

15 December 2020

Stephen O'Connor
Chair of the Dendrobium Extension Project Panel
Office of the Independent Planning Commission NSW
Level 3, 201 Elizabeth Street
SYDNEY NSW 2000

Dear Mr O'Connor

**WaterNSW submission to Independent Planning Commission
Dendrobium Extension Project (SSD 8194)**

WaterNSW would like to thank the Commission for the opportunity to meet on 26 November 2020 and appreciates this opportunity to provide further comments on the above project.

WaterNSW role

WaterNSW is a State-Owned Corporation established under the *Water NSW Act 2014*. WaterNSW has an important statutory role "*to protect and enhance the quality and quantity of water in declared catchment areas*".

WaterNSW has no legislated powers to control or stop mining in the declared catchments. However, as the key government authority responsible for protecting the water supply catchment for over five million people in Sydney, we seek to influence the planning decisions and hold the subsequent mining operations to account for all impacts which significantly harm our values.

Position on the project

WaterNSW remains **strongly opposed** to the project (in its current form) due to the concerns that we have consistently raised throughout the assessment process about impacts on water quantity, water quality and ecological integrity within the Special Areas of the declared catchment. These concerns remain relevant and have largely not been adequately addressed by South32.

Special Areas

The Sydney drinking water catchment covers an area of almost 16,000 square kilometres, of which the Special Areas comprise approximately 3,700 square kilometres. The Special Areas are pristine areas of bushland that have been specifically set aside for drinking water supply, and protected from human access and activities since the 1880s.

The Special Areas provide natural buffers that protect the water storages and infrastructure that supply Sydney, the Illawarra, Blue Mountains, Southern Highlands and Shoalhaven regions. These buffer zones are an essential component of the 'multi-barrier' approach to protecting water quality and quantity (consistent with the Australian Drinking Water Guidelines). Access to the Special Areas is restricted by law to protect water quantity and water quality.

Mining Principles

WaterNSW has established a set of four principles that underpin WaterNSW's approach to managing the impacts of mining in Sydney's drinking water catchment. These principles establish the outcomes that WaterNSW considers are essential to protect the catchment and were recently updated to reflect the most up-to-date science, with particular reference to the Final Report of the Independent Expert Panel on Mining in the Catchment (IEPMC).

The Mining Principles are summarised as follows:

- 1) **Water supply infrastructure** – mining must not result in the integrity of water supply infrastructure being compromised.
- 2) **Water quantity** – leakage from reservoirs as a result of mining activities must be avoided, and regional depressurisation and diversion of surface water flows must be avoided and minimised by adopting a precautionary approach to mine design.
- 3) **Water quality** – all mining activities must have a neutral or beneficial effect on water quality.
- 4) **Ecological integrity** – of the Special Areas must be maintained and protected.

New paradigm of science and policy

This project is the first new development application lodged for coal mining in the Special Areas in almost a decade. WaterNSW considers that the mine design does not sufficiently consider a 'paradigm shift' in scientific understanding and policy settings that has occurred since the last longwall mine was approved in the Special Areas.

Since the 2008 Southern Coalfield Inquiry, all of the operating mines in the catchment have been subject to comprehensive reviews and increasingly stringent conditions of approval. Over the past 20 years of mine assessments in the Special Areas, there is a clear trend of minimising environmental impacts through mine design changes (particularly as a result of Commission reviews). Further detail is included in **Appendix 1**, which provides a short summary of previous mine design changes at Dendrobium, Metropolitan, Bulli Seam Operations and Russell Vale.

Since the most recent longwall mining approval in the Special Areas, there have also been multiple independent scientific reviews, including reviews by the Chief Scientist and Engineer, and the IEPMC. A list of key reports is provided in **Appendix 2**. These reports have led to significant advances in our understanding of longwall mining impacts in the Special Areas, including:

- the potential for fracturing to extend to the surface and cause surface water losses;
- the increased likelihood of swamp impacts overlying longwall mining;
- the difficulty of remediating mining-related damage to watercourses and swamps; and
- the extent of non-conventional subsidence impacts (e.g. valley closure and far-field movements) on watercourses and swamps.

Further, since the last longwall mine approval in the Special Areas, significant statutory and policy changes have also occurred, including stricter requirements in water and biodiversity legislation. A list of key changes is provided in **Appendix 2**. Importantly, the Dendrobium Extension Project is the first major coal mining project in the Special Areas that will be subject to statutory requirements to:

- strictly achieve a neutral or beneficial effect (NorBE) on water quality;
- acquire surface water licences due to likely surface water take; and
- assess the impacts on upland swamps as a listed species in both NSW and Commonwealth legislation, and provide appropriate offsets (if necessary).

