New South Wales Government
Independent Planning Commission

Dendrobium Extension Project SSD 8194

Statement of Reasons for Decision

Mr Stephen O'Connor (Chair)
Mr John Hann

5 February 2021

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EXECUTIVE SUMMARY

South32 Limited (the Applicant) has sought development consent to extend underground longwall mining operations at its Dendrobium Coal Mine (the Project), located approximately 8km west of Wollongong in the NSW Southern Coalfields, until 31 December 2048.

Coal from the Dendrobium Mine and South32's nearby Appin Mine is used to produce a metallurgical coal blend for use in steelmaking. It is supplied directly to BlueScope Steelworks at Port Kembla and transported by sea to the Whyalla Steelworks in South Australia, as well as international markets.

The $956-million Dendrobium Extension Project (SSD 8194) would see an additional 78-million tonnes of run-of-mine coal recovered from two new areas, Areas 5 and 6, comprising 21 long wall panels. Of those, 18 would have a void width of 305m.

Special Areas are lands declared under the *Water NSW Act 2014* for protecting the quality of stored waters, whether intended for drinking or other purposes, and maintaining the ecological integrity of that land. Areas 5 and 6 are located within the Metropolitan Special Area which supplies drinking water to the populations of the Macarthur and Illawarra regions, the Wollondilly Shire and Metropolitan Sydney.

The Department of Planning, Industry & Environment (the Department) finalised its whole-of-government assessment of the State significant development application for the Project in November last year. Under section 4.5(a) of the *Environmental Planning and Assessment Act 1979*, the Independent Planning Commission is the consent authority for this application because the Department received more than 50 'unique' objections during public exhibition of the environmental impact statement.

Commissioners Steve O'Connor (Panel Chair) and John Hann were appointed to constitute the Commission in determining this SSD application. They met with the Applicant, Department, Wollondilly and Wingecarribee Shire Councils, WaterNSW and the Independent Advisory Panel for Underground Mining (IAPUM) and conducted a site inspection and aerial viewing of the surrounding area.

In December 2020, the Panel also hosted a three-day electronic Public Hearing, as requested by the NSW Minister for Planning and Public Spaces (amongst hearing from expert witnesses) to listen to the community's views.

Significant concerns were raised during consultations undertaken by the Department and Commission in relation to several key issues: mine design, subsidence, ground and surface water impacts, biodiversity and upland swamps, Aboriginal cultural heritage, greenhouse gas (GHG) emissions, the 'NorBE test' and bushfire risk.

In the Department's view the Project is "approvable", and it concluded that its benefits "*significantly outweigh its residual costs, and that it is in the public interest*".

However, after careful examination of all the evidence and weighing all relevant considerations, the Commission has found that the longwall mine design put forward by South32 does not achieve a balance between maximising the recovery of a coal resource of State significance and managing, minimising or mitigating the impacts on the water resources and biodiversity and other environmental values of the Metropolitan Special Area.

For the reasons outlined in this Statement of Reasons, the Commission is of the view that the impacts of the Project outweigh the benefits from an approval, such that the Project should be refused. The Commission concluded that the level of risk posed by the Project has not been properly quantified and based on the potential for long-term and irreversible impacts -- particularly on the integrity of a vital drinking water source for the Macarthur and Illawarra regions, the Wollondilly Shire and Metropolitan Sydney -- it is not in the public interest.

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The Applicant was aware of concerns raised by WaterNSW and others regarding its mine design and the associated impacts. The Applicant has made minor amendments; however, the impacts remain significant. The Commission notes the Applicant has offered mitigation measures for remediation of selected key stream features, financial offsets for water losses and water quality impacts and an upland swamp offset site; however, a number of these measures have not been considered acceptable by the responsible Statutory agencies.

In reaching its determination, the Commission found:

- the proposed longwall mine design introduces uncertainty regarding the extent of environmental impacts in the Metropolitan Special Area and the Applicant's ability to adequately manage those impacts. The Project will significantly impact on the Metropolitan Special Area in a manner which is inconsistent with its statutory purpose.
- the subsidence effects resulting from the proposed longwall mine design are likely to be significant with surface-to-seam cracking predicted within Areas 5 and 6. This subsidence will result in the degradation of 25 watercourses and swamps in the Metropolitan Special Area and lead to the potential instability and fracturing of up to 40 cliffs located above the proposed longwalls. It would also result in detrimental impacts to biodiversity, threatened ecological communities, such as Upland Swamps, and Aboriginal cultural artefacts and values.
- The Project will lead to potentially significant surface water losses into the groundwater system, as well as impact local ecological processes and potentially contribute to increased concentrations of metals, which may impact water quality in the Metropolitan Special Area.
- there is uncertainty about predicting the volume of surface water losses into the groundwater system, with evidence of an increase in the interconnectivity of surface and groundwater sources resulting from longwall mining in the catchment.
- surface and subsurface fracturing of the bedrock from longwall mining has seen the loss of surface water flows from some sections of rivers and streams in the catchment during low flow times. According to the Independent Advisory Panel for Underground Mining, the Project would result in a 3.9 percent reduction of the yield of the Avon Reservoir catchment during drought conditions.
- this is further exacerbated by uncertainty in relation to managing mine water inflow after mine closure, including the type, magnitude and longevity of the impacts on water quantity and quality. There are therefore significant concerns regarding the adequacy of the Applicant's proposed offsets and compensatory provisions for impacts on water quantity and water quality in the catchment.
- the Project would increase the area affected by subsidence, including undermining upland swamps and first, second and third order streams. There are 47 upland swamps lying partly or wholly within 600 m of the Project's proposed longwalls, 25 of which satisfy the Threatened Ecological Community listing and are required to be offset. The Applicant has sought to limit subsidence impacts in the case of the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek and 57 selected key stream features. However, in the absence of supporting evidence, the Commission shares the significant concerns of the Biodiversity Conservation and Science Division of the NSW Environment, Energy and Science cluster within the Department (BCS) and others about the proposed offsets and the robustness of the Applicant's mitigation measures.
- The likely extent of subsidence impacts in Area 5 and Area 6 introduce considerable risk of irreversible damage to 58 identified Aboriginal cultural heritage sites.
- the predicted Scope 1, Scope 2 and Scope 3 greenhouse emissions from the Project would be significant.
- The Commission agrees with the anticipated economic benefits of the Project insofar as they are set out by the Applicant's consultant Cadence Economics. The Project would have positive contributions to the local, regional and State economy.

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- The Commission accepts that the Dendrobium Mine does contribute coal to BlueScope Steelworks historically from the Wongawilli Seam, however the bulk of this coal is primarily destined for other markets beyond the Illawarra Region.
- The dependence of BlueScope Steelworks on Wongawilli Seam coal from the Dendrobium Mine is unclear given that the Wongawilli Seam coal would not be available for some considerable time after the proposed cessation of longwall mining at Dendrobium Mine in 2024 even if the Project was approved. This is based on the Applicant's scheduling of Area 5 (Bulli Seam) from 2024, followed some 19 years later by Area 6 (Wongawilli Seam). The Commission does not accept the suggested dependence of BlueScope Steelworks on ongoing access to the Wongawilli Seam coal from this Project.

The Commission's reasons for refusal are explained in full in this Statement of Reasons for Decision.

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DEFINED TERMS

ABBREVIATION	DEFINITION
ACCC	Australian Competition and Consumer Commission
ACHA	Aboriginal Cultural Heritage Assessment, dated May 2019
AIP	*NSW Aquifer Interference Policy*
Applicant	Illawarra Coal Holdings Pty Ltd, a subsidiary of South32 Limited (South32)
Application	SSD-8194
ARP	Assessment Report Paragraph
BC Act	*Biodiversity Conservation Act 2016*
BCS	Biodiversity Conservation and Science Division of the NSW Environment, Energy and Science cluster within the Department
CBA	Cost Benefit Analysis
CCPF	*NSW Climate Change Policy Framework*
CCL	Consolidated Coal Lease
Commission	Independent Planning Commission of NSW
CPP	Coal Preparation Plant
CWE	Coal Wash Emplacement
DAWE	Commonwealth Department of Agriculture, Water and the Environment
DCP	Development Control Plan
Department	Planning & Assessment Group, Department of Planning, Industry and Environment
Department's AR	Department's Assessment Report, dated 30 October 2020
DPIE-Water	Water Group, Department of Planning, Industry and Environment
DSNSW	Dams Safety NSW
EIS	Environmental Impact Statement, dated 22 July 2019
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPI	Environmental Planning Instrument
ESD	Ecologically Sustainable Development
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPL	Environment Protection License
Existing Approval	Development Consent under DA 60-03-2001 approved 20 November 2001 (July 2018 modification (MOD 8))
FBA	NSW Framework for Biodiversity Assessment
FSLs	Full Supply Levels
GHGEs	Greenhouse Gas Emissions
IAPUM	Independent Advisory Panel for Underground Mining
IEPMC	Independent Expert Panel for Mining in the Catchment

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IESC	Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development
KVCLF	Kemira Valley Coal Loading Facility
LEP	Local Environmental Plan
LGA	Local Government Area
LW	Longwall
Mandatory Considerations	Relevant mandatory considerations, as provided in s 4.15(1) of the EP&A Act
Material	The material set out in section 4.6
MEG	Minerals Energy and Geoscience Group, Department of Regional NSW
Metropolitan Special Area	The 'Special Area' declared under the *Water NSW Act 2014 (***WNSW Act)** and managed by WaterNSW that supplies drinking water to the populations of the Macarthur and Illawarra regions, the Wollondilly Shire and Metropolitan Sydney
Mining SEPP	*State Environmental Planning Policy (Mining, Petroleum and Extractive Industries) 2007*
Minister	Minister for Planning and Public Spaces
Minister's Request	Request from the Minister on 23 September 2020 under section 2.9(1)(d) of the EP&A Act (set out in paragraph 1)
ML	Megalitres
Mt	Million tonnes
Mtpa	Million tonnes per annum
Net Zero Plan	*NSW Net Zero Plan Stage 1: 2020-2030*
NorBE	Under *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).
NPWS	National Parks & Wildlife Service
PKCT	Port Kembla Coal Terminal
POWA	Protect Our Water Alliance
Project	Dendrobium Expansion Project as described in Section 2.3 of this Statement of Reasons
Regulations	*Environmental Planning and Assessment Regulations 2000*
RoM	Run-of-Mine
RtS	Response to Submissions
SASPoM	*Special Areas Strategic Plan of Management 2015*
SDWC SEPP	*State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011*
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 44	*SEPP No. 44 - Koala Habitat Protection*
Site	The land listed in Attachment 3 of the EIS
Special Areas	Lands declared under the *Water NSW Act 2014* for protecting the quality of stored waters

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SRD SEPP	*SEPP (State and Regional Development) 2011*
SSD	State significant development
TEC	Threatened Ecological Community
Upland Swamps	Coastal Upland Swamps of the Sydney Basin Bioregion (TEC)
WNSW Act	*Water NSW Act 2014*
WCC	Wollongong City Council
WiSC	Wingecarribee Shire Council
WoSC	Wollondilly Shire Council

