



DENDROBIUM COAL MINE

LONGWALL 19A SUBSIDENCE MANAGEMENT PLAN

Reasons For Decision

BACKGROUND

- South32 Illawarra Metallurgical Coal's (South32's) Dendrobium Coal Mine (the mine) was approved by the then Minister for Planning in 2001 following a Commission of Inquiry.
- The development consent expressly allows longwall coal mining in Areas 1, 2, 3A, 3B and 3C. Longwall mining has already occurred in most of Areas 1, 2, 3A and 3B. Longwall mining has commenced in Area 3C, with the extraction of the first longwall (i.e. LW 21) recently completed.
- While mining in Area 3A (including the area covered by LW 19A) is already approved, the development consent requires a Subsidence Management Plan (SMP) to be submitted and approved before any longwall mining can occur.
- South32 proposes that LW 19A would be extracted following completion of LW 21 in Area 3C.

SMP APPLICATION

- South32 submitted an SMP application for LW 19A to the Department in December 2022. Due to inconsistencies in the longwall geometries considered in the SMP's specialist impact assessments, South32 submitted amendments to the SMP assessments in March 2023. This Reasons for Decision relies on information in both the original SMP and the amended assessments.
- In addition to the SMP itself, conditions of consent require that the SMP integrates three other more detailed plans, including a Watercourse Impact Monitoring, Management and Contingency Plan (WIMMCP), a Swamp Impact Monitoring, Management and Contingency Plan (SIMMCP) and a Sandy Creek Waterfall Management Plan (SCWMP). Each of these plans contains a Trigger, Action, Response Plan (TARP). Most of the detailed monitoring, management, remediation and contingency measures applicable under the SMP are contained within the WIMMCP, SIMMCP SCWMP and their associated TARPs.

CONSIDERATION BY AGENCIES

- The Department sought review and advice on the original and amended SMP applications from WaterNSW and the Department's Biodiversity and Conservation Division (BCD).
- Detailed advice was received from WaterNSW and BCD. These were forwarded to South32 for review and response.
- The Department also held meetings with both South32 and BCD.

INDEPENDENT EXPERT ADVISORY PANEL FOR MINING

- On 16 June 2023, the Department requested that the Independent Expert Advisory Panel for Mining (the Panel) provide advice on the SMP, specifically in relation to the appropriateness of the proposed setback distance from a significant swamp (i.e. Swamp 15a).
- The Panel provided the Department with its advice on 1 August 2023. The Panel's advice included twenty conclusions and eleven recommendations.
- South32 provided a response to the Panel's advice on 7 August 2023.

KEY CONSENT REQUIREMENTS

- The key matters for consideration by the Department in determining whether to approve the SMP application are whether South32 can meet the following conditions of consent (DA 60-03-2001):

Condition	Requirement
Condition 5, Schedule 3	The Applicant must ensure that subsidence does not cause erosion of the surface or changes in ecosystem functionality of Swamp 15a and that the structural integrity of its controlling rockbar is maintained or restored, to the satisfaction of the Secretary.
Condition 2, Schedule 3	The Applicant must ensure that underground mining operations do not cause subsidence impacts at Sandy Creek and Wongawilli Creek other than “minor impacts” (such as minor fracturing, gas release, iron staining and minor impacts on water flows, water levels and water quality) to the satisfaction of the Secretary.
Condition 1, Schedule 3	The Applicant must ensure that, as a result of the development: a) no rock fall occurs at Sandy Creek Waterfall or from its overhang; b) the structural integrity of the waterfall, its overhang and its pool are not impacted; c) cracking in Sandy Creek within 30 m of the waterfall is of negligible environmental and hydrological consequence; and d) negligible diversion of water occurs from the lip of the waterfall, to the satisfaction of the Secretary.
Condition 3, Schedule 3	The Applicant must ensure the development does 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, to the satisfaction of the Secretary.

KEY ISSUES

Mine Design

- BCD and WaterNSW recommended mine design changes to minimise or avoid subsidence-related impacts to watercourses, swamps and threatened/endangered species. Key suggestions included additional setbacks from natural features, particularly Swamp 15a and Wongawilli Creek.
- As discussed in detail below, based on historical and, in particular, recent monitoring results, and advice from the Panel, the Department considers that the proposed setback from Swamp 15a (i.e. 61 meters (m)) may not provide adequate protection to the “ecosystem functionality” of the swamp. The Department has therefore recommended that LW 19A be set back at least 120 m from Swamp 15a.
- Based on subsidence predictions, a rock bar model and previous experience of impacts at the mine, the Department accepts that the existing proposed setback from Wongawilli Creek (i.e. 390 m) is adequate to ensure that mining of LW 19A would result in no greater than “minor impacts” at Wongawilli Creek.

