14_006	19/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on minor track adjacent to Fire Road 6A	29/08/2018
DA3B_LW14_007	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	29/08/2018
DA3B_LW14_008	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A at entrance to Fire Trail 6N	29/08/2018
Wongawilli Creek (Update)	29/08/2018 (Update)	LW14	Pool Water Level	Level 3	Reduction in surface pooling	29/08/2018
DA3B_LW14_009	03/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A near entrance to Fire Trail 6N	03/09/2018
DA3B_LW14_010	10/09/2018	LW14	Soil Cracking	Level 2	Soil Cracking on Fire Road 6A	This Report
DA3B_LW14_011	16/09/2018	LW14	Soil Cracking, Rock Fracture and Uplift	Level 1	Soil crack, rock fracture and uplift on rail corridor adjacent to Fire Road 6A	This Report
DA3B_LW14_012	16/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A	This Report
23_02	20/09/2018	LW14	Soil Moisture	Level 1	Soil moisture level below baseline	This Report

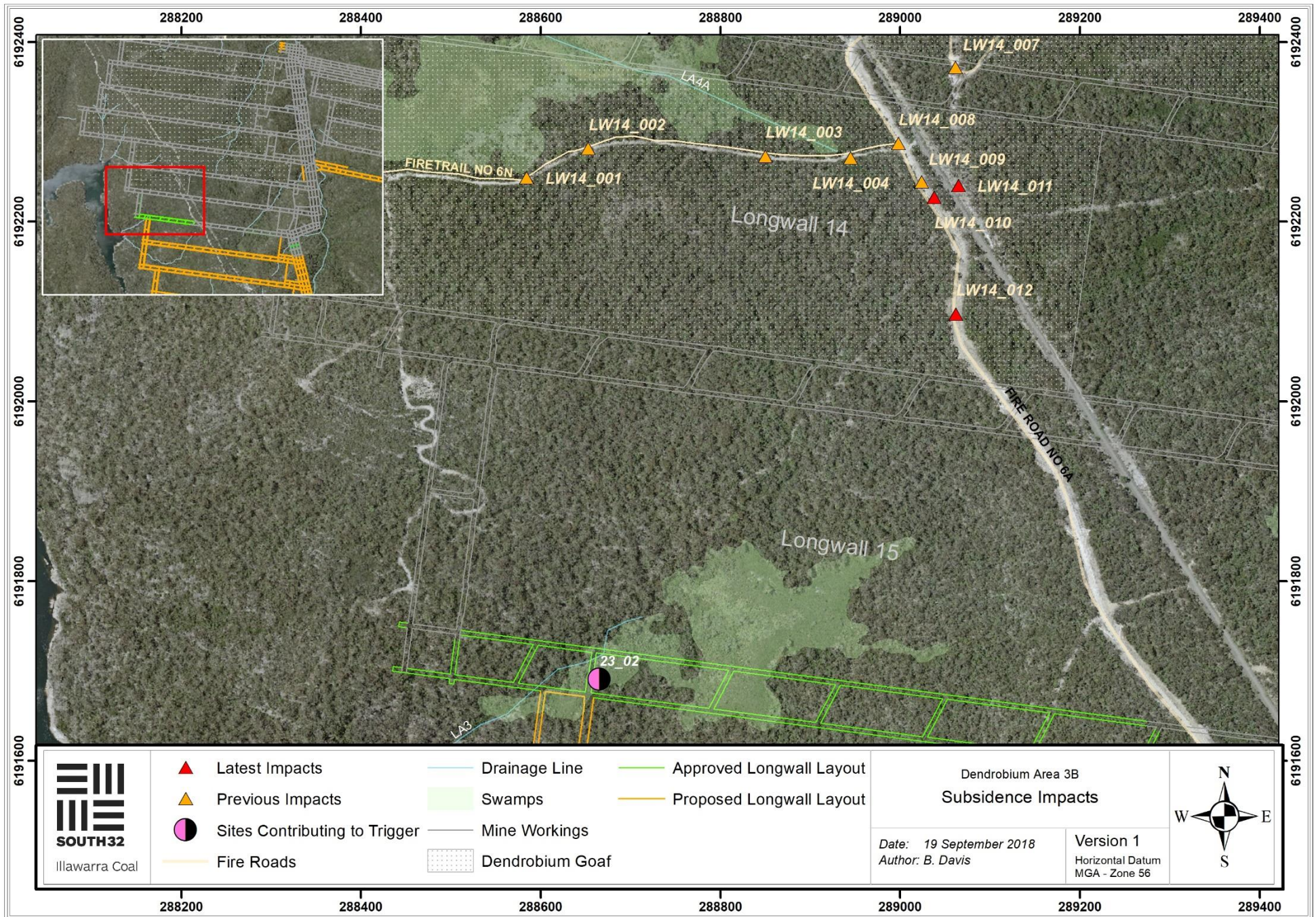


Figure 2: Latest subsidence impacts relevant to Longwall 14.

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 Swamp TARP

Performance Measures	Potential Impacts	Performance Triggers	Management Strategies	Offsets	Other Actions
<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>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018.

Recent inspections identified surface impacts over Longwall 14 (Figure 1).

DA3B_LW14_013 (E 289080, N 6192069)

Impact DA3B_LW14_013 consists of a continuous soil crack along, and perpendicular to Fire Trail 6A (Figure 1). The crack is approximately 14m long, 0.01m wide and 0.05m deep at the deepest measurable point (Photo 1 and 2). The cracking does not impede access and is expected to self-remediate. This impact 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



Photo 1: Impact DA3B_LW14_013. Taken on 26/09/18.



Photo 2: Impact DA3B_LW14_013. Taken on 26/09/18.

Corrective Management Actions

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 row indicates latest impact.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_006	19/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on minor track adjacent to Fire Road 6A	29/08/2018
DA3B_LW14_007	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6AA	29/08/2018
DA3B_LW14_008	28/08/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A at entrance to Fire Trail 6N	29/08/2018
Wongawilli Creek (Update)	29/08/2018 (Update)	LW14	Pool Water Level	Level 3	Reduction in surface pooling	29/08/2018
DA3B_LW14_009	03/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A near entrance to Fire Trail 6N	03/09/2018
DA3B_LW14_010	10/09/2018	LW14	Soil Cracking	Level 2	Soil Cracking on Fire Road 6A	21/09/2018
DA3B_LW14_011	16/09/2018	LW14	Soil Cracking, Rock Fracture and Uplift	Level 1	Soil crack, rock fracture and uplift on rail corridor adjacent to Fire Road 6A	21/09/2018
DA3B_LW14_012	16/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A	21/09/2018
23_02	20/09/2018	LW14	Soil Moisture	Level 1	Soil moisture level below baseline	21/09/2018
DA3B_LW14_013	26/09/2018	LW14	Soil Cracking	Level 2	Soil cracking along Fire Road 6A	This Report

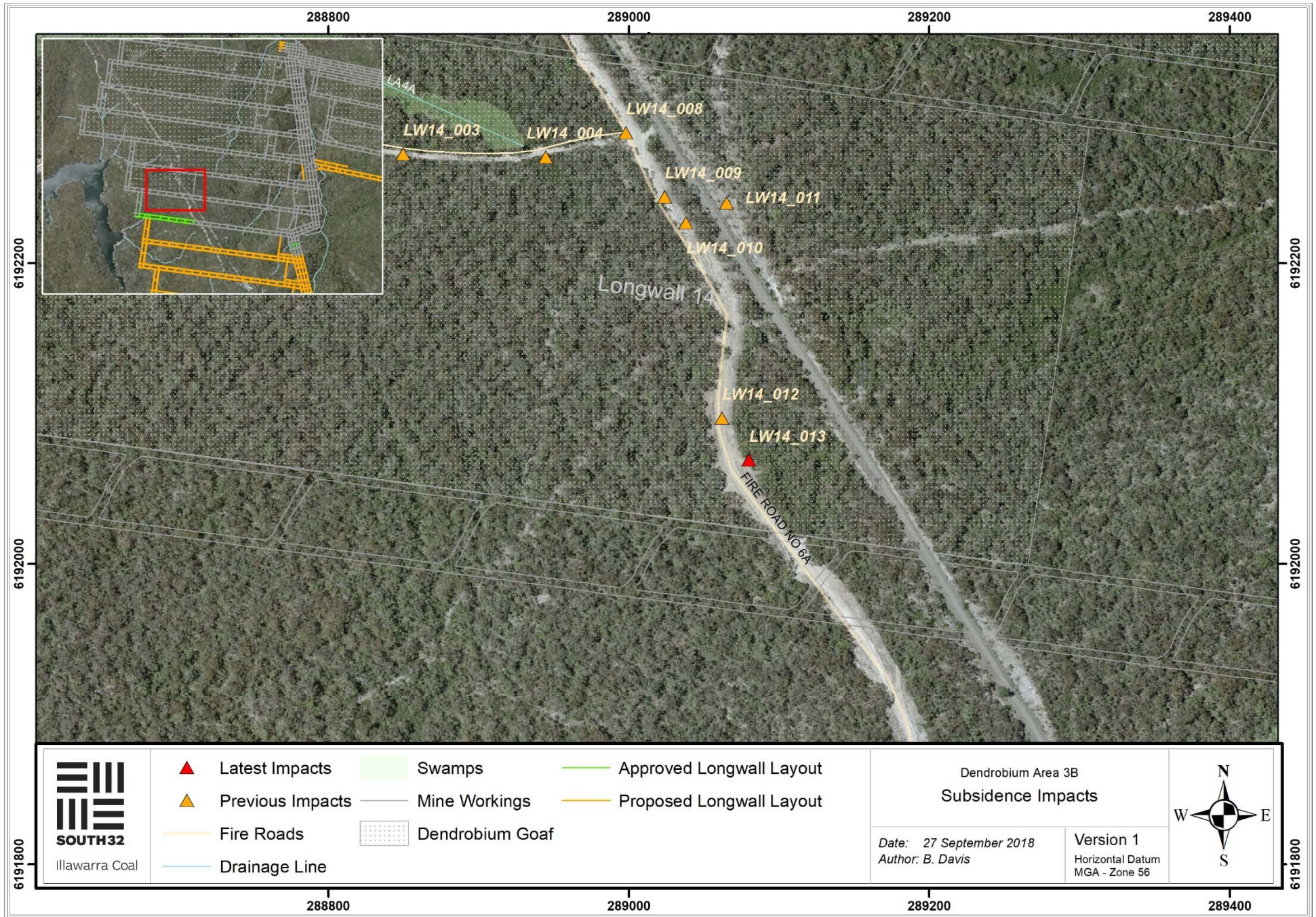


Figure 1: Latest subsidence impacts relevant to Longwall 14.

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 Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd of May 2018 and as of the 11th of November 2018 had progressed approximately 1210m (Figure 1). During the latest landscape inspection one new soil crack was identified. In addition, water quality changes to DC13 were also identified.

Impact DA3B_LW14_014

During the latest inspection of the surface over Longwall 14 a soil crack was identified on an access track (Photo 1 and 2). The crack is approximately 1.1m long, 0.06m wide and 0.15m deep. The crack does not pose a risk to safety or serviceability of the track and will likely self-remediate. No additional actions are recommended.

This impact is a Level 1 trigger according to the DA3B Landscape Impact Monitoring, Management and Contingency Plan, specifically:

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



Photo 1: Impact DA3B_LW14_014, soil cracking. Taken on 13/11/2018.

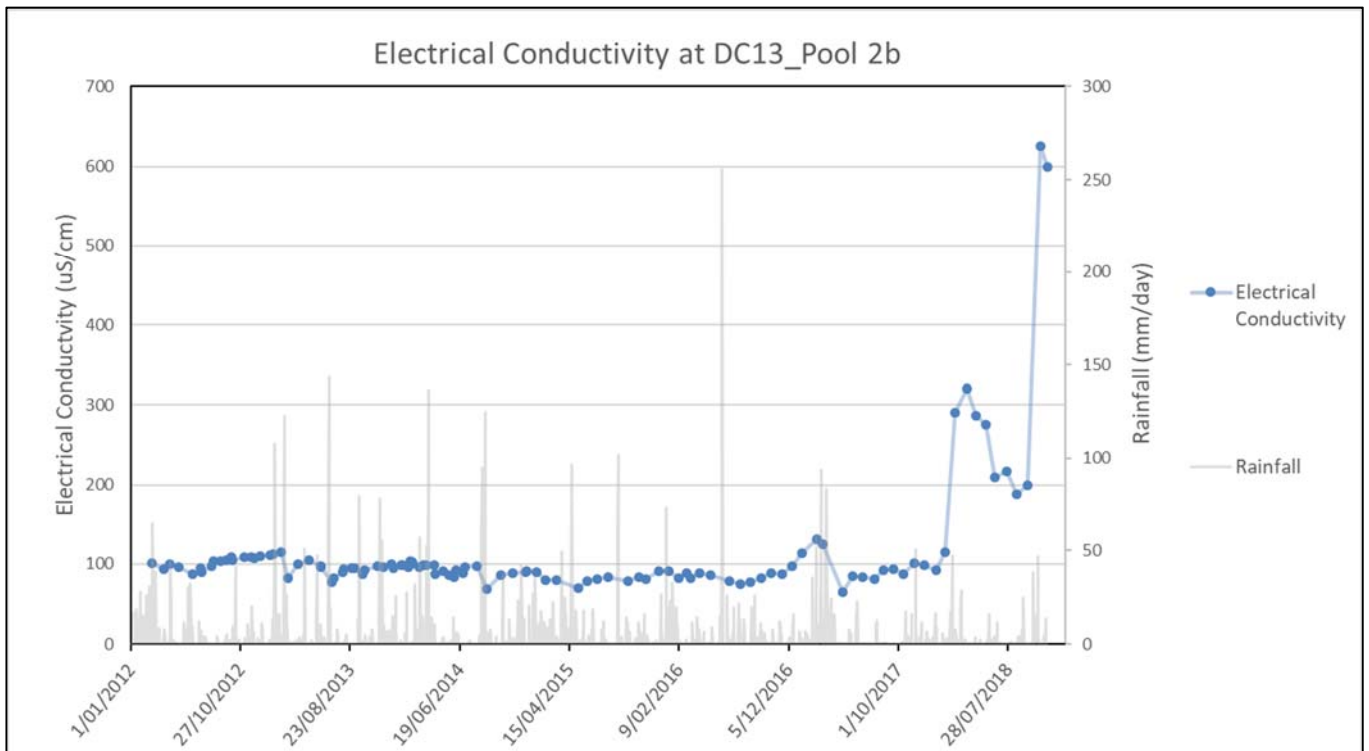


Photo 2: Impact DA3B_LW14_014, soil cracking. Taken on 13/11/2018.

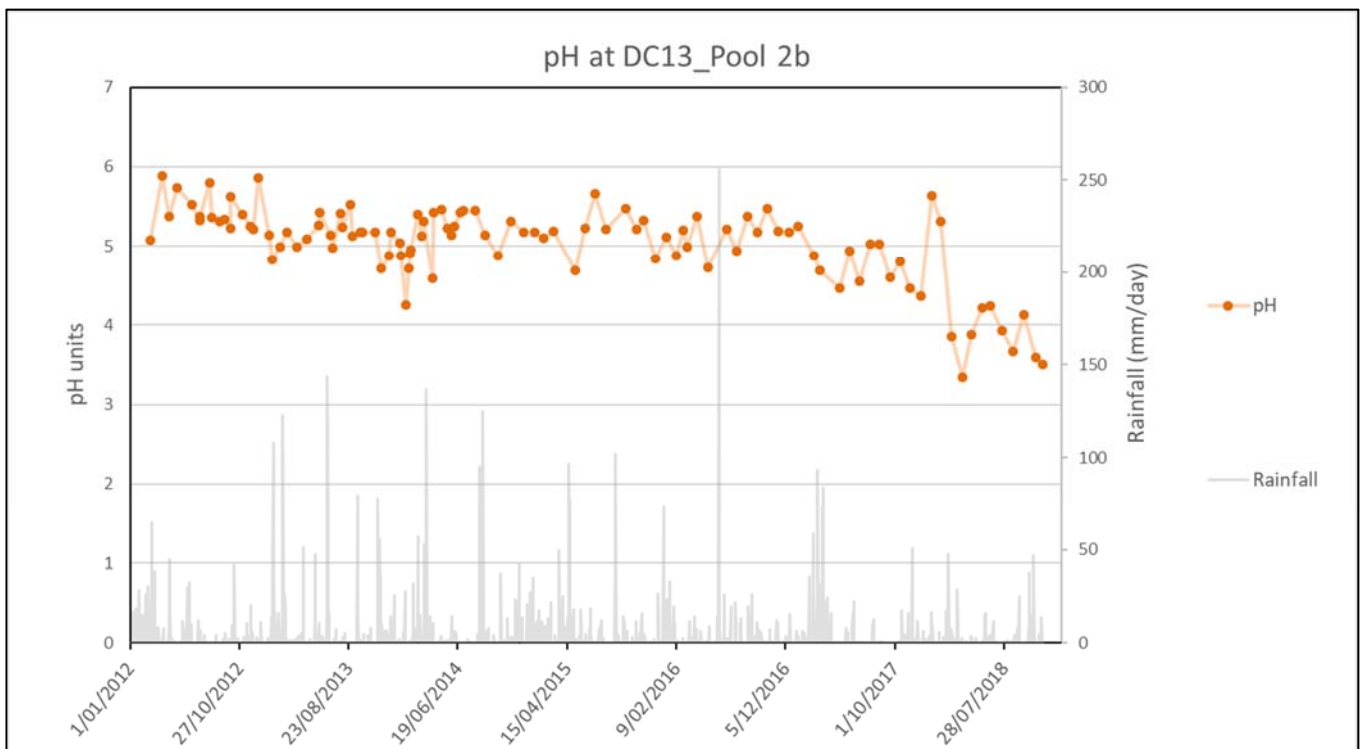
Tributary DC13

DC13_Pool 2b is a water quality monitoring site on tributary DC13, approximately 680m downstream from DA3B (Figure 1, inset). During recent inspections of DC13, an increase in electrical conductivity (EC) has been observed at Pool 2b (Graph 1). A drop in pH has also been observed (Graph 2). During the latest inspection an EC of 599 $\mu\text{S}/\text{cm}$ and pH of 3.51 was recorded at the site. On the latest inspection no surface flow was observed entering Pool 2b however it is probable that subsurface flow is entering from the boulderfield directly upstream.

The site is approximately 2400m away from current Longwall 14. The changes in field parameters don't appear to be reflected at other nearby sites.



Graph 1: Electrical conductivity recorded at site *DC13_Pool 2b*, downstream from DA3B operations.



Graph 2: pH recorded at site *DC13_Pool 2b*, downstream from DA3B operations.

