



**DENDROBIUM LONGWALL 12
END OF PANEL LANDSCAPE
REPORT**
MAY 2017



EXECUTIVE SUMMARY

This report summarises the observed and measured subsidence effects on landscape features resulting from the extraction of Dendrobium Longwall 12.

Longwall 12 is the fourth panel extracted from Dendrobium Area 3B. Extraction began on the 22nd of February 2016 and was completed on the 31st of January 2017.

The Illawarra Coal Environmental Field Team (ICEFT) conducts detailed monitoring and inspections of landscape features including swamps, watercourses, rock outcrops, landscape features and the general area within Dendrobium Area 3B. This monitoring is conducted in accordance with:

- Dendrobium Area 3B Subsidence Management Plan (SMP);
- Dendrobium Area 3B Watercourse Impact, Monitoring, Management and Contingency Plan (WIMMCP) (October 2015);
- Dendrobium Area 3B Swamp Impact, Monitoring, Management and Contingency Plan (SIMMCP) (October 2015); and
- Dendrobium Subsidence, Landscape Monitoring and Management Plan (SLMMP) (November 2012).

The Watercourse, Swamp and Landscape Trigger Action Response Plans (TARPs) form the basis of the impact assessments in this report.

Twenty-five surface impacts were identified by the ICEFT. Five of these surface impacts were observed on natural features with 20 occurring on fire roads and access tracks.

Swamp groundwater and soil moisture triggers were also measured, as were water quality triggers and, while included in this report, will be addressed in more detail in the Surface and Shallow Groundwater Assessment.

The Dendrobium Area 3B mine plan was modified to reduce the potential for impacts to Wongawilli Creek. No impacts have been identified in Wongawilli Creek during the extraction of Longwall 12. Additionally, iron staining present in the Wongawilli Creek tributary WC21 has not been detected downstream in Wongawilli Creek.

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ABBREVIATIONS

CMA – Corrective Management Action

DPE - Department of Planning and Environment

DPI – Department of Primary Industries

DRE - Department of Trade and Investment, Division of Resources and Energy

EoP – End of Panel

ICEFT – Illawarra Coal Environmental Field Team

OEH - Office of Environment and Heritage

SCA – Sydney Catchment Authority (now WaterNSW)

SIMMCP – Swamp Impact, Monitoring, Management and Contingency Plan

SLMMP – Subsidence Landscape Monitoring and Management Plan

SMP – Subsidence Management Plan

TARP – Trigger Action Response Plan

WIMMCP – Watercourse Impact, Monitoring, Management and Contingency Plan

DEFINITIONS

Zone of Influence or Mining Area – Within 400m of the workings of an active longwall.

OVERVIEW OF MONITORING PROGRAM

Landscape monitoring was conducted within the Longwall 12 mining area during baseline, active mining and post-mining periods. Baseline inspections were conducted up until the longwall was within 400m of each feature. When within this 400m, inspections of each feature increased to weekly until the longwall was at least 400m past the feature. Post-mining inspections continue as outlined in the relevant Management Plans or as required.

Surface Monitoring for Longwall 12

ICEFT and external consultants conducted observations and measurements of surface and shallow groundwater levels, swamp soil moisture, surface water flows, surface water quality and inspections of key landscape features. This monitoring regime included targeted sites within swamps and watercourses as well as steep slopes, cliff-lines and other landscape features (Table 5 and Figure 1).

Landscape Monitoring Summary (SLMMP)

In accordance with the Area 3B SMP approvals, landscape monitoring sites (SLMMP Photo Points) within 400m of the Longwall 12 face were monitored at monthly intervals. Monitoring photos from SLMMP sites are compared to relevant baseline photos at each site (examples shown in Photo 1 and Photo 2). A total of 15 landscape sites (SLMMP Photo Points) were monitored before, during and after the Longwall 12 extraction period (

Table 1 and Figure 2). A Longwall 12 post-mining inspection was carried out on the 9th of March 2017; no impacts were observed other than at site 'LA4b-slmmp-Pt2', previously reported (*Impact DA3B_LW12_008*).



Photo 1: DA3B_170309_A3b_SLMMP_SS3_Pt1, Baseline photo.



Photo 2: DA3B_170309_A3b_SLMMP_SS3_Pt1, post-LW12. Taken 09/03/2017.

Table 1: Summary table of SLMMP sites relevant to Longwall 12.

Site Name	Easting	Northing	Impact Description
FR6A-slmmp-Pt1	288414	6193305	No impacts observed
FR6A-slmmp-Pt2	288710	6192918	No impacts observed
AT6000-slmmp-Pt1	289360	6192787	No impacts observed
AT6000-slmmp-Pt2	289527	6193186	No impacts observed
A3b-SS3-slmmp-Pt1	287609	6193229	No impacts observed
Ab3-SS3-slmmp-Pt2	287656	6193113	No impacts observed
A3b-SS3-slmmp-Pt3	287618	6193015	No impacts observed
A3b-SS4-slmmp-Pt1	288240	6192825	No impacts observed
WC21-Pt6	289886	6192874	No impacts observed
WC21a-slmmp-Pt1	289762	6192875	No impacts observed
LA4b-slmmp-Pt1	288326	6193013	No impacts observed
LA4b-slmmp-Pt2	288300	6192957	Fracturing and uplift to rockbar in tributary LA4b at the basal step of Swamp 4 (Impact DA3B_LW12_008)
LA5-slmmp-Pt1	287991	6192976	No impacts observed
S05-slmmp-Pt4	289075	6193179	No impacts observed
S10-slmmp-Pt1	289806	6192722	No impacts observed

Reference Site Monitoring

Swamp reference sites are monitored in accordance with the SIMMCP (example reference swamps Photo 3 and Photo 4). Data recorded from reference swamps is compared with data from impact monitoring sites relevant to previously mined and active longwalls.



Photo 3: Reference site S02_S01. Photo taken 11/11/2016.



Photo 4: Reference site S24_S01. Photo taken 16/09/2016.

TARP Overview

In accordance with the Dendrobium Area 3B SMP approvals, the SIMMCP and WIMMCP (and Environmental Management Plan) were revised during the extraction of Longwalls 9 and 10. Key government agencies including the DPI, DRE, DPE, WaterNSW (previously known as SCA) and OEH were consulted during this process. This revision included the TARPs, which address Performance Measures, specified in the approval conditions. Impacts to surface features observed during the extraction of Longwall 12 were reported under the most recent version of the TARPs. Table 2: Summary of the date range of Area 3B TARPs used to date.

Table 2: Summary of the date range of Area 3B TARPs

Aspect	Management Plan	TARP Date Range
Swamps	Swamp Impact, Monitoring, Management and Contingency Plan (October 2013)	10/10/2013 – 03/06/2014
	Swamp Impact, Monitoring, Management and Contingency Plan (June 2014)	04/06/2014 – 11/10/2015
	Swamp Impact, Monitoring, Management and Contingency Plan (October 2015)	12/10/2015 - Present
Watercourse	Watercourse Impact, Monitoring, Management and Contingency Plan (December 2013)	19/12/2013 – 03/06/2014
	Watercourse Impact, Monitoring, Management and Contingency Plan (June 2014)	04/06/2014 – 11/10/2015
	Watercourse Impact, Monitoring, Management and Contingency Plan (October 2015)	12/10/2015 - Present
Landscape	Dendrobium Area 3B Subsidence Management Plan (SMP), Volume 2 – Table 1.2 Dendrobium Landscape Impacts, Triggers and Response (November 2012)	12/11/2012 – Present

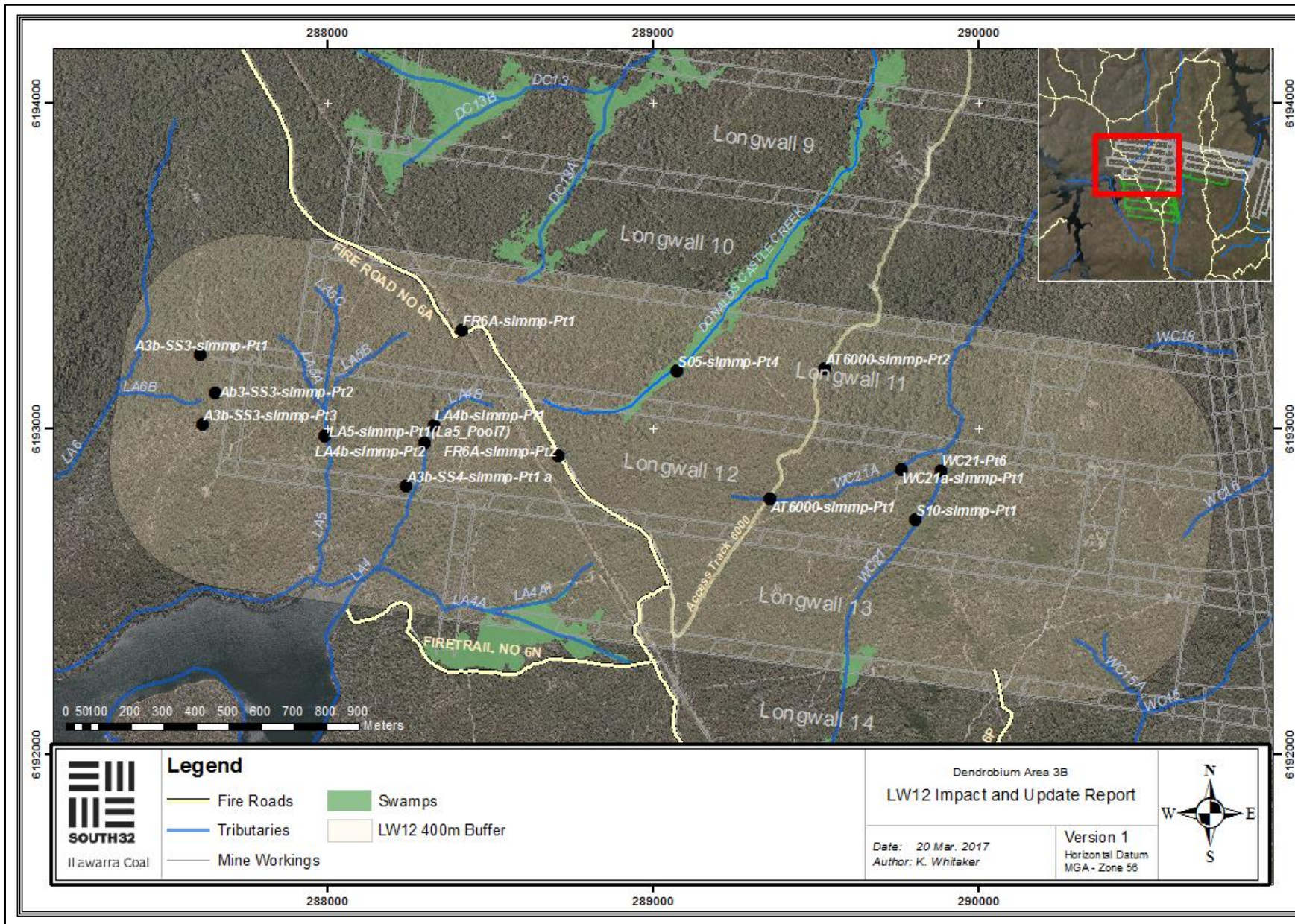


Figure 2: Map showing SLMMP sites in relation to the Longwall 12 mining area (400m buffer).

SUMMARY OF IMPACTS

During the extraction of Longwall 12, 25 new surface impacts were identified (Table 3, Figure 3). These impacts are labelled as “DA3B_LW12_001” to “DA3B_LW12_026” (Note- DA3B_LW12_006 refers to a water quality trigger at site LA4_S1). An additional water quality trigger was recorded, at *Wongawilli Ck (FR6)*. A shallow groundwater trigger was recorded in *Swamp 10* and a soil moisture trigger was recorded in *Swamp 11*. These triggers are further discussed in the Longwall 12 Surface and Shallow Groundwater Assessment. Additional water quality triggers were identified at *Donalds Castle Ck (FR6)* as part of the Surface Water and Shallow Groundwater Assessment and are also discussed in that report.

Impacts to Natural Features

Subsidence includes vertical and horizontal movement of the land surface, which can result in surface and subsurface cracking, buckling, dilation and tilting. These impacts can affect watercourse hydrology and morphology, swamp hydrology and ecological function, and other landscape features by means of surface cracking, which can lead to erosion and rock falls. Potential mine subsidence impacts within Area 3B are discussed in the Dendrobium Area 3B SMP, WIMMCP and SIMMCP.