Swamp 15a

- Under its consent, South32 is required to ensure that subsidence does not cause erosion of the surface or changes in ecosystem functionality of Swamp 15a¹ and that the structural integrity of its controlling rock bar² is maintained or restored. In addition, the LW 19 SMP approval includes a performance measure for Swamp 15a requiring negligible environmental consequences (i.e. negligible erosion, change in swamp size, change in ecosystem functionality, change in composition or distribution of species and maintenance or restoration of the structural integrity of the rock bar).
- Swamp 15a is a large upland coastal swamp (approximately 1,330 m in length and 17.38 ha in area) which is located to the east, southeast and south of the proposed LW 19A (**Figure 2**). The swamp’s controlling rock bar is a 12 m waterfall at the north-eastern, downstream end of the swamp, which is located approximately 700 m from the proposed LW 19A.
- In its advice on both LW 19 and LW 19A, the Panel³ advised that adaptive management is not suitable for managing the risk of impacts to the ecosystem functionality of Swamp 15a because:
 - there are no real time performance indicators suitable for pre-empting impending mining-induced changes in the ecosystem functionality of a swamp;
 - the time lag between cause and impact on ecosystem functionality is too long for identifying the need to implement preventative measures (responses) during active mining in time for them to be effective;

¹ Swamp 15a is also denominated as Den15a in some of South32’s documentation for the LW19A application.

² The Swamp 15a rock bar is denominated as SC10-RB15A on South32’s documentation for the LW19A application.

³ Note that advice on LW 19 was provided by the predecessor of the Panel [i.e. the Independent Advisory Panel for Underground Mining (IAPUM)].

- swamp soil moisture, groundwater dependent community and species changes that are the basis for current TARPs for Swamp 15a ecosystem functionality can, themselves, be irreversible impacts of mining; and
- remediation of swamps has yet to be proven technically feasible.
- On this basis, in its advice on the LW 19A application the Panel concluded that for Swamp 15a *“the only feasible option for practising adaptive management is the selection prior to the commencement of extraction of each longwall panel, of an appropriate setback distance based on field experience; setback distance from Swamp 15a is the critical (essential) primary control in the case of LW19A”*.
- The Department agrees with this conclusion.
- South32 proposes that LW 19A is setback a minimum distance of 61 m from the swamp. This setback was proposed based on historic analysis⁴ of Dendrobium coastal upland swamps which found that rapid drawdown to levels lower than pre-mining levels and increased rate of recession (drainage) in the water tables in colluvial sediments of swamps had not been observed at Dendrobium Mine to that point in time in swamps further than 60 m from a longwall panel.
- Based on this analysis, in relation to LW 19 the Panel advised that a 60 m setback is *“a minimum requirement for meeting.... the no change in ecosystem functionality”* consent requirement⁵. The Department accepted this advice and subsequently approved an additional 100 m setback of LW 19 from Swamp 15a, resulting in a smaller portion of the swamp (i.e. 1.84%) remaining within 60 m of the longwall footprint.
- In its advice on the current LW 19A SMP application, both BCD and WaterNSW raised concerns in relation to potential impacts to Swamp 15a from mining of LW 19A. In May and June 2023, BCD met with the Department and raised further concerns based on historical and, in particular, recent monitoring results, that indicated the proposed layout for LW 19A may not provide adequate protection to the ecosystem functionality of Swamp 15a.
- Between March and July 2023, the Department received a series of Impact Reports⁶ and the End of Panel (EoP) Report for LW 19 from South32 which confirmed that impacts had been identified in swamps located further than 60 m from longwalls. Specifically, mining induced hydrological changes in shallow groundwater beneath swamps extending beyond a distance of 120 m from longwall panels have been reported at:
 - Swamp 35b in Area 3B, located 116 m from LW 18;
 - Swamp 144 in Area 3C, located 118 m from LW 21; and
 - Swamp 15a in Area 3A, located 70 m from LW 19.
- The Panel stated that these findings *“appear to provide clear evidence that a setback distance of 60 m is inadequate for ensuring that moisture levels in Swamp 15a will not be impacted by longwall mining”*. Further, the Panel noted other factors that could have environmental consequences for Swamp 15a but which have not specifically been considered in the LW 19A SMP, including:
 - flow losses from fractures and diversion of flow in 1st and 2nd order streams located within 400m of the longwall and flow into the swamp (i.e. SC10A and SC10B); and
 - fracturing of the 10 rock bars located along SC10 due to incremental valley closure associated with LW 19A and associated reductions in flow of water from the creek to the swamp impacting the riparian ecosystem.
- Based on these findings and considerations, the Panel recommended that *“as a minimum requirement to meet Condition 5 regarding ecosystem functionality of Swamp 15a, LW 19A should be set back at a distance of, at least, 120 m from the closest edge of Swamp 15a”*. The Department accepts this advice and has recommended a condition to give it effect.
- The Department notes that the Panel emphasised that a setback distance of 120 m is the minimum required to meet the conditions of consent, and did not have sufficient information to recommend an upper bound for setback. Ultimately, it is South32’s responsibility to achieve the performance measures in the consent, rather than the Department’s. If South32 does not meet the requirements of condition 5 relating to changes in ecosystem functionality of Swamp 15a, then this would be a breach of its consent and would be subject to appropriate enforcement action by the Department. The risk, and the responsibility for appropriate risk mitigation and avoidance, lies solely with South32.