Corrective Management Actions (CMAs)

Prescribed actions for the soil crack according to the Dendrobium Area 3B Landscape Impacts, Triggers and Response Plan (Appendix A, Table 1.2):

- Continue monitoring program
- Submit an Impact Report to key stakeholders
- Report in End of Panel Report and AEMR

No TARPs apply to the water quality changes at DC13. Specialist assessment will be undertaken with results included in the Longwall 14 End of Panel Report.

Table 1: Recent impacts and triggers recorded during Longwall 14, Dendrobium Area 3B. Highlighted row indicate latest impact.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_013	26/09/2018	LW14	Soil Cracking	Level 2	Soil cracking along Fire Road 6A	27/09/2018
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Dissolved oxygen trigger at Wongawilli Ck (FR6)	16/10/2018
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Conductivity trigger at Wongawilli Ck (FR6)	16/10/2018
S13_01	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_01	16/10/2018
S13_02	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_02	16/10/2018
S13_03	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_03	16/10/2018
DA3B_LW14_014	13/11/2018	LW14	Soil Cracking	Level 1	Soil cracking along access track	This Report

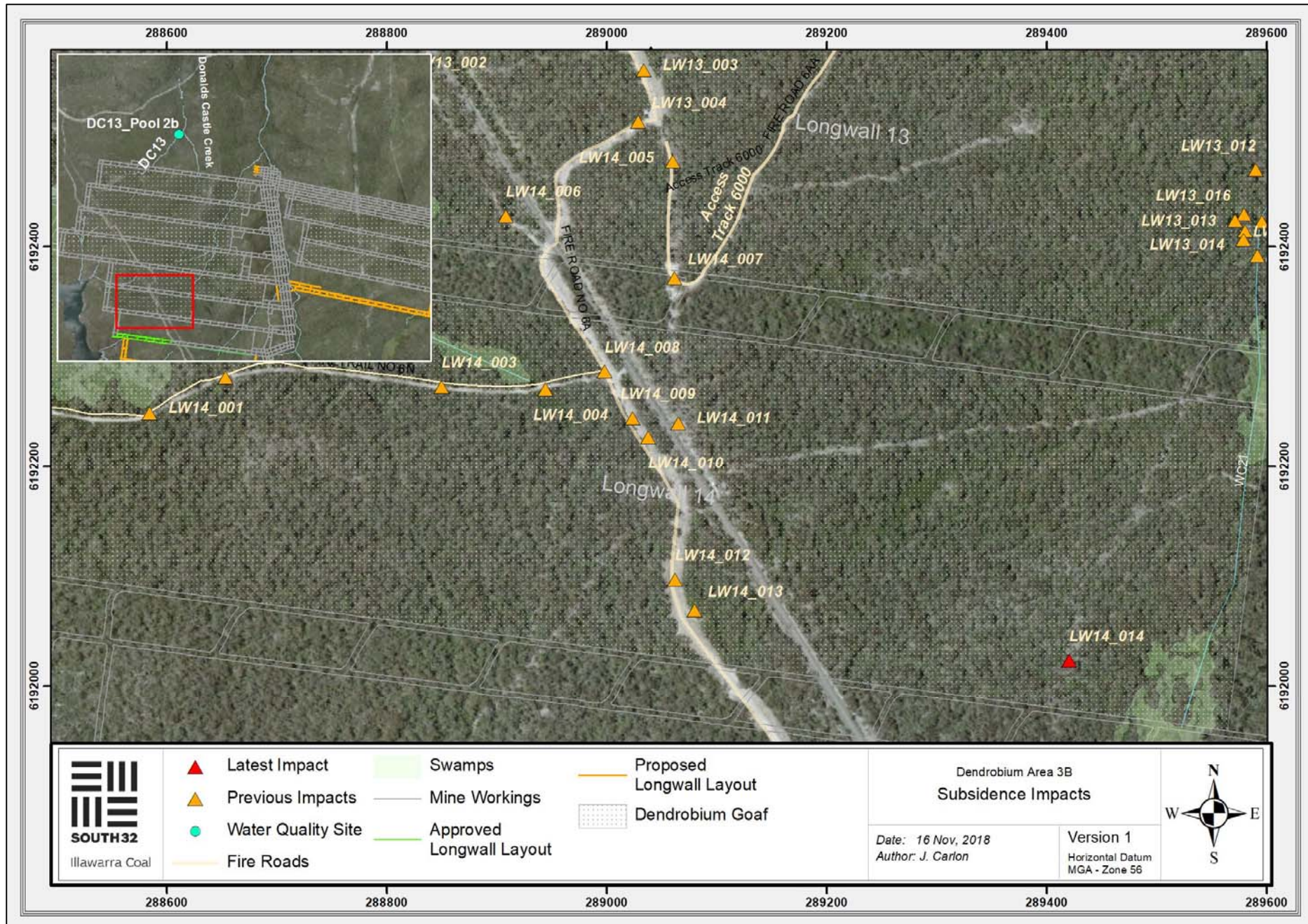


Figure 1: Latest surface impact and DC13 water quality site in relation to DA3B mine workings.

Appendix A

Table 1.2 – Dendrobium Landscape Impacts, Triggers and Response

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 Coal Environmental Field Team (ICEFT) 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 13 began on the 4th March 2017 and was completed on the 19th April 2018. Extraction of Longwall 14 began on the 22nd of May 2018 and as of the 6th December 2018 had progressed approximately 1410m (Figure 1). During the most recent inspection carried out on the 5th December 2018, changes to an existing Longwall 13 impact were observed as well as a previously unobserved impact. This report also includes an update on shallow groundwater levels in Swamp 13.

DA3B_LW13_043 Update (288106 E, 6192537 N)

Impact DA3B_LW13_043 is located on LA4, a tributary to Lake Avon, 300 m from the commencing end of Longwall 13 and 300 m from the southern edge of Longwall 12 (**Figure**). The impact is comprised of rock fracturing at LA4_Step 0 (**Photos 1 to 3**), which is the most downstream feature before entering Lake Avon. Lowering lake water levels has enabled recent access to areas that were previously under water. Additional rock fracturing was observed during the latest inspection. The additional fracturing has a maximum length of 1.5m and a maximum width of 0.01m. An increase of iron staining was also identified during this inspection (**Photo 4**).

DA3B_LW13_043 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (**Appendix A: Table 1**), specifically:

- Crack or fracture that results in observable loss of surface water or erosion
- Observable increase in iron staining within the mining area continues to outside the mining area.



Photo 1: DA3B_LW13_043, looking at a section of rock fracturing. Taken on 6 December 2018.



Photo 2: DA3B_LW13_043, looking at a section of rock fracturing and uplift. Taken on 6 December 2018.

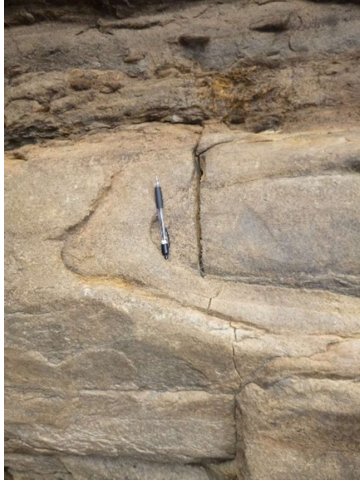


Photo 3: DA3B_LW13_043, looking at a section of rock fracturing.. Taken on 6 December 2018.



Photo 4: DA3B_LW13_043, looking at iron staining. Taken on 6 December 2018.

DA3B_LW14_015 (288070 E, 6192528 N)

Impact DA3B_LW14_015 is located on the cliff line edge of Lake Avon, approximately 350 m from the commencing end of Longwall 13 and Longwall 14, and 330 m from the southern edge of Longwall 12 (**Figure**). The impact is comprised of two distinct rock fractures and a rock fall (**Photo 5 and Photo 6**). The rock fracturing has a maximum length of 1.8m, a maximum width of 0.01m and a maximum measurable depth of 0.29m. The rock fall is approximately 4m x 1.5m x 0.5m. It is probable that the impact occurred during the extraction of Longwall 13 (**Figure 1**) Previously, the site has been inundated by lake water, which prevented observation of the impact.

DA3B_LW14_015 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (**Appendix A: Table 2**):

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

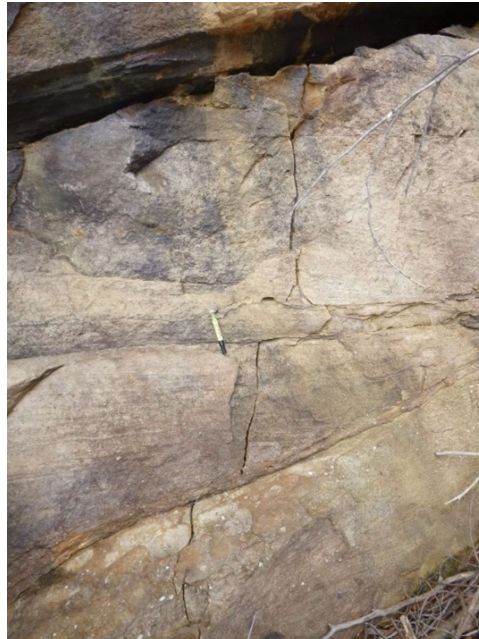


Photo 5: DA3B_LW14_015, looking at a section of rock fracturing. Taken on 6 December 2018.



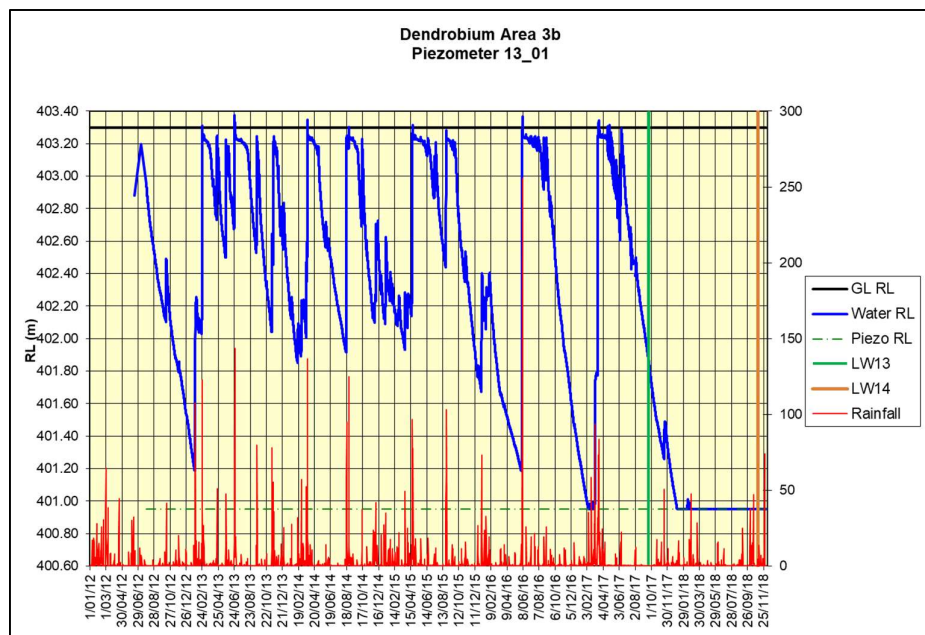
Photo 6: DA3B_LW14_015, looking at the rockfall. Taken on 6 December 2018.

Swamp 13

During recent analysis of shallow groundwater levels for borehole 13_01 (**Figure 1**), changes to the typical rainfall response were observed (**Graph 1**). A piezometer and logger were installed at the site in June 2012. The site was passed by Longwall 13 on the 21st September 2017 and mined beneath by Longwall 14 on the 4th November 2018 (**Graph 1**). The lowest recorded baseline water level was RL 400.95 m, which corresponds to water levels below the piezometer, however groundwater levels typically increased following rainfall events during the baseline period (**Graph 1**). Following Longwall 14 passing beneath the site, groundwater levels have not responded to rainfall events to date.

Groundwater levels at 13_01 contribute to a Level 3 trigger according to the Dendrobium Swamps Impacts, Triggers and Response (**Appendix A, Table 3**), specifically:

- Groundwater level lower than baseline level at >80% of monitoring sites* (within 400m of mining) within a swamp (in comparison to reference swamps) *Note- there is one shallow groundwater site in Swamp 13, hence the >80% trigger.



Graph 1: Shallow groundwater levels at 13_01, logged hourly interval

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
- Notify relevant technical specialists and seek advice on any CMA required
- Provide safety signage and barricades as appropriate
- Implement agreed CMAs as approved
- Review monitoring frequency

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

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Dissolved oxygen trigger at Wongawilli Ck (FR6)	16/10/2018
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Conductivity trigger at Wongawilli Ck (FR6)	16/10/2018
S13_01	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_01	16/10/2018
S13_02	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_02	16/10/2018
S13_03	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_03	16/10/2018
DA3B_LW14_014	13/11/2018	LW14	Soil Cracking	Level 1	Soil cracking along access track	16/11/2018
DA3B_LW13_043 (Update)	18/05/2018	LW13	Rock fracturing & Iron Staining	Level 2	Rock fracturing, fragmentation and iron staining to LA4_Step 0	This Report
DA3B_LW14_014	5/12/2018	LW14	Rock fracturing & Rockfall	Level 1	Rockfall and rock fracturing on Lake Avon rock ledge	This report
13_01	5/12/2018	LW14	Groundwater	Level 3	Shallow groundwater trigger in Swamp 13	This report

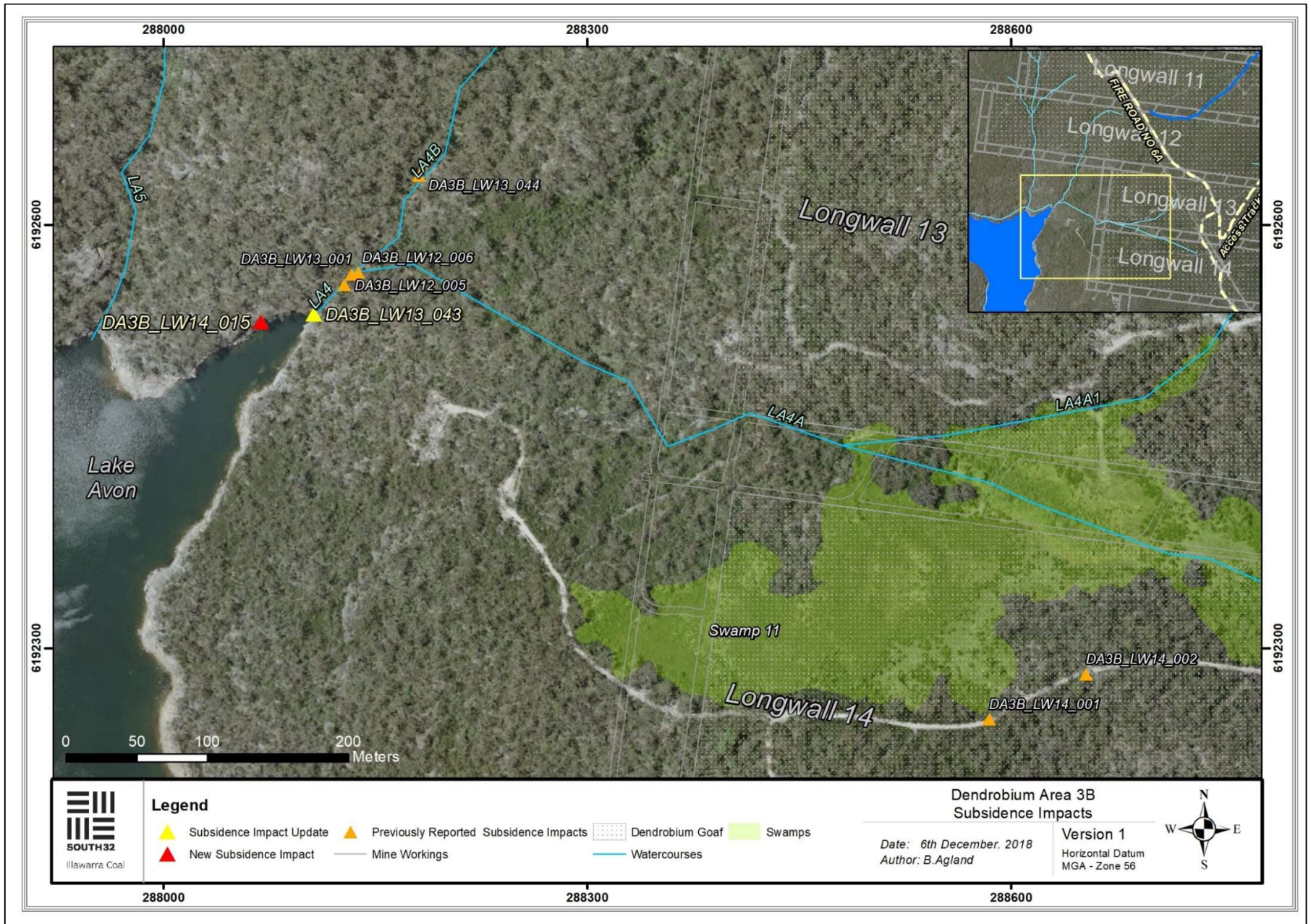


Figure 1: Map showing the latest subsidence impacts relevant to DA3B mining operations.