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1 INTRODUCTION

1.1 The Minister's Request

1. On 23 September 2020, the Minister for Planning and Public Spaces (**Minister**) made a request (**Minister's Request**) under section 2.9(1)(d) of the Environmental Planning Assessment Act 1979 (**EP&A Act**), that the Independent Planning Commission of NSW (**Commission**):

   1. *Conduct a further public hearing into the carrying out of the Dendrobium Extension Project SSD 8194 prior to determining the development application for the project under the Environmental Planning and Assessment Act 1979, paying particular attention to:*
      a) *the Department of Planning, Industry and Environment's assessment report, including any recommended conditions of consent;*
      b) *key issues raised in public submissions during the public hearing; and*
      c) *any other documents or information relevant to the determination of the development application.*
   2. *Complete the public hearing and make its determination of the development application within 12 weeks of receiving the Department's assessment report in respect of the project, unless the Planning Secretary agrees otherwise.*

2. The Minister's Request set out above in paragraph 1, was received by the Commission on 6 October 2020.

1.2 The Department's Referral

3. On 2 November 2020, the NSW Department of Planning, Industry and Environment (**Department**) referred the State significant development application SSD-8194 (**Application**) from Illawarra Coal Holdings Pty Ltd, a subsidiary of South32 Limited (South32) (**Applicant**) to the Commission for determination. The Application seeks approval for the Dendrobium Expansion Project (**Project**) located in the Wollongong, Wingecarribee and Wollondilly local government areas (**LGAs**) under section 4.38 of the EP&A Act. More than 50 unique public objections to the Application were received and therefore, under section 4.5(a) of the EP&A Act, the Commission is the consent authority for the Application.

4. In accordance with the Minister's Request, the determination of the Application is due not more than 12 weeks from the referral, on 3 March 2021 (including the Christmas/New Year shutdown period from 20 December 2020 to 26 January 2021).

1.3 The Commission Panel

5. Professor Mary O'Kane AC, Chair of the Commission, nominated Mr Stephen O'Connor (Chair) and Mr John Hann to constitute the Commission Panel determining the Application.

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2 THE APPLICATION

2.1 Site and Locality

6. The Department's Assessment Report (**Department's AR**) dated 30 October 2020, states that the Applicant owns and operates the Dendrobium Mine, an underground coal mine located approximately 8 kilometres west of Wollongong in the Southern Coalfield of NSW. The mine produces metallurgical coal for steelmaking in Australia and overseas (Assessment Report Paragraph (**ARP**) 1.1.1 and 1.1.4).

7. The Applicant is seeking development consent for the Dendrobium Mine Extension Project to allow it to extract an additional 78 million tonnes (**Mt**) of run-of-mine (**RoM**) coal from two new mining areas (Areas 5 and 6), and to extend the life of the mine until 31 December 2048. The Project has a capital investment value of $956 million and is expected to increase the existing mine workforce from around 400 to 500 personnel.

8. The Project would use the existing mine infrastructure with minor upgrades and extensions. Coal handling and processing would be integrated with existing operations such that the Project would effectively be a continuation of the existing mine. Key existing surface facilities at Dendrobium Mine would continue to be used for the Project but some additional surface infrastructure would be required, including four new ventilation shafts and upgrades to the existing Cordeaux Pit Top, which is currently decommissioned. The spatial relationships between the currently approved mining areas and the proposed Areas 5 and 6 are shown in Figure 1 and Figure 2. The site is the land listed in Attachment 3 of the EIS (**Site**) and includes a large portion of the mining lease outlined in Figure 2.

Figure 1 - Regional Context (Source: EIS)

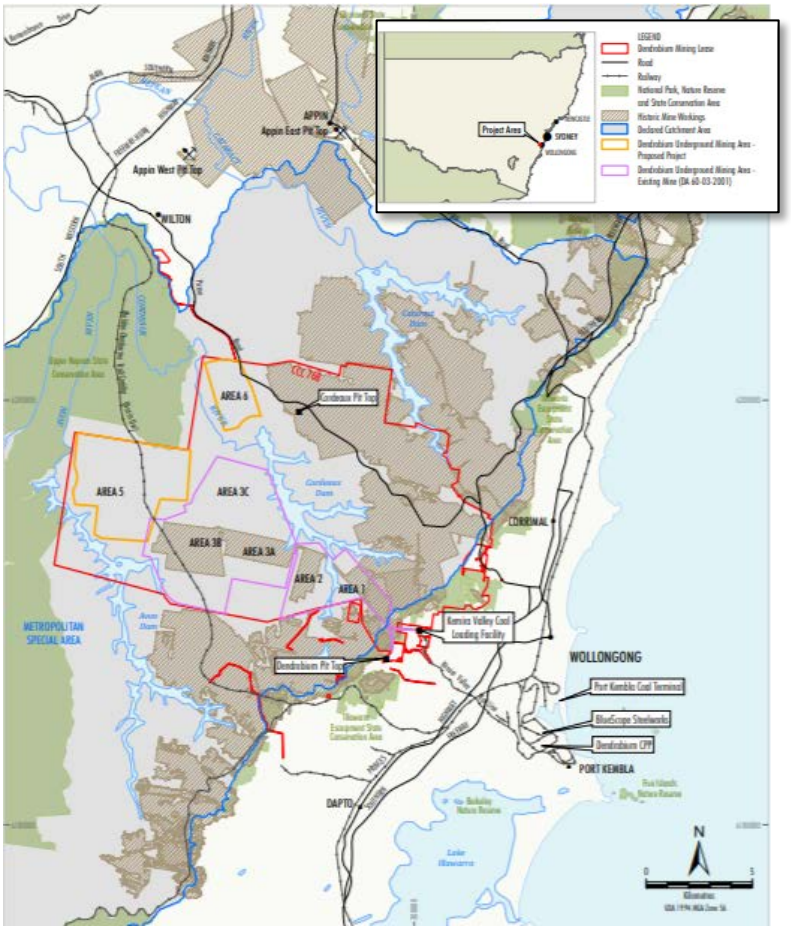

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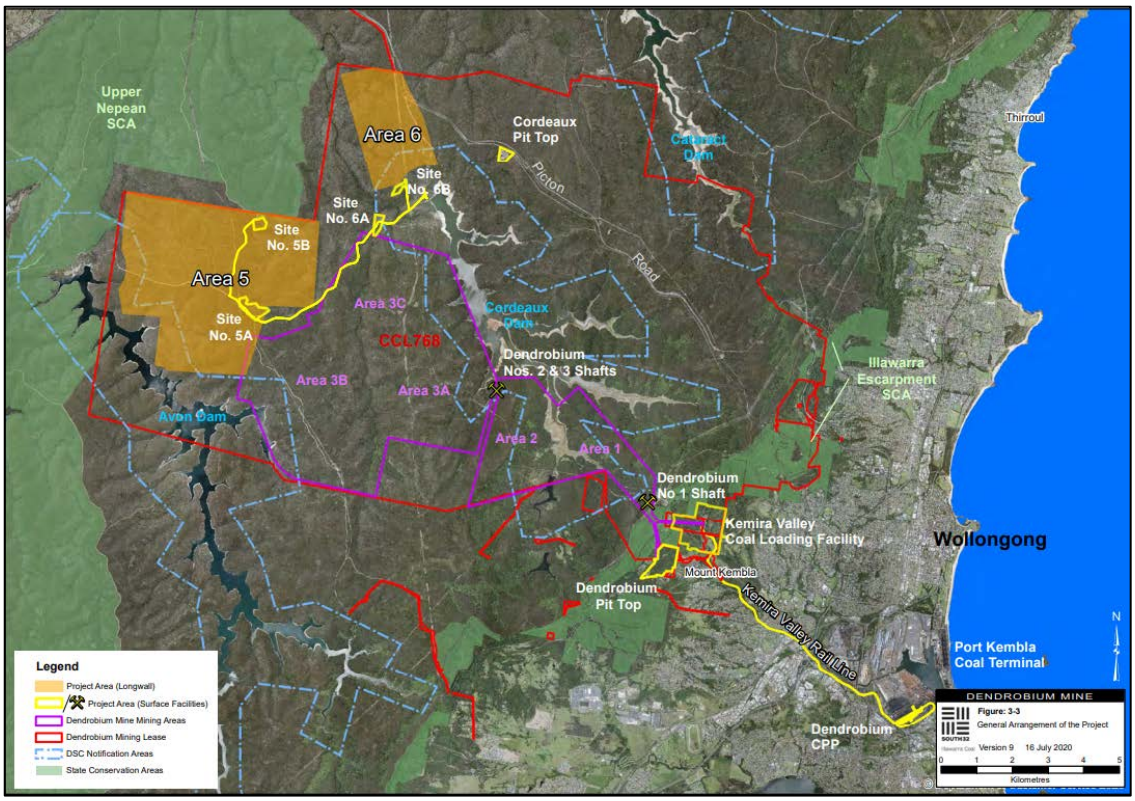
Figure 2 - Local Context & General Arrangement (Source: Amendment Report)



2.2 Background to the Application

9. The Applicant is proposing that the two new mining areas together with all existing surface operations and all new and existing underground mining roads would be managed under a new development consent. These are the primary components of the Project. However, the existing approved mining in Areas 1, 2, 3A, 3B and 3C and associated surface activities such as monitoring and remediation would continue to be managed under the existing development consent DA 60-03-2001. Consequently, the two consents would overlap in both area and effect for some time as the Applicant is not proposing to surrender the existing consent and has not lodged an application to align DA 60-03-2001 with any new consent granted for the Project. The Application states that mining of the great majority of Area 3C would not proceed, until that Area can be adequately drained of underground gas.

10. The Project's Areas 5 and 6 are located within the catchments of the Avon and Cordeaux Rivers, and the associated Avon and Cordeaux Dams, which are part of Greater Sydney's water supply system. These catchments are included within the Metropolitan Special Area, which is a 'Special Area' declared under the *Water NSW Act 2014* **(WNSW Act)** and are managed by WaterNSW.

11. Under the existing development consent mining operations may take place in the mining area until 31 December 2030.

12. In the absence of the Project, the Applicant has indicated that it expects longwall mining at Dendrobium Mine would be discontinued in 2024.

2.3 Summary of the Application

13. The Project's underground mining areas are located wholly within the Applicant's existing mining lease, Consolidated Coal Lease (**CCL**) 768. No new mining leases are required for the Project.