An overview of impacts observed during the extraction of Longwall 12 is provided in the following sections. For specific details on the impacts listed in Table 3, refer to the relevant impact reports (attached separately to the Longwall 12 EoP Report).

Landscape Features

Fractures and cracking observed during the extraction of Longwall 12 were assessed against the relevant TARP (for landscape, swamp or watercourse) and assigned a trigger value (Level 1, Level 2, Level 3 or exceedance of performance measure, where applicable). Trigger values for fractures and cracks were determined based on characteristics such as:

- Width and length of the fracture;
- Whether the fracture contributed to any observable loss of surface water or water diversion; and
- Any erosion or potential for erosion caused by a fracture or crack.

Table 3: Summary of impacts and triggers relevant to Longwall 12

Site ID	Easting	Northing	Impact Type	Feature Affected	Identification Date	Impact Level	Description	Refer to Impact Report/s Dated
DA3B_LW12_001	287851	6193085	Surface Cracking	Seismic Track	6/04/2016	1	Soil Cracking on seismic track, approx. 3.9m length, 0.08m width, 0.56m depth.	16/04/2016
DA3B_LW12_002	287856	6193130	Surface Cracking	Seismic Track	6/04/2016	1	Soil Cracking on seismic track, approx. 1.9m length, 0.01m width, 0.155m depth.	16/04/2016
DA3B_LW12_003	287827	6193060	Surface Cracking	Seismic Track	12/04/2016	1	One continuous soil crack 20m from seismic track. 5.5m length, 0.07m width, 0.53m depth.	13/04/2016
DA3B_LW12_004	287814	6193085	Surface Cracking	Seismic Track	12/04/2016	1	Multiple soil cracks on seismic track. 2.6m length, 0.05m width, 0.37m depth.	13/04/2016
DA3B_LW12_005	288128	6192557	Rock Fracturing	LA4	3/05/2016	2	Rock fracturing and uplift in watercourse LA4 rockbed.	4/05/2016, 6/07/2016
<i>DA3B_LW12_006 (Addressed in Surface and Shallow Groundwater Assessment)</i>	<i>288137</i>	<i>6192566</i>	<i>Water Quality</i>	<i>LA4</i>	<i>3/05/2016</i>	<i>2</i>	<i>DO trigger, now Level 2. Water quality trigger for dissolved oxygen at site LA4_S1.</i>	<i>4/05/2016, 23/05/2016</i>
DA3B_LW12_007	287947	6193233	Surface Cracking	Seismic Track	20/05/2016	1	Soil Cracks on seismic track north of Swamp 3. 2.2m length, 0.008m width.	23/05/2016
DA3B_LW12_008	288300	6192957	Rock Fracturing	LA4B	20/05/2016	2	Fracturing and uplift to rockbar in tributary LA4B at the basal step of Swamp 4.	23/05/2016, 6/07/2016
DA3B_LW12_009	288403	6193000	Surface Cracking	Seismic Track	25/05/2016	1	Soil cracking to seismic track adjacent to Swamp 4.	26/05/2016
DA3B_LW12_010	288303	6192988	Rock Fracturing	LA4B	25/05/2016	2	Rock fracturing to sandstone channel on tributary LA4B. Flow diversion evident.	26/05/2016
DA3B_LW12_011	288416	6193009	Surface Cracking	Seismic Track	30/05/2016	1	Soil cracking on seismic track south of Swamp 4.	31/05/2016
DA3B_LW12_012	288407	6192908	Surface Cracking	Seismic Track	30/05/2016	1	Discontinuous soil crack on seismic track south of Swamp 4.	31/05/2016

DA3B_LW12_013	288676	6192976	Surface Cracking	FR6A	27/06/2016	1	Discontinuous soil cracking on Fire Trail 6AA with associated uplift.	27/06/2016, 6/07/2016
DA3B_LW12_014	288630	6192929	Surface Cracking	Rail Corridor	22/07/2016	1	Displacement and uplift across rail corridor, visible as bump on railway ballast.	26/07/2016
DA3B_LW12_015	289379	6192828	Surface Cracking	AT6AA	5/10/2016	1	Multiple soil cracks and associated uplift of tree roots in a 7m x 2m area on Fire Road 6AA.	5/10/2016
DA3B_LW12_016	289382	6192912	Surface Cracking	AT6AA	5/10/2016	1	Soil crack across Fire Road 6AA.	5/10/2016
DA3B_LW12_017	289457	6192953	Surface Cracking	AT6AA	11/10/2016	1	Soil cracking across Fire Road 6AA. Max 2m length, 0.03m width.	13/10/2016
DA3B_LW12_018	289425	6192930	Surface Cracking	AT6AA	11/10/2016	1	Soil cracking across Fire Trail 6AA. Longest continuous crack is approximately 4m length and 0.08m width.	13/10/2016
DA3B_LW12_019	289682	6192531	Rock Fracturing	WC21	9/11/2016	1	Hairline fracture and associated uplift to step between WC21_Pool 49 and 48. No water loss is expected.	9/11/2016
DA3B_LW12_020	289377	6192711	Surface Cracking	Seismic Track	15/11/2016	1	Soil cracking on seismic. Discontinuous.	15/11/2016
DA3B_LW12_021	289492	6192809	Surface Cracking	Seismic Track	15/11/2016	1	Uplift and soil cracking over a 10m section of seismic track.	15/11/2016
DA3B_LW12_022	289747	6192807	Surface Cracking	Seismic Track	15/11/2016	1	Discontinuous soil cracks and associated hairline cracks on seismic track.	15/11/2016
DA3B_LW12_023	289437	6192786	Surface Cracking	Access Track	24/11/2016	1	Soil cracking across access track to WC21. Max 0.003m width, 1.5m length.	24/11/2016
DA3B_LW12_024	289765	6192905	Surface Cracking	Access Track	24/11/2016	1	Soil cracking and uplift on access track adjacent to WC21. 3m length, 0.01m of uplift.	24/11/2016
DA3B_LW12_025	289703	6192697	Surface Cracking	Access Track	24/11/2016	2	Soil cracking in sediment, exposing underlying rock fracturing. Max 10m length, 0.110m width, 1.1m depth.	24/11/2016
DA3B_LW12_026	290125	6192832	Rock Fracturing	Sandstone Outcrop	20/01/2017	2	Rock fractures on sandstone outcrop. 25m length, 0.02m width, 0.15m depth.	24/01/2017

Wongawilli Ck (FR6) (Addressed in Surface Water Assessment)	290957	6197417	Water Quality	Wongawilli Creek	23/01/2017	1	Electrical Conductivity of 189 μ S/cm was recorded at Wongawilli Ck (FR6), above the 154.1 μ S/cm trigger level.	2/02/2017
Swamp 10 (Addressed in Surface and Shallow Groundwater Assessment)	289815	6192702	Shallow Groundwater	Swamp 10	24/11/2016	3	Rate of water level recession exceeds highest baseline rate at site S10_01.	24/11/2016
Swamp 11 (Addressed in Surface and Shallow Groundwater Assessment)	288631	6192391	Soil Moisture	Swamp 11	2/03/2017	3	Soil moisture at S11_S01 and S11_S02 exceed lowest recorded baseline level.	2/03/2017

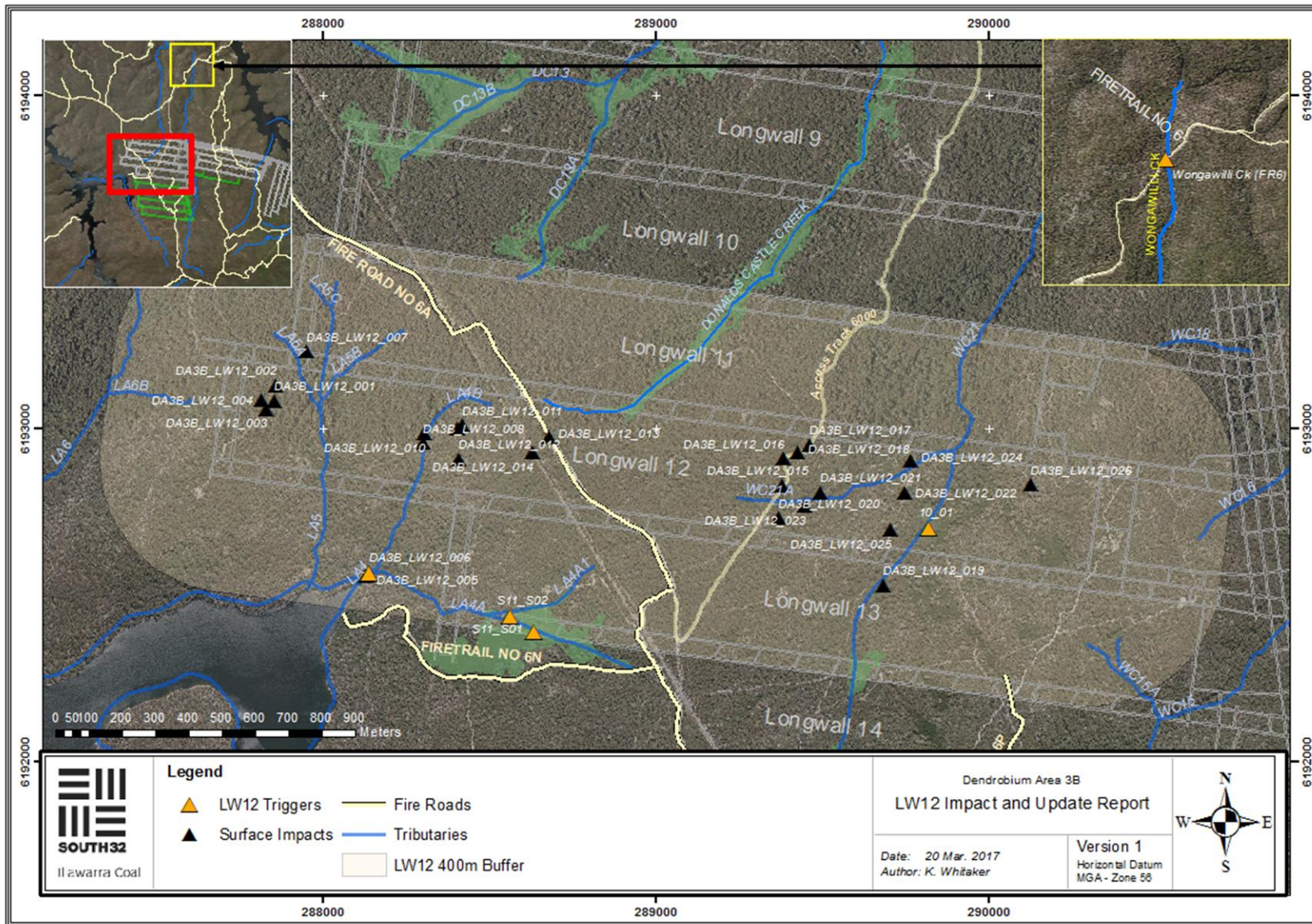


Figure 3: Map showing landscape impacts and triggers recorded during Longwall 12.

First and Second Order Streams

Seven first and second order streams were monitored as part of the Longwall 12 monitoring program; LA6, LA5, LA4, LA4B, WC21, WC18 and WC16. Impacts observed at these streams, within the zone of influence of Longwall 12, are described below.

LA4

Impact *DA3B_LW12_005* was identified on the 4th of May 2016, which consisted of fracturing and uplift in tributary LA4; uplifted rock fragments were transported further downstream due to high flow conditions. The largest rock fragment, measuring approximately 1.60m x 1.10m x 0.25m, was transported 3m downstream from its original position (Photo 5). Photos 6 and 7 also show fracturing at the site. Additionally, flow diversion was observed in the rockbar. Impact *DA3B_LW12_005* was reported as a Level 2 Impact in accordance with the WIMMCP (Table 8), specifically:

Level 2: Crack or fracture between 100 and 300mm width at its widest point or any fracture which results in observable loss of surface water or erosion.



Photo 5: DA3B_LW12_005- Rock fragment transported downstream at tributary LA4. Taken on 5/07/2016.



Photo 6: DA3B_LW12_005- Uplift and fracturing with fresh rock Photo 7: DA3B_LW12_005- Separated rock fragment. Taken on surface due to movement of rock fragments downstream. Taken on 5/07/2016.
on 5/07/2016.