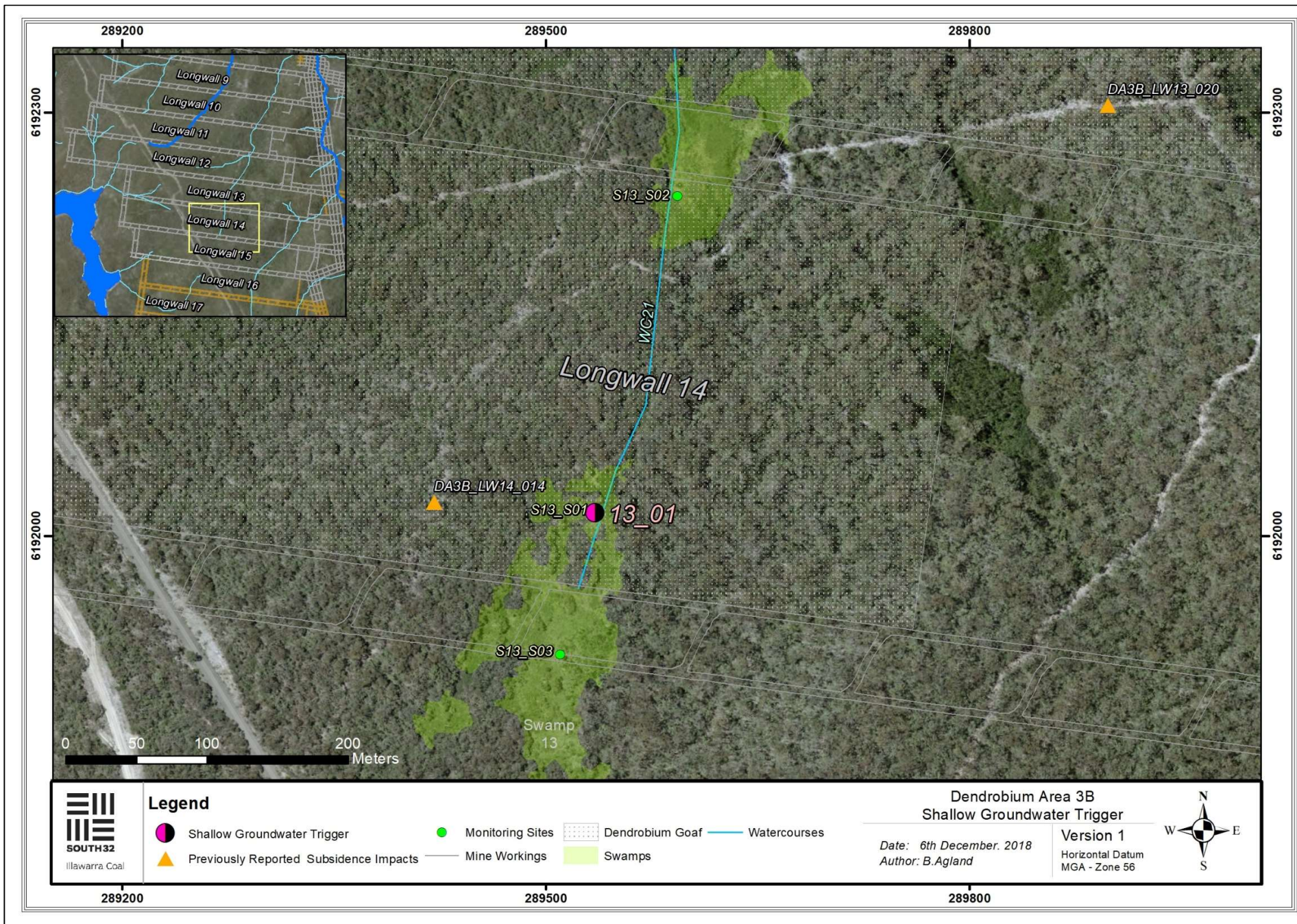


Figure 1: Map showing the latest trigger relevant to DA3B mining operations

Appendix A

Table 1: Extract from Dendrobium Area 3B Watercourse TARP

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences • Donalds Castle Creek - minor environmental consequences • Waterfall WC-WF54 – negligible environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers • 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 • Notify relevant technical specialists and seek advice on any CMA required • Implement agreed CMAs as approved (subject to stakeholder 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> • Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders • Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period • Gas release results in vegetation dieback that does not 	<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

Table 2- Extract from Dendrobium Area 3B Landscape TARP

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<p>AREA 2 Cliffs A2-CL1 (above LW4) Steep Slopes A2-SL1 and A2-SL2 (above LWs 4 & 5) Watercourses A2-WC10 and A2-WC11 (above LW3) A2-WC13 & A2-WC16 (above LWs 4 & 5) Swamp A2-SW1 (above LWs 4 & 5) 4WD Track A2-FT1 (above LWs 4 & 5) 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 Cliffs All mapped cliff sites in subsidence area (Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites) Steep Slopes All mapped steep slopes in subsidence area Refer to Dendrobium Area 3A SMP Figures 19.3 for location of sites Watercourses/ Swamps All mapped watercourse and swamps in subsidence area Refer to Dendrobium Area 3A SMP Figure 19.3 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 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 <u>D_oP_l</u>, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required

Table 3- 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>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 13 began on 4 March 2017 and was completed on 19 April 2018. Extraction of Longwall 14 began on 22 May 2018 and as of 20 January 2019 had progressed approximately 1820m (Figure 1). During the most recent inspection of tributary WC15, carried out on 21 January 2019, subsidence impacts were identified.

DA3B_LW13_035 Update (E290408, N6191915)

Impact DA3B_LW13_035 is located on WC15_Rockbar 21 and was originally identified during Longwall 13 (Figure 1). Additional fracturing with flow diversion was observed on the latest inspection (Photo 1 to 5). The largest fracture is up to 3.7m long, with the widest fracture up to 0.02m wide. Uplifted sections of rock are associated with the fracturing.

DA3B_LW13_035 is now a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 1: Circular fracture and uplift on rockbar. Taken on 21/01/2019.



Photo 2: Fracturing and uplift on rockbar. Taken on 21/01/2019.



Photo 3: Fracturing to rockbar. Taken on 21/01/2019.



Photo 4: Fracturing with flow diversion across small step on rockbar. Taken on 21/01/2019.



Photo 5: Fracturing across rockbar. Taken on 21/01/2019.

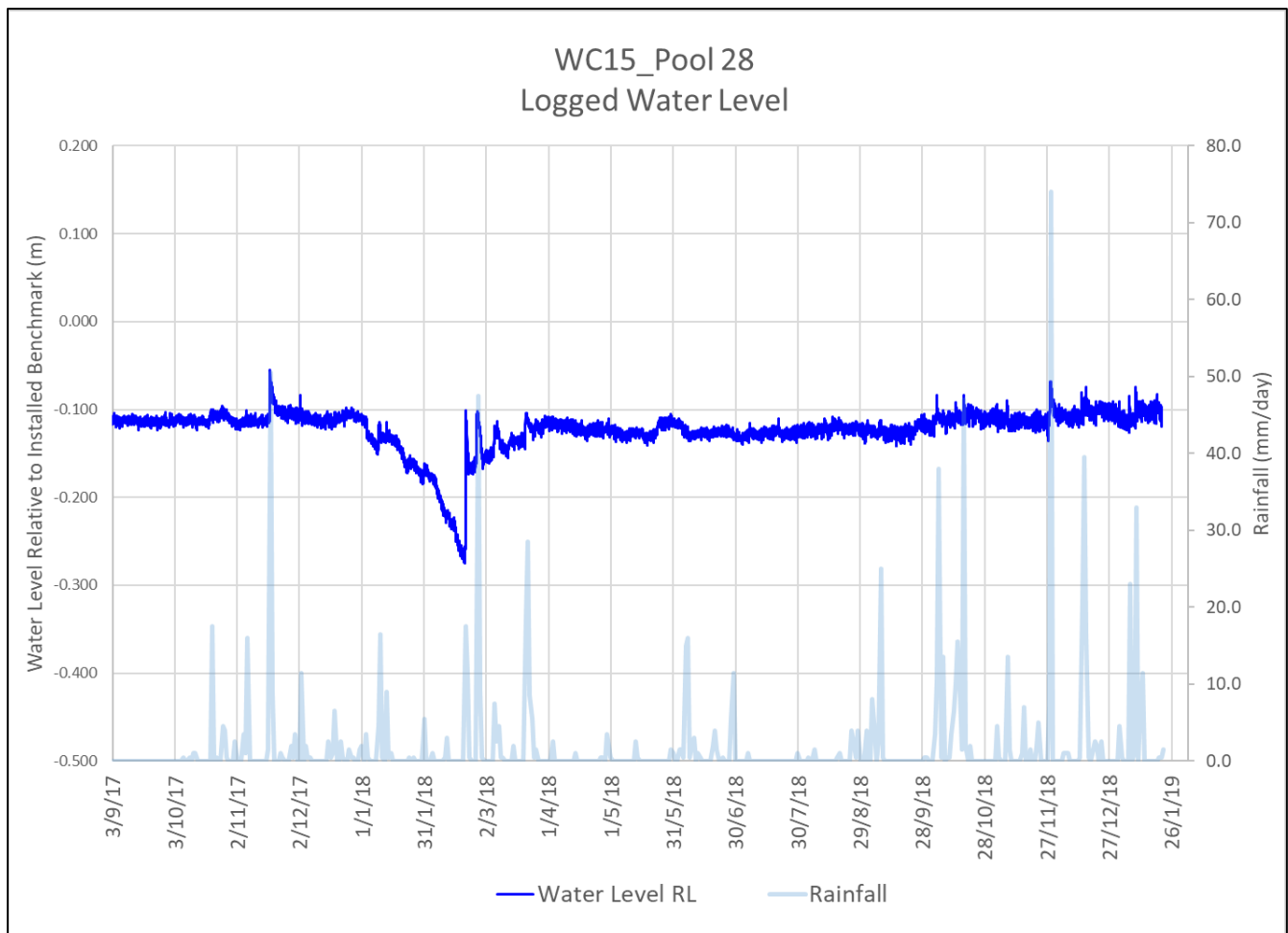
DA3B_LW14_016 (E290345, N6191835)

Impact DA3B_LW14_016 is located on WC15_Rockbar 25 and Step 25 (Figure 1). The impact consists of multiple fractures, uplift and dislodged sections of rock (Photo 6 to 11). The longest fracture is up to 4.0m long and 0.03m wide. Surface flow diversion was recorded at the site during baseline mapping on WC15. While there was no active flow diversion observed through fractures, it is likely diversion would occur during higher flow conditions.

The fracturing is located approximately 30m downstream from monitoring site WC15_Pool 28. The site had a water level logger installed in 2017. Pool water levels at the site to date do not appear to be affected by subsidence movements (Graph 1).

DA3B_LW14_016 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Graph 1: Pool water level results from logger installed at WC15_Pool 28.



Photo 6: Fracturing and dislodged sections of rock extending down step. Taken on 21/01/2019.



Photo 7: Fracturing and dislodged sections of rock extending along rockbar. Taken on 21/01/2019.



Photo 8: Fracturing and uplift on rockbar. Taken on 21/01/2019.



Photo 9: Fracturing at base of step. Taken on 21/01/2019.



Photo 10: Fracturing and dislodged rock segment to incised step. Taken on 21/01/2019.



Photo 11: Fracture to incised step. Taken on 21/01/2019.

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
- Implement agreed CMAs as approved

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

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Dissolved oxygen trigger at Wongawilli Ck (FR6)	16/10/2018
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Conductivity trigger at Wongawilli Ck (FR6)	16/10/2018
S13_01	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_01	16/10/2018
S13_02	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_02	16/10/2018
S13_03	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_03	16/10/2018
DA3B_LW14_014	13/11/2018	LW14	Soil Cracking	Level 1	Soil cracking along access track	16/11/2018
DA3B_LW13_043 (Update)	18/05/2018	LW13	Rock fracturing & Iron Staining	Level 2	Rock fracturing, fragmentation and iron staining to LA4_Step 0	6/12/2018
DA3B_LW14_015	5/12/2018	LW14	Rock fracturing & Rockfall	Level 2	Rockfall and rock fracturing on Lake Avon rock ledge	6/12/2018
13_01	5/12/2018	LW14	Groundwater	Level 3	Shallow groundwater trigger in Swamp 13	6/12/2018
DA3B_LW13_035 (Update)	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21	This report
DA3B_LW14_016	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 25 and Step 25	This report

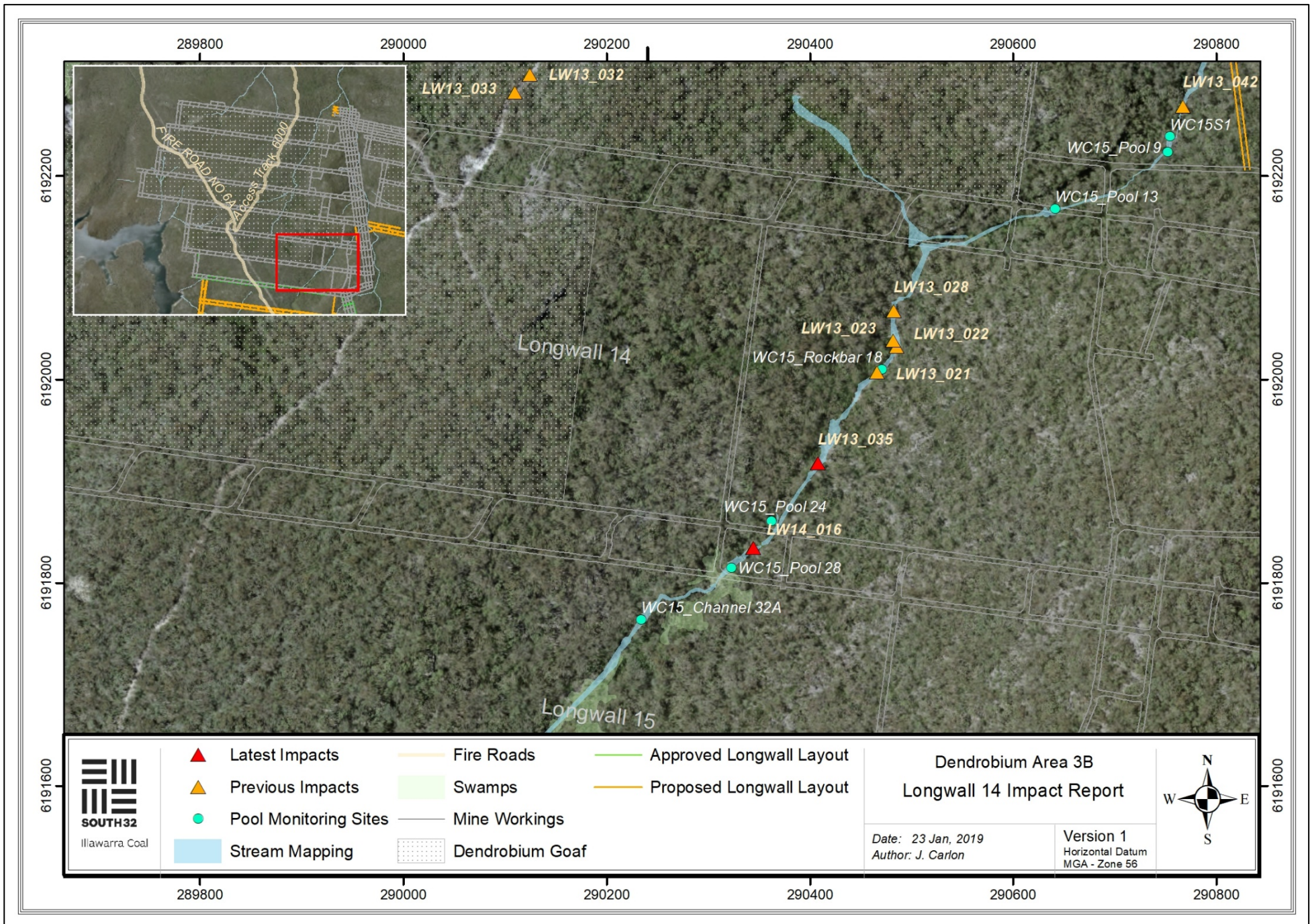


Figure 1: Map showing the latest subsidence impacts and monitoring relevant to DA3B mining operations.

Appendix A

Table 1: Extract from Dendrobium Area 3B Watercourse TARP

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Wongawilli Creek - minor environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers Report in the End of Panel Report Summarise actions and monitoring in AEMR
<ul style="list-style-type: none"> Donalds Castle Creek - minor environmental consequences Waterfall WC-WF54 – negligible environmental consequences 	<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"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Implement agreed CMAs as approved (subject to stakeholder 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"> Actions as stated for Level 2 Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) Implement additional monitoring or increase frequency if required Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period Gas release results in vegetation dieback that does not 	<ul style="list-style-type: none"> Actions as stated for Level 3 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

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on 22 May 2018 and as of 7 February 2019 had progressed approximately 1938m (Figure 1). During an inspection carried out on 11 February 2019 a decrease in pool surface water level was observed in *WC15* and a shallow groundwater trigger was recorded in *Swamp 14*. Additionally, this report includes the results of fracture monitoring on tributary *WC15*.

WC15_Pool 28 (E290323, N6191815)

WC15_Pool 28 is located on *WC15*, a tributary to *Wongawilli Creek*. The pool is situated approximately 47m south east of Longwall 14 (Figure 2 and Graph 1). Recent data and observations show water levels have decreased despite recent rainfall events (Graph 1 and Photos 1-2). No fracturing in the pool or surface flow was observed during the most recent inspection. No surface impacts have been recorded upstream, however rock fracturing was identified 30m downstream on an inspection carried out on 21 January 2019.



Photo 1: *WC15_Pool 28*, looking downstream. Taken 5/02/2019.



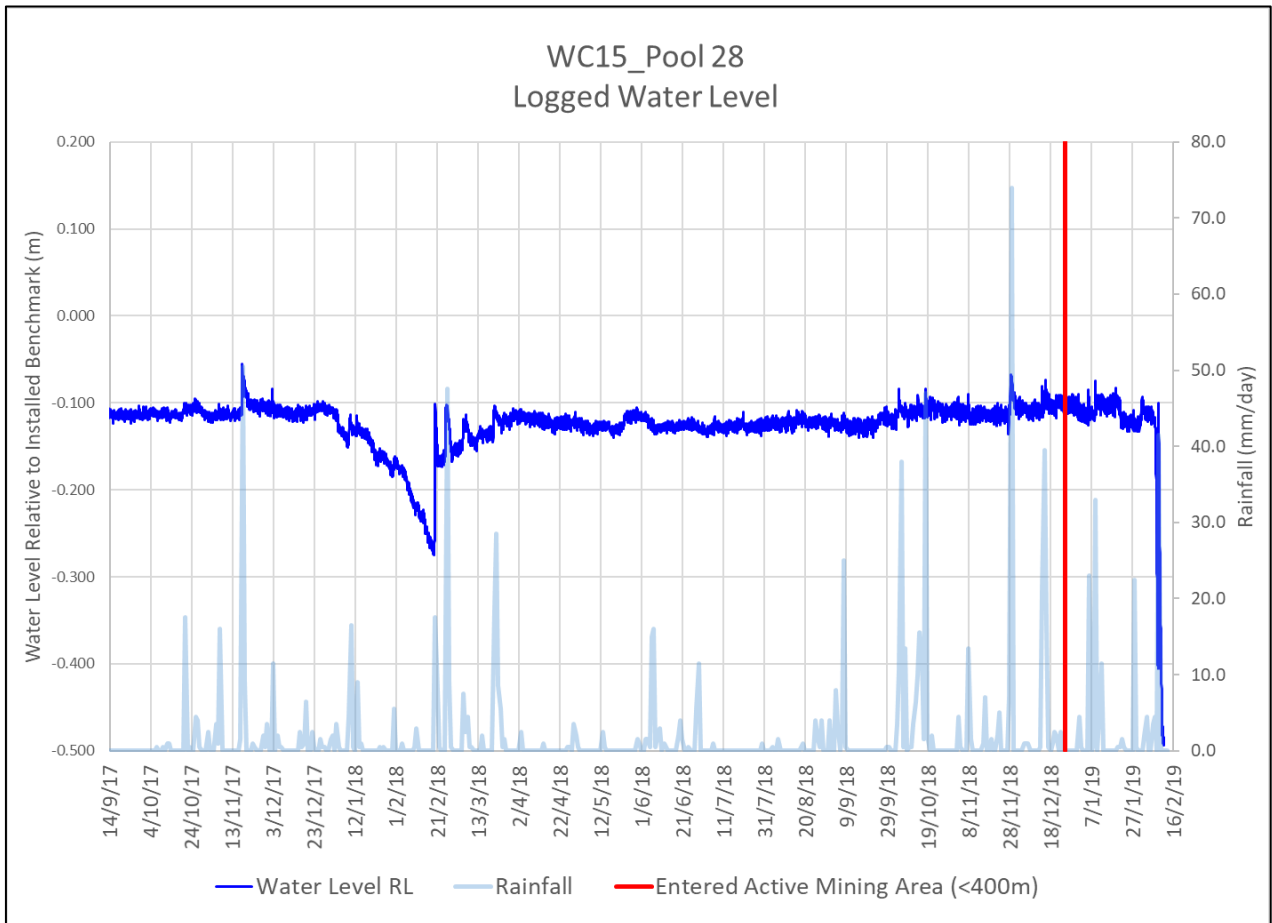
Photo 2: *WC15_Pool 28*, looking downstream. Taken 11/02/2019.