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14. As generally described in ARP 2.1.1 the Project proposes the following:
    - longwall mining of the Bulli Seam (depth 250-390m, seam thickness 2-3m) in a new underground mining area (Area 5);
    - longwall mining of the Wongawilli Seam (depth 375-460m, seam thickness 9-11m, working thickness 2.5-4m) in a new underground mining area (Area 6);
    - development of underground roadways within the Bulli Seam, Wongawilli Seam and other strata required to access these two mining areas;
    - use of existing underground roadways and drifts for personnel and materials access, coal clearance, ventilation, dewatering and other ancillary activities related to Areas 5 and 6;
    - development of surface infrastructure associated with mine ventilation and gas management and abatement, water management, and other ancillary infrastructure;
    - handling and processing of up to 5.2 million tonnes per annum (**Mtpa**) of RoM coal;
    - use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility (**KVCLF**), Dendrobium Coal Preparation Plant (**CPP**) and Dendrobium Ventilation Shafts with minor upgrades and extensions;
    - transport of sized RoM coal from the KVCLF via the Kemira Valley Rail Line to the Dendrobium CPP;
    - use of the Cordeaux Pit Top for mining support activities to reduce underground travel time for workers and delivery of materials while underground development and longwall mining occurs in Area 6;
    - augmentation of mine access arrangements, including upgrades to, and the use of, the existing Cordeaux Pit Top;
    - delivery of product coal from the Dendrobium CPP to the BlueScope Steelworks at Port Kembla for domestic use or to the Port Kembla Coal Terminal (**PKCT**) for export and for seaborne transport to the Liberty Primary Steel Whyalla Steelworks at Whyalla;
    - transport of up to 1.6Mtpa of coal wash by road to customers for engineering purposes (e.g., civil construction fill), for other beneficial uses and/or for emplacement at the West Cliff Coal Wash Emplacement (**CWE**) Stages 3 and 4;
    - progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure;
    - controlled release of excess water in accordance with the conditions of Environment Protection Licence 3241; and
    - monitoring, rehabilitation and remediation of subsidence and other mining effects.

15. As described in ARP 2.1.3, additional infrastructure and upgrades to existing infrastructure required to support the Project would be progressively developed in parallel with ongoing mining operations, including:
    - development of underground roadways, coal clearance infrastructure and other ancillary infrastructure required to access and support the two new underground mining areas;
    - underground mining machinery replacement and upgrades;
    - development and augmentation of mine ventilation infrastructure;
    - additional gas management and abatement infrastructure;
    - upgrades to the Dendrobium Pit Top and decommissioning and removal of redundant infrastructure;
    - upgrades to the Cordeaux Pit Top and decommissioning and removal of redundant infrastructure to facilitate workers and materials access during development and mining operations in Area 6;
    - ongoing maintenance and upgrades of the Kemira Valley Rail Line and water management infrastructure;

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- upgrades and replacement of infrastructure at the Dendrobium CPP and removal of redundant infrastructure; and
- minor augmentations and upgrades of other surface facilities.

16. Construction would generally occur 7.00 am to 5.00 pm Monday to Sunday. Some construction and development works (e.g., drilling and construction of ventilation shafts, and underground development activities) would occur on a 24 hour per day basis (ARP 2.1.4).

2.4 Project Need and Strategic Context

17. The Dendrobium Mine is part of an integrated coal mining, coke-making, iron and steel-making and coal and coke export complex located in the Illawarra Region of NSW. The Applicant operates two large underground coal mines, which extract coal from beneath the Illawarra Plateau to the west of Wollongong in the Southern Coalfield. The company's Bulli Seam Operations (also referred to as the Appin Mine) are approved to extract up to 10.5 Mtpa of RoM coal. This Bulli Seam coal is prepared ('washed') to remove stony material at the West Cliff CPP. The Dendrobium Mine is approved to extract up to 5.2 Mtpa of RoM coal from the Wongawilli Seam, which is washed at the Dendrobium CPP (ARP 3.1.1).

18. A proportion of the product coal from the two seams is blended to produce optimum quality coal which is used to make coke for steel-making purposes. Blending takes place at Dendrobium CPP, prior to delivery to BlueScope Steelworks for coke making or to PKCT for shipping to the Liberty Primary Steel Whyalla Steelworks, other domestic users, or for international export. Figure 3 illustrates these interrelationships (ARP 3.1.2).

19. The Applicant currently supplies the BlueScope Steelworks with about 60% of its overall coking coal requirements, about 1.5 Mtpa of the total 2.5 Mtpa. In Financial Year 2019, the Applicant supplied BlueScope Steel with 0.505 Mt of coking coal from the Dendrobium Mine, together with 0.945 Mt from its Bulli Seam Operations (ARP 3.3.3).

20. In Financial Year 2019, 1.7 Mt of metallurgical coal and 1.2 Mt of thermal coal from Dendrobium Mine was trucked from Dendrobium CPP to PKCT for loading and shipping to a variety of international export markets (2.51 Mt), Liberty Primary Steel (0.22 Mt) or delivery to other domestic consumers (0.165 Mt). In Financial Year 2019, the international export markets for Dendrobium Mine's metallurgical coal were (in order of sales) India, Vietnam, China, Taiwan, South Korea, Japan and the European Union. The international markets for thermal coal were India, Vietnam and China (ARP 3.4.2).

21. BlueScope has coking coal supply contracts with the Applicant which extend until 2032, with an option to renew for a further five years (ARP 3.3.8).

22. The Port Kembla steelworks was first developed by Australian Iron and Steel Limited in 1928 due to its proximity to the coking coal mines of the Southern Coalfield. BHP took over Australian Iron and Steel Limited in 1935 and later formed the business unit known as BHP Steel. BlueScope was demerged from BHP Billiton in 2002 to form a stand-alone public company (ARP 3.2.2).

23. The Applicant, South32, is a mining and metals company headquartered in Perth, Western Australia. A demerger of South32 from BHP Billiton was implemented on 25 May 2015.

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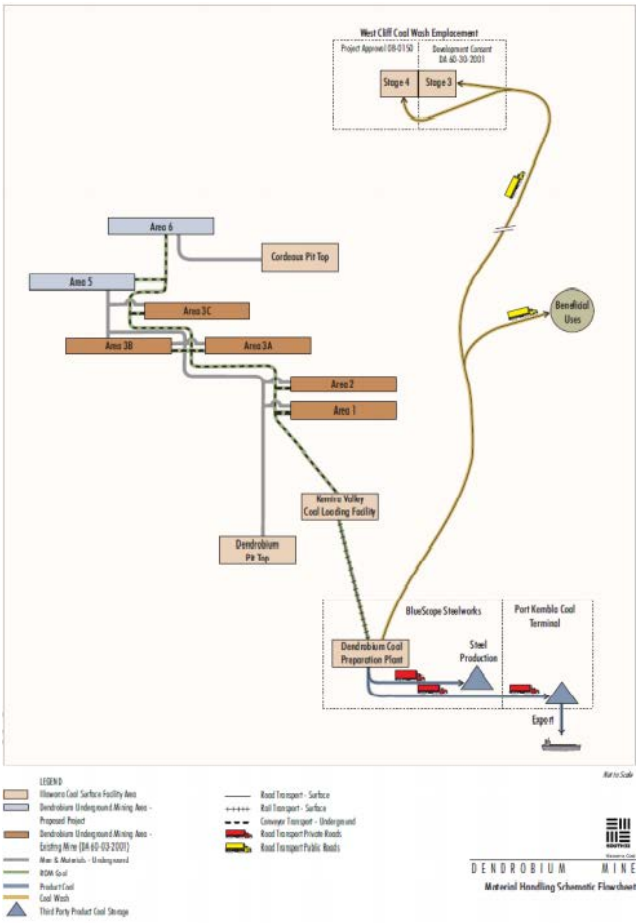
Figure 3 - Relationships between Key Project Elements and Key External Elements (Source: EIS)



24. Large quantities of metallurgical (primarily coking) coal are an essential raw material in the large scale production of iron and steel. Coal (in the form of coke) is introduced to a blast furnace together with pelletised iron ore and a flux (generally limestone). Molten iron is the product of this process. Approximately 770 t of coal is used to make 600 t of coke, which in turn is used to create 1,000 t of steel. According to the Department, there is currently no economically viable alternative to the use of metallurgical coal as a reducing agent in a blast furnace (i.e. the method employed at the BlueScope Steelworks) at a commercial scale (ARP 3.2.1)

25. According to the Department, there has been increasing public discussion related to the possibility of Australia developing a so-called ‘green steel’ industry. This industry would be based on using hydrogen (produced by electrolysis of water, using low-cost renewable wind or solar electricity) to reduce iron ore and produce molten steel (ARP 3.2.9).

26. Precisely when steel-making technology will be commercially viable without the use of coal is uncertain. It may be commercially viable before 2040, but for now it is not.

27. According to the Department nearly all coal from the Project that is not sold to BlueScope Steelworks would be transported from Dendrobium CPP to PKCT via private road, where it is stockpiled primarily for international export or else for seaborne transport to Liberty Primary Steel’s Whyalla Steelworks and other domestic users. The EIS reports that coal from the Applicant’s two mining operations currently accounts for the majority of throughput at PKCT (ARP 3.4.1).

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3 THE DEPARTMENT'S CONSIDERATION OF THE APPLICATION

3.1 Key Steps in the Department's Consideration

28. Table 1 provides an overview of the key steps in the Department's consideration of the Application.

Table 1 - Overview of Key Steps

18 September 2018	The Department issued the Secretary's Environmental Assessment Requirements (**SEARs**).
22 July 2019	The Applicant lodged the Application and supporting Environmental Impact Statement (**EIS**) to the Department.
25 July to 18 September 2019	The Department publicly exhibited the EIS for 56 days. The Department received 775 submissions, including: 154 in objection 603 in support 18 comments (not stated in support or objection)
3 October 2019	The Department requested the Applicant provide a response to the submissions received.
February 2020	The Applicant provided its Response to Submissions (**RtS**) to the Department.
20 April 2020	The Department requested the Applicant to provide further information in response to particular submissions.
May to October 2020	The Applicant provided **Additional Information** to the Department.
18 August 2020	The Applicant provided an **Amendment Report** to the Department.
6 October 2020	The Minister requested the Commission conduct a **Public Hearing** and determine the Application.
2 November 2020	The Department referred the Application to the Commission for determination.

3.2 The Department's Assessment Report

29. In the AR the Department gave consideration to Sydney's Drinking Water Catchment (Section 3.6), the Independent Expert Panel for Mining in the Catchment (**IEPMC**) (Section 3.7), their findings specific to Dendrobium (Section 3.8), the review by the Independent Advisory Panel for Underground Mining (**IAPUM**) (Section 5.6) and objections raised by key agencies including WaterNSW and the Biodiversity, Conservation and Science Division of the NSW Environment, Energy and Science Group within the Department (**BCS**).

30. The Department is satisfied that the Applicant "*has designed the project in a manner that achieves an appropriate balance between maximising the recovery of a recognised coking coal resource of State significance and minimising the potential impacts on the water resource, biodiversity values and other environmental values of the Metropolitan Special Area as far as is practicable*" (ARP 7.1.3).