⁴ Reported in Niche (2022) and referenced as “Watershed HydroGeo (2019), Dendrobium Mine Geographic review of mining effects on Upland Swamps at Dendrobium Mine. Unpublished Report for Illawarra Coal.”

⁵ Refer to the Panel’s advice on LW 19 dated February 2021.

⁶ South32 Impact Reports dated 14 March 2023, 28 June 2023 and 17 July 2023.

- The Subsidence Assessment prepared by Mine Subsidence Engineering Consultants (MSEC) (Attachment C of the SMP) indicated that the controlling rock bar associated with Swamp 15a is located outside of the 600 m study area boundary for LW 19A and is therefore unlikely to be impacted by mining of this longwall. The Panel agrees that the rock bar is very unlikely to be impacted by extraction of LW 19A.
- A key issue raised by the Panel is in relation to the definition of “ecosystem functionality” which has been adopted by South32 since 2013 and is included in the SIMMCP for LWs 19 and 19A. The Panel considers that South32’s definition is *“outdated and inadequate and should be revised to accommodate all processes (such as swamp hydrology) that are essential for swamps and their dependent ecosystems”*.
- South32’s response to this recommendation argues that the ecosystem functionality of swamps should continue to be measured by the size of the groundwater dependent communities contributing to the swamp for reasons of consistency with previous SMP approvals.
- The Department considers the Panel is best placed to advise on the definition of ecosystem functionality and accepts the Panel’s advice. A condition has been recommended requiring the SIMMCP to be updated to address the broader definition of ecosystem functionality recommended by the Panel.
- The Department accepts the Panel’s advice in relation to the SIMMCP and has recommended that a new SIMMCP is prepared for LW 19A prior to commencing the extraction.

Sandy Creek and Wongawilli Creek

- Under its consent, South32 is required to ensure that underground mining operations do not cause subsidence impacts at Sandy Creek or Wongawilli Creek other than “minor impacts”. In addition, the LW 19 SMP approval includes a performance measure for the creeks requiring no more than minor impacts and minor environmental consequences, including *minor* fracturing, gas release and iron staining and *minor* impacts on water flows, water levels and water quality.
- Sandy Creek is located on the eastern side of Area 3A, approximately 1,210 m from the commencing end of LW 19A, at its closest point. Given this distance, MSEC predicted that it is unlikely that adverse impacts would occur along Sandy Creek due to the mining of LW 19A.
- Wongawilli Creek is located on the western side of Area 3A, at a minimum distance of 390 m from the finishing end of LW 19A, at its closest point. The total length of creek within the 600 m boundary of the proposed LW 19A is approximately 1.1 km.
- The minimum distances between the thalweg of Wongawilli Creek and the completed longwalls are 110 m for LW 6 in Area 3A and 290 m for LW 9 in Area 3B. LW 19 is located 175 m from the creek.
- Wongawilli Creek is a 3rd order perennial stream with a small base flow and increased flows for short periods of time after significant rain events. A large number of stream features have been mapped along the section of the creek within 600 m of the proposed longwalls, including 17 pools, 11 shallow riffle zones and 5 short channels.
- Based on predicted subsidence movements along Wongawilli Creek, MSEC consider it is possible that fracturing could occur along Wongawilli Creek due to the valley-related compressive strains from existing and future mining in Areas 3A, 3B and 3C (including the proposed LW 19A).

Water Level / Flow

- MSEC developed a rock bar model to predict the level of risk of impact of mining of LW 19A on the water level / flow of Wongawilli Creek. The model is based on the potential for “Type 3” impacts, defined as *“fracturing in a rockbar or upstream pool resulting in reduction in standing water level based on current rainfall and surface water flow”*.
- Although the Department acknowledges that “Type 3” impacts do not necessarily constitute “minor impacts” as required by the development consent, they are considered useful to provide an indicator for interpreting the level of impact to streams and stream features from mining.
- Using the rock bar model, MSEC’s predicted rate of impact for the rockbars and other stream controlling features along the creek after the extraction of the existing and future longwalls is in the order of 7% based on the maximum predicted closure of 200 mm. On this basis, MSEC concluded that *“the likelihood of fracturing resulting in surface water flow diversions along Wongawilli Creek, due to the extraction of the proposed LW19A, is low”*.
- The Department notes that a similar level of risk was predicted as part of the LW 19 assessment, and that the EoP report for LW 19 reported that no new fracturing was observed along Wongawilli Creek due to mining of this longwall. Further, no pool level reductions beyond natural variability or new surface flow diversions along Wongawilli Creek were observed.