LA4B

Impact *DA3B_LW12_008* was identified on the 20th of May 2016, which consisted of fracturing and uplift to a rockbar in tributary LA4B, downstream from Swamp 4. The largest single fracture is located immediately above and on the face of a step on the tributary. This fracture is 3m long, 0.03m wide, has a measurable depth of 0.085m with maximum uplift of 0.045m (Photo 8). Approximately 6m upstream of this fracture is a 5.5m section of uplifted rockbar, which has uplifted a maximum of 0.09m (Photo 9, Photo 10). Flow diversion is expected during periods of flow at the site. Impact *DA3B_LW12_008* was reported as a Level 2 impact in accordance with the WIMMCP (Table 8), specifically:

Level 2: Crack or fracture between 100 and 300mm width at its widest point or any fracture, which results in observable loss of surface water or erosion.



Photo 8: DA3B_LW12_008 – Longest continuous rock fracture on top of the basal step. Taken on 20/05/2016.



Photo 9: DA3B_LW12_008 – Highest section of uplift on Rockbar upstream of the basal step of Swamp 4. Taken on 20/05/2016.



Photo 10: DA3B_LW12_008 – Uplift on Rockbar upstream of the basal step of Swamp 4. Taken on 20/05/2016.

Impact *DA3B_LW12_010* was identified on the 26th of May 2016, and consisted of fracturing and uplift within tributary LA4B. The fracture is up to 1m long and 0.05m wide (Photo 11, Photo 12). Some flow diversion is expected and as a result, the impact was reported as Level 2 in accordance with the WIMMCP (Table 8), specifically:

Level 2: Crack or fracture between 100 and 300mm width at its widest point or any fracture, which results in observable loss of surface water or erosion.



Photo 11: DA3B_LW12_010 - Fracture to channel in LA4b. Taken on 25/05/2016



Photo 12: DA3B_LW12_010 - Fracture to channel in LA4b. Taken on 25/05/2016.

WC21

Impact *DA3B_LW12_019* was identified on the 9th of November 2016, and consisted of hairline fracturing and associated uplift on WC21_Rockbar 48 in tributary WC21 (Photo 13). The fracture is 1.2m long and has a maximum uplift of 0.015m (Photo 14). The fracture continues from the rockbar onto the face of WC21_Step 48, with no observable loss of surface water or erosion (Photo 15). Impact *DA3B_LW12_019* was reported as a Level 1 impact in accordance with the WIMMCP (Table 8: Dendrobium Watercourse Impacts, Triggers and Response), specifically:

Level 1: 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



Photo 13: DA3B_LW12_019 - Fracturing to WC21_Rockbar 48 and WC21_Step 48. Taken on 9/11/2016.



Photo 14: DA3B_LW12_019 - Highest section of uplift. Taken on 9/11/2016.



Photo 15: DA3B_LW12_019 – Fracturing to the face of a step in WC21_Step 48. Taken on 9/11/2016.

Other Landscape Features

Impact *DA3B_LW12_026* was first identified on the 20th of January 2017, and consisted of rock fracturing across a sandstone outcrop over the eastern end of Longwall 12. Initial observations identified a single fracture up to 25m long and 0.020m wide (Photo 16). On the 3rd of February 2017, an inspection identified an additional fracture, adjacent to the original, measuring up to 5m long and 0.01m wide (Photo 17). The fracturing appears stable, does not impede access, and is not likely to lead to erosion. Impact *DA3B_LW12_026* was reported as a level 2 impact in accordance with the Dendrobium SMP Landscape TARP (Table 9), specifically:

Level 2: Crack or fracture between 10 and 50m length



Photo 16: DA3B_LW12_026 - Fracturing to sandstone outcrop. Taken on 20/01/2017.



Photo 17: DA3B_LW12_026 - Additional fracturing to sandstone outcrop. Taken on 03/02/2017.

Shallow Groundwater

Swamp 10

During the extraction of Longwall 12, a shallow groundwater trigger was measured in *Swamp 10*; Longwall 12 passed under borehole 10_01 on 16th of November 2016. Since Longwall 12 passed beneath the site, the post-mining rate of water level recession (3.21 mm/hour calculated between 14/11/16, 16:41 and 20/11/16, 9:41) has exceeded the highest baseline recession rate, recorded at the equivalent horizon (0.62 mm/hour calculated between 28/12/12, 7:27 and 26/01/13, 19:27) (Figure 4). Water level has also dropped below the lowest recorded level during the baseline period (Figure 4). The shallow groundwater trigger in *Swamp 10* was reported as a Level 3 in accordance with the SIMMCP (Table 7), specifically:

Level 3: 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 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.

Further discussion of the shallow groundwater response is included in the Surface and Shallow Groundwater Assessment.

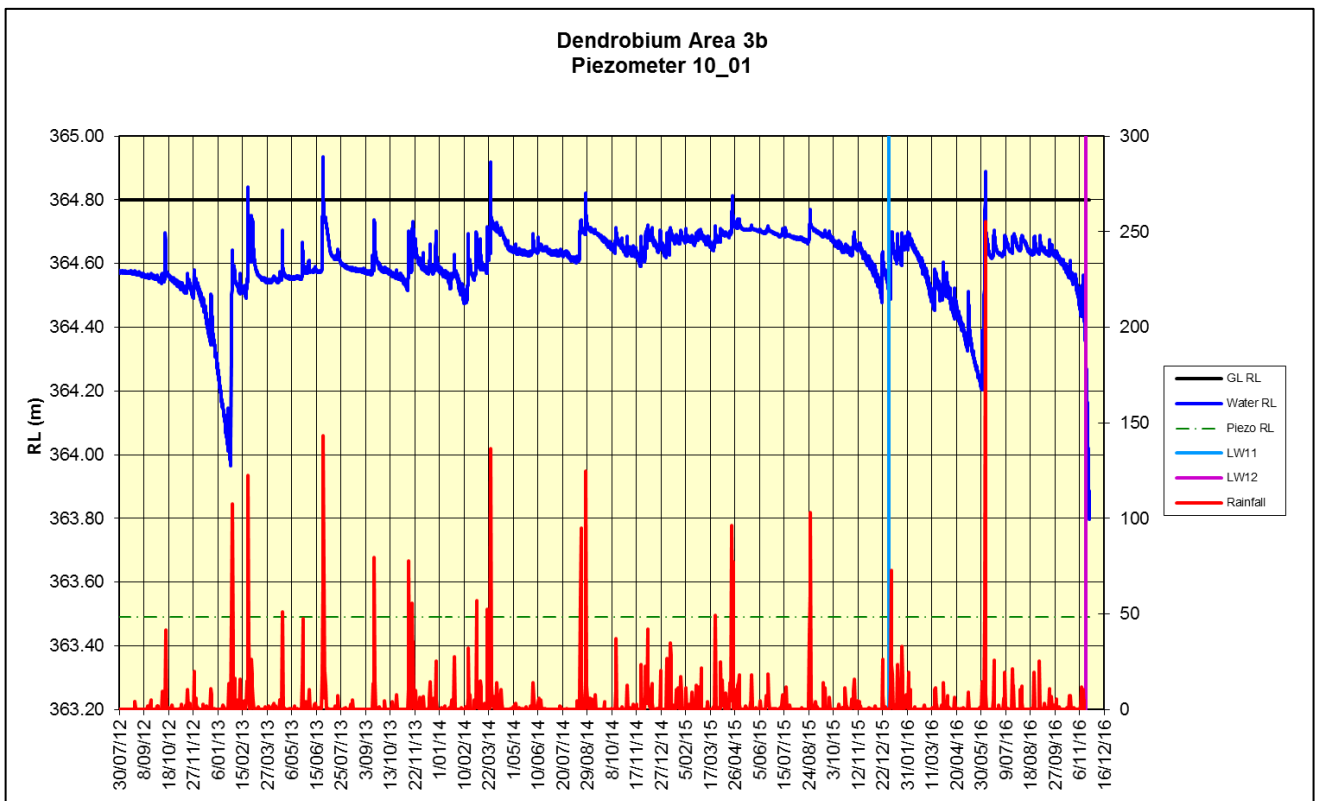


Figure 4: Swamp groundwater levels recorded at Borehole 10_01.

Soil Moisture

Soil moisture levels are measured using either a “Diviner” probe, during each site inspection, or an “EnviroScan” probe and logger, which continuously logs hourly-interval data, collected during each site inspection. Soil moisture analysis is conducted as required by the SIMMCP (Table 7).

Swamp 11

Swamp 11 is located to the south of the Longwall 12 workings. Within Swamp 11, soil moisture is recorded at three sites (*S11_S01*, *S11_S02*, and *S11_S05*), two of which (*S11_S01*, *S11_S02*), are located within the mining area of Longwall 12. Following extraction of Longwall 12, soil moisture results in Swamp 11 were reported as a Level 3 Trigger according to the SIMMCP, specifically:

Level 3: Soil moisture level lower than baseline level at **>80%** of monitoring sites (within 400m of mining) within a swamp (in comparison to reference swamps).

S11_S01

Soil moisture in *S11_S01* is measured using an “EnviroScan” probe. Longwall 12 passed *S11_S01*, at a closest distance of approximately 395m, in June 2016. Since Longwall 12 extraction, soil moisture levels recorded at *S11_S01* dropped below the lowest level recorded in the baseline period (Figure 5). As this site is located within 400m of Longwall 12, it contributes to a trigger according to the SIMMCP (Table 7).

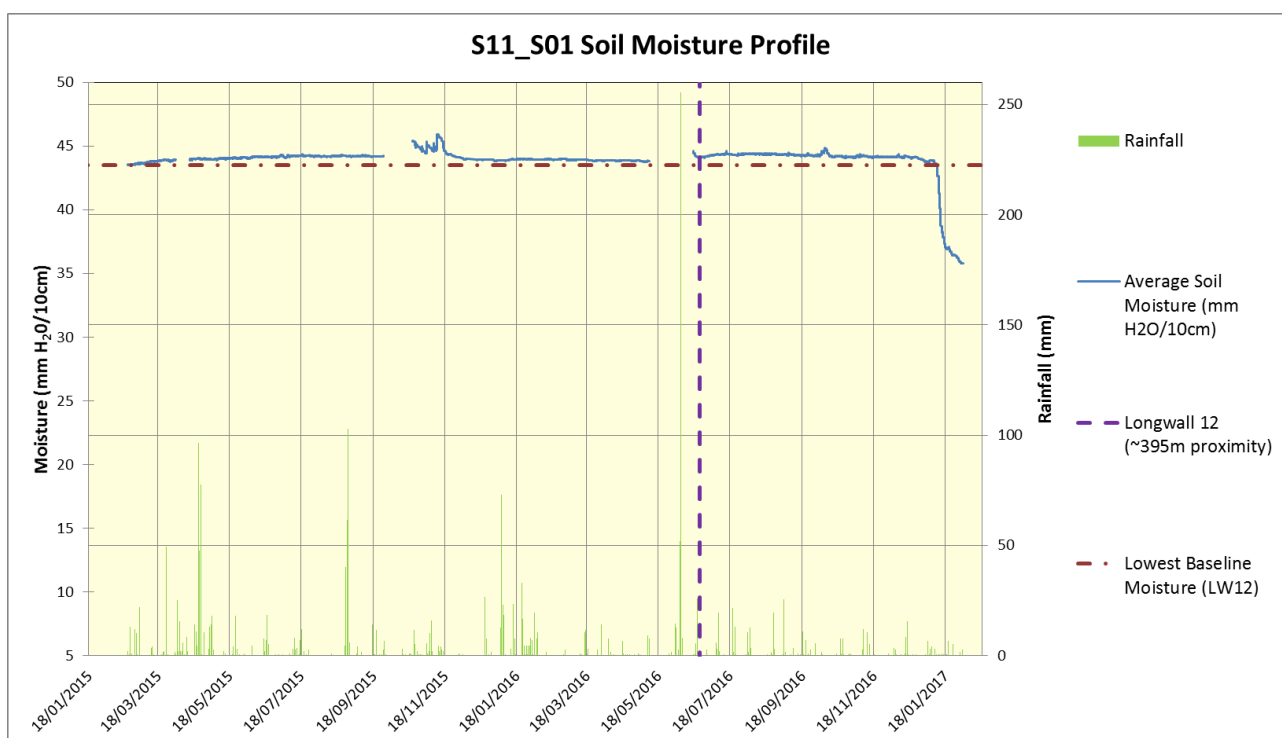


Figure 5: *S11_S01* Soil Moisture Profile

S11_S02

Soil moisture at S11_S02 is measured using a “Diviner” probe during each inspection of the site. Longwall 12 passed adjacent to S11_S02, at a closest distance of approximately 360m, in June 2016. Since Longwall 12 extraction, soil moisture levels at the site have dropped below the lowest level recorded in the baseline period (Figure 6). As this site is located within 400m of Longwall 12, it contributes to the reported trigger according to the SIMMCP (Table 7).