Photo 3: WC15_Pool 28, looking upstream. Taken 5/02/2019.



Photo 4: WC15_Pool 28, looking upstream. Water level logger housing also shown. Taken 11/02/2019.



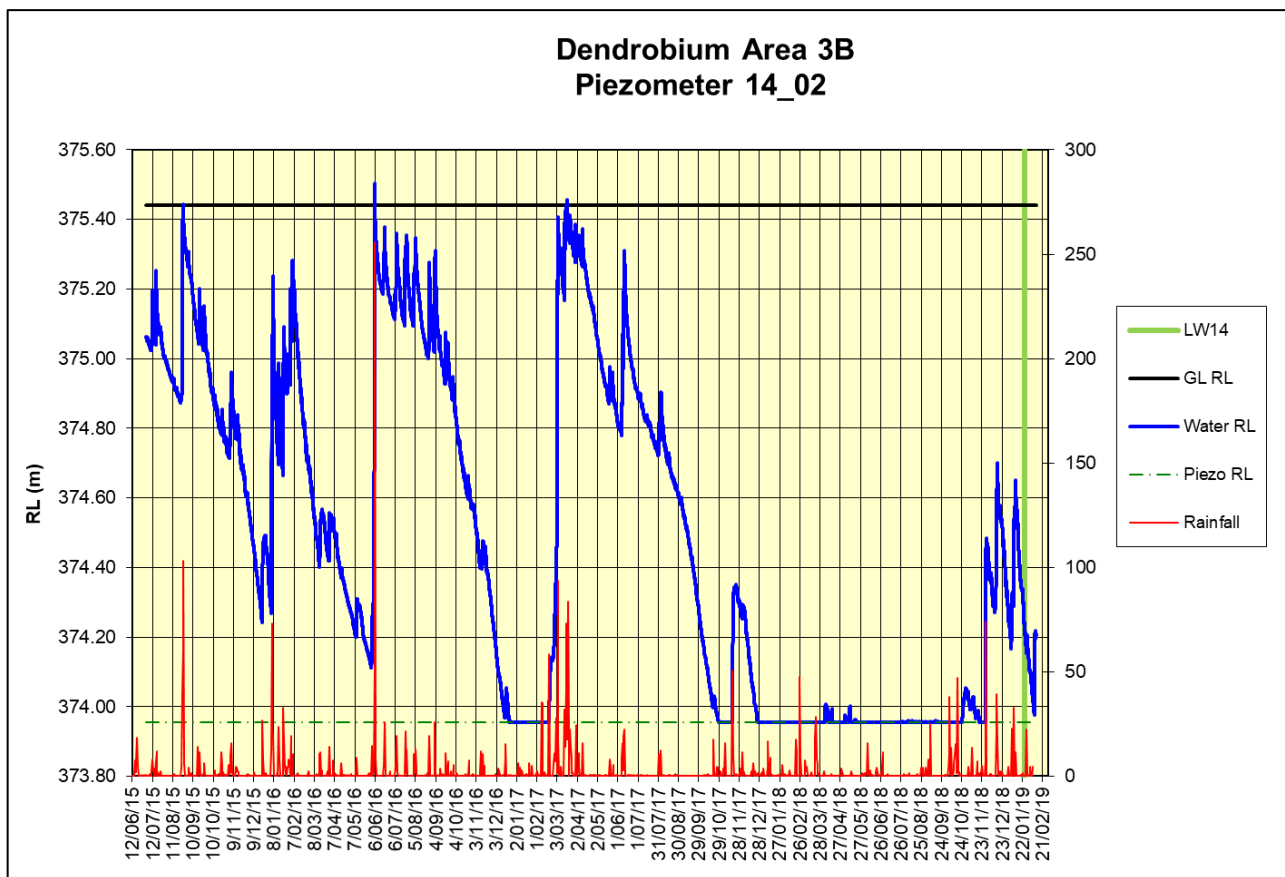
Graph 1: Pool water level results from logger installed at WC15_Pool 28.

Swamp 14

A shallow groundwater trigger was recorded at borehole 14_02 during recent analysis of piezometer data for Swamp 14. A piezometer and logger were installed in a hand augured borehole at 14_02 in July 2015. This site is situated approximately 205m south of Longwall 14 at its closest point (Figure 2). The post-mining rate of water level recession (0.89 mm/hour calculated between 29/01/2019 11:00 and 7/02/2019 14:00) has exceeded the rate recorded before mining (0.64 mm/hour calculated between 9/12/2017 15:00 and 22/12/2017 14:00) (Graph 2).

Groundwater results at 14_02 contribute to a Level 2 trigger according to the Dendrobium Swamps Impacts, Triggers and Response (**Appendix A, Table 1**), specifically:

- Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline period at **50%** of monitoring sites (within 400m of mining) within the swamp



Graph 2: Shallow groundwater levels at 14_02, logged hourly, date range: 2/07/2015 to 11/02/2019

WC15 Crack Monitoring

Crack monitoring devices were installed 9 November 2018 on pre-existing rock fractures resulting from Longwall 13. These devices were installed to measure the movement of fractures resulting from Longwall 14 (Figure 2). Figure 1 outlines the movement of each fracture. Devices dislodged by subsidence movements are represented with a dotted line.

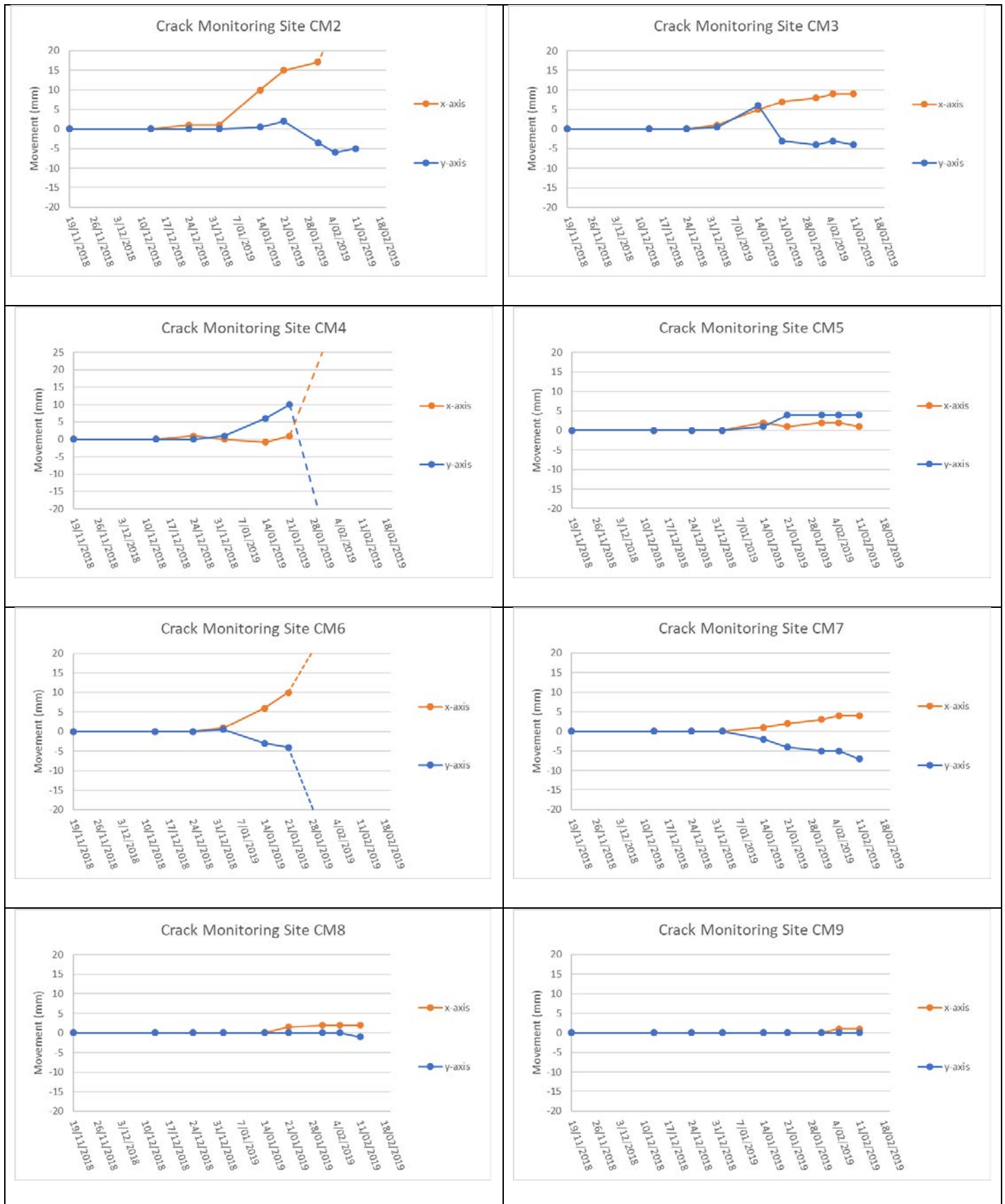


Figure 1: WC15 crack monitoring - crack movements due to Longwall 14. Dotted lines indicate movement past measurable range.

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
- Implement agreed CMAs as approved

Table 1: Recent subsidence impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW13_043 (Update)	18/05/2018	LW13	Rock fracturing & Iron Staining	Level 2	Rock fracturing, fragmentation and iron staining to LA4_Step 0	6/12/2018
DA3B_LW14_015	5/12/2018	LW14	Rock fracturing & Rockfall	Level 2	Rockfall and rock fracturing on Lake Avon rock ledge	6/12/2018
13_01	5/12/2018	LW14	Groundwater	Level 3	Shallow groundwater trigger in Swamp 13	6/12/2018
DA3B_LW13_035 (Update)	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21	24/01/2018
DA3B_LW14_016	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 25 and Step 25	24/01/2018
14_02	12/02/2019	LW14	Groundwater	Level 2	Shallow groundwater trigger in Swamp 14	This Report

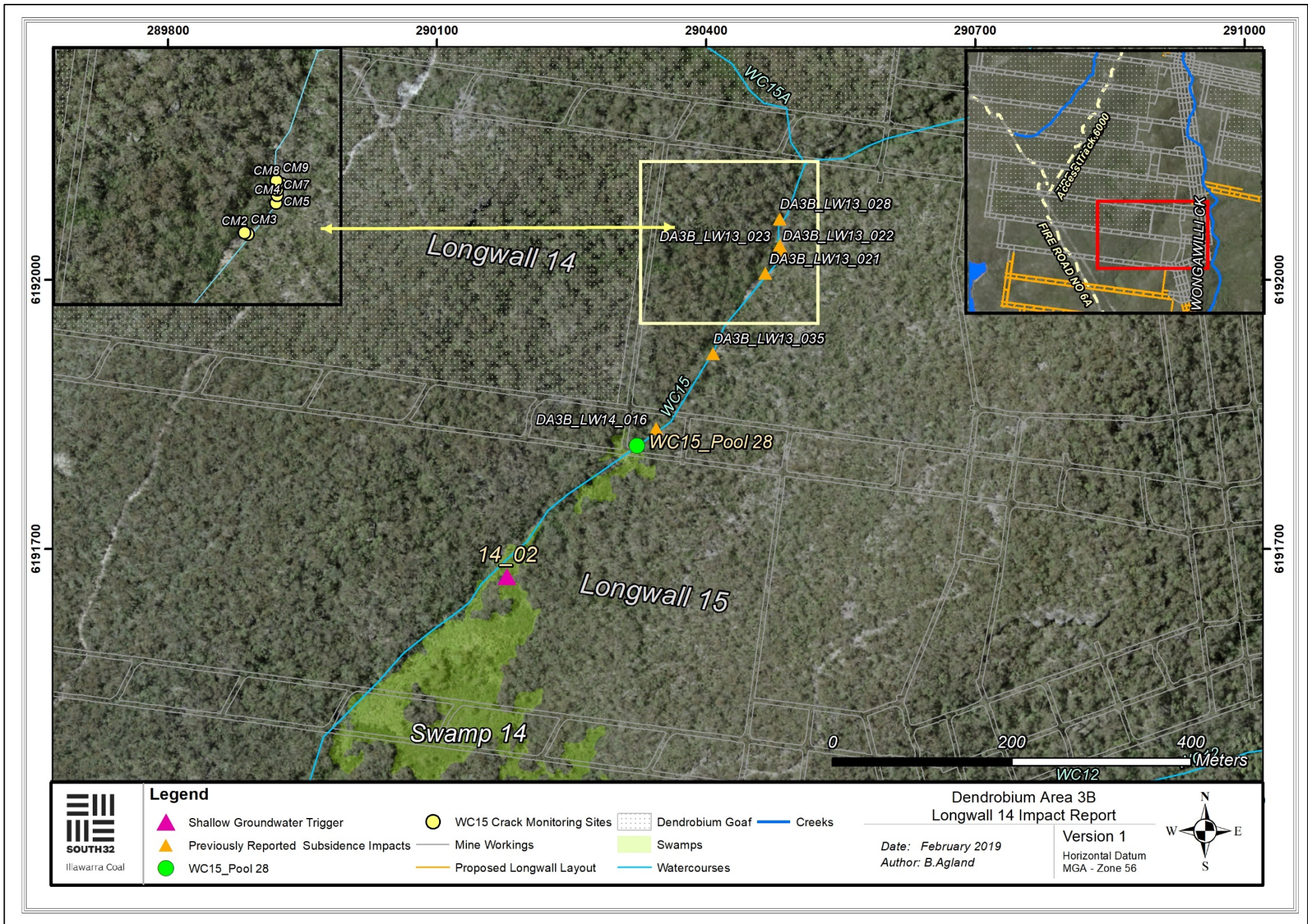


Figure 2: Map showing the latest subsidence impacts and monitoring relevant to DA3B mining operations.

APPENDIX A

Table 1- 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>

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on 22 May 2018 and as of 7 February 2019 had progressed approximately 1938m (Figure 1). During the most recent inspection, carried out 20 February 2019, six new surface impacts were identified.

DA3B_LW14_017 (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 79m south of Longwall 14 at its closest point (Figure 1). The impact is comprised of two rock fractures (Photos 1 and 2). The rock fracturing has a maximum measurable length of 0.8m, a maximum width of 0.025m and a maximum measurable depth of 0.17m. While not evident during the latest inspection, flow diversion would occur if surface flow was present.

DA3B_LW14_017 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 1: *DA3B_LW14_017*, looking at a section of rock fracturing. Taken 20/02/2019.



Photo 2: *DA3B_LW14_017*, looking at a section of rock fracturing. Taken 20/02/2019.

DA3B_LW14_018 (E290282, N6191791)

DA3B_LW14_018 is located on WC15, a tributary to *Wongawilli Creek*. The Impacted feature is WC15_Pool 30 which is situated approximately 73m south of Longwall 14 at its closest point (Figure 1). The impact is comprised of a rock fracture (Photos 3 to 4). The rock fracture has a maximum measurable length of 0.7m, a maximum width of 0.015m and a maximum measurable depth of 0.10m. While not evident during the latest inspection, flow diversion would occur if surface flow was present.

DA3B_LW14_018 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 3: DA3B_LW14_018, looking at the extent of the rock fracturing. Taken 20/02/2019.



Photo 4: DA3B_LW14_018, looking at the width of the fracturing. Taken 20/02/2019.

DA3B_LW14_019 (E290312, N6191805)

DA3B_LW14_019 is located near WC15, a tributary to *Wongawilli Creek*. The Impacted feature is situated approximately 55m south of Longwall 14 at its closest point (Figure 1). The impact is comprised of rock fracturing and uplift (Photos 5 to 8). The rock fracture has a maximum measurable length of 4.5m, a maximum width of 0.05m, a maximum measurable depth of 0.7m.

DA3B_LW14_019 is a Level 1 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 10m length



Photo 5: DA3B_LW14_019, looking at a section of uplift. Taken 20/02/2019.



Photo 6: DA3B_LW14_019, looking at the width of the fracturing. Taken 20/02/2019.



Photo 7: DA3B_LW14_019, looking at a section of rock fracturing. Taken 20/02/2019.



Photo 8: DA3B_LW14_019, looking at a section of rock fracturing. Taken 20/02/2019.

DA3B_LW14_020 (E290334, N6191828)

DA3B_LW14_020 is located on WC15, a tributary to Wongawilli Creek. The Impacted feature is WC15_Rockbar 26 which is situated approximately 40m south east of Longwall 14 at its closest point (Figure 1). The impact is comprised of a rock fracture (Photos 9 and 10). The rock fracture has a maximum measurable length of 1.3m, a maximum width of 0.05m and a maximum measurable depth of 1.13m. While not evident during the latest inspection, flow diversion would occur if surface flow was present.

DA3B_LW14_020 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 9: *DA3B_LW14_020*, looking at the extent of the rock fracturing. Taken 20/02/2019.



Photo 10: *DA3B_LW14_020*, looking at the depth of the fracturing. Taken 20/02/2019.

DA3B_LW14_021 (E290416, N6191943)

DA3B_LW14_021 is located on *WC15*, a tributary to *Wongawilli Creek*. The Impacted features are *WC15_Rockbar 21* and *WC15_Step 21* which are situated approximately 100m east of Longwall 14 at its closest point (Figure 1). The impact is comprised of two rock fractures (Photos 11 and 12). The rock fractures have a maximum measurable length of 1.1m and a maximum width of 0.01m. While not evident during the latest inspection, flow diversion would occur if surface flow was present.

DA3B_LW14_021 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 11: *DA3B_LW14_021*, looking at the section of rock fracturing. Taken 20/02/2019.



Photo 12: *DA3B_LW14_021*, looking at the section of rock fracturing. Taken 20/02/2019.

DA3B_LW14_022 (E290483, N6192052)

DA3B_LW14_022 is located on WC15, a tributary to Wongawilli Creek. The Impacted feature is WC15_Rockbar 18 which is situated approximately 150m east of Longwall 14 at its closest point (Figure 1). The impact is comprised of a rock fracture (Photos 13 and 14). The rock fracture has a maximum measurable length of 2.9m, and a maximum width of 0.05m. While not evident during the latest inspection, flow diversion would occur if surface flow was present.