- The Department acknowledges concerns raised by WaterNSW and BCD regarding South32's ability to meet the existing "minor impact" condition for Wongawilli Creek. However, based on the results of the rockbar model and the previous results of mining impacts at Dendrobium, the Department agrees with MSEC that there is a low risk of additional impacts of mining in LW 19A resulting in greater than minor impact to pools along Wongawilli Creek. This is particularly the case given the proposed longwall is setback further from the creek than existing longwalls and the very low levels of predicted additional incremental closure.
- The Department also considers that the existing LW 19 SMP approval performance measure for Wongawilli and Sandy Creeks (requiring no greater than minor impacts and minor environmental consequences for water flows and water levels) also apply to LW 19A. The Department has recommended conditions to this effect.

Water Quality

- As noted above, the existing consent and SMP approval for LW 19 performance measures require minor impacts to water quality, and minor gas releases and iron staining in Sandy Creek and Wongawilli Creek.
- The Surface Water Assessment prepared by HGEO Pty Ltd (Attachment E of the SMP) assessed the potential for impacts to water quality in Sandy and Wongawilli Creeks and associated tributaries as a result of mining of LW 19A. Based on previous observations, HGEO predicted that the water quality influence due to mining of LW 19A is likely to include localised and temporary changes in water salinity, pH and iron content with local transient discolouration of streambeds and rock faces by iron hydroxide.
- EoP reports for completed longwalls have confirmed that most previously recorded water quality impacts which have triggered TARPs have been identified in 1st and 2nd order tributaries located directly above or within the mining area of influence. The Department notes that there are no conditions of consent or performance measures that directly apply to 1st or 2nd order tributaries located in the vicinity of the approved mining areas.
- However, several water quality impacts have been identified in Wongawilli Creek and Sandy Creek, including:
 - gas release in Pool 50 along Wongawilli Creek (Level 1 TARP);
 - iron staining along downstream reaches of Wongawilli Creek (Level 3 TARP) and Sandy Creek (Level 2 TARP); and
 - higher than baseline levels of EC, sulphate, Fe, Mn and Zn in a downstream monitoring point within Sandy Creek (no TARP triggered).
- The EoP Report for LW 19 noted that water quality TARPs were triggered in response to mining of previous longwalls (i.e. prior to extraction of LW 19) and they did not exceed the "minor impact" exceedance measures defined in the WIMMCP. No new water quality TARPs were triggered as a result of extraction of LW 19.
- The Department notes that shortening LW 19A by an additional 59 m would avoid directly undermining any 1st or 2nd order tributaries of Sandy Creek or Wongawilli Creek. Although several 1st and 2nd order tributaries are located adjacent to the proposed LW 19A. Subsidence impacts and the associated risk of water quality impacts are likely to be reduced when compared to impacts associated with previous longwalls which directly undermined significant reaches of some tributaries.
- On this basis, the Department considers that mining of LW 19A is unlikely to result in additional water quality impacts in Wongawilli Creek or Sandy Creek that would result in greater than "minor impacts".

Sandy Creek Waterfall

- Under its existing consent, South32 is required to ensure that underground mining operations do not cause rock falls or structural integrity impacts, and negligible water diversions at Sandy Creek Waterfall⁷.
- LWs 6, 7, 8 and 19 mined within 388 m, 427 m, 739 m and 900m respectively, of the waterfall, with no visible changes to the waterfall.
- LW 19 is located 1,400 m from the centreline of the waterfall.
- Based on the extensive subsidence monitoring data available, and the greater distance of LW 19A from the waterfall compared to previous mining, MSEC consider it unlikely that Sandy Creek Waterfall would experience any adverse impacts due to the mining of LW 19A.

⁷ Sandy Creek Waterfall is also denominated as SW-WF1 in South32 documentation and the Department's Notice of Approval for LW 19.

- The Department accepts this conclusion. The Department has recommended conditions requiring South32 update the existing SCWMP for LW 19A and continue to utilise the existing Sandy Creek Waterfall Steering and Technical Committees⁸ to review monitoring data during the mining of LW 19A, assess the acceptability of any ongoing level of risk to the waterfall and recommend management actions, as required.