Key areas of concern

In summary, WaterNSW has four key areas of residual concerns about the project, which are:

1. **Water quantity:** There has been insufficient consideration of an alternative mine design that would prevent the height of free drainage from extending to the surface. Such an alternative mine design would likely result in a reduction in the surface water losses of the project.
2. **Water quality:** Uncertainty remains about whether the project would meet the NorBE test for water quality, particularly in relation to post-closure groundwater repressurisation.
3. **Stream Impacts:** The project would cause significant environmental impacts in various significant watercourses, including nine major streams (third order or above).
4. **Ecological integrity:** The proposed mine design and predicted fracturing would fundamentally change the hydrological and ecological functions of 25 endangered Coastal Upland Swamps.

Within these four areas of concern, WaterNSW has identified 8 specific residual questions, which we believe need to be carefully considered before any determination on the project is made.

Water quantity

1. Are the predicted catchment water losses accurate and reliable?

Throughout the history of the Dendrobium mine, the volume of catchment losses has been continually underestimated. In 2001, the Commission of Inquiry noted that the company contended that stream fracturing *"does not represent a loss to the creek system but simply a diversion of water into voids beneath the creek bed"*. In fact, South32 has relied on this line of argument (i.e. that stream losses would re-emerge elsewhere in the catchment) until very recently.

Over the life of the mine, each planning decision for additional mining (whether a development application, modification application or Subsidence Management Plan) has been based on predicted catchment losses that were later found to be underestimated.

In recent years, South32's groundwater model has substantially increased its predictions of surface water losses at the existing mine, from 272 ML/year in 2014, to 330 ML/year in 2016, to 683 ML/year in 2018, to 1,372 ML/year in 2019. Even now, South32 still does not accept the findings of the IEPMC on existing surface water losses at Dendrobium of approximately 5 ML/day.

For the current project, there are serious residual questions about whether the groundwater model provides accurate worst-case predictions. The Independent Advisory Panel for Underground Mining (IAP) stated that *"it is not possible, at this stage, to be comfortable that the worst-case losses from the surface water regime have been identified."*

One of the key issues that needs to be resolved is the proportion of surface water in predicted mine inflows. In 2016, Dr Col Mackie calculated that the proportion of surface water in Dendrobium's mine inflows was approximately 44% (between 2010 and 2015). In 2019, the IEPMC estimated that 40 to 50% of previous inflows to mine workings is from surface water. This contrasts with South32's 'conservative' predicted average of 25% for the current project.

WaterNSW understands that the estimates from Dr Mackie and the IEPMC are based on a comparative analysis of historical rainfall and measured mine inflows (and quantifying the proportion of total inflow associated with peak inflows). South32 refers to this method as 'water balance hydrograph separation'. Dr Mackie concluded that his analysis *"indicates that there is a direct association between rainfall and water inflow in all four mining areas at Dendrobium Mine"* (Galvin, 2017).

While South32 claims that its groundwater model adopts conservative assumptions, it has not adopted the estimates from the IEPMC or Dr Mackie on the surface water component of mine inflows. In fact, even the groundwater model predicts that the proportion of surface water flows for the project *"could be 43% in wet conditions"*, however this does not appear to have been used in calculating the total surface water losses of up to 3.3 GL per year.

In disputing the estimates of Dr Mackie and the IEPMC, South32 relies heavily on geochemistry 'fingerprinting' (using radioactive Tritium as 'tracers') and a statistical 'resampling' technique. The reliability of this methodology has been questioned by both Dr Mackie and the IEPMC. This 'fingerprinting' methodology led to an estimate that the proportion of surface water is only 4% in previously mined areas.

These 'fingerprinting' estimates appear to contradict with South32's own previous consultant's calculations using 'water balance hydrograph separation', which suggested that 78% of Area 2's recorded mine inflows were from surface water (Hgeo, 2017c). South32 has since undertaken a new 'water balance hydrograph separation', which estimated the surface water component across Areas 1, 2, 3A and 3B was between 18% and 22% (HydroSims, 2019).

The discrepancy between the IEPMC and South32 on the proportion of surface water in mine inflows for previous mining areas is significant (i.e. 44% versus a range of 4-22%). This is particularly concerning for the Dendrobium Extension Project, as South32 predicts that there will be a higher proportion for the new project than previous mining areas. South32 states that this is *"due to the higher proportion of the mine footprint covered by longwalls of 305m width in Areas 3C, 5 and 6"*.

Based on the discrepancy between the IEPMC and South32 in previous mining areas (and South32's own predicted losses during 'wet conditions'), WaterNSW considers that it is possible that surface water losses could be up to double those that have been assessed (i.e. in the order of 6-7 GL/year). This would clearly have major implications for the proposed compensation package.