31. The Department recommended a suite of conditions to ensure that the Project complies with acceptable criteria and standards, that the impacts are consistent with those predicted by the Applicant in its documentation, and that residual impacts are effectively minimised, managed and compensated for (ARP 7.1.5).

32. The Department's recommended suite of conditions was provided to key NSW Government agencies and their comments were taken into account in finalising them. The Department considers that the conditions reflect current best practice for the regulation of underground coal mining projects in environmentally sensitive areas (ARP 7.1.7).

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33. The Department has weighed the environmental impacts of the Project against the significance of the Project's identified coking coal resource and the socio-economic benefits associated with continued operation of the Dendrobium Mine for a further 25 years. On balance, the Department concludes that the Project's benefits significantly outweigh its residual costs, and that it is in the public interest and is approvable, subject to stringent conditions (ARP 7.1.10).

4 THE COMMISSION'S CONSIDERATION

4.1 The Department's Assessment Report

34. Clause 55 of the *Environmental Planning and Assessment Regulation 2000* (**EP&A Regulation**) provides that an applicant may, with the agreement of the consent authority, amend or vary a development application at any time before its determination. On 18 August 2020, the Applicant submitted an Amendment Report for the Project to the Department. On the same day, a delegate of the Commission agreed to the amendment of the development application for the Project and the Amendment Report was lodged by the Applicant on the Department's web portal, as required by clause 55 (ARP 5.5.1 and 5.5.2).

35. Under section 4.6 of the EP&A Act, certain functions of the Commission are to be exercised by the Planning Secretary on behalf of the Commission, including "*undertaking assessments of the proposed development and providing them to the Commission (but without limiting the assessments that the Commission may undertake*": section 4.6(b). The Planning Secretary's assessment of the Project is set out in the Department's AR.

36. Accordingly, the Commission considers that it is permitted to take into account the Department's AR, but that it should be weighed in the same manner as the other Material referred in this Statement of Reasons. To the extent that any policy outside of the EP&A Act purports to require the Commission to give the Department's AR greater weight than the other Material, the Commission has not applied that policy.

4.2 Strategic context

37. The Dendrobium Mine extracts coal from beneath Sydney's drinking water catchment. For this reason, it has been controversial since before its approval in 2001. A significant section of the community is either opposed to or concerned about longwall mining of coal beneath the Metropolitan Special Areas of the catchment (ARP 3.6.1).

38. As described in paragraph 10, the Project's Areas 5 and 6 are located within the catchments of the Avon and Cordeaux Rivers, and the associated Avon and Cordeaux Dams, which are part of Greater Sydney's water supply system. They are also located within the Metropolitan Special Area as declared under the WNSW Act and managed by WaterNSW (ARP 3.6.2). The Avon and Cordeaux Dams form part of the Upper Nepean Scheme which supplies 20 - 40% of Sydney's water, primarily to the Macarthur and Illawarra regions and to the Wollondilly Shire. The system also supplies water to Sydney residents via Sydney Water's Prospect Filtration Plant. The Commission understands that the Avon, Cataract, Cordeaux and Nepean dams, and the Upper Canal System are listed on the State Heritage Register for their technical and aesthetic historic significance.

39. The *Special Areas Strategic Plan of Management 2015 (***SASPoM***)* was adopted in accordance with the provisions of section 52 of the *WNSWAct*. The SASPoM provides the strategic framework for the planning, delivery and reporting of land management activities within the Special Areas by WaterNSW and the National Parks and Wildlife Service (**NPWS**). It is a long-term plan to secure high quality water for the storages, the maintenance of ecosystem integrity and the management of cultural values within the Special Areas. Relevant extracts of the SASPoM are presented below:

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- WaterNSW has an important statutory role "to protect and enhance the quality and quantity of water in declared catchment areas" under the Water NSW Act 2014 (WNSW Act).
- The Special Areas are the protected catchment lands surrounding the water storages and are critical controls in the supply of quality water to Greater Sydney and its population of over five million people. They cover approximately 364,000 hectares of mostly unspoilt native bushland around the water storages that supply Sydney, the Illawarra, Blue Mountains, Southern Highlands and Shoalhaven regions. This is approximately 23 percent of the broader hydrological catchment. They contain landscapes of great beauty with significant natural and cultural heritage values.
- Special Areas are lands declared under the WNSW Act for the following purposes:
  - Protecting the quality of stored waters, whether intended for drinking or other purposes; and
  - Maintaining the ecological integrity of an area of land declared to be a Special Area in a manner that is consistent with WaterNSW's objectives.
- The Special Areas form part of the Greater Sydney drinking water catchments. Investments in catchment management seek to reduce risks to water quality, protect and prevent the degradation of the environment and conserve cultural values.
- Management of the Special Areas focuses on the ongoing protection of water quality and natural and cultural values, including responding to emerging threats, and seeking to address existing issues. This requires a coordinated approach by WaterNSW and NPWS in collaboration with neighbours and other stakeholders.
- The Special Areas are critical for the protection of water quality and quantity and play an important role in the conservation of many threatened plant and animal species as well as other significant natural and cultural values.
- The Special Areas primarily comprise intact native forest and largely exclude land uses with the potential to generate excessive nutrients, sediments, pathogens and other substances that can pose a threat to water quality. Modelling has demonstrated that the level of pollutant export would increase if the Special Area lands were put to alternative use.
- Special Areas provide a critical barrier in a multi-barrier approach to protecting water quality. The multi-barrier approach addresses risks to water quality throughout the whole of the water supply chain, from the raw water source in the catchment to the customers' taps. The multi-barrier approach includes management of the hydrological catchments, water storages, transfer systems, treatment plants and delivery systems (NHMRC and NRMMC 2011; SCA 2012). The multi-barrier approach recognises that while each individual barrier may not be able to completely remove or prevent contamination, they collectively provide greater assurance that the water supply will be safe.
- Ecological integrity and connectivity have been maintained in most of the Special Areas through protective management over the past 100 years. The Special Areas display very high biodiversity and protect a large number of important threatened species populations and endangered ecological communities. They also protect large areas of diverse natural landscapes, including wilderness areas and significant geological and other natural features. As well as being important in their own right, scientific evidence suggests that robust ecological systems have a positive benefit on water quality. The Special Areas also protect a rich and diverse range of Aboriginal heritage sites and values in a relatively undisturbed landscape setting, and historic heritage features such as early infrastructure associated with roads, water supply, farming and mining. A number of communities maintain ongoing cultural connections to Special Area lands.

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- Coal mining in the Southern Coalfield about the Illawarra escarpment commenced in 1848 and is likely to continue under the Special Areas into the foreseeable future. The coal resources in the Southern Coalfield are high quality hard coking coal. Large parts of the Metropolitan and Woronora Special Areas as well as the eastern and north western fringes of the Warragamba Special Area have been the subject of mining, both historically and currently.
- Production and exploration mining titles extend across the majority of the Woronora and Metropolitan Special Areas.
- Longwall coal extraction has affected the local water quality of impacted rivers and streams through increases in iron and manganese concentrations, the formation of bacterial mats and fine sediment accumulation.
- Mine subsidence has the capacity to affect ecosystems, water quality and water quantity by disrupting drainage patterns, and can also damage other natural and cultural values.
- Surface and subsurface fracturing of the bedrock has seen the loss of surface water flows from some sections of rivers during low flow times. There is evidence of an increase in the interconnectivity of surface and groundwater sources. These changes have the potential to cause impacts on local ecological processes and contribute to increased concentrations of metals.
- Whilst the rehabilitation of stream beds has been attempted, long-term success is unproven.
- There is evidence of an increase in the interconnectivity of surface and groundwater sources due to surface and subsurface fracturing. These changes have the potential to cause impacts on local ecological processes and contribute to increased concentrations of metals.
- To date, there is no documented, reliable and practical rehabilitation technique for returning the pre-mining water balance to impacted swamps.
- Mining has also resulted in the destabilisation of cliff lines above longwall operations resulting in rock falls in some locations. It is not feasible to repair such damaged cliffs.
- Mining and coal seam gas operations also result in the clearing of vegetation for exploration programs, road establishment, monitoring equipment and infrastructure such as mine ventilation shafts. These activities have the potential to contribute pollutants to waterways through erosion and the unintended discharge of drilling fluids, wastewater, fuels and chemicals.

40. The Commission met with WaterNSW on 26 November 2020 (paragraph 56) and WaterNSW also provided a written submission to the Commission on 15 December 2020, during the public submission period (paragraph 58). At its meeting with the Commission and in its written submission, WaterNSW raised the following key points for the Commission's consideration with respect to the Special Areas:
    - 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.
    - 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.

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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 (source: WNSW submission 151220).

- 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). 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. 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.
- Since the last longwall mine approval in the Special Areas, significant statutory and policy changes have also occurred, which will apply to the Project. 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 licences 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.

4.3 IEPMC Panel - Special Areas & Dendrobium Mine Findings

41. In November 2017, the NSW Government established the Independent Expert Panel for Mining in the Catchment (**IEPMC**) to provide expert advice on the impact of coal mining activities in the Greater Sydney Water Catchment Special Areas, with a particular focus on risks to the quantity of water in the catchment available for water supply (ARP 3.7.1).

42. The IEPMC was established following the release during 2017 of two key reports which provided detailed recommendations about future mining within the Sydney drinking water catchment. These were a Height of Cracking Study at the Dendrobium Mine and a regular triennial independent audit of Sydney's drinking water catchment, undertaken for WaterNSW (ARP 3.7.2).

43. The Height of Cracking Study concluded that further work should be carried out to improve prediction and management of water impacts at the mine, while the Catchment Audit Report recommended six broad measures to reduce mining risks and impacts in the Special Areas (ARP 3.7.3).