Catchment Water Losses and Quality

- Under its consent, South32 is required to ensure that the development does 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.
- At its closest distance, LW 19A is located approximately 1.46 km and 3.23 km from the full supply levels of the Cordeaux and Avon Reservoirs, respectively. The proposed longwall is located more than 5 km from the Cordeaux Dam Wall and Avon Dam Wall.
- MSEC has confirmed that the predicted vertical and horizontal movements at the Cordeaux and Avon Reservoirs and their associated dam walls from mining in LW 19A are very small and are unlikely to be measurable. MSEC therefore concluded that it is unlikely that the reservoirs and dam walls would experience any adverse impacts due to the extraction of the proposed LW 19A.
- The Groundwater Assessment prepared by Watershed HydroGeo Pty Ltd (Watershed) (Attachment B of the SMP) confirmed that, given the distances involved, there is negligible risk of LW 19A causing further deformation of strata between the longwall panel and the reservoirs. Watershed concluded that incremental leakage from the reservoirs as a result of mining of LW 19A would therefore be negligible for Cordeaux Reservoir (ie. <0.01 ML/d) and effectively zero for Avon Reservoir.
- The Groundwater Assessment predicted surface water losses from groundwater drawdown and baseflow reductions across all nearby watercourses associated with the whole of the mine were up to 1,090 ML/yr. Incremental losses due to LW 19A was approximately 20 ML/yr. When comparing these losses on a catchment scale to the mean annual yield from Pheasants Nest Weir (which receives regulated flows from Avon, Cordeaux and Nepean dams) of 276,400 ML/yr, they represent about 0.39% and 0.007%, respectively.
- The EoP report for LW 19 included a further assessment of catchment surface water losses against performance measures using Assessment Method C (i.e. changes to median flow compared with Reference Sites) as recently agreed by agencies. The measured and inferred reduction in medium flow from mining in the Lake Avon catchment is 78 ML/yr, or 0.1% of Lake Avon inflow for the period 2015 to April 2023. The measured and inferred reduction in medium flow from mining in the Lake Cordeaux catchment is 69 ML/yr, or 0.2% of Lake Cordeaux inflow for the period 2015 to April 2023.
- These estimated losses are considered negligible and likely to be indistinguishable from natural variability in catchment conditions. Importantly, the losses are within the tolerable loss limit of 1 ML/day prescribed by Dams Safety NSW.
- The EoP Report for LW 19 verifies that changes to stream flow characteristics are not evident at the downstream flow gauges on Wongawilli Creek (ie. WWL) or Sandy Creek (ie. GS2122205), despite mining-related effects being clear and significant at upstream tributaries (e.g. WC21, WC15 and SC10CS1). This suggests that some or all flow lost in headwater catchments is returned downgradient, or that upstream diversions or losses are not significant in relation to the larger catchment water balance given the natural variability and the accuracy of flow measurements.
- In relation to catchment scale water quality, HGEO reported that although there have been several observed water quality impacts in Sandy and Wongawilli Creeks and associated tributaries as a result of previous mining, no adverse trends in water quality have been measured in either Lake Avon or Lake Cordeaux reservoirs. HGEO predicted that the water quality effects on stored waters of the reservoirs would be negligible and undetectable due to extreme dilution. This view has again been recently reiterated by HGEO in the EoP Report for LW 19 (Attachment D).
- The Department notes that the Panel agreed with this position in its advice on a previous Dendrobium application⁹, stating that *“there is no evidence to date of deterioration of water quality due to the Dendrobium Mine that is significant at catchment scale or detected in reservoirs, except visual impacts due to staining that are expected to reduce over time”*.

⁸ The establishment and implementation of the Sandy Creek Waterfall Steering and Technical Committees is required under Appendix 3 Statement of Commitments (Commitment 6) of the existing development consent (DA 60-03-2001).

⁹ Refer to advice on the Dendrobium Mine Extension Project (SSD 8194) dated 20 October 2020.

- On this basis, the Department considers that extraction of LW 19A would not compromise South32's ability to meet the existing consent condition requiring no more than negligible reduction in the water quantity or quality of Lake Cordeaux or Lake Avon.

Water Offsets

- The Department notes that offsetting of loss of water flows to WaterNSW storages is a requirement of the existing conditions of consent (condition 14, Schedule 3), and has been more recently been applied in conditions of the SMP approvals for LWs 21, 22 and 23.
- BCD raised concern that South32 has not offered any offset payments for the surface water losses already identified or future additional water losses as a result of the proposed LW 19A.
- The Department acknowledges that until recently, mining companies operating in the Special Areas of Sydney's drinking water catchment have been unable to acquire licences as virtually all the surface water entitlements in these areas are held by WaterNSW as major utility access licences under the *Water Management Act 2000*. The Department can confirm that the NSW Government has recently endorsed a new surface water licensing and offsetting regime for mines operating in Special Areas, and that it will apply to all areas at Dendrobium, including Area 3A.