DA3B_LW14_022 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 9: DA3B_LW14_022, looking at the rock fracturing. Taken 20/02/2019.



Photo 10: DA3B_LW14_022, looking at the rock fracturing. Taken 20/02/2019.

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
- Implement agreed CMAs as approved

Table 1: Recent subsidence impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW13_043 (Update)	18/05/2018	LW13	Rock fracturing & Iron Staining	Level 2	Rock fracturing, fragmentation and iron staining to LA4_Step 0	6/12/2018
DA3B_LW14_015	5/12/2018	LW14	Rock fracturing & Rockfall	Level 2	Rockfall and rock fracturing on Lake Avon rock ledge	6/12/2018
13_01	5/12/2018	LW14	Groundwater	Level 3	Shallow groundwater trigger in Swamp 13	6/12/2018
DA3B_LW13_035 (Update)	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21	24/01/2018
DA3B_LW14_016	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 25 and Step 25	24/01/2018
14_02	12/02/2019	LW14	Groundwater	Level 2	Shallow groundwater trigger in Swamp 14	13/02/2019
DA3B_LW14_017	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Channel 30	This Report
DA3B_LW14_018	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Pool 30	This Report
DA3B_LW14_019	20/02/2019	LW14	Rock Fracturing & Uplift	Level 1	Rock fracturing and uplift to WC15_Rockbar 28	This Report
DA3B_LW14_020	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 26	This Report
DA3B_LW14_021	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21 and WC15_Step 21	This Report
DA3B_LW14_022	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 18	This Report

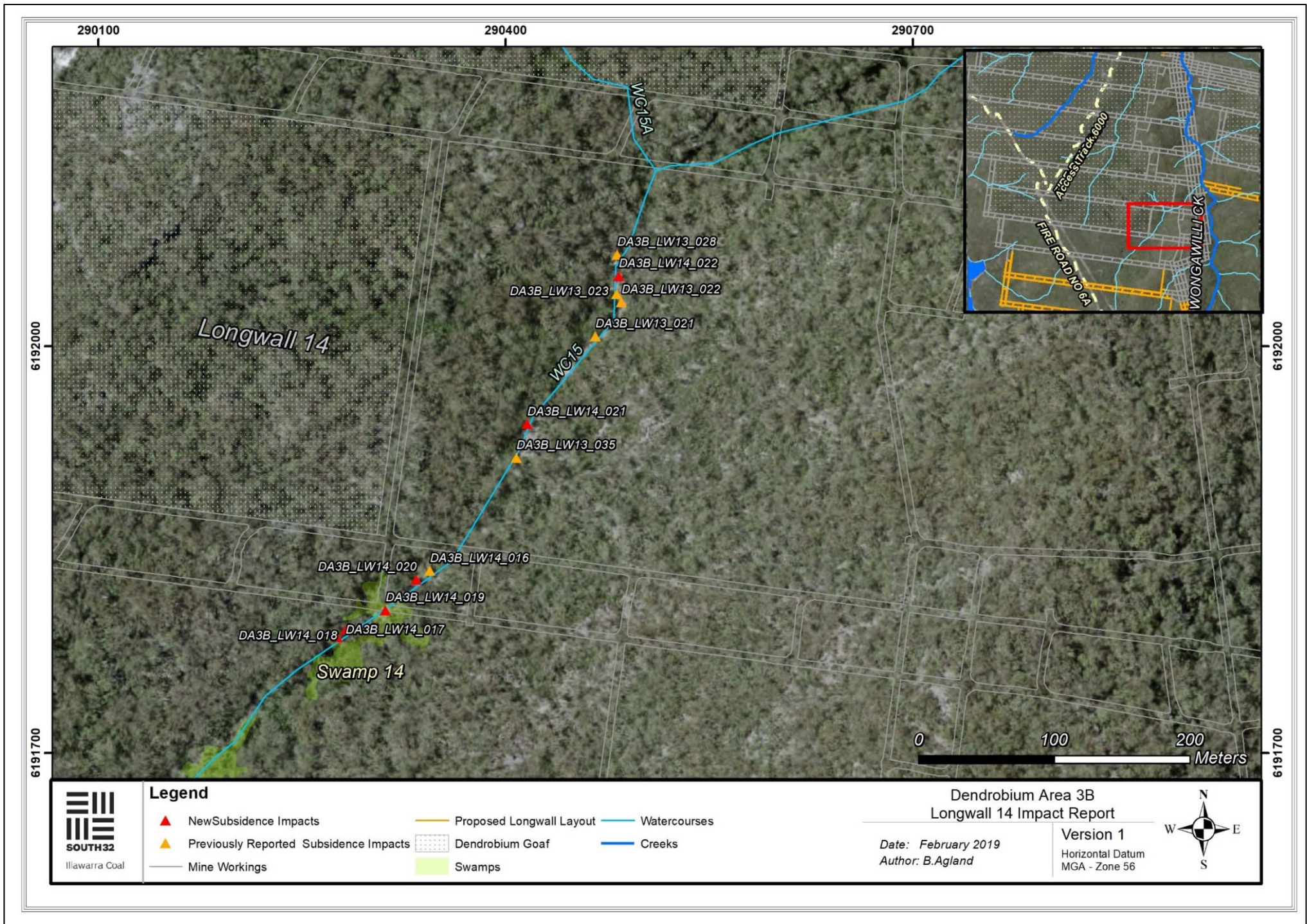


Figure 1: Map showing the latest subsidence impacts and monitoring relevant to DA3B mining operations.

Appendix A

Table 1- Extract from Dendrobium Area 3B Watercourse TARP

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences • Donalds Castle Creek - minor environmental consequences • Waterfall WC-WF54 – negligible environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers • 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 • Notify relevant technical specialists and seek advice on any CMA required • Implement agreed CMAs as approved (subject to stakeholder 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> • Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) • Implement additional monitoring or increase frequency if required • Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders • Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period • Gas release results in vegetation dieback that does not 	<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

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on 22 May 2018 and was completed on 26 February 2019. During the most recent inspection, carried out 1 April 2019, two new surface impact sites were identified. This report also includes an update to a Longwall 13 surface impact.

DA3B_LW14_023 (E290398 N6191907)

DA3B_LW14_023 is located on *WC15*, a tributary to *Wongawilli Creek*. The impacted feature is *WC15_Pool 22* which is situated approximately 75m east of Longwall 14 at its closest point (Figure 1). The impact is comprised of three rock fractures (Photos 1 and 2). The rock fracturing has a maximum measurable length of 0.35m and a maximum width of 0.001m. No flow diversion was observed through the fracturing. Inspection during lower flow conditions should verify this.

DA3B_LW14_023 is a Level 1 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion



Photo 1: *DA3B_LW14_023*, looking at a section of rock fracturing. Taken 01/04/2019.



Photo 2: *DA3B_LW14_023*, looking at a section of rock fracturing. Taken 01/04/2019.

DA3B_LW13_046 (E290887, N6192408)

DA3B_LW13_046 is located on *WC15*, a tributary to *Wongawilli Creek*. The Impacted feature is the base of *WC15_Step 2* which is situated approximately 245m east of Longwall 13 and 590m north-east of Longwall 14 (Figure 1). It is likely that this impact occurred during the extraction of Longwall 13 however has only now become visible due to recent heavy rainfall events (187.5mm between 15 March and 20 March 2019) which has dislodged vegetation and rock fragments. The impact is comprised of a rock fracture and minor rock displacement (Photos 3 to 4). The rock fracture has a maximum measurable length of 1.2m and a maximum width of 0.02m. No flow diversion was evident due to location of the fracture on the step.

DA3B_LW13_046 is a Level 1 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion



Photo 3: *DA3B_LW13_046*, looking at the extent of the rock fracturing. Taken 01/04/2019.



Photo 4: *DA3B_LW13_046*, looking at the section of rock displacement. Taken 01/04/2019.

DA3B_LW13_042 Update (290772 E, 6192286 N)

DA3B_LW13_042 is located on *WC15*, a tributary to *Wongawilli Creek*. The impact site is situated approximately 150m east of Longwall 13 (Figure 1). The impact was first identified on 16 May 2018 during the extraction of Longwall 13. The impact was originally comprised of multiple rock fractures, with associated rock fragmentation and iron staining to *WC15_Rockbar 7*, an incised rockbar. Additional fracturing and rock fragmentation was observed during the most recent inspection (Photos 5 to 8). The new rock fracturing has a maximum measurable length of 0.2m and a maximum width of 0.002m. The largest rock fragment has a length of 0.8m, width of 0.65m and height of 0.1m. Recent heavy rainfall events (187.5mm between 15 March and 20 March 2019) have cleared vegetation and debris which has allowed the new fractures to be identified. Additionally, the rainfall events have likely caused dislodgement of the new rock fragments and transport downstream (Photo 9).

DA3B_LW13_042 is a Level 2 trigger as per the Dendrobium Area 3B Watercourse TARP (Appendix A: Table 1), specifically:

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



Photo 5: DA3B_LW13_042, looking at the largest section of rock dislodgement. Taken 01/04/2019.



Photo 6: DA3B_LW13_042, looking at largest section of rock fragmentation. Taken 01/04/2019.



Photo 7: DA3B_LW13_042, looking at a section of new rock fracturing. Taken 01/04/2019.



Photo 8: DA3B_LW13_042, looking at a section of new rock fracturing. Taken 01/04/2019.



Photo 9: DA3B_LW13_042, higher level view of the impact site. Looking at the area of rock dislodgement and transport downstream. Taken 01/04/2019.

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
- Implement agreed CMAs as approved

Table 1: Recent subsidence impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_017	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Channel 30	21/02/2019
DA3B_LW14_018	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Pool 30	21/02/2019
DA3B_LW14_019	20/02/2019	LW14	Rock Fracturing & Uplift	Level 1	Rock fracturing and uplift to WC15_Rockbar 28	21/02/2019
DA3B_LW14_020	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 26	21/02/2019
DA3B_LW14_021	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21 and WC15_Step 21	21/02/2019
DA3B_LW14_022	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 18	21/02/2019
Donalds Castle Ck (FR6)	25/03/2019	LW14	Water Quality	Level 3	Electrical Conductivity Trigger	28/03/2019
DA3B_LW14_023	1/04/2019	LW14	Rock Fracturing	Level 1	Rock fracturing to the base of WC15_Pool 22	This Report
DA3B_LW13_046	1/04/2019	LW13	Rock Fracturing	Level 1	Rock fracturing to the base of WC15_Step 2	This Report
DA3B_LW13_042 (Update)	16/05/2018 1/04/2019	LW13	Rock Fracturing & Fragmentation	Level 2	Rock fracturing, displacement and Iron staining to WC15_Rockbar 7	This Report

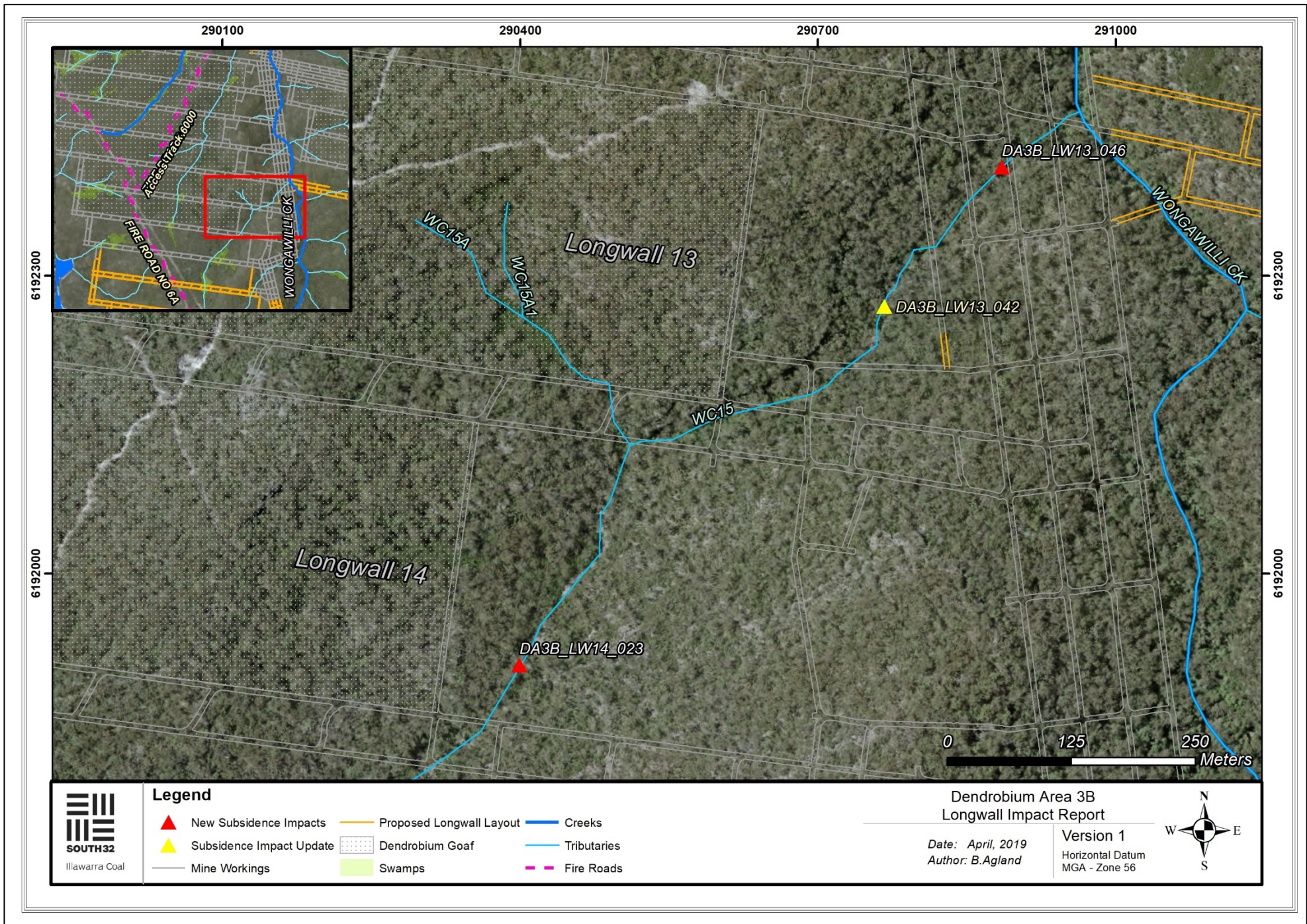


Figure 1: Map showing the latest subsidence impacts and monitoring relevant to DA3B mining operations.

Table 1- Extract from Dendrobium Area 3B Watercourse TARP

Monitoring	Trigger	Action
OBSERVATIONAL, PHOTO POINT AND WATER MONITORING		
<p>Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, 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>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Wongawilli Creek - minor environmental consequences Donalds Castle Creek - minor environmental consequences Waterfall WC-WF54 – negligible environmental consequences 	<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 OEH, DoPE, T&I, Water NSW and other relevant resource managers 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"> Actions as stated for Level 1 Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Implement agreed CMAs as approved (subject to stakeholder 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"> Actions as stated for Level 2 Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) Implement additional monitoring or increase frequency if required Develop site CMA (subject to stakeholder feedback). This may include: grouting of rockbar and bedrock base of any significant pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 stakeholders
	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> Structural integrity of the bedrock base of any significant pool or controlling rockbar cannot be restored i.e. pool water level within the pool after CMAs continues to be lower than baseline period Gas release results in vegetation dieback that does not 	<ul style="list-style-type: none"> Actions as stated for Level 3 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

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began 22 May 2018 and was completed 26 February 2019. During the most recent inspection, carried out 9 April 2019, two new surface impact sites were identified.

DA3B_LW14_024 (E290133, N6191978)

DA3B_LW14_024 is located at SLMP site 'A3b-SS9-Pt2' which is a steep slope/step approximately 100m in length with some overhanging sections. The site is situated between tributary *WC15* and *Fire Road 6P* and was mined under by Longwall 14 on 16 January 2019 (Figure 1). Access to the site was restricted during mining due to site safety concerns. The impact is comprised of a small rockfall, multiple rock fractures and soil cracking (Photos 1 to 4). The rock fracturing has a maximum measurable length of 3m, a maximum width of 0.04m and a maximum measurable depth of 0.21m. The largest fragment resulting from the rockfall has a length of 0.41m, a width of 0.20m and a height of 0.07m. The soil cracking has a maximum measurable length of 1m, a maximum width of 0.01m and a maximum measurable depth of 0.14m.

DA3B_LW14_024 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

- Crack or fracture up to 100m 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 1: *DA3B_LW14_024*, looking at a section of rock fracturing. Taken 09/04/2019.



Photo 2: *DA3B_LW14_024*, looking at the depth of rock fracturing. Taken 09/04/2019.



Photo 3: DA3B_LW14_024, looking at the area of the rockfall. Taken 09/04/2019.



Photo 4: DA3B_LW14_024, looking at a section of soil cracking. Taken 09/04/2019.

DA3B_LW14_025 (E290115, N6192041)

DA3B_LW14_025 is located at a steep slope/ step between tributary WC15 and Fire Road 6P (Figure 1). The site was undermined by Longwall 14 12 January 2019. Access to the site was restricted during mining due to site safety concerns. The impact is comprised of rock fracturing and rock displacement (Photos 5 to 8). The rock fracturing has a maximum measurable length 5.15m, a maximum width of 0.015m and a maximum measurable depth of 0.4m. The largest rock fragment resulting from the displacement has a length of 0.20m, width of 0.04m and height of 0.15m.

DA3B_LW14_025 is a Level 1 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

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



Photo 5: DA3B_LW14_025, looking at a section of the rock fracturing. Taken 09/04/2019.



Photo 6: DA3B_LW14_025, looking at the width of the rock fracturing. Taken 09/04/2019.



Photo 7: *DA3B_LW14_025*, looking at a section of the rock fracturing and displacement. Taken 09/04/2019.



Photo 8: *DA3B_LW14_025*, looking at a section of the rock fracturing. Taken 09/04/2019.