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44. The IEPMC's key functions were to:
    - undertake an initial review of current mining in the catchment;
    - review and update the findings of the 2008 Southern Coalfield Inquiry; and
    - strengthen assessment of the ongoing operation of approved mines and new applications for mining within the Special Areas of the catchment by providing advice (ARP 3.7.4).
45. The IEPMC submitted its Initial Report in November 2018, focusing on activities at the Dendrobium and Metropolitan mines. It also provided initial observations and sought comment through a consultation and submission process on a number of issues (ARP 3.7.5).
46. The IEPMC's Final Report was released in October 2019. Part 2 of the Final Report provides a review of developments since the 2008 Southern Coalfield Inquiry as well as risks to water quantity, environmental consequences for swamps, cumulative impacts and measures to improve the way the effects, impacts and consequences of mine subsidence are assessed and managed in relation to water quantity (ARP 3.7.6).
47. The two reports contained 50 recommendations, with key recommendations including:
    - establishment of a new expert panel to provide advice on future mining applications and performance outcomes;
    - establishment of an inter-agency working group to identify acceptable water losses;
    - reducing the risk of surface to seam fracturing through appropriate mine design;
    - ensuring mining companies hold sufficient water licences;
    - provision for offsets for catchment water losses associated with mining;
    - improved management of and access to environmental data;
    - independent peer reviews of groundwater and surface water assessments prepared in support of mining applications;
    - improved, more objective performance measures;
    - improved monitoring of water flows and water quality;
    - a future study to inform mine closure planning; and
    - further research into the height of fracturing above longwall voids, the impacts of geological structures on subsidence effects and impacts and the hydrological and ecological impacts of mining on upland swamps (ARP 3.7.7).
48. On 31 October 2019, the Minister for Planning and Public Spaces announced that the Government would review and respond to the IEPMC's 50 recommendations in due course and that "*In the interim, no new development applications for mining in the Special Areas will be determined*". This commitment prevented determination of the Project until the Government provided its response to the recommendations (ARP 3.7.8).
49. On 18 April 2020, the Minister announced that the Government had accepted all 50 of the IEPMC's recommendations and had established an interagency taskforce to implement an action plan to:
    - ensure there is a net gain for the metropolitan water supply by requiring more offsetting from mining companies;
    - establish a new independent expert panel to advise on future mining applications in the catchment;
    - strengthen surface and groundwater monitoring;
    - improve access to and transparency of environmental data;
    - adopt a more stringent approach to the assessment and conditioning of future mining proposals to minimise subsidence impacts;

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- review and updating current and potential future water losses from mining in line with the best available science;
- introduce a licensing regime to properly account for any water losses; and
- undertake further research into mine closure planning to reduce potential long-term impacts (ARP 3.7.9).

50. The Government's temporary moratorium on determination of development applications ended with this announcement (ARP 3.7.10).

51. The IEPMC gave very careful consideration to the impacts of the existing Dendrobium Mine on the drinking water catchment. The IEPMC's key conclusions in its Part 1 report with respect to the mine were:
    - water inflow into all four existing mining areas (Areas 1, 2, 3A & 3B) exhibits some correlation with rainfall, ranging from weak in Area 3B to strong and rapid for Area 2;
    - it is very likely that the high rate of influx is associated with a connected fracture regime that extends upwards to the surface (i.e., 'surface-to-seam cracking');
    - it is plausible that an average of around three megalitres/day (ML/day) of surface water and seepage from reservoirs is currently being diverted into the mine workings; and
    - faulting, basal shear planes and lineaments need to be very carefully considered and risk assessed in the future, especially when planning for further longwall panels to the south of LW 16 (in Area 3B) (ARP 3.8.1).

52. The IEPMC's Part 2 report contained a second figure for its estimate of surface water loss from above Dendrobium mine. In considering data relating to surface water flow into the mine, leakage from the reservoir into the mine, and loss of baseflow to streams due to depressurisation, the Panel considered that the "*upper limit of recent loss rate … is less than 5 ML/day*" (ARP 3.8.2).

53. The IEPMC's Part 2 report also gave particular consideration to water flow losses in Wongawilli Creek (a 'named watercourse', within the context of the Project's EIS). By August 2018, when mining of LW 13 in Area 3B had been completed, a 1,543 m length of Wongawilli Creek was showing zero or discontinuous flow. The IEPMC agreed with the Applicant's interpretation that the loss of flow in this length of the Creek most likely reflected a combination of two factors, being:
    - low streamflow rates due to an extended period of well-below average rainfall; and
    - loss of baseflow (i.e., regular leakage of near-surface groundwater to the stream channel) due to broadscale groundwater depressurisation resulting from mine subsidence in Areas 3A and 3B (ARP 3.8.3).

54. More straightforwardly, the wide longwall panels at Dendrobium (305 m width) caused extensive cracking in the strata above the panels, which reached the surface in some places. These cracks provided a pathway across much of the mining area for drainage of near surface groundwater to lower strata. When Wongawilli Creek's streamflow (from further upstream) reduced substantially during an extended drought, there was insufficient near surface groundwater remaining to support continued flow in the Creek. Therefore, the Creek stopped flowing and in places dried up (ARP 3.8.4).

55. This interpretation was supported by the Applicant's groundwater model, which predicted baseflow loss from Wongawilli Creek (ARP 3.8.5).

4.4 The Commission's Meetings

56. As part of its proposal determination, the Commission met with various persons as set out in Table 2. All meeting and Site Inspection notes were made available on the Commission's website.

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Table 2 – Commission's Meetings

Meeting	Date of Meeting	Transcript/Notes Available on
Department	16 November 2020	22 November 2020
Applicant	16 November 2020	20 November 2020
Wollongong City Council	Cancelled (at the request of Wollongong City Council)	N/A
Wollondilly Shire Council	16 November 2020	20 November 2020
Wingecarribee Shire Council	16 November 2020	26 November 2020
Site Inspection	24 November 2020	26 November 2020
WaterNSW	26 November 2020	30 November 2020
Public Hearing	2 December - 4 December 2020	Day 1 – 3 December 2020 Day 2 – 8 December 2020 Day 3 – 8 December 2020
Helicopter Locality Tour	1 December 2020	27 January 2021
Independent Advisory Panel for Underground Mining	14 December 2020	17 December 2020

4.5 Public Engagement

57. Per the Minister's Request outlined in paragraph 1, the Commission conducted a Public Hearing over three days from Wednesday 2 December 2020 to Friday 4 December 2020. In addition to hearing the public's views, the Commission also heard from the Department and the Applicant at the Public Hearing. In total, 80 speakers presented to the Commission during the Public Hearing.

58. All persons were offered the opportunity to provide written comments to the Commission until 11.59pm AEDT on Tuesday 15 December 2020.

59. The Commission received a total of 1,973 written public comments on the Application (summarised in Table 3) comprising:

- 1559 unique author submissions;
- 260 form letters; and
- 154 campaign emails.

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Table 3 - Summary of written submissions

Number of submissions			
Total submissions*	**Objections**	**Support**	**Comment**
1973	1090	869	14
Total unique author submissions^	**Objections**	**Support**	**Comment**
1559	936	609	14
Geographic distribution of unique author submissions			
Local Regional Area	Other NSW	Other Australia	No Location Provided
48%	38%	4%	10%
Location	**Objections**	**Support**	**Comment**
Local Regional Area	40%	59%	1%
Wollongong City Council (within the Local Regional Area)	50%	50%	0
Other NSW	82%	17%	1%
Other Australia	62%	33%	5%
No location provided	63%	34%	3%

* Includes form letters and campaign emails

^ "Unique author submissions" excludes form letters or campaign emails.

Note: while all care has been taken to ensure that the data presented in the tables and figures in this Statement of Reasons is accurate, minor and immaterial statistical anomalies may be present.

4.5.1 Topic Modelling Distribution

60. In addition to reviewing the text of written submissions, a word frequency and cluster analysis of the unique author submissions (after multiple submissions from each single submitter had been amalgamated) has been undertaken by the Commission. The analysis was undertaken to identify the key themes raised in unique author submissions made to the Commission. The analysis showed that the key issues raised were as follows:
    1) environmental impacts (41.4%)
    2) economics impacts (35.7%)
    3) water impacts (22.9%)

61. Figure 4 below illustrates the key issues raised in unique author submissions and the nature of their submissions. The Commission observes that the majority of unique author submissions made in relation to environmental and water impacts were objections to the Project. The Commission also notes that the 74.9% of unique author submissions made in relation to economic impacts were in support of the Project being approved.

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Figure 4 – Unique Author Submission Topic Modelling (Source: Online Gravity 2021)

4.5.2 Geographic Distribution

62. Geographic analysis of the distribution of unique author submissions was undertaken by the Commission. Figure 5 below illustrates the approximate location of unique author submissions including the nature of their submissions. The Commission observes that the majority of the unique author submissions were made from people located in the Greater Sydney and Illawarra regions. The Commission also notes that a large portion of submissions from the Illawarra region were in support of the Project. A breakdown of the geographical location of submissions has also been provided in Table 3 above.

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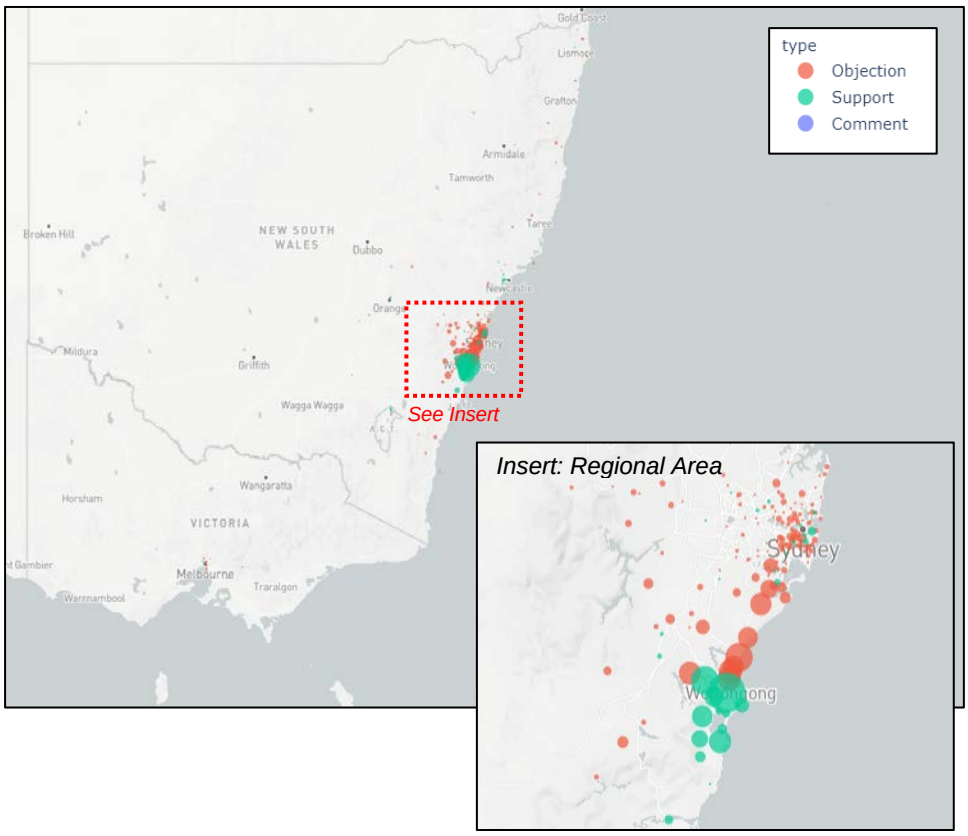
Figure 5 – Geographic Analysis Map for NSW (Source: Online Gravity 2021)



4.6 Material considered by the Commission

63. In this determination, the Commission has carefully considered the following material (**Material**) along with the other documents referred to in this Statement of Reasons:

- the SEARs, dated 18 September 2018;
- the Applicant's EIS, dated 22 July 2019;
- the Applicant's RtS, dated February 2020;
- the Applicant's Additional Information, May to October 2020;
- the Applicant's Amendment Report, submitted to the Department on 18 August 2020;
- the Department's AR, dated 30 October 2020 (received 2 November 2020);
- the Department's Recommended Conditions of consent, undated (received on 2 November 2020);
- the Applicant's response to the Commission, dated 23 November 2020, 15 December 2020 and 30 December 2020;
- the Department's response to the Commission regarding surface water quality offsets, dated 4 December 2020;
- all speaker comments made to the Commission at the Public Hearing held over 3 days between 2 December 2020 and 4 December 2020;
- material presented at that Public Hearing; and
- all written comments received and accepted by the Commission in the extended submission period from 3 November 2020 until 11:59pm on 15 December 2020.