Other Swamps

- In addition to Swamp 15a, two other swamps have been identified partially above LW 19A (i.e. Swamp 15c and 148) and 4 swamps wholly or partially within the 600 m boundary (i.e. Swamps 12, 15b, 34 and 96) (**Figure 2**).
- MSEC predicted that the swamps above approved LW8 and LW 19A and partially above the proposed LW 19A (i.e. Swamp 12, 15b, 15c and 148) would experience the full range of subsidence impacts and consequences, including minor and localised increased ponding, fracturing of the bedrock of the swamps, surface water flow diversions and flow losses. Swamps adjacent to proposed LW 19A but within the 600 m subsidence boundary (i.e. Swamps 34 and 96) may also experience fracturing of the bedrock of the swamp due to valley closure.
- The Terrestrial Ecological Assessment prepared by Niche Environment & Heritage Pty Ltd (Niche) (Attachment F of the SMP) predicted that mining of LW 19A may result in changes to upland swamp sub-community patterns, swamp boundaries, vegetation communities and threatened species habitat, particularly for Swamps 15c, 34 and 148. It is noted that the majority of these impacts would occur as a result of mining in existing approved longwalls (ie. LWs 7-8 and 19).
- The Department notes that the development consent for Dendrobium Mine was modified in April 2015 to allow South32 to provide a strategic biodiversity offset (SBO) having conservation values exceeding those required to meet immediate offsetting requirements prescribed in a condition of an approval (such as an SMP) (condition 15, Schedule 2). In 2016, South32 provided an SBO in the form of 598 ha of land at Maddens Plains to satisfy existing and future offsetting requirements required under the consents for both Dendrobium Mine and its Bulli Seam Operations mines. This large parcel of land contained 140 ha of coastal upland swamp equivalent to those being impacted at Dendrobium. The SBO was secured in perpetuity by transfer to the National Parks Estate.
- The Departments Statement of Reasons for LW 19 indicates that, as Area 3A (including LW 19) and swamps in the area were shown in Figure 1 of SBO, the swamps were therefore considered to be included in the offset. Figure 1 of the SBO labels and/or shows Swamps 12, 15a, 15b, 15c and 34, however it does not show Swamp 148. The Department therefore considers that Swamp 148 has not currently been offset.
- South32's Impact Report dated 22 December 2022 and the EoP Report for LW 19 indicates that extraction of LW 19 has resulted in a reduction in the soil moisture levels within Swamp 148, with the average soil moisture data recorded to be lower than the lowest data recorded during the baseline period (triggering a Level 3 TARP). Based on the cumulative impact predictions, the Department considers that Swamp 148 may be further impacted by mining in LW 19A.
- Consistent with the approach in SMP approvals for LW 21, 22 and 23, the Department has therefore recommended that a subsidence performance measure requiring "*minor environmental consequences*" for Swamp 148. If mining is found to cause an exceedance of these performance measures, South32 would be required to either remediate or offset (or any combination of these measures) in order to meet the condition requirement.

Threatened Species

- BCD raised concerns regarding existing and potential future impacts of longwall mining at Dendrobium on threatened fauna species dependent on streams and swamps (e.g. Littlejohn's Tree Frogs and Giant Dragonflies), and inadequate offsets for impacts to these species.
- In accordance with existing conditions of consent¹⁰, South32 submitted an updated Swamp Rehabilitation and Research Program (SRRP) in May 2023¹¹. The SRRP contained a *Littlejohn's Tree Frog Research Report* prepared by the University of Newcastle which provided clear evidence of the impact on mining at Dendrobium on the frog species. Significantly, the report found that there has been a 33% reduction in recruitment of Littlejohn's treefrog in Area 3B with models suggesting the population within Area 3B could be extinct within 30 years. The SRRP also contain research results on the impact of mining on other species, including the Giant Dragonfly, however the impact results were inconclusive, primarily due to the limited survey season that focused on longwall mining impacts.
- The SRRP and Niche identified that the Littlejohn's treefrog species is not solely dependent on swamps for habitat and breeding, but is rather more likely to be dependent on pools within streams. The species is known to exist and breed within 1st and 2nd order streams and associated pools within Dendrobium Areas 3A and 3B.
- The Department notes that the existing conditions of consent require South32 to "*mitigate and/or offset any adverse impacts on groundwater dependent ecosystems, aquatic ecosystems or riparian vegetation*" (refer to condition 17b, Schedule 4). The Department acknowledges that the existing conservation values of the Maddens Plains offset site may not provide adequate offset to ensure protection of this species. It is understood that there are currently no records of this species within the offset area.
- In response to a request from the Department¹², South32 has subsequently engaged Niche to conduct further investigations into the conservation values of the Maddens Plains offset area which include surveys for Littlejohn's Treefrog. The Department notes that South32 has also engaged specialists to conduct studies to inform a 'Restoration of Littlejohn's tree frog populations within the Dendrobium mine-lease area project' (described in Section 5.10 of the SRRP). South32 proposes that the project would involve conducting seven studies that each contribute knowledge to support tailored mitigation and conservation actions for Littlejohn's Tree Frog.
- The Department has recommended a condition requiring South32 to provide 6 monthly updates on the status and outcome of the surveys and studies detailed in the SRRP. This will inform the Department and relevant agencies on the adequacy of the offsetting and/or mitigation requirements for threatened species impacted by mining at Dendrobium.

OTHER FACTORS

- The Dendrobium Coal Mine remains a significant contributor to regional employment and expenditure in the Illawarra, with around 400 people working at the mine, and a further 600 people indirectly reliant on the mine.
- The coal extracted from the mine is a key component in the production of a premium coal blend that is used in steel production at the BlueScope Steelworks in Port Kembla, which employs 3,000 people.