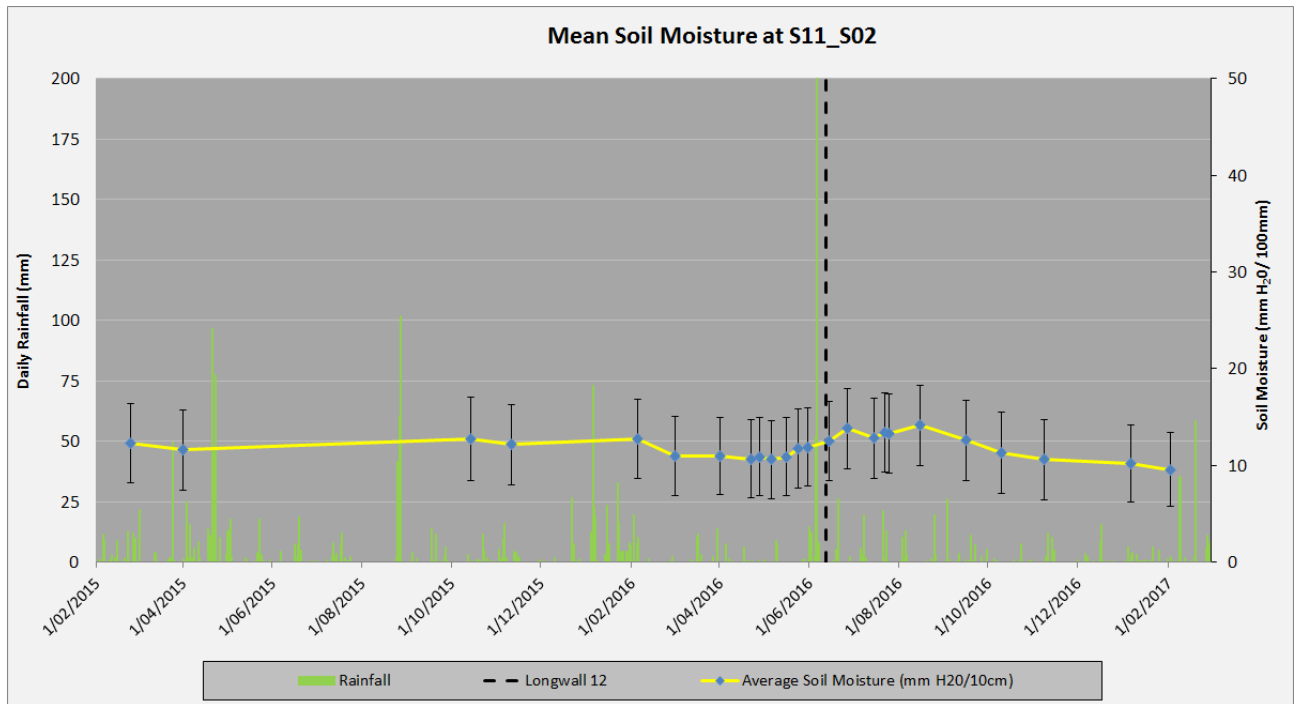


Figure 6: S11_S02 Mean Soil Moisture Profile. The Error bars show standard error of the mean. The date that the site came within 400m of Longwall 12 is depicted as ‘Longwall 12’. Each series marker represents a spot measurement; the line between markers is a moving average interpolation.

S11_S05

Soil moisture at S11_S05 is measured at the site using a “Diviner” probe during each inspection of the site. S11_S05 is located outside the mining area of Longwall 12, approximately 520m to the south of Longwall 12. Mean soil moisture at S11_S05 has shown a decline, similar to S11_S01 and S11_S02 (Figure 7). These soil moisture levels are the lowest, yet to be recorded, in the monitoring period. As this site is not located within 400m of Longwall 12, it does not contribute a trigger according to the SIMMCP (Table 7). However, it is worthwhile noting the similarities in soil moisture values between all three sites.

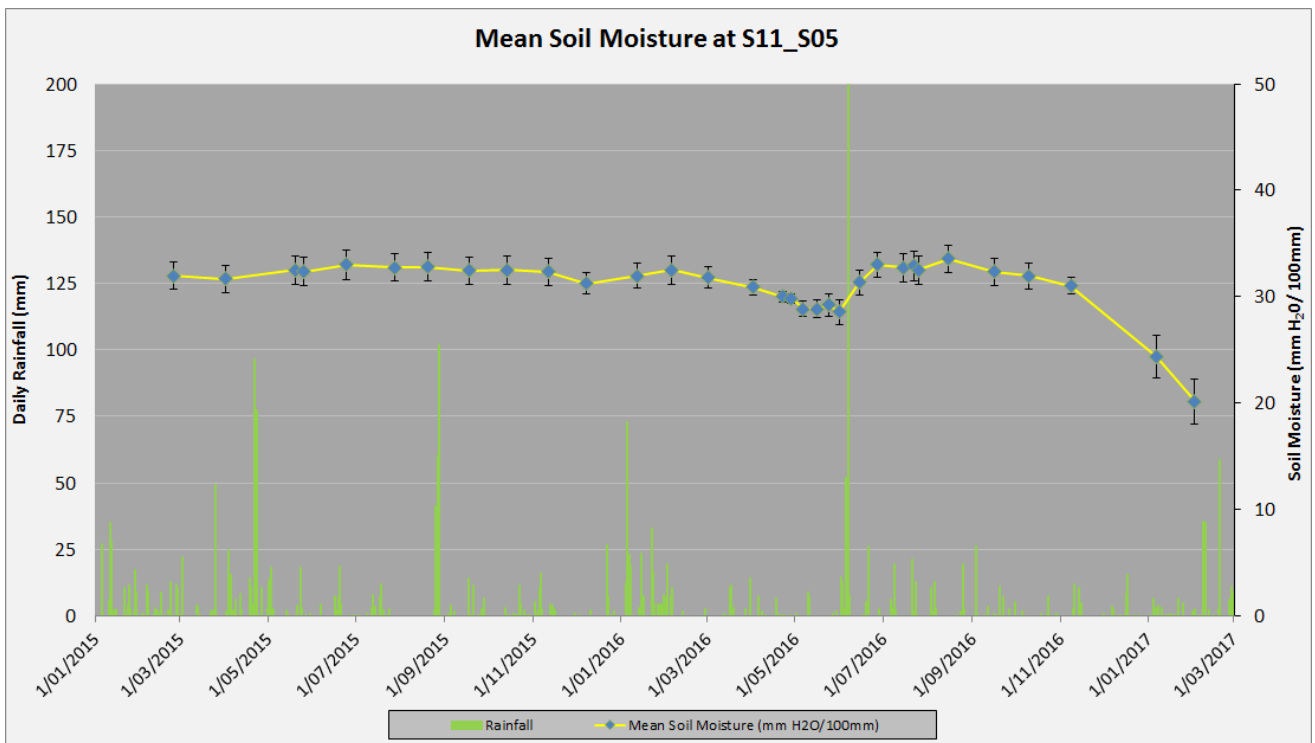


Figure 7: S11_S05 Mean Soil Moisture Profile. The Error bars show standard error of the mean. Each series marker represents a spot measurement; the line between markers is a moving average interpolation.

Swamp 5

Impacts to soil moisture in Swamp 5 have previously been reported during the extraction of Longwall 11. At site *S05_S01*, a soil moisture site located in *Swamp 5*, soil moisture levels dropped below baseline levels. Soil moisture at *S05_S01* is measured using an “EnviroScan” probe and logger. During the extraction of Longwall 12, no additional soil moisture impacts were observed at *S05_S01*. However, it is worthwhile noting that soil moisture levels at *S05_S01* have dropped below the previous recorded minimum (post-Longwall 11) (Figure 8).

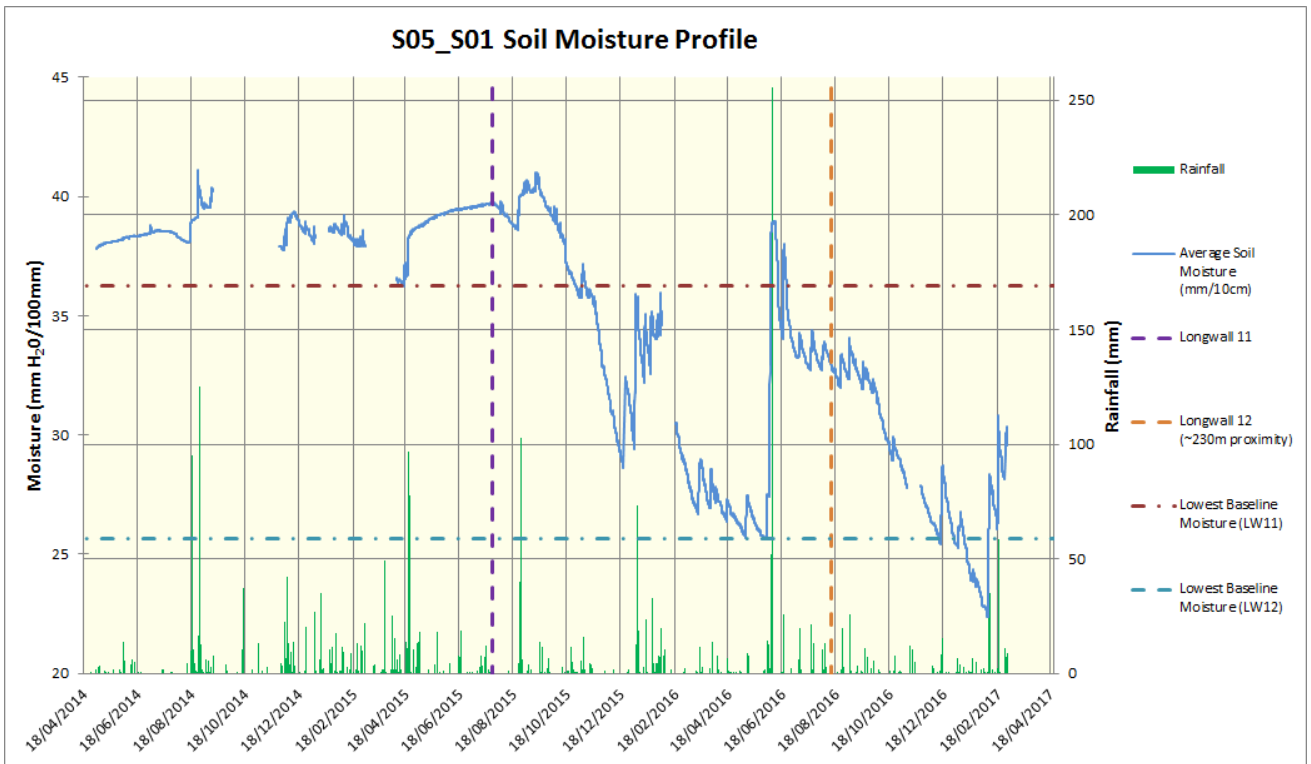


Figure 8: Soil moisture Profile of S05_S01 (Swamp 5).

Further discussion of soil moisture results will be included in the Longwall 12 Surface and Shallow Groundwater assessment.

Impacts to Built Features

Twenty surface impacts associated with built features were identified during the extraction of Longwall 12 (Table 3). These features include FR6A (Fire Road 6A), AT6AA (Access Track 6AA, also known as FR6000) and some smaller unnamed access tracks.

Level 1 Surface Cracking

Nineteen impacts (Photo 18 to Photo 21) to built features were reported as Level 1 impacts in accordance with the Dendrobium Area 3B SMP (Table 9); specifically:

Level 1: 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



Photo 18: DA3B_LW12_017 – Soil cracking across AT6AA. Taken on 11/10/2016.



Photo 19: DA3B_LW12_013 – Surface cracking along FR6A. Taken on 27/06/2016.



Photo 20: DA3B_LW12_014- Uplift across railway corridor, looking southeast.



Photo 21: DA3B_LW12_020 - Soil cracks on access track. Taken on 15/11/2016.

Remediation works were conducted on Impact *DA3B_LW12_017*, which was reported as a level 1 impact. Although no CMA is required for level 1 impacts according to the SMP, the surface cracking was filled as a precautionary measure (Photo 22, Photo 23).