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64. At its meetings with the Department, Applicant and Wollondilly and Wingecarribee Shire Councils (paragraph 56), the Commission asked questions, some of which the Department and the Applicant took on notice. The responses received from each stakeholder are included in the Material considered by the Commission (paragraph 63) and were made publicly available on the Commission's website.

4.6.1 Additional Considerations

65. In determining this Application, the Commission has also considered:

- *NSW Noise Policy for Industry*;
- *Interim Construction Noise Guideline*;
- *NSW Road Noise Policy*;
- *NSW Aquifer Interference Policy* (**AIP**);
- *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016);
- *NSW Climate Change Policy Framework* (**CCPF**);
- *NSW Risk Assessment Guideline for Groundwater Dependent Ecosystems* (NOW, 2012);
- *Guidelines for the economic assessment of mining and coal seam gas proposals* (NSW Government, 2015);
- *Mining Impacts at Dendrobium Coal Mine Area 3B* (DPE, 2015)
- *NSW Net Zero Plan Stage 1: 2020-2030* (**Net Zero Plan**)
- Australian Competition and Consumer Commission (**ACCC**) *Statement of Issues – South32 proposed acquisition of Metropolitan* (23 February 2017)

4.7 Statutory Context

4.7.1 Permissibility

66. Section 4.3.1 of the Applicant's EIS states that the Wollongong Local Environmental Plan (**LEP**) 2009, Wollondilly LEP 2011 and Wingecarribee LEP 2010 all apply to the Project.

67. The Commission notes that Project Area 5 and Area 6 includes land zoned under the Wingecarribee and Wollondilly LEPs as: Zone E2 (Environmental Conservation); and Zone SP2 (Infrastructure). For both LEPs the objectives of Zone E2 (Environmental Conservation) are:

    - *To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values.*
    - *To prevent development that could destroy, damage or otherwise have an adverse effect on those values*

    For both LEPs, Zone SP2 (Infrastructure) share the following two objectives:

    - *To provide for infrastructure and related uses.*
    - *To prevent development that is not compatible with or that may detract from the provision of infrastructure.*

    The following objective of Zone SP2 (Infrastructure) also applies to Wollondilly LEP:

    - *To ensure that the scale and character of infrastructure is compatible with the landscape setting and built form of surrounding development.*

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68. The Commission notes that under the Wollondilly LEP 2011 and Wingecarribee LEP 2010 mining is prohibited on land zoned SP2 and E2. However, clause 7(1) of *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007* (**Mining SEPP**) provides that 'underground mining carried out on any land' is permissible with development consent.

69. The Commission therefore agrees with the Department in G2, Appendix G of the Department's AR and finds that the Project is permissible on the Site.

4.7.2 Integrated and other NSW Approvals

70. As per Section 4.7 of the Department's AR, the Commission notes the Department has consulted with relevant government authorities that are responsible for providing integrated and other approvals. The Commission acknowledges that the Applicant may also require other approvals which are not integrated into the SSD process as detailed in Section 4.7 of the Department's AR.

4.7.3 Commonwealth Approvals

71. As per Section 4.6 of the Department's AR, on 6 March 2017, a delegate of the Commonwealth Minister for the Environment and Energy determined that the Project is a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) due to its potential impacts on Matters of National Environmental Significance. The Department's AR states:

- Under the current Bilateral Agreement between the Commonwealth and NSW governments, the Commonwealth has accredited the NSW assessment process under the EP&A Act for the controlled action (EPBC 2017/7855), to enable a single integrated assessment of the Project. However, the Commonwealth's decision-maker maintains a separate determination role, exercised following the Commission's grant of consent to a development application (ARP 4.6.2).
- Following clarification of the then Commonwealth Department of Environment and Energy's assessment requirements, the Department issued revised Secretary's Environmental Assessment Requirements (SEARs) for the Project, including an attachment covering the Commonwealth's matters. The Department has assessed the potential impact of the Project on the applicable [Matters of National Environmental Significance] in accordance with the requirements of the Bilateral Agreement. These matters are addressed briefly in Section 6.6 of the Department's AR (ARP 4.6.3).

4.8 Mandatory considerations

72. In determining this application, the Commission is required by section 4.15(1) of the EP&A Act to take into consideration such of the following matters as are of relevance to the development the subject of the Application (**Mandatory Considerations**):

- the provisions of:
  - any environmental planning instrument;
  - any proposed instrument that is or has been the subject of public consultation under the EP&A Act and that has been notified to the Commission (unless the Planning Secretary has notified the Commission that the making of the proposed instrument has been deferred indefinitely or has not been approved);
  - any development control plan;
  - any planning agreement that has been entered into under s 7.4 of the EP&A Act, and any draft planning agreement that a developer has offered to enter into under s 7.4;
  - the Regulations to the extent that they prescribe matters for the purposes of s 4.15(1) of the EP&A Act;

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that apply to the land to which the Application relates;

- the likely impacts of the development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;
- the suitability of the site for the development;
- submissions made in accordance with the EP&A Act and Regulations; and
- the public interest.

73. In accordance with s 4.15(1), the Commission has considered the relevant Mandatory Considerations. They are addressed in the following sections.

74. The Mandatory Considerations are not an exhaustive statement of the matters the Commission is permitted to consider in determining the Project. To the extent that any of the Material does not fall within the Mandatory Considerations, the Commission has considered that Material where it is permitted to do so, having regard to the subject matter, scope and purpose of the EP&A Act.

4.8.1 Relevant Environmental Planning Instruments

75. The following Environmental Planning Instruments (**EPIs**) apply to the Project:

- *State Environmental Planning Policy Mining, Petroleum Production and Extractive Industries) 2007* (**Mining SEPP**);
- *SEPP (Infrastructure) 2007*;
- *SEPP (State and Regional Development) 2011* (**SRD SEPP**);
- *SEPP (Sydney Drinking Water Catchment) 2011*;
- *SEPP No. 33 – Hazardous and Offensive Development*;
- *SEPP No. 44 (Koala Habitat Protection) 2019;*
- *SEPP No. 55 – Remediation of Land;*
- *Wollongong LEP 2009;*
- *Wingecarribee LEP 2010;* and
- *Wollondilly LEP 2011.*

4.8.2 Relevant Proposed Instruments

76. The Commission has considered proposed instruments as are of relevance to the present Application.

4.8.3 Relevant Development Control Plans

77. Pursuant to clause 11 of the SRD SEPP, development control plans do not apply to SSD. The Commission does not consider any development control plans to be relevant to the determination of the Application.

4.8.4 Relevant Planning Agreements

78. There are no relevant planning agreements.

4.8.5 Relevant Draft Planning Agreements

79. At ARP 6.3.155, the Department states:

> *The draft conditions of consent make provision for both the Applicant's water take and water quality offsetting offers to be delivered by way of a Planning Agreement, to be entered into by the Applicant with the Secretary and the Minister for Water, Property and Housing under Division 7.1 of Part 7 of the EP&A Act, within six months of commencing development under the consent.*

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4.8.6 The Likely Impacts of the Development

80. The likely impacts of the Project have been considered in section 4.9 to 4.18 of this Statement of Reasons.

4.8.7 The Suitability of the Site for Development

81. For the reasons set out in this Statement of Reasons, the Commission is of the view that the Site (as illustrated in Figure 2 and comprehensively detailed in the EIS *Attachment 3 Development Application Area and Real Property Descriptions*) can only support the development if the detrimental impacts do not outweigh the benefits. In this regard, the Commission has given consideration to the likely impacts of the development and the suitability of the Site and is satisfied that the Site is not suitable for the development as proposed.

4.9 Key Issue - Proposed Mine Design

Public Comments

82. Many agencies and public submitters proposed that the longwall width be reduced substantially in order to reduce subsidence impacts at the surface.

83. The Lock the Gate Alliance in its submission dated 12 November 2020 questioned whether the Department had asked the Applicant to consider bord and pillar mining at Dendrobium instead of longwall mining. At its meeting with the Commission on 16 November 2020, the Department advised that it must assess the application before it, which involves longwall mining and does not propose bord and pillar mining. The Department advised there is no existing bord and pillar mining at the Dendrobium Mine nor the Appin Mine nor the Tahmoor Mine nor the Metropolitan Mine. Wollongong Coal has recently been granted development consent to undertake bord and pillar mining at its Russell Vale Mine. Bord and pillar mining is a less efficient coal production method and is generally not used except in particular circumstances where longwall mining is not an acceptable form of mining.

84. The Commission also received a submission made on instructions from the Environmental Defenders Office Inc on behalf of Protect Our Water Alliance (**POWA**), supplementing the oral submissions made to the Commission on 4 December 2020, stating:

- 18. ……., it is important to consider a range of alternatives to the project to reach a conclusion as to whether the social, economic and environmental disbenefits of the project outweigh the social, economic and environmental benefits of the project. POWA submits that the economic benefits of the project do not justify its environmental impacts.
- 19. The Assessment Report does not include sufficient consideration of alternatives to the project. It does not consider whether the economic benefits can be achieved by a different project that would not have the associated environmental impacts.
- 20. At 6.2.13-6.2.42 the Assessment Report includes a detailed consideration of narrower longwalls. This assessment compared the environmental impacts and the economic benefits of various mine designs using a range of longwall panel widths. At 6.2.37-6.2.38 the Assessment Report records the Department's view that economic costs of reducing panel widths outweigh the resulting environmental benefits (reduced surface water impacts) and accordingly, concludes that narrower longwall panels are not justified.
- 21. At 6.6.33-6.6.41, the Assessment Report considers two alternative longwall mine designs for the project to reduce the subsidence impacts on upland swamps. First, it notes that the selection of mining areas 5 and 6 over area 4 has avoided impact on upland swamps because area 4 has a greater proportion of its area affected by swamps. Secondly, the Assessment Report considers a 'minimum case' mine design that avoided undermining upland swamps. This option was ruled out as South32 "advised that this longwall layout is not considered economically feasible". The Assessment Report also notes that although

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this design would avoid impacts on upland swamps, it would offer little benefit to watercourses and ultimately catchment flows.