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 impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_017	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Channel 30	21/02/2019
DA3B_LW14_018	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Pool 30	21/02/2019
DA3B_LW14_019	20/02/2019	LW14	Rock Fracturing & Uplift	Level 1	Rock fracturing and uplift to WC15_Rockbar 28	21/02/2019
DA3B_LW14_020	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 26	21/02/2019
DA3B_LW14_021	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21 and WC15_Step 21	21/02/2019
DA3B_LW14_022	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 18	21/02/2019
Donalds Castle Ck (FR6)	25/03/2019	LW14	Water Quality	Level 3	Electrical Conductivity Trigger	28/03/2019
DA3B_LW14_023	1/04/2019	LW14	Rock Fracturing	Level 1	Rock fracturing to the base of WC15_Pool 22	03/04/2019
DA3B_LW13_046	1/04/2019	LW13	Rock Fracturing	Level 1	Rock fracturing to the base of WC15_Step 2	03/04/2019
DA3B_LW13_042 (Update)	16/05/2018 1/04/2019	LW13	Rock Fracturing & Fragmentation	Level 2	Rock fracturing, displacement and Iron staining to WC15_Rockbar 7	03/04/2019
DA3B_LW14_024	9/04/2019	LW14	Rock Fracturing, Rockfall & Soil Cracking	Level 1	Rock fracturing, rockfall and soil cracking at SLMMP site 'A3b-SS9-Pl2'	This Report
DA3B_LW14_025	9/04/2019	LW14	Rock Fracturing & Displacement	Level 1	Rock fracturing and displacement at a steep slope/ step between WC15 and Fire road 6P	This Report

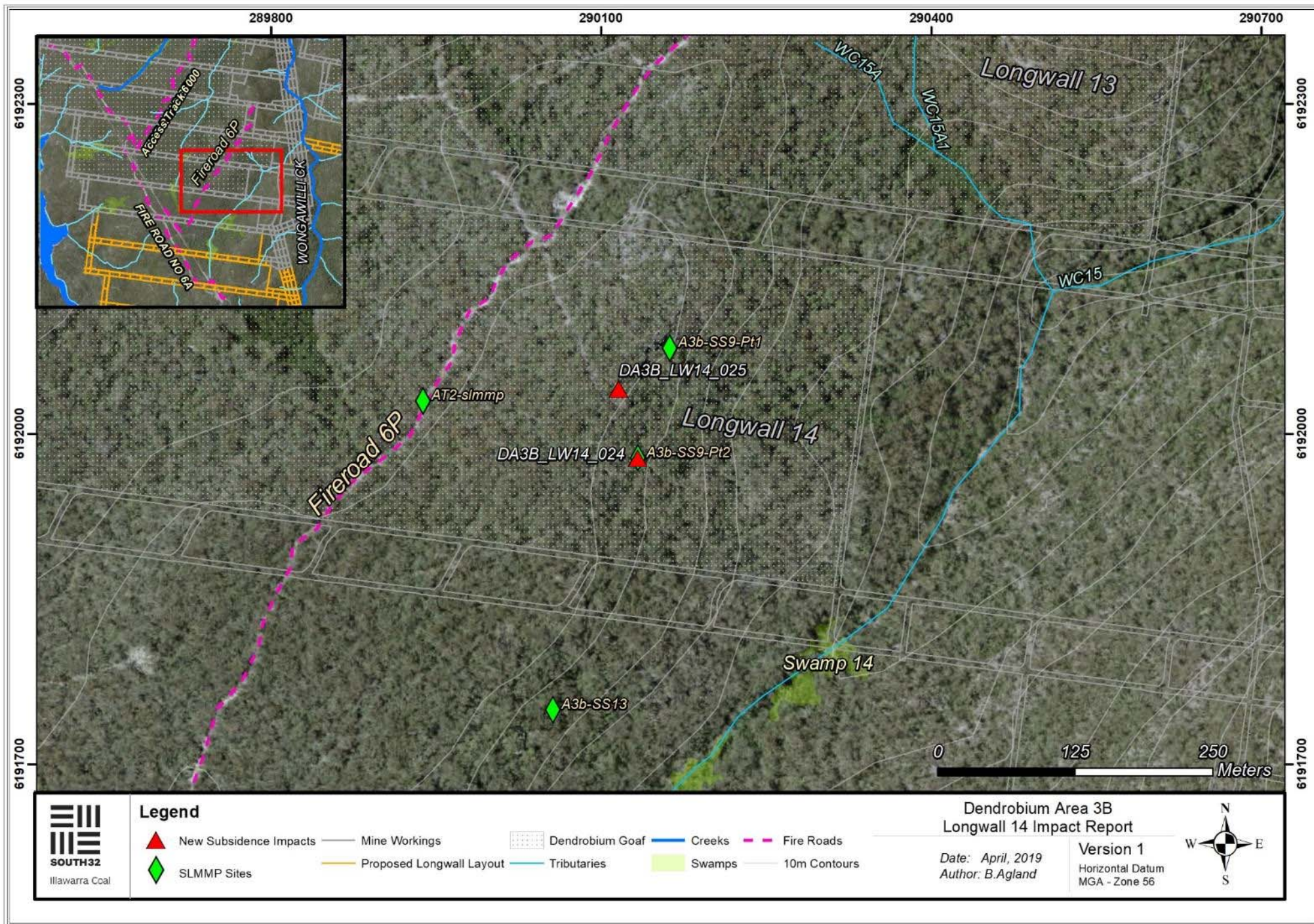


Figure 1: Map showing the latest subsidence impacts and DA3B mining operations.

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 <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"> 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 <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"> 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>
Sandy Creek Waterfall	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Rock fall at Sandy Creek Waterfall or from its overhang • Structural integrity of the waterfall, its overhang and its pool are impacted • More than negligible cracking within 30 m of the waterfall • More than negligible diversion of water from the lip of the waterfall 	<ul style="list-style-type: none"> • Actions as stated for Level 3 • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on 22 May 2018 and was completed on 26 February 2019. During the most recent inspection, carried out on 10 May 2019, three new surface impact sites were identified.

DA3B_LW14_026 (E290101, N6191958)

DA3B_LW14_026 is located at a steep slope/step between tributary *WC15* and *Fire Road 6P* (Figure 1). The site was undermined by Longwall 14 on 12 January 2019. Access to the site was restricted during mining due to safety concerns. The impact is comprised of rock fracturing and rock movement (Photo 1 to 3). The movement between the rock and soil has resulted in a fracture with a maximum measurable length of 22m, a maximum width of 0.13m and a measurable depth of less than 5m.

DA3B_LW14_026 is a Level 2 trigger as per the Dendrobium Area 3B Landscape TARP (Appendix A: Table 1), specifically:

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

The fracturing and displacement appear stable and the site will be monitored for any further changes.



Photo 1: *DA3B_LW14_026*, looking at the width of the fracturing. Taken 10/05/2019.



Photo 2: DA3B_LW14_026, section of rock fracturing and displacement. Taken 10/05/2019.



Photo 3: DA3B_LW14_026, looking at a section of displacement. Taken 10/05/2019.

DA3B_LW14_027 (E290238, N6191984)

DA3B_LW14_027 is located on a rock outcrop beneath an overhang, situated over Longwall 14 (Figure 1). The impact is comprised of two rock fractures with the largest having a maximum measurable length of 1m, and a maximum width of 0.03m (Photo 4 and 5). The fracturing is located within the back wall of Aboriginal heritage *Site 1-DB1*. The site comprises a sandstone shelter containing art. The shelter is 4.5m in length, 2m wide, 1.2m. The art is not directly impacted by the fracture, which is contained to the underlying, disconnected rock. The site was undermined by Longwall 14 on 28 January 2019. Access to the site was restricted during mining due to safety concerns.

DA3B_LW14_027 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.

Cultural heritage site *Site 1 – DB1* has been assessed by an archaeologist and further details and assessment will be included in the Longwall 14 End of Panel Report.



Photo 4: DA3B_LW14_027, looking at a section of rock fracturing. Taken 10/05/2019.



Photo 5: DA3B_LW14_027, looking at a section of rock fracturing. Taken 10/05/2019.

DA3B_LW14_028 (E290103, N6192021)

DA3B_LW14_028 is situated at a sandstone outcrop between tributary WC15 and Fire Road 6P (Figure 1). The site was undermined by Longwall 14 on 11 January 2019. The impact is comprised of two rock fractures with the largest having a maximum measurable length of 0.75m, and a maximum width of 0.015m (Photo 6 and 7).

DA3B_LW14_028 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_LW14_028, looking at a section of rock fracturing. Taken 10/05/2019.



Photo 7: DA3B_LW14_028, looking at a section of rock fracturing. Taken 10/05/2019.

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

Table 1: Recent subsidence impacts and triggers. Highlighted row indicates impact featured in this report.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_023	1/04/2019	LW14	Rock Fracturing	Level 1	Rock fracturing to the base of <i>WC15_Pool 22</i>	03/04/2019
DA3B_LW13_046	1/04/2019	LW13	Rock Fracturing	Level 1	Rock fracturing to the base of <i>WC15_Step 2</i>	03/04/2019
DA3B_LW13_042 (Update)	16/05/2018 1/04/2019	LW13	Rock Fracturing & Fragmentation	Level 2	Rock fracturing, displacement and Iron staining to <i>WC15_Rockbar 7</i>	03/04/2019
DA3B_LW14_024	9/04/2019	LW14	Rock Fracturing, Rockfall & Soil Cracking	Level 1	Rock fracturing, rockfall and soil cracking at SLMMP site 'A3b-SS9-P12'	10/04/2019
DA3B_LW14_025	9/04/2019	LW14	Rock Fracturing & Displacement	Level 1	Rock fracturing and displacement at a steep slope/ step between <i>WC15</i> and <i>Fire road 6P</i>	10/04/2019
DA3B_LW14_026	10/05/2019	LW14	Rock Fracturing & Movement	Level 2	Rock fracturing and displacement at a steep slope/step between <i>WC15</i> and <i>Fire road 6P</i>	This Report
DA3B_LW14_027	10/05/2019	LW14	Rock Fracturing	Level 1	Rock fracturing at cultural heritage site 'Site 1 – DB 1'	This Report
DA3B_LW14_028	10/05/2019	LW14	Rock Fracturing	Level 1	Rock fracturing at sandstone outcrop between <i>WC15</i> and <i>Fire road 6P</i>	This Report

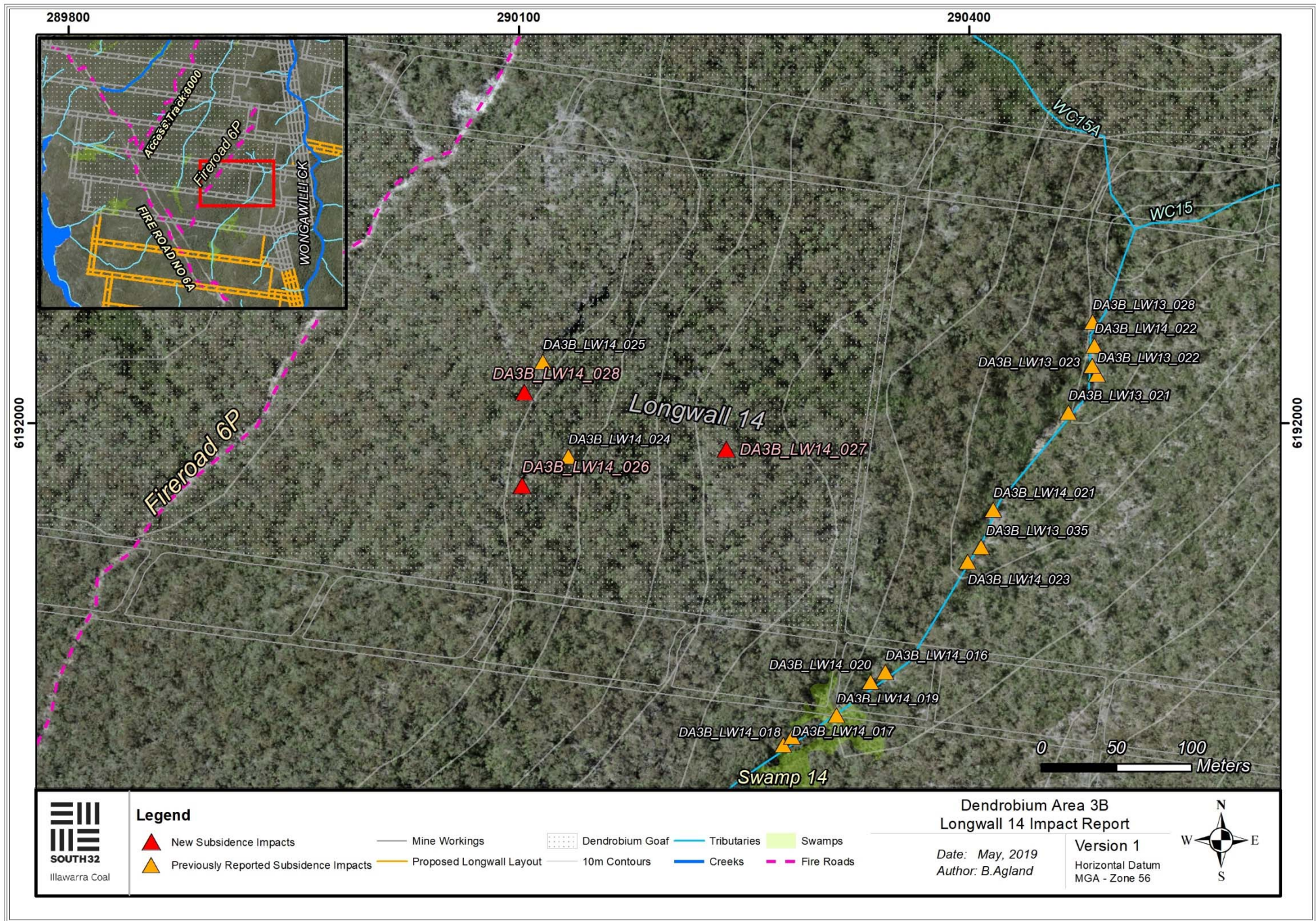


Figure 1: Map showing the latest subsidence impacts and DA3B mining operations.

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 <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"> 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 <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"> 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>
Sandy Creek Waterfall	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Rock fall at Sandy Creek Waterfall or from its overhang • Structural integrity of the waterfall, its overhang and its pool are impacted • More than negligible cracking within 30 m of the waterfall • More than negligible diversion of water from the lip of the waterfall 	<ul style="list-style-type: none"> • Actions as stated for Level 3 • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation

Monitoring of watercourses, swamps and landscape features is undertaken to identify subsidence impacts. These features are monitored by the Illawarra Coal Environmental Field Team (ICEFT) 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 14 began on the 22nd May 2018 and was completed on the 26th February 2019. During recent inspections of *Donalds Castle Creek*, a water quality trigger was identified.

Donalds Castle Ck (FR6)

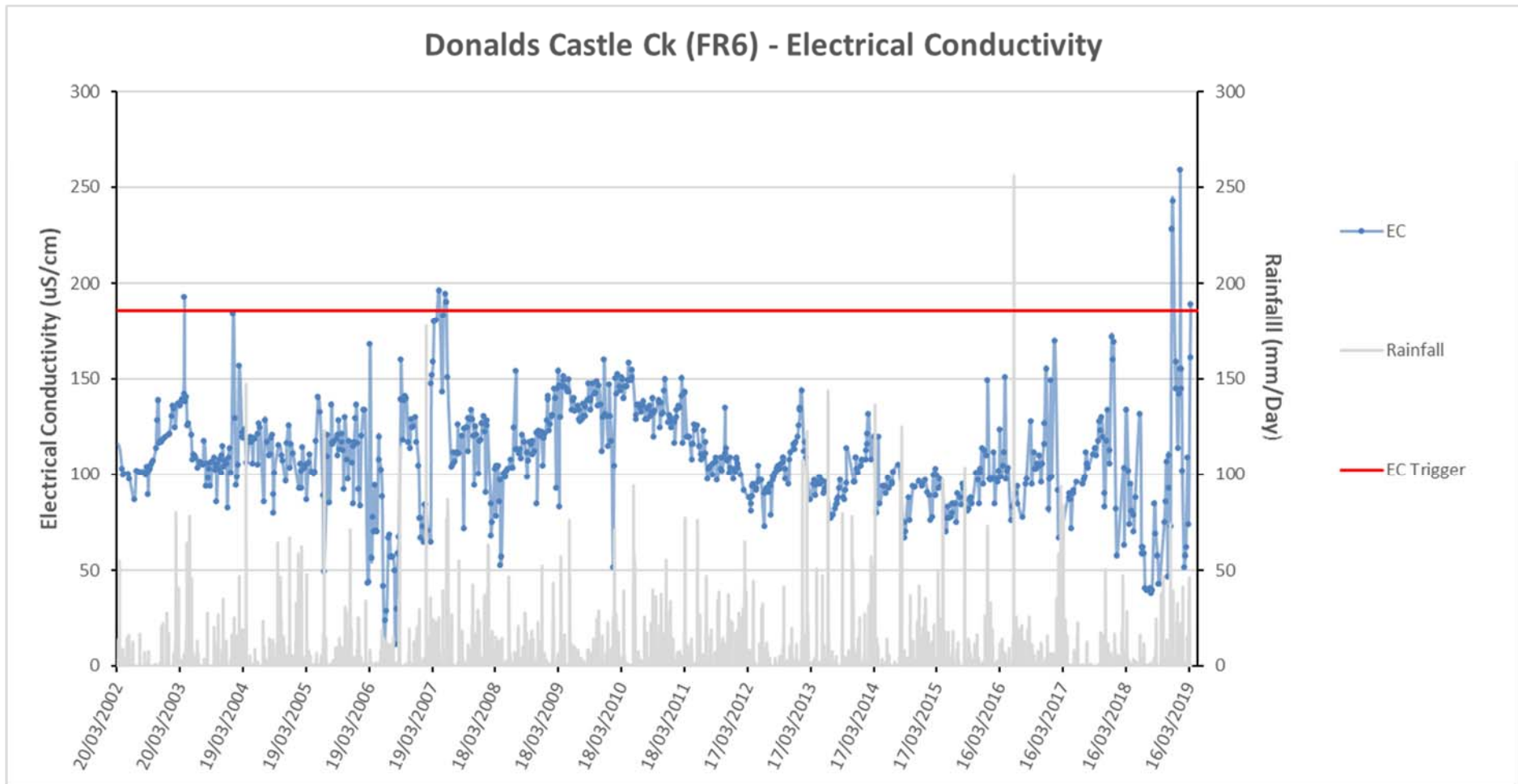
Donalds Castle Ck (FR6) is a water quality monitoring site approximately 1.4km downstream from DA3B (Figure 1). Water quality triggers for Electrical Conductivity (EC) were identified during recent inspections of the site. EC values on 6 December 2018, 10 December 2018, 23 January 2019 and 25 March 2019 exceeded the 185.8 $\mu\text{S}/\text{cm}$ trigger level for EC (Graph 1). EC values exceeding the trigger level have been recorded during the baseline monitoring period (Graph 1).

No surface flow was present at *Donalds Castle Ck (FR6)* during three of the inspections where EC triggers were recorded (Photos 1 to Photo 6). An absence in surface flow can result in an increase in EC due to evaporation and resultant increase in salt concentration in the pool. The latest inspection where EC was above the trigger level was associated with surface flow present at the site, following heavy rainfall in the preceding week.

This water quality observation contributes to a Level 3 Trigger according to the Dendrobium Area 3B Watercourse Impacts, Triggers and Response 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 during the monitoring period:
 - pH <3.60
 - **EC >185.8 $\mu\text{S}/\text{cm}$**
 - DO <40.1%

This water quality observation will be assessed in the specialist Surface Water and Shallow Groundwater Assessment (underway) for the Longwall14 End of Panel Report.