Photo 22: DA3B_LW12_017 – Soil cracking across AT6AA. Taken on 9/11/2017.



Photo 23: Remediation of DA3B_LW12_017. Taken on 18/01/2017.

Level 2 Surface Cracking

Impact *DA3B_LW12_025* was identified on 24th of November 2016, which consisted of rock fracturing and soil cracking, part of which extended across an access track adjacent to WC21. The cracking is up to 10m long, 0.110m wide and 1.1m deep (Photo 24, Photo 25). The cracking extends into vegetation on either side of the access track and does not impede access. No noticeable changes in stability were observed during subsequent inspections. Impact *DA3B_LW12_025* was reported as a Level 2 Trigger according to the Dendrobium SMP (Table 9), specifically:

Level 2: Crack or fracture between 100mm and 300mm width

Following approval from WaterNSW, the section of cracking across the access track was remediated (Photo 26).



Photo 24: DA3B_LW12_025 - Fracturing beneath leaf litter. Taken on 24/11/2016.



Photo 25: DA3B_LW12_025 -Rock fracture extending from access track. Taken on 20/01/2017.



Photo 26: DA3B_LW12_025 -Section of remediated cracking across access track. Taken on 18/05/2017.

Recommendations for Future Monitoring

Recommendations for future monitoring in Dendrobium Area 3B, particularly concerning Longwall 13, are outlined in Table 4. These recommendations are based on monitoring commitments in the Dendrobium Area 3B SMP, WIMMCP and SIMMCP and the proximity of sites to future longwalls.

Table 4: Monitoring associated with Longwall 12 and recommendations for monitoring during the extraction of Longwall 13.

ASPECT	MONITORING SITES ASSOCIATED WITH LONGWALL 12	MONITORING REQUENCY	RECOMMENDED FUTURE MONITORING
Watercourses	Observational, Photo Point and Water Monitoring		
	<ul style="list-style-type: none"> • Wongawilli Creek • Donalds Castle Creek • WC21 • WC16 • WC18 • LA4 • LA4A • LA4B • LA5 • LA6 • Swamps 1a, 3, 4, 5, 8, 10,11 and 13 	<p>Monthly 2 years pre and post mining, weekly when longwall is within 400m of monitoring site</p> <p>SLMMP Sites: pre and post mining, monthly when longwall is within 400m of monitoring site</p>	<ul style="list-style-type: none"> • WC15 • Swamp 14 • Wongawilli Creek – Continue as required • Donalds Castle Creek – Continue as required • WC21, WC16 and WC18 – Continue as required • DC13 – Continue as required • LA4, 4A, 4B and LA5 - continue as required • Swamps 1a, 3, 4, 5, 8, 10, 11 and 13 – Continue as required
	Water Quality		
	<ul style="list-style-type: none"> • WWU1 (Wongawilli Creek headwaters) • WWU4 (Wongawilli Creek upstream) • WC Pool 49 (Wongawilli Creek adjacent to LW15) • WC_Pool 46 [<i>Previously named WWM1</i>] (Wongawilli Creek adjacent to LW12) • WWM2 (Wongawilli Creek adjacent to LW11) • WC_Pool 43b [<i>Previously named WWM3</i>] (Wongawilli Creek downstream of LW9) • Wongawilli Ck (FR6) [<i>Previously named WWL2</i>] (Wongawilli Creek downstream) • WC21_Pool 5 [<i>Previously named WC21S1</i>] (Wongawilli Creek tributary downstream of mining) • WC21 Pool 30 (Wongawilli Creek tributaries over mining) 	<p>Monthly monitoring during and post mining for two years until required</p>	<p>Continue water quality sample sites as required by the SMP</p>

	<ul style="list-style-type: none"> • WC21 Pool 53 (Wongawilli Creek tributaries over mining) • WC15_Pool 9 [<i>Previously named WC15S1</i>] (Wongawilli Creek tributary downstream of mining) <p>Lake Avon</p> <ul style="list-style-type: none"> • LA4_S1, LA4_S2, LA5_S1, LA5_S2, LA_1, LA2_Pool 5, LA3_Pool 4 <p>Donalds Castle Creek:</p> <ul style="list-style-type: none"> • Donalds Castle Ck (FR6) [<i>Previously named DCU3</i>] (Donalds Castle Creek lower) • DCL3 (Donalds Castle Creek @ Cordeaux River) • DC_Pool 22 [<i>Previously named DCS2</i>] (Donalds Castle Creek downstream of mining) • DC13_Pool 2b [<i>Previously named DC13S1</i>] (Donalds Castle Creek tributary downstream of mining) 		
Swamps	Observational, Photo Point and Water Monitoring		
	<ul style="list-style-type: none"> • Swamps 1a, 3, 4, 5, 8, 10, 11 and 13 	Pre and post mining for two years, monthly when longwall is within 400m of monitoring site	<ul style="list-style-type: none"> • Swamp 14 • Swamps 3, 4, 5, 8, 10, 11 and 13- Continue as required by the SMP
	Shallow Groundwater Level		
	<ul style="list-style-type: none"> • Swamp 01A: 01a_01, 01a_02, 01a_03, 01a_04, 01a_04i, 01a_04ii, 01a_04iii, 01a_04iv, 01a_04v • Swamp 01B: 01b_01, 01b_02, 01b_02i, 01b_02ii, 01b_02iii, 01b_02iv, 01b_03 • Swamp 3: 03_01. • Swamp 05: 05_01, 05_02, 05_03, 05_03i, 05_03ii, 05_03iii, 05_04, 05_05, 05_06 • Swamp 08: 08_01, 08_02, 08_03, 08_04, 08_05, 08_06 • Swamp 10: 10_01 • Swamp 11: S11-H1, S11-H2, S11-H3 • Swamp 13: 13_01 	<p>For open hole sites:</p> <ul style="list-style-type: none"> • Monthly monitoring pre, during and post mining for two years to be removed annually • Reference sites 6 monthly <p>For instrumented sites:</p> <ul style="list-style-type: none"> • Automatic groundwater level monitoring , during and post mining (4 hour interval or similar) • Monitoring post mining for five years to be reviewed annually 	<ul style="list-style-type: none"> • Swamp 01A: 01a_01, 01a_02, 01a_03, 01a_04, 01a_04i, 01a_04ii, 01a_04iii, 01a_04iv, 01a_04v • Swamp 01B: 01b_01, 01b_02, 01b_02i, 01b_02ii, 01b_02iii, 01b_02iv, 01b_03 • Swamp 3: 03_01. • Swamp 05: 05_01, 05_02, 05_03, 05_03i, 05_03ii, 05_03iii, 05_04, 05_05, 05_06 • Swamp 08: 08_01, 08_02, 08_03, 08_04, 08_05, 08_06 • Swamp 10: 10_01 • Swamp 11: S11-H1, S11-H2, S11-H3 • Swamp 13: 13_01 • Swamp 14: 14_01, 14_02
	Soil Moisture		
	<ul style="list-style-type: none"> • Swamp 05: S05_S01, S05_S02, S05_S03, S05_S03i, S05_S03ii, 	<ul style="list-style-type: none"> • 6 monthly baseline and reference site monitoring 	<ul style="list-style-type: none"> • Swamp 05: S05_S01, S05_S02, S05_S03, S05_S03i, S05_S03ii,

	<p>S05_S03iii, S05_S04, S05_S05, S05_S08</p> <ul style="list-style-type: none"> • Swamp 08: S08_S01, S08_S02, S08_S03, S08_S04, S08_S05, S08_S06 • Swamp 11: S11_S01, S11_S02, S11_S05 • Swamp 13: S13_S01, S13_S02, S13_S03 <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamp 2: S02_S01 • Swamp 7: S07_S05, S07_S06 • Swamp 15A: S15a_S01, S15a_Piezo, S15a_S04, S15a_S06 • Swamp 22: 22_01, 22_02 • Swamp 24: S24_S01 • Swamp 25: S25_S01 • Swamp 33: S033_S01, S033_S03 • Swamp 84: S84_S02 • Swamp 85: S85_S01, S85_S02 • Swamp 86: S86_S01, S86_S02 • Swamp 87: S87_S01, S87_S02 • Swamp 88: S88_S01, S88_S02 	<ul style="list-style-type: none"> • Weekly monitoring when longwall is within 400m of swamp • 6 monthly monitoring for 2 years post mining 	<p>S05_S03iii, S05_S04, S05_S05, S05_S08</p> <ul style="list-style-type: none"> • Swamp 08: S08_S01, S08_S02, S08_S03, S08_S04, S08_S05, S08_S06 • Swamp 11: S11_S01, S11_S02, S11_S05 • Swamp 13: S13_S01, S13_S02, S13_S03 • Swamp 14: 14_01, 14_02 <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamp 2: S02_S01 • Swamp 7: S07_S05, S07_S06 • Swamp 15A: S15a_S01, S15a_Piezo, S15a_S04, S15a_S06 • Swamp 22: 22_01, 22_02 • Swamp 24: S24_S01 • Swamp 25: S25_S01 • Swamp 33: S033_S01, S033_S03 • Swamp 84: S84_S02 • Swamp 85: S85_S01, S85_S02 • Swamp 86: S86_S01, S86_S02 • Swamp 87: S87_S01, S87_S02 • Swamp 88: S88_S01, S88_S02
Landscape	Targeted Sites		
	<p>Cliffs No clifflines associated with Longwall 12</p> <p>Fire Trails Fire road 6A (Across Longwalls 10-18)</p>	<ul style="list-style-type: none"> • Baseline monitoring campaign prior to monitoring • Monthly monitoring during any subsidence period • Monitoring to continue 6 monthly for 2 years following the completion of mining 	<p>Cliffs</p> <ul style="list-style-type: none"> • DA3-CF19 • DA3-CF20 • DA3-CF21 • DA3-CF22 • DA3-CF23 <p>Fire Trails Fire Road 6A (across LWs 10-18) - Continue as required by the SMP</p>
Inspection of Active Mining Area – Landscape Features, Vegetation, Watercourses			
	<p>All mapped cliff, steep slopes, watercourse, swamp and fire trail sites in subsidence area</p> <p>General observation of active mining areas</p>	<ul style="list-style-type: none"> • Weekly monitoring when longwall extraction is within 400m of feature 	<p>Continue monitoring of all mapped cliffs, steep slopes, watercourse, swamp and fire trail sites in subsidence area</p> <p>Continue general observation of active mining areas</p>

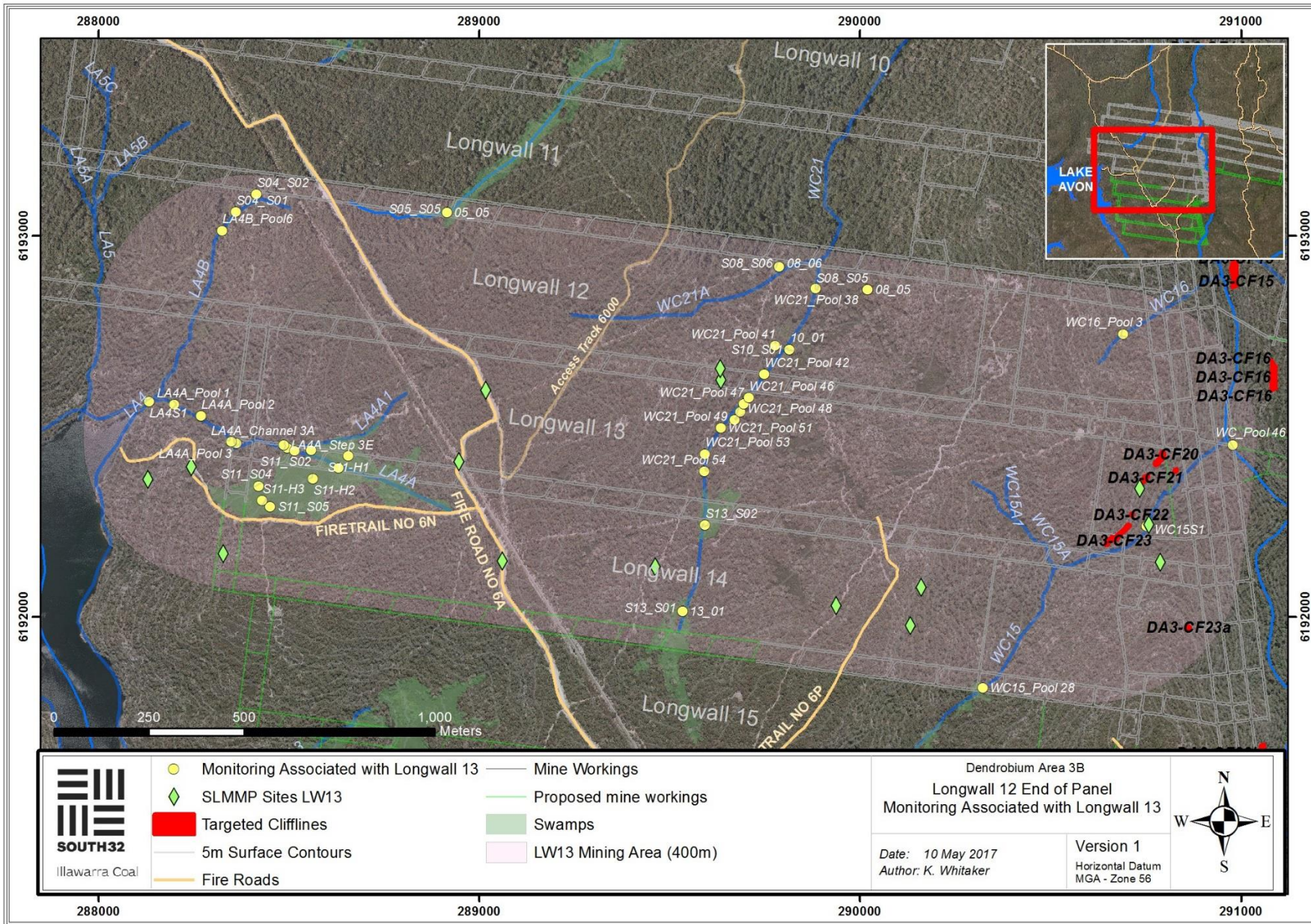


Figure 9: Monitoring sites relevant to Longwall 13.