- 22. The Assessment Report reasons that these alternative longwall mine designs are not justified on the basis of their reduction in environmental impact compared to their economic costs and therefore the project should not be modified to require the alternative longwall mine designs. This reasoning is flawed. It assumes that the project will proceed and considers whether changes to the project are justified. POWA submits that what the assessment of alternative longwall mine designs demonstrates is that there is no economically feasible way of carrying out the project that avoids the unacceptable environmental impacts and accordingly development consent for the project must be refused.
- 23. There are a number of alternatives to the project that ought to be considered by way of comparison when weighing the social, economic and environmental considerations of the project. The purpose of this comparison is to determine whether or not the project is justified, in other words, whether the IPC should grant development consent for the project. Alternatives to the project that could achieve the same or similar economic benefits without incurring the unacceptable environmental impacts such as a different mining method, mining a different resource and producing steel without coking coal.
- 24. POWA submits that consideration of the above alternatives demonstrates that the same or similar economic benefits of the project could be achieved without the unacceptable environmental impacts. Accordingly, the project should not be approved.

85. The following extract from page 13 of the Lock the Gate submission also relates to lack of consideration of alternatives:

- Neither the Applicant nor NSW DPIE have adequately explored alternative development options which would allow decision makers to consider trade-offs and decide whether the community as a whole is better or worse off as a result of this proposal.

Council & Government Agency Comments

86. Wollongong City Council (**WCC**), in its submission to the Department dated 2 March 2020 with respect to the RtS, remained concerned about the extent of subsidence related impacts upon watercourses and coastal upland swamps due to the current proposed mine layout, especially the 305 metre widths of the proposed longwalls. WCC was also specifically concerned about the cumulative loss of water to reservoirs, creeks and upland swamps in the Greater Sydney Water Catchment due to mining activities.

87. Wollondilly Shire Council (**WoSC**) during its meeting with the Commission on 16 November 2020, confirmed that its submission to the Department dated 27 September 2019 to formally object to the expansion of the Project until the potential impacts on water resources (e.g., drinking water) and supplies are addressed to the satisfaction of WaterNSW, remains current.

88. WoSC also expressed concerns regarding traffic movements along Appin Road and water quality impacts in Brennans Creek and Georges River associated with the existing West Cliff CWE located within its LGA. The application proposes to utilise the existing approved facility. Stage 3 is approved under DA 60-03-2001. Stage 4 would require an extension to Project Approval 08_0150 for Bulli Seam Operations from 31 December 2041 to 31 December 2048. This would be subject to a separate modification application and is not part of this application.

89. Wingecarribee Shire Council (**WiSC**), during the meeting with the Commission on 16 November 2020, confirmed that its submission to the Department dated 11 September 2019 remains current. WiSC maintains its policy, which it adopted in 2010, to oppose longwall mining and any new coalmine in the Shire because of its concerns over the potential impacts on groundwater, water catchments, agricultural land and tourism.

90. At Page 7 of its submission to the Commission, WaterNSW provides the following comments in relation to mine design:

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- 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.

91. BCS's letter to the Department dated 3 March 2020 provided the following key comments on the RtS for the Project:
    - The RtS exposes continued substantial shortcomings with the project.
    - Longwall subsidence is almost certain and serious concerns remain about the further long-term adverse impacts that arise and there remains an inability to satisfactorily account for biodiversity impacts.
    - There is no change to the proposed mining layout which was presented in the EIS. The RtS comprises limited discussion of alternate mining geometry layouts and extraction methods. However, such alternatives are not outlined in any detail or with transparency. Further detailed evidence regarding alternative layouts, extraction method or measures taken to avoid impacts needed to be presented.
    - Accordingly, we maintain that the proposal does not sufficiently demonstrate that the "avoid" principle has been met, having regard to biodiversity assessment policy, guidelines and the SEARs, as per our EIS submission. In its current form the proposal is almost certain to have a significant impact on NSW and Commonwealth-listed water-dependent threatened species and ecological communities. The proposed longwall mining layout remains, and the resultant associated subsidence will lead to adverse impacts to all tributaries and associated ecosystems that are adjacent or above.

Applicant's Consideration

92. Section 3.5 of the EIS describes underground mining operations. Section 3.5.3 - Project Longwall Design Constraints states that "Longwalls for the Project would have coal face widths of up to approximately 305 m and extraction height would be restricted to a maximum of 3.9 m. A number of longwall design constraints have been incorporated in the Project underground mining layout to reduce potential environmental impacts in consideration of previous mining experience in Dendrobium Mine Area 3B and key stakeholder feedback." The adopted longwall constraints that would be incorporated in the Project longwall mining layout are summarised in Table 3-4 of the EIS.

93. The SEARs dated 18 September 2018 required:
    - consideration of alternatives, including development of the Area 3C and Area 4 mining domains, the development of a mine plan which avoids key sensitive surface features including swamps and water storage infrastructure, and the 'do nothing' option; and
    - a conclusion justifying why the development should be approved, taking into consideration – alternatives, inter alia; and
    - The EIS for the development must comply with the requirements of Schedule 2 of the Regulations. Clause 7(4)(a)(ii) requires an assessment of the risk-weighted consequences of various options.

94. In the EIS, responses to these requirements are presented in Section 9 (particularly Section 9.2 and 9.3.5). The following points are highlighted:

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- As stated on Page 9-5 of the EIS:
  - Open cut mining was not considered to be an option for the Project;
  - While bord and pillar mining is an underground mining technique that can be viable for some shallow coal seams, it is uneconomic in Australia to use bord and pillar mining as the primary production method at depths from the surface that are greater than about 200 m;
  - South32 has considered the option to adopt narrower longwall panels for the Project (such as the 163 m wide panels adopted by Metropolitan Mine), in which case there would be some reduction in total vertical surface subsidence, and some corresponding reduction in predicted tilts and strains. There would also be some reduction in the height of connective fracturing and associated groundwater depressurisation above the longwalls, which may reduce or negate the proportion of surface water flows from overlying streams reporting to deeper groundwater systems, and ultimately into the mine water management system;
  - However, with narrower longwall panels it is clear that subsidence impacts would still be expected to occur to streams and upland swamps overlying the Project longwall panels, particularly the potential for surface cracking at controlling rockbars that retain water to form in-stream and upland swamp features;
  - The potential for losses in surface flow and diversion of water from the bases of pools and/or upland swamps would therefore be largely unchanged by the adoption of narrower longwall panels, as the effects of subsidence would still be above thresholds at which subsidence impacts on rockbars, pools and upland swamp hydrology have been observed.
  - Adoption of narrower longwall panels for the Project would still require South32 to apply the same compensatory and offset measures to address potential impacts to water quality, aquatic ecology and upland swamps that have been adopted for the proposed 305 m wide Project longwall panels; and
  - The net effect of adopting narrower panels for the Project would be a material reduction in the recovery of coal and an increase in the cost of mining, with associated reductions in economic benefits to NSW and increased production costs to South32.
- As stated on Pages 9-6 and 9-7 of the EIS:
  - The ‘maximum’ case longwall layout….. includes mining of additional economically recoverable coal reserves within CCL 768 in Project Area 5 and Area 6.
  - Compared to the setbacks adopted for the Project longwall layout, the ‘maximum’ case mine plan adopts reduced setbacks from the Avon and Cordeaux Dam walls and FSLs of 500 m and 150 m respectively, and does not apply specific setbacks from named watercourses or key mapped stream features.
  - The ‘maximum’ case mine plan is predicted to result in increased subsidence and closure, particularly along named watercourses and key mapped stream features, with associated increases in the likelihood of impacts to stream features (e.g. pools)…. On the basis of the increase in the potential for impacts to these features, this is not the preferred longwall layout for the Project.
  - The ‘minimum’ case longwall layout…. adopts the mine design constraints for the Project longwall layout…, and in addition, includes setbacks from all upland swamps of 50 m from the ends of longwalls and 100 m from the sides of longwalls….
  - The ‘minimum’ case longwall layout is predicted to result in similar vertical subsidence and closure at named watercourses and the drainage lines that overlie the longwalls….

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- Based on analysis of upland swamp monitoring data from the Dendrobium Mine significant changes in upland swamp hydrology would not be expected for upland swamps more than 60 m from the longwalls…. and therefore a reduction in the likelihood of impacts to upland swamp hydrology would be expected based on the 'minimum' case longwall layout, noting that the likelihood of impacts would not be nil.
- This reduction in coal output and associated economic benefit is not considered to be reasonable.

- As stated on Pages 9-9 and 9-10 of the EIS the future development of Area 3C and Area 4 have not been discounted.
- As stated on Page 9-32 of the EIS in the absence of approval of the Project, South32 would undertake further analysis regarding the feasibility of extraction of some portions of Area 3C.

95. The Applicant during the meeting with the Commission on 16 November 2020 advised that the Dendrobium Mine is an existing longwall mining operation and different mining methods, such as bord and pillar mining, are not viable for the Dendrobium Mine. The applicant advised the Project can only proceed as a longwall operation. For the remaining footprints covered by Areas 5 and 6 the Applicant advised that it seeks to maximise the efficient recovery of metallurgical coal resources through the continued use of 305-metre-wide panels.

96. In the Applicant's letter to the Commission dated 30 December 2020 responding to the transcript of the meeting with the IAPUM on 14 December 2020, the Applicant stated that it does not disagree that if the sub-surface fracture network remained below the Bald Hill Claystone, it would reduce surface water loss from the catchment in comparison to what has been predicted in the EIS. However, the Applicant believes the impacts of the fracture network extending to the surface would have negligible impacts at the catchment scale and would be offset in accordance with the terms of the proposed planning agreement.

Department's Assessment

97. The Department's AR on pages ix and x identified the following key environmental impacts of the mine design:

- South32 has sought to avoid or minimise surface subsidence impacts primarily through applying minimum separation distances between the longwall voids and key surface features;
- However, above the two mining areas, subsidence impacts would be significant. The major surface features impacted would be Coastal Upland Swamps of the Sydney Basin Bioregion (upland swamps), which are a Threatened Ecological Community (TEC), and a large number of small and relatively small ephemeral watercourses which feed the larger streams and the water storages;
- Of the 21 proposed longwall panels, 18 have a void width of 305 m. This width is such that subsidence cracking would extend from the mine to the surface over (at least) the major proportion of the two mining areas. This cracking would cause infiltration of surface water from both upland swamps, watercourses and the water table. A significant proportion of this water would continue to infiltrate through fractured rock strata and reach the mine. Many agencies and public submitters proposed that the longwall width be reduced substantially in order to reduce subsidence impacts at the surface;
- South32 provided additional expert consideration of subsidence impacts resulting from narrower longwall voids. This advice indicated that, although the severity of impacts would be reduced, narrower panels (even at an uneconomic width of 150 m) would not prevent surface subsidence impacts. While cracking resulting from 'conventional' subsidence would reduce with narrower longwall voids, cracking would still result from 'non-conventional' subsidence impacts on watercourses and upland swamps;

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- Anticipated subsidence impacts include fracturing of streambeds and diversion of surface water underground; losses from the reservoirs due to increased permeability in the solid rock mass separating them from longwall voids; and impacts on surface water quality, including an increase mobilisation of metals such as iron. Stream function would be impacted due to cracking of creek beds, loss of pool holding capacity and loss of baseflow reporting to streams from upland swamps and near surface aquifers; and
- South32's approach has been to recognise and accept these impacts; to incorporate conservative assumptions into its groundwater modelling and surface water modelling; to provide for specific limits on impacts in the case of the four named watercourses (Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek) and 57 key stream features; and to provide for remediation of impacts on these features. It has also proposed to offset the surface water losses (in terms of both quantity and quality) and also to offset related ecosystem and fauna species losses.