WaterNSW notes that the IAP has not commented on the discrepancy between predicted surface water proportions in its advice to the Department, or the predicted losses during 'wet conditions', or any other issues relating to the potential worst-case scenarios for surface water losses.

2. Are the likely catchment water losses considered acceptable?

WaterNSW has consistently maintained its position that the predicted loss of surface water of up to 3.3 GL/year from the project (as currently proposed) is unacceptable.

In relation to specific water storages, South32's groundwater model has predicted losses of up to 903 ML/year from the Avon Reservoir, which equates to 4.3% of the average annual yield in a median year. Separate to this, South32's surface water assessment has predicted that in a drought there would be a 3.9% reduction in the yield of Avon Reservoir catchment and a 2.9% reduction in Pheasant's Nest catchment due to 100% of streams ceasing to flow.

Both of these predictions about potential yield loss are concerning to WaterNSW, and it would appear that they have been derived from different prediction methodologies. The potential yield reductions are particularly concerning (and would likely be discernible) during dry years. WaterNSW notes that Avon Reservoir was recently as low as 38% capacity, with approximately 55 GL of total capacity.

While the significance of potential yield losses in drought conditions was not considered in the IAP's advice, the IAP questioned South32's conclusion that "*this represents a likely indiscernible impact to Lake Avon inflow*" as "*3.9% may well be discernible under dry conditions*". The IAP also did not provide any comments on the groundwater model's predicted 4.3% reduction in Avon Reservoir's security yield in a median year, or the potential inconsistency between these predictions.

The Independent Expert Scientific Committee (IESC) also raised the issue of losses during dry periods. It stated this "*requires further discussion considering that most of the sub-catchments within Area 5 are predicted to cease flowing under the 10th percentile (dry) rainfall conditions*". The IESC also emphasised that the dry predictions are based on historical rainfall, which show that "*equally dry or worse conditions have occurred for 10% of the record*".

WaterNSW notes that South32 (and others) have made various attempts to determine the 'materiality' (or otherwise) of the predicted water losses from the catchment. This a fundamentally problematic exercise as the parameters of any comparison are not well-defined (e.g. geographical boundaries, temporal constraints, or the relative accuracy and reliability of predictions). Any comparative numbers can be distorted to present apparently reasonable positions from differing perspectives.

In that context, WaterNSW has reviewed the potential catchment losses from the project (as currently proposed) and makes the following key points:

- **Statutory provisions:** as the key public authority responsible for protecting Sydney's water supply, WaterNSW has been given a 'listed function' in the *Water NSW Act 2014* to "*protect and enhance*" the quantity of water in declared catchment areas.
- **Potential underestimates:** the predicted losses likely do not represent the worst-case scenario (as required by the Secretary's Environmental Assessment Requirements) and could be twice as high (e.g. up to 6-7 GL/year). The true nature and extent of the impacts to the catchment have not been sufficiently addressed in the EIS documentation to date.
- **Historical context:** this project is predicted to have the most significant surface water losses in the catchment of any mining project approved under a contemporary development assessment system (i.e. in the last 25 years at least). All previous projects were approved on the basis that there would be negligible impacts on catchment water. In that regard, the water licensing regime was established (through the relevant Water Sharing Plans) on the basis that mining companies would not require any surface water entitlements.
- **Cumulative impacts:** the IEPMC estimates that current surface water losses in the Special Areas are 8 ML/day, with 5 ML/day from Dendrobium. South32 predicts that this new project would cause 5 ML/day. If approved, Dendrobium would account for over 75% of all losses in the Special Areas (i.e. 10 of the 13 ML/day losses). It is also important to distinguish between rate of loss and total loss. WaterNSW has estimated that if mining stopped at the end of the existing approval, total water losses would be approximately 80 GL, but if the project is approved, these losses would equate to approximately 300 GL.

- **Yield losses:** South32 has justified the predicted surface water losses on the basis that they would be less than 20% of security yields for Avon and Cordeaux Reservoirs. This conclusion appears to be based on an incorrect interpretation of a draft risk assessment document that WaterNSW prepared in recent years. Notwithstanding South32's misinterpretation of a draft risk assessment document, WaterNSW is concerned about the predicted losses in annual yield from Avon Reservoir in the order of 4%.
- **Precedent:** while Dendrobium currently causes the majority of the impacts on water quantity in the Special Areas, WaterNSW is aware that other mines have future expansion plans that could result in additional surface water losses (e.g. Metropolitan and Russell Vale). It is important that a precautionary approach is adopted for any mining-related catchment losses, which should be based on the 'avoid-minimise-offset' hierarchy. WaterNSW considers that South32 has not adequately demonstrated a precautionary approach and is concerned that this project, if approved, could lead to other applications with similar surface water losses.