APPENDIX A – LONGWALL 12 MONITORING PROGRAM

Table 5: Overview of surface monitoring for Longwall 12

ASPECT	MONITORING SITE	MONITORING FREQUENCY	MONITORED SITES ASSOCIATED WITH LONGWALL 12
Watercourse	Observational, Photo Point and Water Monitoring		
	<p>Impact Sites:</p> <ul style="list-style-type: none"> • Native Dog, Wongawilli and Donalds Castle Creeks, WC21, WC15, LA4, DC13, LA5, LA6, ND1, WC6, WC7, WC8, WC9, WC12, WC16 and WC18 • Swamps 5, 10, 11, 13, 14, 23, 35a, 35b, 1a, 1b, 8, 3 and 4 <p>Reference Sites:</p> <ul style="list-style-type: none"> • Wongawilli Creek, Sandy Creek, LC7B, WC11, SC9A, SC10A, NDC1, DC10 and D10 • Swamps 2, 7, 15a, 22, 24, 25, 33, 84, 85, 86, 87 and 88 	<ul style="list-style-type: none"> • Monthly 2 years pre and post mining, weekly when longwall is within 400m of monitoring site • Reference sites 6 monthly • SLMMP Sites: Pre and post mining, monthly when longwall is within 400m of monitoring site 	<ul style="list-style-type: none"> • Wongawilli Creek • Donalds Castle Creek • WC21 • WC16 • WC18 • DC13 • LA4, LA5 and LA6 • Swamps 1a, 1b, 3, 4, 5 8, 10, 11, 13
	Water Quality		
	<p>Wongawilli Creek</p> <ul style="list-style-type: none"> • WWU1 (Wongawilli Creek headwaters) • WWU4 (Wongawilli Creek upstream) • WC Pool 49 (Wongawilli Creek adjacent to LW15) • WC_Pool 46 (Wongawilli Creek adjacent to LW12) • WWM2 (Wongawilli Creek adjacent to LW11) • WC_Pool 43b (Wongawilli Creek downstream of LW9) • Wongawilli Ck (FR6) (Wongawilli Creek downstream) • WC21_Pool 5 (Wongawilli Creek tributary downstream of mining) • WC21 Pools 30 and 53 (Wongawilli Creek tributaries over mining) 	<ul style="list-style-type: none"> • Monthly monitoring pre, during and post mining for two years 	<p>Wongawilli Creek</p> <ul style="list-style-type: none"> • WWU1 • WWU4 • WC Pool 49 • WC_Pool 46 • WWM2 • WC_Pool 43b • Wongawilli Ck (FR6) • WC21_Pool 5, Pool 30 and Pool 53

<ul style="list-style-type: none"> • WC15_Pool 9 (Wongawilli Creek tributary downstream of mining) <p>Lake Avon</p> <ul style="list-style-type: none"> • LA4_S1, LA4_S2, LA5_S1, LA5_S2, LA3 Pool 4, LA2 Pool 5 and LA_1 (Lake Avon tributaries downstream of mining) • NDC4 (Native Dog Creek downstream of mining) • NDC1 (Native Dog Creek upstream of Area 3B) <p>Donalds Castle Creek</p> <ul style="list-style-type: none"> • Donalds Castle Ck (FR6) (Donalds Castle Creek lower) • DCL3 (Donalds Castle Creek @ Cordeaux River) • DC_Pool 22 (Donalds Castle Creek downstream of mining) • DC13_Pool 2b (Donalds Castle Creek tributary downstream of mining) 		<ul style="list-style-type: none"> • WC15_Pool 9 <p>Lake Avon</p> <ul style="list-style-type: none"> • LA4_S1, LA4_S2, LA5_S1, LA5_S2, LA3 Pool 4, LA2 Pool 5 and LA_1 • NDC4 • NDC1 <p>Donalds Castle Creek</p> <ul style="list-style-type: none"> • Donalds Castle Ck (FR6) • DCL3 • DC_Pool 22 • DC13_Pool 2b
Swamps		
Observational, Photo Point and Water Monitoring		
<p>Impact Sites:</p> <ul style="list-style-type: none"> • Swamps 1a, 1b, 3, 4, 5, 8, 10, 11, 13, 14, 23, 35a and 35b <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamps 2, 7, 15a, 22, 24, 25, 33, 84, 85, 86, 87 and 88 	<ul style="list-style-type: none"> • Pre and post mining for 2 years, monthly when longwall is within 400m of monitoring site • Weekly inspection and pool water levels when longwall is within 400m of monitoring site • Reference sites 6 monthly 	<ul style="list-style-type: none"> • Swamps 1a, 1b, 3, 4, 5 8, 10, 11, 13
Erosion Monitoring		
<p>Impact Sites:</p> <ul style="list-style-type: none"> • Swamps 1a, 1b, 3, 4, 5, 8, 10, 11, 13, 14, 23, 35A and 35B <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamps 2, 7, 15A, 22, 24, 25, 33, 84, 85, 86, 87 and 88 	<p>ALS base surveys were completed in December 2005, with a verification base survey performed in 2013, immediately prior to the commencement of Longwall 9 extraction</p> <p>Ground based surveys to be completed for each longwall after each longwall or to define any</p>	<ul style="list-style-type: none"> • Swamps 1a, 1b, 3, 4, 5 8, 10, 11, 13

	new erosions identified by ALS survey
Shallow Groundwater Level	
<p>Impact Sites:</p> <ul style="list-style-type: none"> • Swamp 01A: 01a_01, 01a_02, 01a_03, 01a_04, 01a_04i, 01a_04ii, 01a_04iii, 01a_04iv, 01a_04v • Swamp 01B: 01b_01, 01b_02, 01b_02i, 01b_02ii, 01b_02iii, 01b_02iv, 01b_03 • Swamp 03: 03_01 • Swamp 04: (thin soil profile) • Swamp 05: 05_01, 05_02, 05_03, 05_03i, 05_03ii, 05_03iii, 05_04, 05_05, 05_06 • Swamp 08: 08_01, 08_02, 08_03, 08_04, 08_05, 08_06 • Swamp 10: 10_01 • Swamp 11: S11-HI, S11-H2, S11-H3 • Swamp 13: 13_01 • Swamp 14: 14_01, 14_02 • Swamp 23: 23_01, 23_02 • Swamp 35A: 35A_01 • Swamp 35B: 35B_01 <p>Note: Swamp 4 is too shallow for a piezometer to be installed. Piezometers to be installed in Swamps 14, 23, 35A and 35B prior to mining</p> <p>Reference Sites:</p> <ul style="list-style-type: none"> • Swamp 2: 02_01 • Swamp 7: 07_05, 07_06 • Swamp 15A: 15a_02, 15a_03, 15a_04, 15a_06, 15a_07, 15a_08, 15a_09, 15a_11, 15a_12, 15a_15 • Swamp 22: 22_01, 22_02 	<p>For open hole sites:</p> <ul style="list-style-type: none"> • Monthly monitoring pre, during and post mining for two years to be reviewed annually • Reference sites 6 monthly <p>For instrumented sites:</p> <ul style="list-style-type: none"> • Automatic groundwater level monitoring pre,during and post mining (4 hour interval or similar) • Monitoring post mining for five years to be reviewed annually <p>• Swamps 1a, 1b, 3, 4, 5 8, 10, 11, 13</p>

- Swamp 24: 24_01
- Swamp 25: 25_01
- Swamp 33: 33_01, 33_03
- Swamp 84: 84_02
- Swamp 85: 85_01, 85_02
- Swamp 86: 86_01, 86_02
- Swamp 87: 87_01, 87_02
- Swamp 88: 88_01, 88_02

Soil Moisture

Impact Sites:

- Swamp 03: (thin soil profile)
- Swamp 04: (thin soil profile)
- Swamp 05: S05_S01, S05_S02, S05_S05, S05_S08
- Swamp 08: S08_S05
- Swamp 11: S11_S01, S11_S02, S11_S05
- Swamp 13: S13_S01, S13_S02, S13_S03
- Swamp 14: 14_01, 14_02
- Swamp 23: 23_01, 23_02
- Swamp 35A: 35a_01
- Swamp 35B: 35b_01

Reference Sites:

- Swamp 2: S02_S01
- Swamp 7: S07_S05, S07_S06
- Swamp 15A: S15a_S01, S15a_Piezo, S15a_S04, S15a_S06
- Swamp 22: 22_01, 22_02
- Swamp 24: S24_S01
- Swamp 25: S25_S01
- Swamp 33: S033_S01, S033_S03
- Swamp 84: S84_S02

For manually measured sites:

- Monthly monitoring for 2 years baseline and post mining and 6 monthly reference site
- Weekly monitoring when longwall is within 400m of monitoring site

For instrumented sites:

- Automatic soil moisture monitoring pre, during and post
- Monitoring post mining for five years to be reviewed annually

- Swamps 5, 8, 11, 13

	<ul style="list-style-type: none"> • Swamp 85: S85_S01, S85_S02 • Swamp 86: S86_S01, S86_S02 • Swamp 87: S87_S01, S87_S02 • Swamp 88: S88_S01, S88_S02 		
Landscape	Targeted sites		
	<p>Cliffs</p> <ul style="list-style-type: none"> • DA3-CF19 (E LW13) • DA3-CF20 (E LW13) • DA3-CF21 (E LW13) • DA3-CF22 (E LW13) • DA3-CF23 (E LW13) • DA3-CF25 (E LW17) • DA3-CF26 (E LW17) • DA3-CF41 (E LW18) • DA3-CF42 (E LW18) • DA3-CF43 (E LW18) <p>Watercourses/Swamps Refer to DA3B Watercourses/Swamps Impact Monitoring Management Contingency Plan/s</p> <p>Fire Trails</p> <ul style="list-style-type: none"> • Fire Road No.6A (across LWs 10-18) • Fire Road No.6N (across LW14) • Fire Road No.6Q (across LW 15, 16 and 17) 	<ul style="list-style-type: none"> • Baseline monitoring prior to mining • monthly monitoring during any subsidence period • Monitoring to continue 6 monthly for 2 years following the completion of mining 	<p>Cliffs No clifflines associated with Longwall 12</p> <p>Fire Trails Fire Road No.6A (across LWs 10-18)</p>
	Inspection of Active Mining Area - Landscape Features, Vegetation, Watercourses		
	<ul style="list-style-type: none"> • All mapped cliff, steep slopes, watercourse, swamp and fire trail sites in subsidence area • General observation of active mining areas 	<ul style="list-style-type: none"> • Weekly monitoring when longwall extraction is within 400m of feature 	<ul style="list-style-type: none"> • All mapped cliff, steep slopes, watercourse, swamp and fire trail sites in subsidence area