Graph 1: Electrical Conductivity recorded at site *Donalds Castle Ck (FR6)*, downstream from DA3B operations.



Photo 1: *Donalds Castle Ck (FR6)*, looking upstream. Taken 6/12/2018



Photo 2: *Donalds Castle Ck (FR6)*, looking downstream. Taken 6/12/2018



Photo 3: *Donalds Castle Ck (FR6)*, looking upstream. Taken 10/12/2018



Photo 4: *Donalds Castle Ck (FR6)*, looking downstream. Taken 10/12/2018



Photo 5: *Donalds Castle Ck (FR6)*, looking downstream. Taken 23/01/2019



Photo 6: *Donalds Castle Ck (FR6)*, looking downstream. Taken 23/01/2019



Photo 7: *Donalds Castle Ck (FR6)*, looking downstream. Taken 25/03/2019



Photo 8: *Donalds Castle Ck (FR6)*, looking downstream. Taken 25/03/2019

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
- Implement agreed CMAs as approved

Table 1: Recent impacts and triggers recorded during Longwall 14, Dendrobium Area 3B. Highlighted rows indicate latest triggers.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW13_035 (Update)	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21	24/01/2018
DA3B_LW14_016	21/01/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 25 and Step 25	24/01/2018
14_02	12/02/2019	LW14	Groundwater	Level 2	Shallow groundwater trigger in Swamp 14	13/02/2019
DA3B_LW14_017	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Channel 30	21/02/2019
DA3B_LW14_018	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Pool 30	21/02/2019
DA3B_LW14_019	20/02/2019	LW14	Rock Fracturing & Uplift	Level 1	Rock fracturing and uplift to WC15_Rockbar 28	21/02/2019
DA3B_LW14_020	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 26	21/02/2019
DA3B_LW14_021	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 21 and WC15_Step 21	21/02/2019
DA3B_LW14_022	20/02/2019	LW14	Rock Fracturing	Level 2	Rock fracturing to WC15_Rockbar 18	21/02/2019
Donalds Castle Ck (FR6)	25/03/2019	LW14	Water Quality	Level 3	Electrical Conductivity Trigger	This Report



Figure 1: Donalds Castle Creek and Dendrobium Area 3B mining operations.

Appendix A

Table 2- Extract from Dendrobium Area 3B Watercourse Impact Monitoring Management and Contingency Plan TARP

Monitoring	Trigger	Action
<p>Donalds Castle Creek</p> <p>Donalds Castle Ck (FR6)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> • pH 5.41 • EC 116.0 $\mu\text{S}/\text{cm}$ • DO 85.6% <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Donalds Castle Creek - minor environmental consequences 	<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 during the monitoring period: <ul style="list-style-type: none"> - pH 3.60 - EC 185.8 $\mu\text{S}/\text{cm}$ - DO 40.1% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to OEH, DoPE, T&I, Water NSW and other relevant resource managers • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2 *</p> <ul style="list-style-type: none"> • Two exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean during the monitoring period: <ul style="list-style-type: none"> - pH 3.60 - EC 185.8 $\mu\text{S}/\text{cm}$ - DO 40.1% 	<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 • Implement agreed CMAs as approved (subject to stakeholder 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 during the monitoring period: <ul style="list-style-type: none"> - pH 3.60 - EC 185.8 $\mu\text{S}/\text{cm}$ - DO 40.1% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 2</i> • Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key stakeholders • 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 stakeholder feedback). This may include: <ul style="list-style-type: none"> - Limestone emplacement to raise pH where it is appropriate to do so - Grouting of fractures in rockbar and bedrock base of any significant pool where flow diversion results in pool water level lower than baseline period • Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I and Water NSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success

Monitoring	Trigger	Action
	<p data-bbox="689 185 936 209">Exceeding Prediction</p> <ul data-bbox="689 233 1294 440" style="list-style-type: none"> <li data-bbox="689 233 1294 336">• Mining results in two consecutive exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean during the monitoring period: <ul data-bbox="734 344 954 440" style="list-style-type: none"> <li data-bbox="734 344 864 368">– pH 3.60 <li data-bbox="734 376 954 400">– EC 185.8 $\mu\text{S}/\text{cm}$ <li data-bbox="734 408 887 432">– DO 40.1% 	<ul data-bbox="1328 185 1973 392" style="list-style-type: none"> <li data-bbox="1328 185 1648 209">• <i>Actions as stated for Level 3</i> <li data-bbox="1328 217 1760 240">• Investigate reasons for the exceedance <li data-bbox="1328 248 1928 304">• Update future predictions based on the outcomes of the investigation <li data-bbox="1328 312 1973 392">• 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 Coal Environmental Field Team (ICEFT) 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 14 began 22nd May 2018 and as of 14th October 2018 had progressed approximately 1063m (Figure 1). During the latest inspection of Wongawilli Creek, two water quality triggers were identified. Soil moisture triggers for Swamp 13 were also identified.

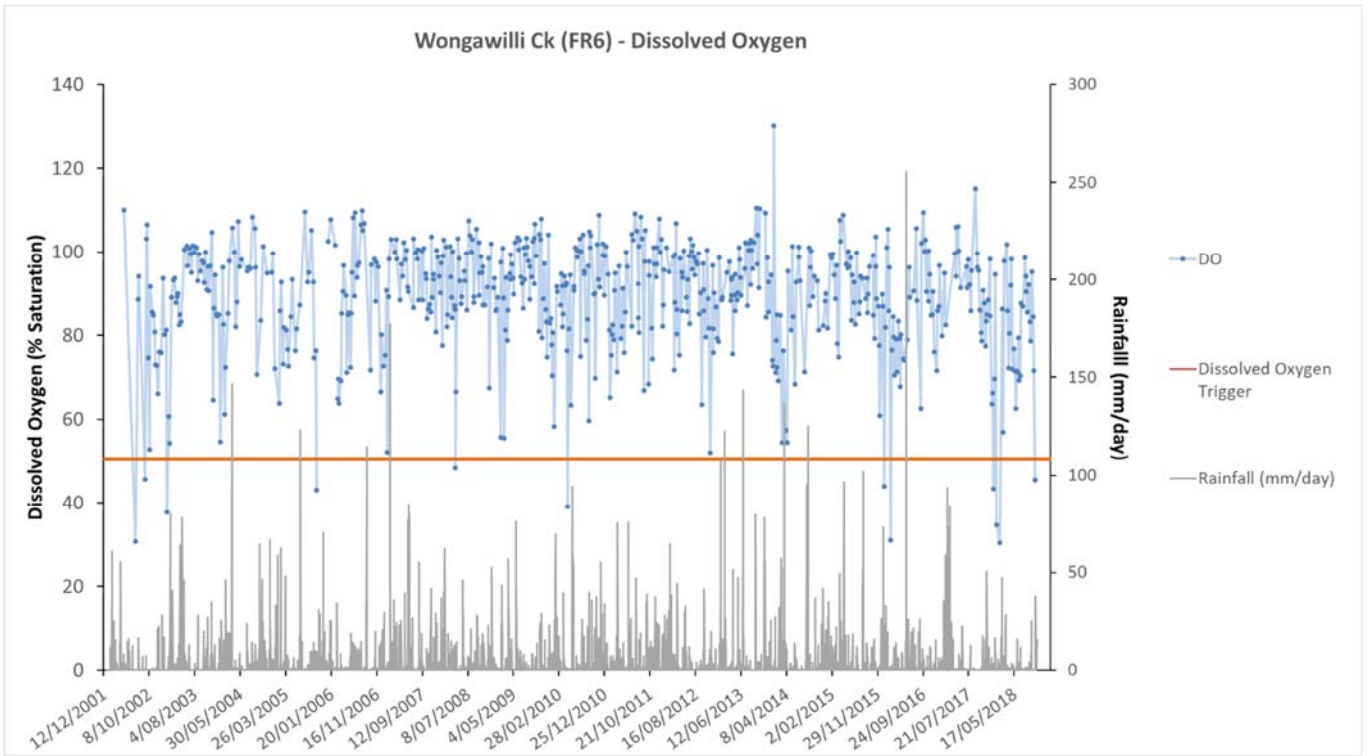
Wongawilli Ck (FR6)

Wongawilli Ck (FR6) is a water quality monitoring site approximately 3.5km downstream from DA3B (Figure 1). During recent inspections of *Wongawilli Ck (FR6)*, on the 3rd October 2018, water quality triggers for Dissolved Oxygen (DO, % saturation) and Electrical Conductivity (EC) were identified. During the inspection, a DO of 45.5 % and an EC of 169 $\mu\text{S}/\text{cm}$ were recorded. These readings are below the 50.5% trigger level for DO and above the 154.1 $\mu\text{S}/\text{cm}$ trigger level for EC (Graph 1 and Graph 2). DO and EC triggers have previously been recorded during the baseline and mining periods (Graph 1 and Graph 2). No surface flow was present at *Wongawilli Ck (FR6)* leading up to and including this latest inspection (Photo 1 and Photo 2).

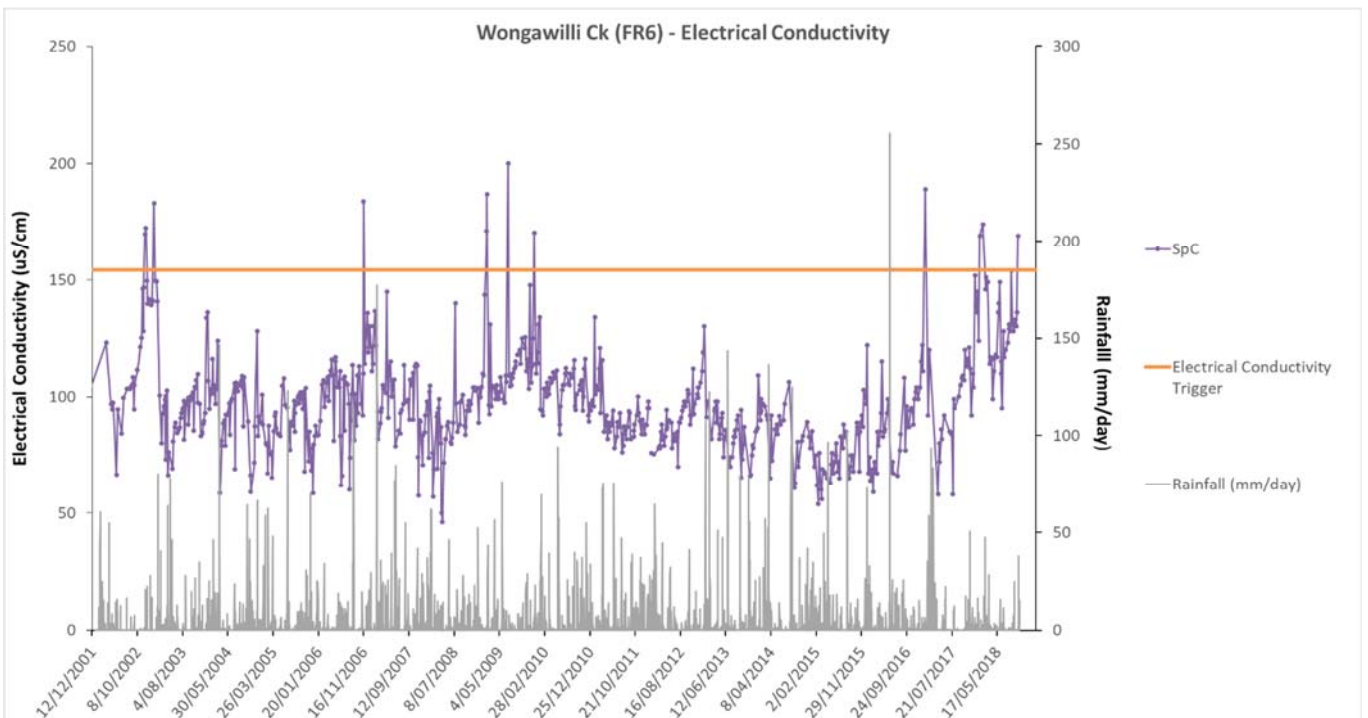
These water quality triggers are likely due to an absence of surface flow at the site for an extended period leading up to the inspection. An absence in surface flow can result in an increase to EC due to evaporation and a decrease to DO due to reduced aeration in the water column.

This water quality observation contributes to a Level 3 Trigger according to the Dendrobium Area 3B Watercourse Impacts, Triggers and Response Plan (Appendix A, Table 1.2), specifically:

- Three exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean during the monitoring period:
 - pH 4.45
 - **EC 154.1 $\mu\text{S}/\text{cm}$**
 - **DO 50.5%**



Graph 1: Dissolved Oxygen recorded at site *Wongawilli Ck (FR6)*, downstream from DA3B operations.



Graph 2: Electrical Conductivity recorded at site *Wongawilli Ck (FR6)*, downstream from DA3B operations.



Photo 1: *Wongawilli Ck (FR6)*, looking upstream. Taken 3/10/2018

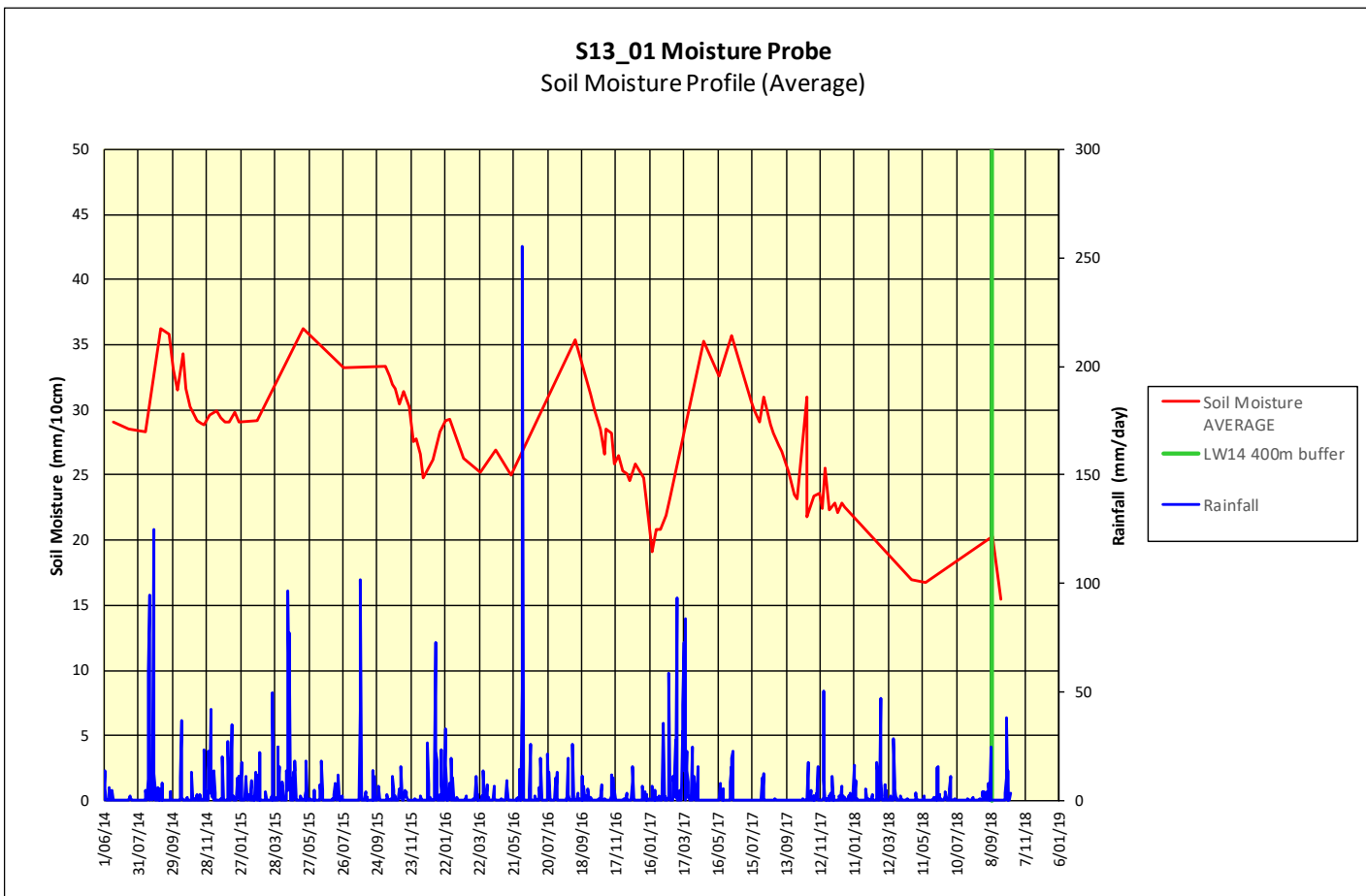


Photo 2: *Wongawilli Ck (FR6)*, looking downstream. Taken 3/10/2018

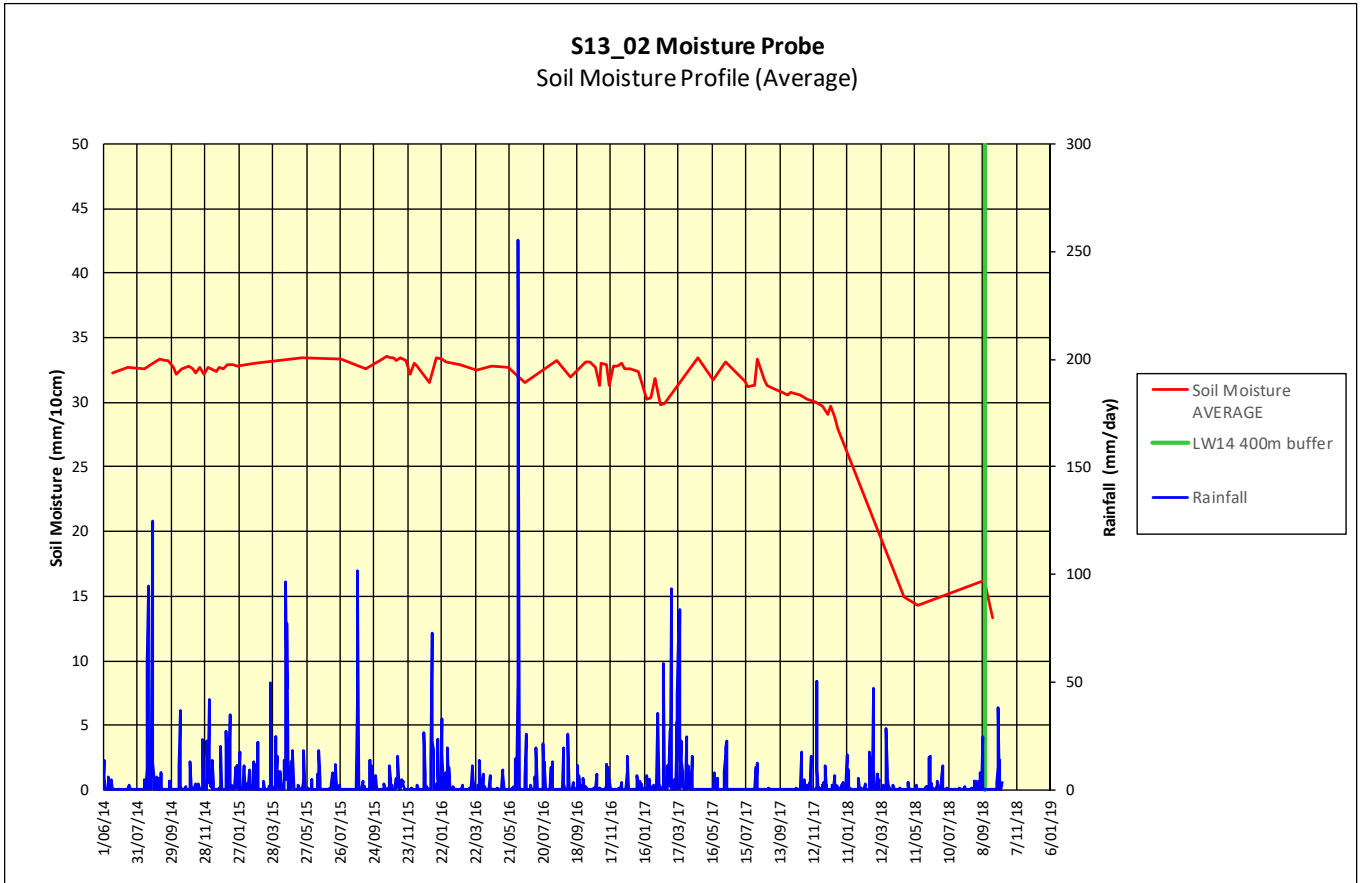
Swamp 13

A soil moisture trigger was measured at sites S13_01, S13_02 and S13_03 during recent analysis of Swamp 13 data. The sites were established in 2015, in hand-augured holes. The sites entered the Longwall 14 400 m risk management zone between the 8th and 11th September 2018. Recent data indicates that soil moisture levels at all three sites have dropped below baseline levels (Graph 3 to Graph 5). This is a Level 3 trigger as per the Dendrobium Area 3B Swamp TARP (Appendix A, Table 2), specifically:

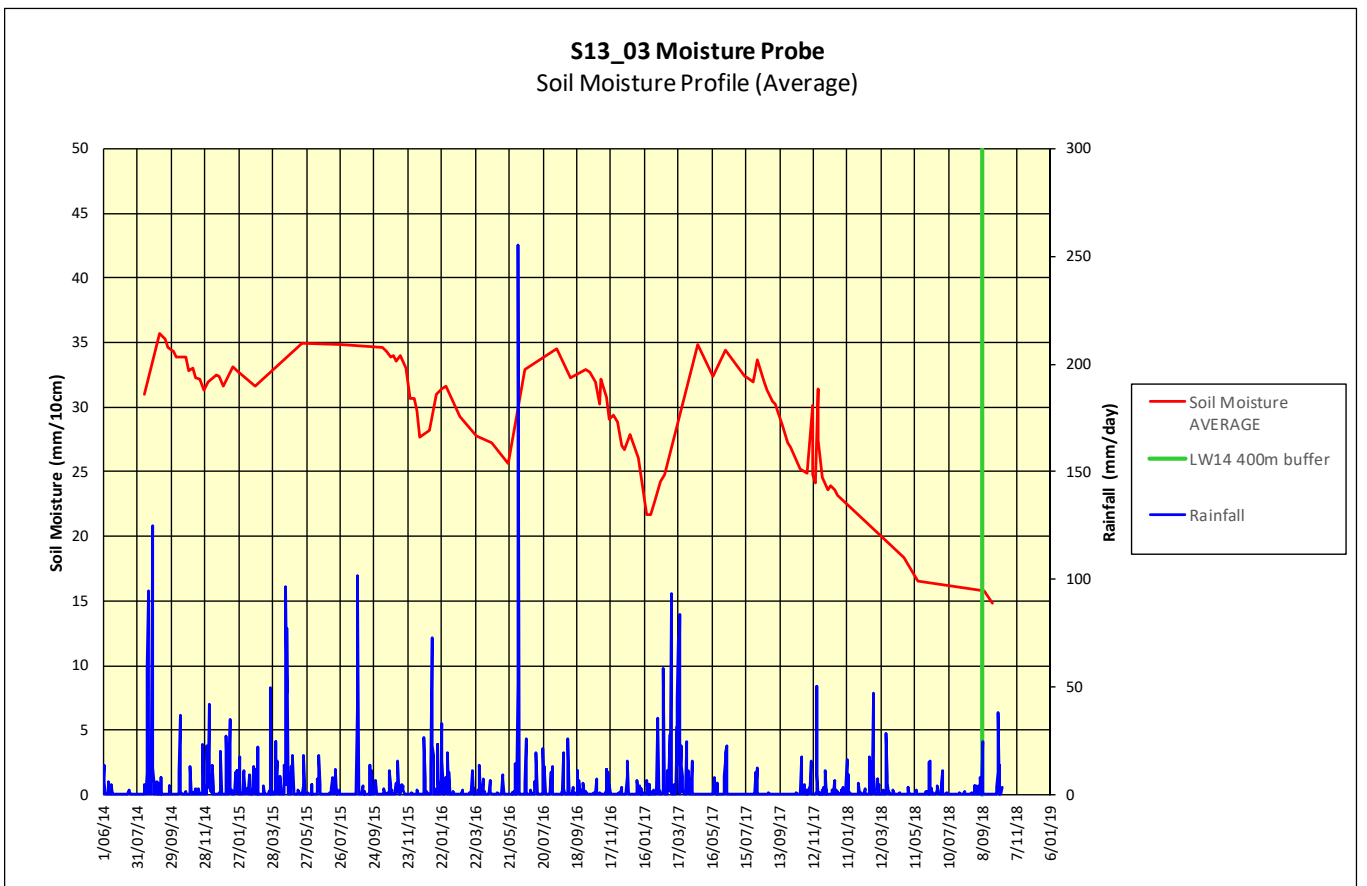
- Soil moisture level lower than baseline level at >80% of monitoring sites (within 400m of mining) within a swamp.



Graph 3: Soil moisture levels at site S13_01.



Graph 4: Soil moisture levels at site S13_02



Graph 5: Soil moisture levels at site S13_03.

Corrective Management Actions (CMAs)

Prescribed actions according to the Dendrobium Area 3B Watercourse Impacts, Triggers and Response Plan (Appendix A, Table 1.1) include:

- Continue monitoring program
- Submit an Impact Report to key stakeholders
- Report in End of Panel Report
- Summarise actions and monitoring in the AEMR
- Review monitoring frequency
- Notify relevant technical specialists and seek advice on any CMA required
- Implement agreed CMAs as approved (subject to stakeholder feedback)
- Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested)
- Implement additional monitoring or increase frequency if required
- Review relevant TARP and Management Plan in consultation with key stakeholders
- Develop site CMA (subject to stakeholder feedback)
- Completion of works following approvals and at a time agreed between South32, DoPE, T&I and WaterNSW (i.e. may be after mining induced movements and impacts are complete), including monitoring and reporting on success

The above actions have been initiated.

Prescribed actions according to the Dendrobium Area 3B Swamp Impacts, Triggers and Response Plan (Appendix A, Table 1.2) include:

- Increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rock bars.

Vegetation monitoring is currently at weekly frequency. More frequent monitoring is not proposed at this stage. Specialist technical advice has been sought regarding any additional recommended actions.

Table 1: Recent impacts and triggers recorded during Longwall 14, Dendrobium Area 3B. Highlighted rows indicate latest triggers.

Site	Identification Date	Activating Longwall	Type	Trigger Level	Comment	Featured in Report Dated
DA3B_LW14_010	10/09/2018	LW14	Soil Cracking	Level 2	Soil Cracking on Fire Road 6A	21/09/2018
DA3B_LW14_011	16/09/2018	LW14	Soil Cracking, Rock Fracture and Uplift	Level 1	Soil crack, rock fracture and uplift on rail corridor adjacent to Fire Road 6A	21/09/2018
DA3B_LW14_012	16/09/2018	LW14	Soil Cracking	Level 1	Soil cracking on Fire Road 6A	21/09/2018
S23_02	20/09/2018	LW14	Soil Moisture	Level 1	Soil moisture level below baseline	21/09/2018
DA3B_LW14_013	26/09/2018	LW14	Soil Cracking	Level 2	Soil cracking along Fire Road 6A	27/09/2018
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Dissolved oxygen trigger at Wongawilli Ck (FR6)	This Report
Wongawilli Ck (FR6)	3/10/2018	LW14	Water Quality	Level 3	Conductivity trigger at Wongawilli Ck (FR6)	This Report
S13_01	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_01	This Report
S13_02	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_02	This Report
S13_03	15/10/2018	LW14	Soil Moisture	Level 3	Soil moisture trigger at swamp site S13_03	This Report

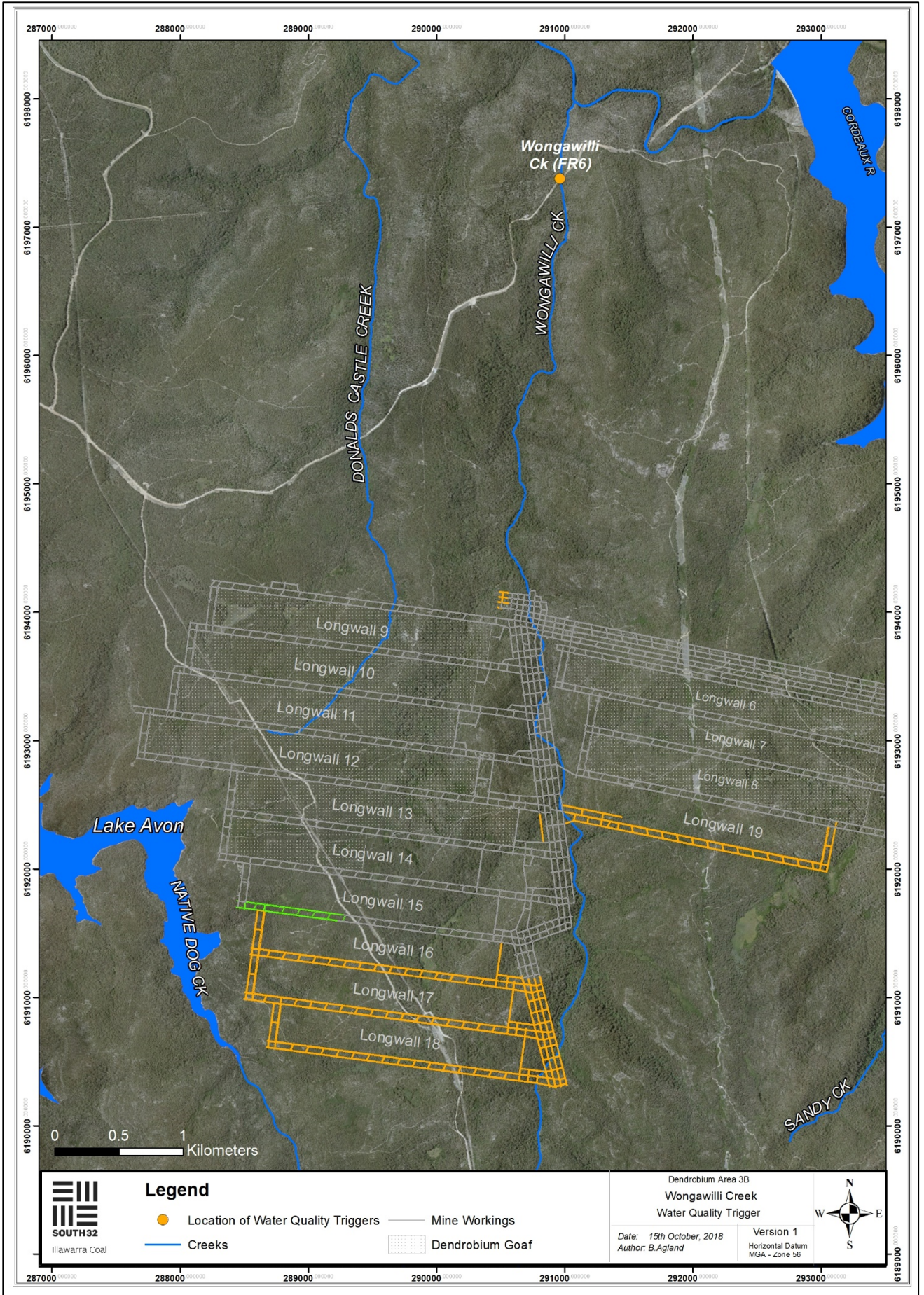


Figure 1: Wongawilli Creek and Dendrobium Area 3B mining operations.

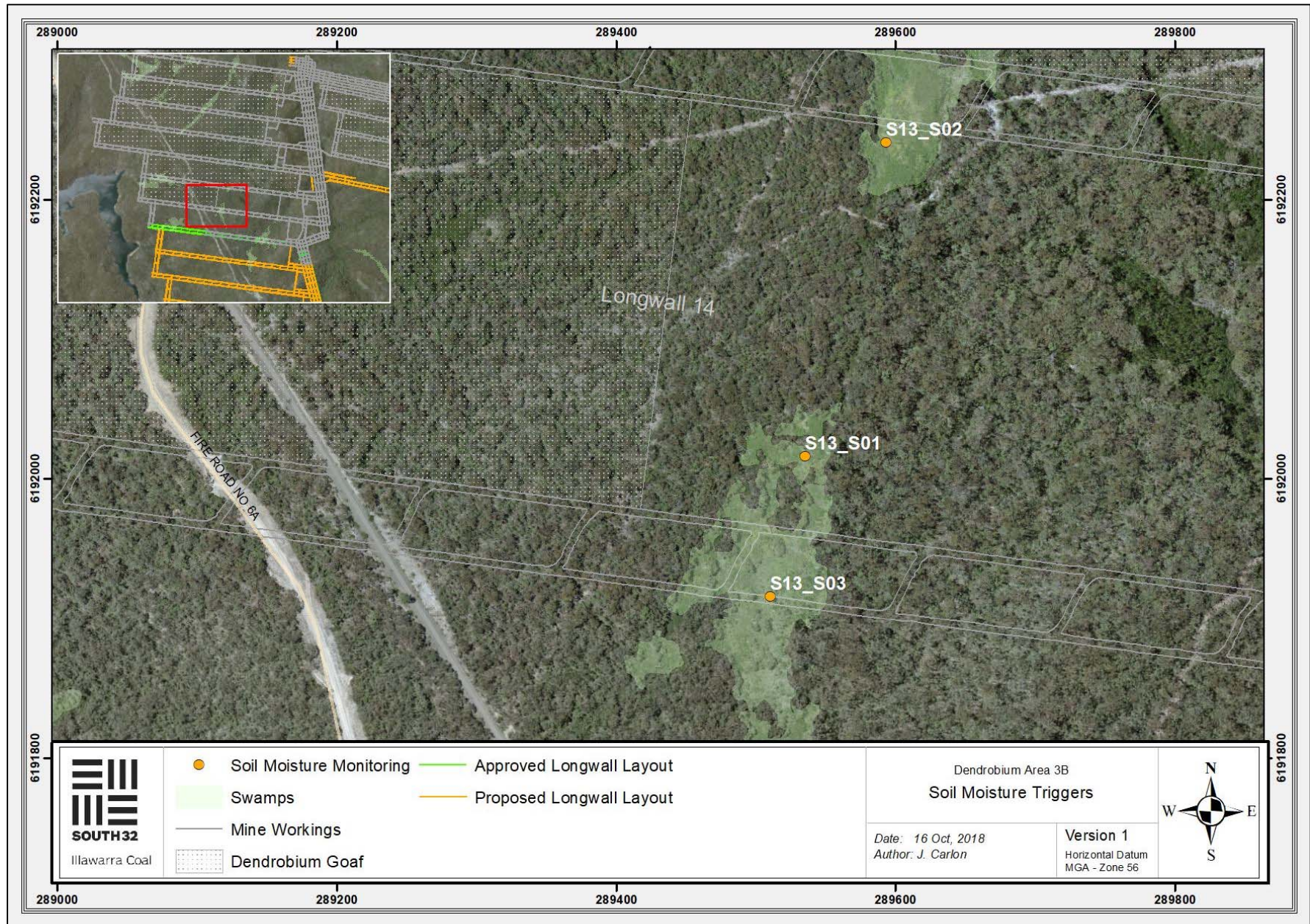


Figure 2: Soil moisture sites in Swamp 13 in relation to Dendrobium Area 3B mining operations.

Appendix A

Table 1.1- Extract from Dendrobium Area 3B Watercourse Impact Monitoring Management and Contingency Plan TARP

WATER QUALITY		
<p>Wongawilli Creek Wongawilli Ck (FR6) Baseline means:</p> <ul style="list-style-type: none"> • pH 5.98 • EC 98.8 uS/cm • DO 89.5% <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences 	<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 during the monitoring period: <ul style="list-style-type: none"> – pH 4.45 – EC 154.1 uS/cm – DO 50.5% 	<ul style="list-style-type: none"> • Continue monitoring program • Submit an Impact Report to OEH, DoPE, T&I, Water NSW and other relevant resource managers • Report in the End of Panel Report • Summarise actions and monitoring in AEMR
	<p>Level 2 *</p> <ul style="list-style-type: none"> • Two exceedances of the ± 3 standard deviation level (positive for EC, negative for pH and DO) from the baseline mean during the monitoring period: <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 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Implement agreed CMAs as approved (subject to stakeholder 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 during the monitoring period: <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> • Site visit with OEH, DoPE, T&I, Water NSW and other resource manager/s (if requested) • Implement additional monitoring or increase frequency if required • Review relevant TARP and Management Plan in consultation with key stakeholders • Develop site CMA (subject to stakeholder feedback). This may include: <ul style="list-style-type: none"> – Limestone emplacement to raise pH where it is appropriate to do so – Grouting of fractures in rockbar and bedrock base of any significant pool where flow diversion results in pool water level lower than baseline period • Completion of works following approvals and at a time agreed between BHPBIC, DoPE, T&I 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 of the ± 3 standard deviation level (positive for EC, negative for pH 	<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

and DO) from the baseline mean during the monitoring period: – pH 4.45 – EC 154.1 uS/cm – DO 50.5%	<ul style="list-style-type: none"> • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
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Table 1.2- Extract from Dendrobium Area 3B Swamp Impact Monitoring Management and Contingency Plan TARP

Performance Measures	Potential Impacts	Performance Triggers	Management Strategies	Offsets	Other Actions
Minor changes in the ecosystem functionality of the swamps	Falls in soil moisture levels in swamps <i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i>	<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>	a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting g) update future predictions		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