Importantly, while WaterNSW has provided in-principle support for 'offsets' for surface water losses, this position was based on South32 demonstrating a precautionary approach using the 'avoid-minimise-offset' hierarchy. WaterNSW considers that this has not been adequately demonstrated.

3. Can catchment water losses be avoided or minimised?

It is now widely understood and accepted that narrower longwalls (and/or a lower mining height) can have significant benefits in reducing impacts on water resources.

WaterNSW considers the three key benefits are:

1. A reduction in catchment losses due to regional depressurisation
2. A reduction in the intensity of surface fracturing, and
3. Improved chances of stream remediation.

The key benefit of reducing longwall widths is to reduce the height of free drainage and to minimise surface water losses from the catchment due to 'regional depressurisation'. For that reason, the Final Report of the IEPMC recommended adopting "*a precautionary approach and bas[ing] mine design on preventing the height of free drainage in the Special Areas from extending to the surface or interacting with surface fracture networks.*"

In relation to this project, the IAP has confirmed that "*it is technically feasible to reduce short term and long-term environmental impacts by avoiding seam to-surface connective fracturing by modifying panel width and, where practical, mining height*". However, the IAP has not yet provided any detailed comments on this as the EIS documentation does not easily enable the impacts of different longwall panel widths to be assessed or compared.

Importantly, South32 has not provided surface water loss predictions for any alternative mine designs. South32 states that "*there is no definitive methodology to estimate surface water losses at alternative panel widths*" and "*estimating surface water losses for panel widths less than 305 m will be inherently uncertain*".

WaterNSW does not consider that this an adequate response as there will always be some degree of uncertainty based on modelling. It has long been accepted by regulators that modelling of various environmental impacts (e.g. water, air quality, noise, vibration and subsidence) is a necessary part of the environmental impact assessment process.

In fact, South32's environmental assessment for this project relies heavily on various models, including estimates of surface water losses via the groundwater model. Since the EIS was first prepared in early 2019, there is no reason that South32 could not have provided various groundwater model 're-runs' (and estimated water losses) for alternative mine designs.

While the primary benefit of reducing longwall widths is to reduce the height of free drainage and regional depressurisation, there may be important secondary benefits in reducing the intensity of surface fracturing, and improving the chance of stream remediation in the future.

In relation to the intensity of surface fracturing, WaterNSW acknowledges that some level of surface fracturing is still likely to occur with narrower panels (unless panels were reduced to less than 100 metres). WaterNSW agrees with the IAP that the primary cause of fracturing directly within streams and swamps in the landscape above the proposed mining area is non-conventional subsidence. WaterNSW also recognises that reducing longwall widths generally has less influence

in decreasing non-conventional subsidence effects (e.g. valley closure) than conventional subsidence effects.

However, the prediction of valley closure is inherently difficult and relatively unreliable compared to conventional subsidence. This was acknowledged by the IEPMC which stated that *"this situation persists despite considerable research having been undertaken"*. Both the IEPMC and the IAP have noted that, in reality, valley closure and stream fracturing is highly dependent on site-specific characteristics (e.g. laminated strata and cross bedding).

WaterNSW notes that there are still likely to be considerable reductions in both compressive strains and valley closure if longwall widths are reduced. According to South32's consultants (MSEC), there would be a 25% reduction in compressive strains and 15% reduction in average valley closure with only a 50-metre reduction in longwall width. If the longwall widths were reduced by half (150 m), then compressive strains and valley closure would be reduced by up to 66% and 33%, respectively.

There may also be benefits in reducing the 'maximum' levels of valley closure. Based on MSEC's database, the Dendrobium mine has a much wider range of valley closure measurements than any other mine in the Southern Coalfield. For example, Dendrobium is the only mine to have recorded valley closure over 650 mm, with seven measurements ranging from approximately 650 mm to 900 mm.

Importantly, the narrowing of longwalls is also likely to reduce the intensity of surface fracturing in less incised areas of the landscape, near or adjacent to watercourses. In that regard, the IAP has stated that *"the intensity of the impacts (fracturing width, frequency and depth) can be expected to reduce"* and that this *"may have important implications for the volume of surface water that can be diverted into the subsurface, and into the mine through connected fractures."* The IAP specifically referred to an MSEC report from 2016 (not provided in the EIS documentation), which notes that *"there was a series of cracks up to 1.5 metres wide located above the commencing end of Longwall 3"*.