• General observation of active mining areas

Table 6: Area 3B Impacts, TARPs & Performance Measures – Longwall 12 End of Panel Report

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
WATERCOURSES					
<p>Wongawilli Creek & Donalds Castle Creek</p> <p><i>Area 3B SMP Approval:</i> Minor environmental consequences including:</p> <ul style="list-style-type: none"> • <i>minor</i> fracturing, gas release and iron staining; and • <i>minor</i> impacts on water flows, water levels and water quality. <p><i>Dendrobium Modified Development Consent:</i></p> <ul style="list-style-type: none"> • Operations shall not cause subsidence impacts at Wongawilli Creek other than “minor impacts” (such as minor fracturing, gas release, 	<p>Minor environmental consequences including: minor fracturing, gas release and iron staining; and minor impacts on water flows, water levels and water quality</p>	<p><u>Observational</u></p> <ul style="list-style-type: none"> • Fracturing within Wongawilli Creek and/or Donalds Castle Creek resulting in diversion of flow such that >10% of the pools (in Wongawilli Creek or Donalds Castle Creek) have water levels lower than baseline period • Measured surface water flow reduction in Wongawilli Creek and/or Donalds Castle Creek at its confluence with Cordeaux River that is greater than predicted by the groundwater model (to the satisfaction of the Director General - Condition 13 of the SMP) that cannot be 	<p><u>Observational</u></p> <p>Level 1</p> <ul style="list-style-type: none"> • Crack or fracture up to 100mm width at its widest point with no observable loss of surface water or erosion • Crack or fracture up to 10m length with no observable loss of surface water or erosion • Erosion in a localised area (not associated with cracking or fracturing) which would be expected to naturally stabilise without CMA and within the period of monitoring • Observable release of strata gas at the surface • Observable increase in iron staining within the mining area 	<p>Wongawilli Ck (FR6)- One exceedance of the +3 standard deviation level from the baseline mean for Electrical Conductivity (<i>Further discussed in Surface and Shallow Groundwater Assessment</i>)</p>	<p>See update report dated 2/02/2017.</p>

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
<p>iron staining and minor impacts on water flows, water levels and water quality);</p> <ul style="list-style-type: none"> • Operations will not result in reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek. 		<p>attributed to natural variation</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 revegetate • Gas release results in mortality of threatened species or ongoing loss of aquatic habitat • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at Wongawilli Creek downstream monitoring site WONGAWILLI CK (FR6) • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at the Donalds Castle Creek downstream monitoring site Donalds Castle Ck (FR6) 	<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 	No Level 2 impacts observed	
			<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 	No Level 3 impacts observed	

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
			<p>within the monitoring period without intervention</p> <ul style="list-style-type: none"> • 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 		
		<u>Pool Water Level</u> Fracturing resulting in diversion of flow such that >10% of the pools have water levels lower than baseline period	<u>Pool Water Level</u> Level 1 <ul style="list-style-type: none"> • Fracturing not resulting in diversion of flow 	No Level 1 impacts observed	
			Level 2 <ul style="list-style-type: none"> • Fracturing resulting in diversion of flow 	No Level 2 impacts observed	
			Level 3 <ul style="list-style-type: none"> • Fracturing resulting in diversion of flow such that <10% of the pools have water levels lower than baseline period 	No Level 3 impacts observed	

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
	<p><u>Drainage lines</u></p> <ul style="list-style-type: none"> • Changes in the natural gradient and stream alignment • Changes in the levels of ponding, flooding and scouring of the banks • Surface fracturing • Surface water diversion • Induction of ferruginous springs <p><i>N.B. Not linked specifically to a performance measure</i></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 revegetate • Gas release results in mortality of threatened species or ongoing loss of aquatic habitat • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at Wongawilli Creek downstream monitoring site Wongawilli CK (FR6) 	<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"> • Impact DA3B_LW12_019 – Rock fracturing and uplift to step on tributary WC21. 	<p>See Impact Report dated 9/11/2016.</p>

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
		<ul style="list-style-type: none"> Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at the Donalds Castle Creek downstream monitoring site Donalds Castle Ck (FR6) 	<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"> Impact DA3B_LW12_005 – Rock fracturing and uplift with flow diversion observed on tributary LA4. Impact DA3B_LW12_006 – Two exceedances of the -3 standard deviation level from the baseline mean for Dissolved Oxygen (<i>Further discussed in Surface Water Assessment</i>) Impact DA3B_LW12_008 – Rock fracturing and uplift with flow diversion observed on tributary LA4B, downstream from Swamp 4. Impact DA3B_LW12_010 – Rock fracturing and flow diversion, observed on tributary LA4B. 	<p>See Impact Report dated 4/05/2016 and 6/07/2016.</p> <p>See Impact Report dated 4/05/2016 and 23/05/2016.</p> <p>See Impact Report dated 23/05/2016 and 6/07/2016.</p> <p>See Impact Report dated 26/05/2016.</p>

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
			<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 	No Level 3 impacts observed	
SWAMPS					

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
	<p>Falls in surface or near-surface groundwater levels in swamps.</p> <p><i>N.B not linked specifically to a performance measure and would not be considered a breach if predictions were exceeded.</i></p>		<p>Level 1 Groundwater level lower than baseline level at any monitoring site within a swamp (in comparison to reference swamps); and/or 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>No new Level 1 impacts observed.</p>	
			<p>Level 2 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 Rate of groundwater level reduction exceeds rate of groundwater level reduction during baseline</p>	<p>No new Level 2 impacts observed.</p>	

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
			<p>period at a 50% of monitoring sites (within 400m of mining) within the swamp.</p>		
			<p>Level 3 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 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"> • Swamp 10: Groundwater reduction rates exceed that during the baseline period at 1 out of 1 borehole. 	<p>See Impact Report dated 24/11/2016.</p>

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
	Falls in soil moisture levels in swamps. <i>N.B. Not linked specifically to a performance measure and would not be considered a breach if predictions were exceeded.</i>		<p>Level 1 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>Level 2 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>Level 3 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"> • Swamp 11: Soil moisture levels dropped below those experienced in the baseline period, at 2 out of 2 boreholes within 400m of LW12. 	See Impact Report dated 2/03/2017.

Performance Measure	Potential Impacts	Exceeding Prediction	TARP Trigger Level	Observed Impacts	Additional Comments
LANDSCAPE					
	<p>The cliffs located in the SMP Area are all located outside the extents of the proposed longwalls, at minimum distances of 30 m to 460 m at the closest points. It is possible therefore that some small isolated rock falls could occur along the cliffs as a result of the extraction of the proposed longwalls. It is not expected however, that, any large scale cliff instabilities would occur based on previous experience.</p> <p>Impacts to steep slopes due to mining induced</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 	<ul style="list-style-type: none"> • Impact DA3B_LW12_001 – Soil cracking on seismic track. • Impact DA3B_LW12_002 – Soil cracking on seismic track. • Impact DA3B_LW12_003 – Soil cracking on seismic track. • Impact DA3B_LW12_004 – Soil cracking on seismic track. • Impact DA3B_LW12_007 – Soil cracking on seismic track. • Impact DA3B_LW12_009 – Soil cracking on seismic track. • Impact DA3B_LW12_011 – Soil cracking on seismic track. 	<p>Soil cracks stabilised and expected to infill through natural processes. Some filled by hand.</p> <p>Refer to relevant impact reports dated:</p> <p>16/04/2016, 13/04/2016, 23/05/2016, 31/05/2016, 27/06/2016, 6/07/2016, 26/07/2016, 5/10/2016, 13/10/2016, 9/11/2016, 15/11/2016, 24/11/2016</p>

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
	<p>subsidence are most likely to occur in the form of surface cracks. Experience indicates that the likelihood of large-scale down-slope movements is extremely low due to the high depth of cover within the SMP Area.</p> <p>If tension cracks do develop it is possible that soil erosion may occur if the cracks are left untreated. Some remediation may therefore be required.</p>		<p>naturally stabilise without CMA and within the period of monitoring</p>	<ul style="list-style-type: none"> • Impact DA3B_LW12_012 – Soil cracking on seismic track. • Impact DA3B_LW12_013 – Soil cracking on fire trail. • Impact DA3B_LW12_014 – Soil cracking on rail corridor. • Impact DA3B_LW12_015 – Soil cracking on fire trail. • Impact DA3B_LW12_016 – Soil cracking on fire trail. • Impact DA3B_LW12_017 – Soil cracking on fire trail. • Impact DA3B_LW12_018 – Soil cracking on fire trail. • Impact DA3B_LW12_020 – Soil cracking on seismic track. • Impact DA3B_LW12_021 – Soil cracking on seismic track. • Impact DA3B_LW12_022 – Soil cracking on seismic track. • Impact DA3B_LW12_023 – Soil cracking on seismic track. • Impact DA3B_LW12_024 – 	

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
				Soil cracking on seismic track.	
			<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 	<ul style="list-style-type: none"> • Impact DA3B_LW12_025 – Soil cracking on seismic track. • Impact DA3B_LW12_026 – Fracturing to rock outcrop. 	<p>See Impact report dated 24/11/2016.</p> <p>See Impact report dated 24/01/2017.</p>

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
			<ul style="list-style-type: none"> • 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 		
			<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 	No Level 3 Landscape Impacts observed.	

Performance Measure	Potential Impacts	<i>Exceeding Prediction</i>	TARP Trigger Level	Observed Impacts	Additional Comments
			<p>disturbance that is unlikely to naturally stabilise within the monitoring period</p> <ul style="list-style-type: none"> • Crack or fracture over 300mm width • Crack or fracture over 50m length • Mass movement of a slope causing large areas of exposed soil with potential for further movement 		

APPENDIX B – IMPACTS, TRIGGERS AND RESPONSE

Table 7: Dendrobium Swamp Impacts, Triggers and Response

<i>Performance Measures</i>	<i>Potential Impacts</i>	<i>Performance Triggers</i>	<i>Management Strategies</i>	<i>Offsets</i>	<i>Other Actions</i>
Negligible erosion of the surface of the swamp	Gully erosion or similar	<p><u>Level 1:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 2% of the swamp length or area; and/or</p> <p>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.</p> <p><u>Level 2:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 3% of the swamp length or area; and/or</p> <p>Soil surface crack that causes erosion that is likely to stabilise within the monitoring period without intervention; and/or</p> <p>Gully knickpoint forms or an existing gully knickpoint becomes active.</p> <p><u>Level 3:</u> The increase in length of erosion within a swamp (compared to its pre-mining length) is 4% of the swamp length or area; and/or</p> <p>Soil surface crack that causes erosion that is unlikely to stabilise within the monitoring period without intervention.</p> <p><u>Exceeding Prediction</u></p> <p>Mining results in the total length of erosion within a swamp (compared to its pre-mining length) to increase >5% of the length or area of the swamp compared to any increase in total erosion length in a reference</p>	<p>a) upfront mine planning</p> <p>b) erosion monitoring (ie ALS, observation)</p> <p>c) coir logs</p> <p>d) knickpoint control</p> <p>e) water spreading</p> <p>f) weeding</p> <p>g) fire management</p> <p>h) reporting</p> <p>i) investigation and review</p> <p>j) update future predictions</p>	<p>Offset required immediately, if no remediation considered practicable.</p> <p>Offset required 2 years following remediation, if it is ineffective.</p> <p>This period can be extended to 5 years, with the agreement of the Secretary.</p>	

		swamp (ie increase in length or area of erosion in an impact swamp less any increase in length or area in erosion in a reference swamp is >5%).			
<p>Minor changes in the size of the swamps</p> <p>Minor changes in the ecosystem functionality of the swamps</p> <p>No significant change to the composition or distribution of species within the swamps</p>	<p>Swamp vegetation changes:</p> <ul style="list-style-type: none"> - Swamp size - Species richness, distribution, composition and diversity - Vegetation sub-communities 	<p>Swamp Size</p> <p><u>Level 1:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for two consecutive monitoring periods, greater than observed in the Control Group, and exceeding the standard error (SE) of the Control Group.</p> <p><u>Level 2:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for three consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Level 3:</u> A trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for four consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p><u>Exceeding Prediction:</u></p> <p>Mining results in a trending decline in the extent of an upland swamp (combined area of groundwater dependent communities) for five consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p>Ecosystem Functionality</p> <p><u>Level 1:</u> A trending decline in the extent of any individual groundwater dependent community within a swamp for two consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p>	<ul style="list-style-type: none"> a) upfront mine planning b) vegetation monitoring c) water spreading d) seeding/planting e) weeding f) fauna monitoring g) fire management h) grouting of controlling of rockbars and bedrock base and/or use of other remediation techniques i) reporting j) investigation and review k) update future predictions 	<p>Offset required immediately, if no remediation considered practicable.</p> <p>Offset required 5 years following remediation, if it is ineffective.</p> <p>This period can be extended to 10 years, with the agreement of the Secretary.</p>	<p>Monitoring period for swamp size is related to capture of Lidar data at the end of each longwall ~ 1 year</p> <p>Triggers for groundwater decline result in increased intensity and frequency of vegetation monitoring</p>