EVALUATION AND CONCLUSIONS

- The Department has assessed the application for approval of the SMP in accordance with the relevant requirements of the development consent and has carefully considered the potential impacts of the extraction of LW 19A on the surrounding environment.
- The key matters for consideration by the Department in determining whether to approve the LW 19A SMP application are whether South32 can meet the four relevant conditions contained in the development consent. These are that South32 must ensure, to the satisfaction of the Secretary, that:
 - **Swamp 15a** does not experience erosion of the surface or changes in ecosystem functionality of and that the structural integrity of its controlling rockbar is maintained or restored.

¹⁰ Refer to condition 15, Schedule 3 of the development consent and conditions 20 & 21, Schedule 3 of the SMP approval for LW 18.

¹¹ The SRRP was updated from earlier versions dated March 2022 and March 2023 to address agency and Departmental requests and comments.

¹² Letter from the Department to South32 dated 30 March 2023.

- **Sandy and Wongawilli Creeks** do not experience subsidence impacts other than “minor impacts” (such as minor fracturing, gas release, iron staining and minor impacts on water flows, water levels and water quality);
 - **Sandy Creek Waterfall** does not experience rock falls; impacts to its structural integrity; cracking in Sandy Creek within 30 m of the waterfall; and negligible diversion of water; and
 - there is no more than a 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.
- The Department considers that in order to achieve these performance measures, LW 19A must be set back from Swamp 15a by at least 120 m.
 - Extraction of the remainder of LW 19A would allow recovery of valuable coal resources, using existing infrastructure and without significantly increasing the existing disturbance footprint within the approved project boundary.
 - Extraction of LW 19A would continue to underpin the wide-ranging benefits for the local and State economies that derive from the continued operation of the Dendrobium Coal Mine and the part that it plays in supporting the wider coal mining and preparation operations of South32 in the Illawarra Region and the coking coal which it provides for consumption at BlueScope’s Port Kembla Steelworks and for export via the Port Kembla Coal Terminal.
 - On balance, the Department considers that the extraction of LW 19A is in the public interest and that the SMP application should be approved, subject to strict conditions as discussed below.



11/08/2023

Clay Preshaw
Executive Director
Energy, Resources and Industry Assessments
as nominee of the Secretary

Attachments:

1. Advice from the Panel dated 1 August 2023

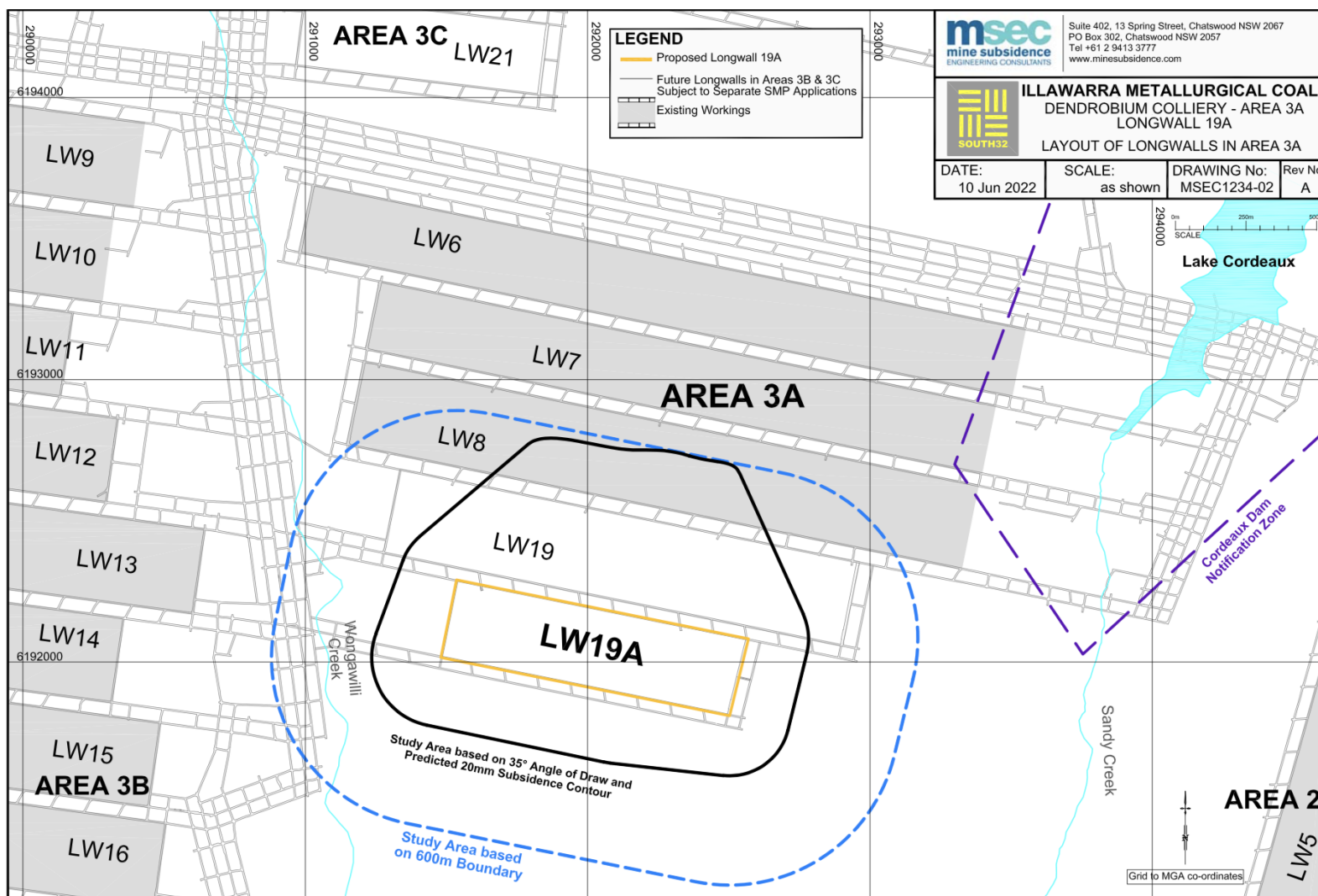


Figure 1: Proposed Longwall 19A in Area 3A

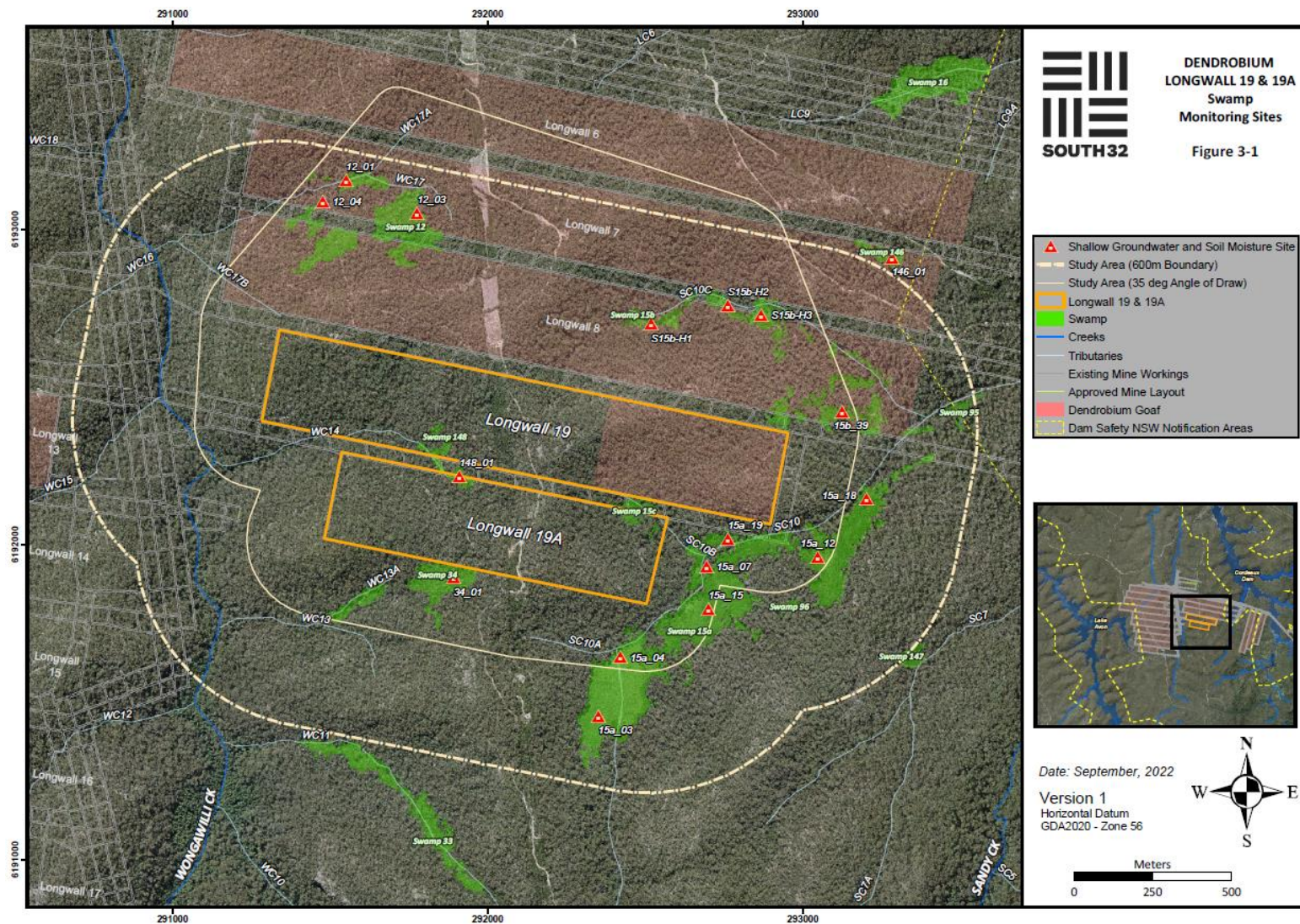


Figure 2: Location of Swamps, including Swamp 15a