There is one example of watercourse damage that illustrates the point that a complex set of various types of impacts can be involved. During a dry weather period in May-June 2018, Wongawilli Creek stopped flowing over a 1.4 km stretch flanked by Area 3A longwalls to the east and Area 3B longwalls to the west. This dry zone, extending upstream and downstream from Pool 43A, comprises around 25% of the length of this stream within the Area 3B assessment area.

WaterNSW considers that there are likely multiple reasons for this drying, including extensive fracturing, a drop in groundwater levels in the surrounding ridges, a reduction in baseflow, and potential basal shear planes. In considering whether this constituted a breach of the development consent conditions, the IEPMC stated that it was *"especially difficult to judge when multiple and/or widespread impacts are involved, as has been the case"*. It further noted that this demonstrated a limitation in the performance measure *"due to past limitations in knowledge about height of fracturing and potential for cumulative impacts on surface water diversions and losses"*.

4. Is there a viable mine plan with reduced catchment impacts?

It is WaterNSW's position that the project fails to consider the paradigm shift that has occurred in both policy settings and scientific understanding. It also differs significantly in its approach to the other most recent mine applications in the Southern Coalfield e.g. first workings at Russell Vale, narrower longwalls at Metropolitan, and significant setbacks from key environmental features at Bulli Seam Operations (see 'Background' in **Appendix 1**).

The IAP expressed similar concerns in that it has *"serious reservations as to whether the mine layout put forward as the Maximum Case constitutes a realistic point of reference for a contemporary mining approval. The Base Case may be more realistic of the upper bound today for a mine layout in the Sydney Water Catchment than of an economically viable layout that takes ecological and mine closure implications into account"*.

A key assumption underlying the potential economic impacts is that there is no other viable mine plan. WaterNSW questions whether there is a viable mine plan with narrower panels (and/or a lower mining height) that prevents connective cracking. However, South32 has continually refused to present or assess alternative mine plans with narrower panels throughout the assessment process.

WaterNSW acknowledges that any such mine design changes can reduce economic benefits, however a significant reduction in environmental impacts may be achievable with relatively minor changes. There is still an opportunity to reduce the height of free drainage and establish a 'constrained zone' between 'surface cracking zone' and 'fractured zone' (above the coal seam).

Basic analysis of the Tammetta formula indicates that a constrained zone of 50 metres (minimum) can be retained with variable longwalls ranging from 200 to 275 m in width (approximately half at 250 to 275 m, and the other half at 200 to 250 m). WaterNSW considers that there may be benefits to such a mine design in terms of a potential reduction in surface water losses, however further information and analysis is required, including re-runs of the groundwater model.

5. What are the catchment water losses post-mining?

The IAP has drawn attention to a 'new' major issue regarding whether the mine can be sealed and fully recharged, and hence whether surface water losses will eventually cease.

WaterNSW has two key concerns if the mine cannot be sealed:

- 1) Potential 'permanent' loss of catchment water; and
- 2) An insufficient 'offset' or compensation package.

The IAP considers that these issues are yet to be fully investigated and assessed. Therefore, the IAP was unable to form a view on the impacts and consequences associated with both the option to seal and flood the mine and the option to allow water to continue to discharge freely from the mine at seam level.

WaterNSW's preliminary view is that if the mine can be sealed, then the acceptability of surface water losses and the appropriateness of offsets can be assessed. If the mine cannot be sealed, then further assessment of total losses and a recalculation of the offset package is required.

WaterNSW notes that this is likely an issue for all mines in the catchment and would have been assessed for all projects if it had been understood at the time. However, Dendrobium likely presents the most significant risk due to the unprecedented level of fracturing that is predicted.

There remains residual uncertainty about post-mining groundwater repressurisation and discharge of contaminated groundwater and how this will affect water quality (discussed in more detail below). The Commission sought advice from WaterNSW as to whether it prefers a sealed or an unsealed underground mine upon completion, and whether the key issue for WaterNSW is water quantity or water quality.

WaterNSW has a legislated function to protect and enhance both the quality and quantity of water in the declared catchment areas. WaterNSW considers that there would be a mine plan that avoids connective fracturing, which in turn would significantly reduce both water quantity and water quality impacts.

Water quality

6. What are the post-mining impacts on water quality?

There is residual uncertainty about post-mining groundwater repressurisation and the potential outflow or discharge of contaminated groundwater. While South32 predicts that deep groundwater would have a relatively low solute load, WaterNSW remains particularly concerned about the solute load in the shallow groundwater.

Further, the IAP noted that *"if it proves impossible or impractical to satisfactorily seal Dendrobium Mine, important questions arise in relation to matters such as ... ongoing management and funding (in perpetuity) for treating mine water discharge. The latter may apply even if the mine is effectively sealed should significant upward leakage and contaminant flux occur"*.