		<p><u>Level 2:</u> A trending decline in the extent of any groundwater dependent community within a swamp for three consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group..</p> <p><u>Level 3:</u> A trending decline in the extent of any groundwater dependent community within a swamp for four consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group..</p> <p><u>Exceeding Prediction:</u> Mining results in a trending decline in the extent of a groundwater dependent community within a swamp for five consecutive monitoring periods, greater than observed in the Control Group, and exceeding the SE of the Control Group.</p> <p>Species Composition and Distribution</p> <p><u>Level 1:</u> A 2% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for two consecutive years; and/or</p> <p><u>Level 2:</u> A 5% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for three consecutive years.</p> <p><u>Level 3:</u> An 8% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for four consecutive years.</p>			
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		<p><u>Exceeding Prediction:</u> Mining results in a >10% (or otherwise statistically significant) decline in species richness or diversity during a period of stability or increase in species richness/diversity in reference swamps for five consecutive years.</p>			
<p>Maintenance or restoration of the structural integrity of the bedrock base of any significant permanent pool or controlling rockbar within the swamps</p>	<p>Subsidence impacts (ie cracking) on bedrock base or controlling rockbar</p>	<p><u>Level 1:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 10% compared to baseline for the pool (in addition to any decrease in reference pools).</p> <p><u>Level 2:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 20% compared to baseline for the pool (in addition to any decrease in reference pools).</p> <p><u>Level 3:</u> Fracturing observed in the bedrock base of any significant permanent pool which results in observable loss of surface water of 20% compared to baseline for the pool for >20% of the time over a period of 1 year (in addition to any decrease in reference pools).</p> <p><u>Exceeding Prediction</u> Structural integrity of the bedrock base of any significant permanent pool or controlling rockbar cannot be restored, ie pool water level within the swamp after CMAs continues to be >20% lower than baseline for >20% of the time over a period of 1 year.</p>	<p>a) upfront mine planning b) subsidence monitoring c) surface water monitoring d) groundwater monitoring e) grouting of controlling of controlling rockbars and bedrock base and/or use of other remediation techniques f) CMAs g) reporting h) investigation and review i) update future predictions</p>	<p>Offset required immediately, if no remediation considered practicable.</p> <p>Offset required 2 years following remediation, if it is ineffective.</p> <p>This period can be extended to 5 years, with the agreement of the Secretary.</p>	
<p>Minor changes in the</p>	<p>Falls in surface or near-surface</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>a) upfront mine planning</p>		<p>Triggers for groundwater</p>

ecosystem functionality of the swamps	groundwater levels in swamps <i>NB. Not linked specifically to a PM and would not be considered a breach if predictions were exceeded.</i>	<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"> b) groundwater monitoring c) implementation of swamp research program d) weeding e) fire management f) reporting g) update future predictions 		decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of subsidence impacts on bedrock base and rockbars
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</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>	<ul style="list-style-type: none"> a) upfront mine planning b) soil moisture monitoring c) water spreading d) weeding e) fire management f) reporting 		Triggers of soil moisture decline result in increased intensity and frequency of vegetation monitoring and/or further investigations of

	<i>predictions were exceeded.</i>	<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).	g) update future predictions		subsidence impacts on bedrock base and rockbars
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Table 8: Dendrobium Watercourse Impacts, Triggers and Response

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>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>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 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 	<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

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> • 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"> • 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 revegetate • Gas release results in mortality of threatened species or ongoing loss of aquatic habitat • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at Wongawilli Creek downstream monitoring site WONGAWILLI CK (FR6) • Iron staining and associated increases in dissolved iron resulting from the mining is observed in water at the Donalds Castle Creek downstream monitoring site Donalds Castle Ck (FR6) • Rock fall at WC-WF54 or its overhang • Impacts on the structural integrity of WC-WF54, its overhang or its pool 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
WATER QUALITY		
<p>Wongawilli Creek</p> <p>Wongawilli Ck (FR6)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> • pH 5.98 • EC 98.8 uS/cm 	<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

Monitoring	Trigger	Action
<ul style="list-style-type: none"> • DO 89.5% <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences 	<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 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 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

Monitoring	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 uS/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 uS/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 uS/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 uS/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
	<p>Exceeding Prediction</p>	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i>

Monitoring	Trigger	Action
	<ul style="list-style-type: none"> 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 style="list-style-type: none"> pH 3.60 EC 185.8 uS/cm DO 40.1% 	<ul style="list-style-type: none"> Investigate reasons for the exceedance Update future predictions based on the outcomes of the investigation Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
<p>Lake Avon</p> <p>Lake Avon tributary (LA4_S1)</p> <p>Baseline means:</p> <ul style="list-style-type: none"> pH 5.38 EC 90.8 uS/cm DO 89.9% <p>(24 months of baseline data available - to be updated with additional baseline data)</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> Lake Avon - negligible reduction in the quality of surface water inflows to Lake Avon 	<p>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 4.90 EC 129.8 uS/cm DO 69.5% 	<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 4.90 EC 129.8 uS/cm DO 69.5% 	<ul style="list-style-type: none"> <i>Actions as stated for Level 1</i> Review monitoring frequency 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 4.90 EC 129.8 uS/cm DO 69.5% 	<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 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

Monitoring	Trigger	Action
		<ul style="list-style-type: none"> - 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 and DO) from the baseline mean of the Lake Avon inflows during the monitoring period: <ul style="list-style-type: none"> - pH 4.90 - EC 129.8 uS/cm - DO 69.5% 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
POOL WATER LEVEL		
<p>Mapped pools in the mining area:</p> <ul style="list-style-type: none"> • Wongawilli Creek • Donalds Castle Creek <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Wongawilli Creek - minor environmental consequences • Donalds Castle Creek - minor environmental consequences 	<p>Level 1 *</p> <ul style="list-style-type: none"> • Fracturing not resulting in diversion of flow 	<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"> • Fracturing resulting in diversion of flow 	<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"> • Fracturing resulting in diversion of flow such that <10% of the pools have water levels lower than baseline period 	<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: 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

Monitoring	Trigger	Action
		<ul style="list-style-type: none"> • 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>Waterfall WC-WF54</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Waterfall WC-WF54 – negligible environmental consequences 	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Fracturing resulting in diversion of flow such that >10% of the pools have water levels lower than baseline period 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent
MODELLED PERIODS OF RECESSIONAL, BASEFLOW AND SMALL STORM UNIT HYDROGRAPH PERIODS		
<p>Subcatchments of Wongawilli and Donalds Castle Creeks and Lake Avon tributaries **</p>	<p>Level 1 *</p> <ul style="list-style-type: none"> • Change 6-12% less than average annual precipitation *** 	<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"> • Change 12-18% less than average annual precipitation *** 	<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"> • Change >18% less than average annual precipitation *** 	<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

Monitoring	Trigger	Action
		<p>pool where it is appropriate to do so in consultation with OEH, DoPE, T&I, Water NSW and other stakeholders</p> <ul style="list-style-type: none"> • 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>Inflows to Lake Avon and Cordeaux River **</p> <p>Relevant Performance Measure(s):</p> <ul style="list-style-type: none"> • Lake Avon - negligible reduction in the quantity of surface water inflows to Lake Avon • Cordeaux River - negligible reduction in the quantity of surface water flows from Wongawilli Creek to Cordeaux River 	<p>Exceeding Prediction</p> <ul style="list-style-type: none"> • Measured surface water flow reduction in Wongawilli Creek at its confluence with Cordeaux River that is greater than predicted by the groundwater model (to the satisfaction of the Director General - Condition 13 of the SMP) that cannot be attributed to natural variation • Surface water flow reduction into Lake Avon is greater than predicted by the groundwater model (to the satisfaction of the Director General - Condition 13 of the SMP) that cannot be attributed to natural variation 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 3</i> • Investigate reasons for the exceedance • Update future predictions based on the outcomes of the investigation • Provide residual environmental offset for any mining impact where CMAs are unsuccessful as required by Condition 14 Schedule 3 of the Development Consent

* These may be revised in consultation with DoPE and T&I and other key stakeholders following analysis of natural variability within the pre-mining baseline data. These TARPs relate to Dendrobium Area 3B and impacts resulting from mining in Areas 1, 2 and 3A were managed under previous TARPs.

** Water budgets during recession, baseflow and small storm unit hydrograph periods would be determined by hydrologic modelling of pre- and post-mining hydrographic data using the Free University of Amsterdam RUNOFF2005 model and validation of model-determined ETs against those estimated by the independent CSIRO Land and Water Division (Zhang et al.) method. These TARPs would apply only to the whole of catchment water delivered to Lake Cordeaux, Lake Avon and Cordeaux River. Model reliability is maintained only for catchments in excess of 1 km² in area. Average annual precipitation is modelled using the most recent 5 years of local record.

*** Hydrologic modelling conducted in the manner described above for the baseline period routinely produces mean estimated water budgets lying within about ±6% of average annual precipitation at the one standard deviation level and within about ±12% at the two standard deviation level.

Table 9: Dendrobium Landscape Impacts, Triggers and Response

Monitoring	Trigger	Action
LANDSCAPE FEATURES		
<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 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>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 	<ul style="list-style-type: none"> • <i>Actions as stated for Level 1</i> • Review monitoring frequency • Notify relevant technical specialists and seek advice on any CMA required • Provide safety signage and barricades as appropriate • Implement approved repairs to ensure safety and serviceability on fire trails • Implement agreed CMAs as approved <p><i>Note: CMAs are to be proposed based on appropriate management of environmental and other consequences of impacts i.e. cracking at the surface with insignificant consequences may not require specific CMAs other than ongoing monitoring to confirm there are no ongoing impacts</i></p>

Monitoring	Trigger	Action
	<p>likely to naturally stabilise within the monitoring period</p> <p>Level 3 *</p> <ul style="list-style-type: none"> Major cliff collapse where the characteristics of the cliff change significantly and there is significant ground disturbance that is unlikely to naturally stabilise within the monitoring period Crack or fracture over 300mm width 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"> Actions as stated for Level 2 Immediately notify DoPI, DPIM, SCA, resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required Review monitoring program and modify if necessary within 1 month Implement increased monitoring if required within 2 weeks 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
TERRESTRIAL FLORA AND FAUNA		
<p>A number of sites located across and around Areas 2, 3A and 3B</p> <p><i>Refer Dendrobium Area 3A SMP Figure 21.1, 21.2 and 21.3 and Dendrobium Area 3B Figure 20.1 for location of sites</i></p>	<p>Level 1 *</p> <ul style="list-style-type: none"> Vegetation impacted by mining (by rockfalls, soil slippage, gas emissions) that is likely to naturally regenerate within the monitoring period 	<ul style="list-style-type: none"> Continue monitoring program Report impacts to key stakeholders Summarise impacts and Report in the End of Panel Report and AEMR
	<p>Level 2 *</p>	<ul style="list-style-type: none"> Actions as stated for Level 1

Monitoring	Trigger	Action
General observation of active mining areas	<ul style="list-style-type: none"> Vegetation impacted by mining (by rockfalls, soil slippage, gas emissions) that is unlikely to naturally regenerate within the monitoring period Statistically significant difference between Before After Control Impact sites as a result of mining 	<ul style="list-style-type: none"> Review monitoring frequency Notify relevant technical specialists and seek advice on any CMA required Implement agreed CMAs as approved
	<p>Level 3 *</p> <ul style="list-style-type: none"> Vegetation impacted by mining that is not responding to CMAs 	<ul style="list-style-type: none"> Actions as stated for Level 2 Immediately notify OEH, DoPI, DPI, SCA, other resource managers and relevant technical specialists and seek advice on any CMA required Site visits with stakeholders if required 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

* These may be revised in consultation with DoPI and DPI and other key stakeholders following analysis of natural variability within the pre-mining baseline data. These TARPs relate to Dendrobium Area 3B and impacts resulting from mining in Areas 1, 2 and 3A were managed under previous TARPs.