The Commission sought advice from WaterNSW on whether mining has affected water quality in a way which has affected its ability to serve its customers.

To date, no significant impacts have occurred that have affected our ability to supply customers, or that have required specific upgrades to water treatment infrastructure. However, WaterNSW remains concerned and continues to monitor closely for any such impacts. Given the time lag for mines to repressurise and that there are still mines actively pumping, it is possible that impacts may not yet have occurred but will do in the future.

WaterNSW notes that there are some relevant precedents for coal mines that have caused impacts on water quality following closure:

- In NSW, the Berrima Colliery caused a deterioration in water quality in the Wingecarribee River following its closure in 2013. This included orange-yellow staining of the river due to the presence of iron and manganese, and increased levels of toxic dissolved metals such as nickel and zinc, in mine discharges.
- In the USA, the Lancashire-15 mine in Pennsylvania discharged large amounts of high acidic metal-laden water following its closure in 1970. This degraded the Susquehanna River and caused fish kills for 160 km downstream. The government was forced to pump and transfer the mine water for over 30 years post-closure.

WaterNSW's position remains that South32 must meet the statutory requirement for a NorBE on water quality, as it is a precondition for approval. Based on the potential water quality impacts post-mining, WaterNSW maintains that NorBE has not (yet) been adequately demonstrated.

WaterNSW acknowledges that clause 11A of the *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* may be applicable to this development as it could be considered as 'continuing development'. However, there are several legal questions which arise when considering this clause, including:

- What are 'similar conditions' for continuing development (noting that the original approval was granted on the basis of negligible impacts)?
- Should the existing conditions simply be transferred across, or can similar conditions be inserted for new mining area (e.g. similar defined points on key watercourses)?
- Is the drafting of 'similar conditions' sufficient (i.e. no assessment of actual water quality), or is an assessment required about whether those conditions can be met?

WaterNSW notes that the existing conditions of consent include performance measures at the confluence of Wongawilli Creek and Cordeaux River. WaterNSW considers that similar performance measures would be necessary at other defined points in Avon River, Cordeaux River and Donalds Castle Creek.

In terms of assessing water quality, WaterNSW considers that it is possible that the project's additional post-mining outflows may be the 'tipping point' for a negligible impact test in the reservoirs (or at any other defined point). The project is predicted to contribute approximately 7 ML/day in excess of the existing approximately 8.5 ML/day. Further information and analysis are required to properly assess this issue.

WaterNSW also considers that South32 should rely on mitigation measures, rather than 'offsets' to address any residual water quality impacts. WaterNSW notes that there is no government policy on water quality 'offsets' and it is particularly difficult to assess the value (or otherwise) of the proposed 'offsets', which are not related to the actual impacts. Therefore, WaterNSW does not support the proposed water quality offsets as it considers they are not like-for-like or commensurate with potential impacts.

Stream impacts

7. What streams should be considered 'significant'?

The IAP noted that while the Environmental Impact Statement included a 'Stream Risk Assessment', it was considered inconsistent with the intent of the recommendations over the past decade by several independent and expert panels examining mining impacts in the Southern Coalfield, as well as being inconsistent with Australian and international standards and guidelines for risk assessment.

It was concluded that "*as a matter of due diligence, the consent authority should confirm the scope and appropriateness of the selected key stream features. In respect of stream classification, whether any of the streams impacted by the proposed mining warrant classification as being of special significance*".

WaterNSW supports further consideration of defining the 'special significance' of streams, including their various sections and features, and considers that the IAP's recommendations for a risk assessment approach is warranted.

WaterNSW highlights that even if a stream is unnamed, that does not necessarily mean it is not significant (i.e. DC8, AR19, AR31 and LA13). For example, SC10 (which overlies South32's planned Longwall 19 in Area 3A) is a very long and significant tributary on Sandy Creek, and flows into Sandy Creek just a short distance from where Sandy Creek flows into Lake Cordeaux.

WaterNSW also notes that the potential for impacts on named streams in the project area were "*obtained using the rock bar impact model developed for Dendrobium Mine*", which relates the likelihood of Type 3 impacts (i.e. streambed fracturing) with the predicted valley closure.

The IAP stated that this model's focus on rockbars does not "*recognize that watercourses constitute systems that can rely on all stream features for their function and ecological integrity.*" It further noted that the PAC for the Bulli Seam Operations Project was "*not satisfied that stream values were protected by a focus on limiting fracturing only at rockbars but allowing for fracturing elsewhere in the valley floor*".

WaterNSW remains concerned about the nature and extent of predicted environmental impacts in significant watercourses, including nine major streams (third order or above), particularly those in the north-western corner of Area 5.

WaterNSW has previously suggested further protection for key third order watercourses, including:

- shifting the western end of LW509 by approximately 150 m to the east (AR31); and
- shifting the northern end of LW510 by approximately 400 m to the south (DC8).

Ecological integrity

8. What is the worst-case scenario for swamps?

WaterNSW reiterates its concern that the predicted ecological impacts of the project, particularly impacts on endangered upland swamps, are inconsistent with one of the key purposes for declaring the Metropolitan Special Area, which is to maintain the ecological integrity of the land.

Up to 25 swamps would likely experience serious or irreversible damage from the project due to fracturing of the bedrock beneath the swamps. WaterNSW considers that this would change both the hydrological and ecological functioning of the swamps, and make them more fire-prone.

WaterNSW agrees with concerns raised by the Biodiversity Conservation Division within the Department that South32 has not calculated worst-case scenario for predicted impacts. In terms of calculating the 'maximum potential impact', the Swamp Offset Policy states:

"It is recognised that the impact of altering the hydrological regime within upland swamps is not equivalent to removing all vegetation. However, this impact is likely to result in total loss of the upland swamp ecological community in the long-term as a result of loss of the critical ecosystem functions."

WaterNSW also considers that the potential impacts of fire should be factored into any calculation of the 'maximum potential impact'. While the Metropolitan Special Area has avoided major burns in recent times, the 2019-20 bushfires burnt 90% of Warragamba Special Areas, and Metropolitan only narrowly avoided impacts. Further, the recent independent Bushfire Inquiry has highlighted the increased risk of fires due to climate change.

WaterNSW notes that the IAP (including its swamp expert) did not comment on South32's estimate of maximum potential impact (including fire risk) or the quantum of proposed offsets.

Conclusion

If the project is not amended, WaterNSW maintains that it should not be approved.

WaterNSW reiterates that the project (as currently proposed) would cause unprecedented levels of subsidence, surface-to-seam fracturing and groundwater depressurisation, which would result in a range of significant predicted impacts to the Special Areas of Sydney's drinking water catchment.

It is therefore not consistent with WaterNSW's statutory role "*to protect and enhance the quality and quantity of water in declared catchment areas*" or its Mining Principles.

In summary, WaterNSW considers that it is not appropriate to assess this project against predicted 'median' impacts because there is considerable uncertainty about the accuracy of the predictions, and there is a historical trend of impacts being substantially greater than predicted.

Instead, it is WaterNSW's view that a precautionary approach should be adopted that considers the following potential maximum impacts as realistic possibilities (until further information or analysis is provided):

- catchment losses of up to 7 GL/year;
- measurable surface water losses in perpetuity;
- loss of surface flows in significant watercourses due to multiple factors;
- outflows of contaminated groundwater post-mining; and
- total loss of 25 swamps with a limited chance of successful remediation.

Recommendations

Throughout this submission, WaterNSW has posed 8 key residual questions, which we believe need to be carefully considered before any determination on the project is made.

In the table below, we have suggested whether further information should be sought from South32 or the IAP on each of the 8 questions. (It may also be appropriate to seek further advice from the IAP on any additional information that South32 provides in the future.)

Question	South32	IAP
1. Are the predicted catchment water losses accurate and reliable?		X
2. Are the likely catchment water losses acceptable?		
3. Can catchment water losses be avoided or minimised?		X
4. Is there a viable mine plan with reduced catchment impacts?	X	
5. What are the catchment water losses post-mining?	X	
6. What are post-mining impacts on water quality?	X	
7. What streams should be considered 'significant'?		X
8. What is the worst-case scenario for swamps?		X

Given WaterNSW's fundamental objection to the project, our comments have not focussed on the recommended conditions. Should the Commission seek to determine in favour of the proposal, WaterNSW would appreciate a further opportunity to comment on the proposed conditions.

WaterNSW also requests that it be listed as a stakeholder for any further consultation and assessment on this project.

If you wish to discuss this letter or the project more generally, please do not hesitate to contact Jessie Evans on 0436 861 165 or e-mail environmental.assessments@waternsw.com.au.

Yours sincerely



CLAY PRESHAW
Manager Catchment Protection

Appendix 1

Background on mining in the catchment

The presence of coal mining within Sydney drinking water catchment has long been a cause of concern for the NSW Government, particularly since the introduction of high-impact longwall mining in the 1970s. Over the past 50 years, the impacts of mining the catchment has been the subject of numerous independent reviews. The first of these was the Reynolds Inquiry in 1977.

Much of the focus of the various reviews and planning decisions has been on attempting to strike an appropriate balance between protecting environmental features for Sydney's water supply and providing socio-economic benefits to the Illawarra region.

For all major coal mining projects in the Special Areas of the catchment, the assessment process (particularly through Commission reviews) has resulted in substantial changes to the proposed mine design, in order to avoid or minimise impacts to environmental features.

The key examples are:

- **Dendrobium (2001):** The mine was originally approved by the Minister following a Commission of Inquiry (COI), which was a predecessor of the current Independent Planning Commission (IPC). While this decision pre-dates the SCI by many years, the COI raised many of the concerns that are most relevant today, including potential impacts on water quantity, water quality, and swamps.

The COI prohibited the extraction of coal from approximately 30% of the proposed Areas 2 and 3, due to potential impacts on Cordeaux Reservoir, Wongawilli Creek, Donalds Castle Creek and various upland swamps. In that regard, the COI stated:

"The Commission has reviewed the evidence with respect to each of these areas to determine the extent to which it considers they can be mined by longwall methods. The time to place restrictions on the area to be mined to appropriately protect the more significant environmental values is at the development consent stage. Fundamental environmental matters cannot be left to a later regulatory regime." (COI, p. 20.)

- **Metropolitan (2009):** Following a review by the PAC, the proponent modified the project to protect significant stretches of the Waratah Rivulet and the Eastern Tributary. It also amended the mining dimensions to include narrower panel widths and wide inter-panel pillar widths when mining directly under Woronora Reservoir.
- **Bulli Seam Operations (2011):** The original mine design included substantial areas of mining within the Metropolitan and Woronora Special Areas.

In undertaking a review, the Planning Assessment Commission (PAC) concluded that *"it is no longer a viable proposition for mining to cause more than negligible damage to pristine or near-pristine waterways in drinking water catchments or where these waterways are elements of significant conservation areas or significant river systems"*.

In response to the PAC review, the proponent modified the project to exclude any mining within the Woronora and Metropolitan Special Areas, which resulted in the excising of approximately half of the originally proposed mining domains.

- **Russell Vale (2020):** Early in the assessment process, this project was divided into two separate project applications based on an acknowledgement that the western areas of the mining lease would likely cause significant impacts to environmental features within the Special Areas. The 'interim' project application initially involved only first workings and two small areas of pillar extraction (with minimal subsidence) and was approved in 2011.

The 'expansion' project took over 10 years to be determined, and involved two comprehensive PAC reviews, both of which were highly critical of the likely environmental impacts of the proposed longwall mining. The initial mine design involved relatively narrow longwalls (125-150m wide) but this was subsequently amended to first workings only.

Appendix 2

New paradigm of science and policy

Since the most recent longwall mining approval in the Special Areas, there have also been multiple independent scientific reviews. Key reports include:

- NSW Chief Scientist & Engineer (2014) Report on cumulative impacts of coal mining;
- NSW DPE (2015) Report to Government - Mining Impacts at Dendrobium Coal Mine Area 3B;
- Advisian (2016) Literature Review of Underground Mining beneath Catchments and Water Bodies (prepared for WaterNSW);
- Alluvium & Ecological (June 2017) Sydney Drinking Water Catchment Audit 2016;
- Sullivan, T & Swarbrick, G (2017) Height of Cracking Dendrobium Area 3B (by PSM), and Emeritus Professor Jim Galvin's and Dr Col Mackie's peer reviews of the PSM report;
- Ecological (June 2020) Sydney Drinking Water Catchment Audit 2019; and
- IEPMC (2019) Final Report, and various advice on Dendrobium Mine's Subsidence Management Plans and Metropolitan Mine's Extraction Plans.

Since the last longwall mine approval in the Special Areas, significant statutory and policy changes have also occurred. Key changes include:

- *Water NSW Act 2014* – WaterNSW is responsible for ensuring that the catchments and controlled areas are protected and that the quality of water in catchment and controlled areas are protected and enhanced.
- *2012 NSW Aquifer Interference Policy (AIP)* specifies minimal impact considerations for various aspects including impacts of the proposal on groundwater resources, connected water resources, and dependent ecosystems. The AIP also clarifies the requirements for obtaining water access licence for aquifer interference activities under NSW water legislation.
- *Sydney Drinking Water Catchment State Environmental Planning Policy (SEPP) 2011* – mining activities in the Sydney Drinking Water Catchment are required to demonstrate that they will have a neutral or beneficial effect on water quality (i.e. NorBE test).
- Biodiversity and ecology considerations:
 - The listing of upland swamps as protected under both NSW and Commonwealth biodiversity legislation;
 - *Biodiversity Conservation Act 2016*, including the *NSW Biodiversity Offsets Policy for Major Projects: Upland swamps impacted by longwall mining subsidence*; and
 - *Commonwealth Environment Protection and Biodiversity Conservation Act 1999*.