98. Extraction heights in the Bulli Seam in Area 5 would be up to 3.2 m, and up to 3.9 m in the Wongawilli Seam in Area 6 (ARP 2.2.1).

99. The Project represents the continuation of an existing underground mining operation which first commenced coal extraction by longwall methods over 16 years ago. There are no changes to the proposed rate of coal extraction or processing and very limited changes to the mine's key surface facilities. Impacts on the surrounding communities have generally been previously assessed and many measures to control or reduce impacts on these communities are already in place (ARP 6.1.2).

100. The Applicant has sought to avoid any impacts on the concrete walls of the Avon and Cordeaux Dams by developing a mine plan for Areas 5 and 6 which includes a separation of at least 1,000 m between any longwall and the dam walls. It has also sought to limit impacts on the dam's reservoirs and the major watercourses within their catchments by committing to:
    - no direct undermining of the existing Avon and Cordeaux Dam waterbodies, with a minimum 300 m longwall setback from their FSL; and
    - variable longwall setbacks from 'named watercourses' (i.e., Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek) to achieve 200 mm or less of predicted Project-related valley closure within those watercourses (ARP 3.6.3).

101. While the Applicant's commitments are significant, its existing longwall mining operations at Dendrobium have resulted in significant impacts on watercourses (ARP 3.6.4).

102. There are a number of major constraints, both at the surface (e.g., extent of mining leases, location of dams and reservoirs) and underground (location of major in-seam igneous intrusions, fault zones and Area 3C), which limit the overall size and general location of Areas 5 and 6 (ARP 6.2.1).

103. The proposed longwall geometry is considered by the Department to be a threshold issue for the Project. This is particularly the case because the IEPMC expressed concerns over reducing the risk of surface to seam fracturing through appropriate mine design. The IEPMC's Part 2 report stated the Panel's view *"that it would be wise to adopt a precautionary approach and base mine design on preventing the height of free drainage in the Special Areas from extending to the surface or interacting with surface fracture networks*." Nonetheless, the Department notes there were no recommendations to give specific effect to this view (ARP 6.2.3)

104. In addition, a number of key agencies expressed concerns to the Department over the proposed longwall geometry (primarily the proposed 305 m width of the longwall voids), including WaterNSW, the Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (**IESC**), BCS and Water Group, Department of Planning, Industry and Environment (**DPIE – Water**) (ARP. 6.2.4).

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105. At ARP 6.2.22, the Department concludes that it:

"accepts the position of South32 and MSEC that reducing longwall void width would not prevent the most critical surface subsidence impacts (ie cracking of watercourses and/or the floors of swamps). While reductions in void width would be expected to reduce the number and severity of impacts, including these key impacts, the potential benefit of a small reduction in void width (say to 275 m or even 250 m) is likely to be illusory. Even at void widths of 200 m or 150 m, significant cracking of watercourses and swamps would be expected to occur and the need for South32 to either remediate or offset such impacts would arise".

IAPUM Comments

106. Two of the IEPMC's 50 recommendations proposed the establishment of a new independent subsidence advisory panel to provide advice to Government regarding new underground coal mining proposals and subsidence-related performance outcomes under mining approvals. This new panel (the Independent Advisory Panel for Underground Mining, or the '**IAPUM**') was established on 21 August 2020. The IAPUM is chaired by Emeritus Professor Jim Galvin, who also chaired the IEPMC (ARP 5.6.1).

107. On 26 August 2020, the Department wrote to Prof Galvin seeking the IAPUM's advice concerning the Project, particularly "*longwall void widths for the two proposed mining domains (Area 5 and 6), and the relative environmental costs and benefits associated with different longwall widths, including whether a reduction in the void widths would materially reduce the environmental impacts of the project*." (ARP 5.6.2).

108. The IAPUM responded that it could not provide advice on the relative environmental costs and benefits associated with different longwall widths, including whether a reduction in the void widths would materially reduce the environmental impacts of the project, because the EIS and supporting documentation, including the Proponent's responses to some of the IAPUM's questions, did not provide the necessary information and analysis to enable the impact of different longwall panel widths to be fully and adequately assessed. As a consequence, the Scope of Works was subsequently amended to include a focus on subsidence impacts associated with the specific mine layout on which the EIS is based (ARP 5.6.3).

109. The IAPUM provided its advice to the Department on 20 October 2020 (see Appendix F of Department's AR). The IAPUM's advice contained 45 conclusions and 14 recommendations regarding the Project (ARP 5.6.4).

110. The Executive Summary of the IAPUM report provides the following key points:

- The Dendrobium Extension Project (DEP) is the first major mining project in the catchment to be assessed in the last decade, with the current mine being based on an approval that is nearly two decades old.
- It is well established that mining panel width, height of extraction and depth of mining are important factors in determining the environmental impacts of mining-induced subsurface and surface ground subsidence. The EIS does not include any substantive sensitivity analysis of the influence of longwall panel width or mining height on subsidence effects, impacts and consequences. Nearly all longwall panel widths continue to be 305 m. The surface and groundwater assessments in the EIS are based on assuming a worst case outcome, being that the deep subsurface connective fracture zone will overlap with the shallow near-surface connective fracture zone to result in connective fracturing from the mine workings through to the surface over the mine workings in Areas 5 and 6. No justification on technical or environmental grounds has been provided for panel widths of 305 m, with the Panel being advised by the Proponent that it is based on experience with this width at Dendrobium Mine and economic returns.

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- The Proponent proposes to offset the environmental consequences associated with connective fracturing during the operational life of the mine by paying government for surface water taken from the catchment, funding or implementing works that reduce existing losses (e.g., pipe losses or evaporation) and offsetting impacts to swamps and some other aspects of biodiversity. The EIS appears to assume that the mine can be sealed successfully after the cessation of mining and so negate ongoing water loss from the catchment. It neither provides an explanation of how connections to the mine (including through neighbouring mines) can be sealed successfully nor an assessment of the long term effects, impacts and consequences of mine sealing on neighbouring mines, the environment, water quantity and quality in the catchment and public safety. If the mine cannot be sealed, then consideration has to be given to how to manage and offset groundwater and surface water inflow to the mine workings in perpetuity.
- Against this background, this advice has been structured around reviewing the sections of the EIS relating primarily to subsidence, groundwater and surface water, having regard to the findings of the Southern Coalfield Inquiry (2008), the Planning Assessment Commission's reports for the Metropolitan Coal Project (2009) and the Bulli Seam Operations Project (2010) and the Independent Expert Panel for Mining in the Catchment (2019) and to supplementary information including key stakeholder submissions and responses to questions put to the Proponent by the Panel. It then considers the DEP impact on some aspects of mine closure planning, the adequacy of mine closure planning as reported in the EIS and the implications of the DEP for the management of water take from the catchment after mine closure. The advice has a limited focus on swamps given that impacts on them are to be offset.

111. The IAPUM makes the following conclusions on Page 37 of its report:
    - 13) The Panel 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. If it does not, then much of the coal that the Applicant claims to be forgoing in adopting the Base Case may not have been available for extraction in the first instance.
    - 14) 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.
    - 15) The Minimum Case is not particularly helpful as it is not based on objective or agreed environmental targets and is not related to an economic appraisal.
    - 16) The subsidence assessment of mining layout options does not provide a basis for assessing the sensitivity of environmental impacts and consequences to setback distances from natural features; longwall panel width; longwall extraction height; and longwall panel orientation.

112. The IAPUM on Page 40-41 of its report provides the following concluding statements in relation to mine closure planning:
    - 41) The consideration given to mine closure planning in the EIS is simplistic and lacks engineering design and risk assessment.
    - 42) Some important aspects of the EIS have a reliance on being able to effectively seal the mine at the completion of mining so that it floods, groundwater levels and pressures recover, and water is not diverted from the catchment in perpetuity.
    - 43) The EIS does not question whether it is physically feasible to seal the mine. This needs careful consideration as a basis for assessing the feasibility of some important controls associated with managing mine water inflow after mine closure, including the type, magnitude, longevity and cost of offsets and compensatory provisions for impacts on water quantity and water quality in the catchment in perpetuity.
    - 44) Offset and compensatory provisions should have regard to the consequences of not being able to seal the mine effectively, should that possibility materialise.

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- 45) The extraction of Areas 5 and/or 6 is unlikely to change the existing legacy of past mining operations at Dendrobium Mine and in surrounding mines in respect of sealing Dendrobium Mine at the end of mining operations and how this impacts on managing mine water inflow in perpetuity. It could increase the scale of the legacy impacts that will need to be managed after mine closure.

113. The Applicant reviewed the IAPUM's advice and provided a response to the Department on 22 October 2020. This response accepted all of the IAPUM's recommendations, while noting that some were directed to the consent authority, rather than the company. The Department also accepted and supports all recommendations (ARP 5.6.5).

114. During its meeting with the Commission on 14 December 2020, the IAPUM discussed Figure 12 of the Department's AR and the accompanying text on pages 101 – 102. The IAPUM advised it found no evidence in the EIS or from information provided by the Applicant to the IAPUM that a comprehensive risk assessment reviewing consequences, likelihood and mitigation measures has been undertaken. The IAPUM considered one of the options which could have been tested was the possibility of leaving a barrier in place by using the Bald Hill Claystone, which has low water permeability. If fracturing was confined to below the claystone, there could be very little surface water loss.

Commission's Findings

115. Special Areas are lands declared under the WNSW Act for protecting the quality of stored waters, whether intended for drinking or other purposes, and maintaining the ecological integrity of that land. The Commission acknowledges that this is a highly sensitive and significant receiving environment and is of great importance to NSW.

116. The Commission notes that Area 5 and Area 6 are located in the Metropolitan Special Area comprising one of the Greater Sydney Water Catchment Special Areas. The Metropolitan Special Area is within the Upper Nepean Scheme which provides 20 – 40% of Greater Sydney's water supply and supplies drinking water to the populations of the Macarthur and Illawarra regions, the Wollondilly Shire and Metropolitan Sydney.

117. The Commission notes that the mine design is the primary determinant of the Project's impacts. As stated in the Department's AR (see paragraph 97 above), of the 21 proposed longwall panels, 18 have a void width of 305 m. This width is such that subsidence cracking would extend from the mine to the surface over (at least) the major proportion of the two mining areas. The Commission agrees with the Department's assessment that this cracking would cause infiltration of surface water from upland swamps, watercourses, and the water table. A significant proportion of this water would continue to infiltrate through fractured rock strata and reach the mine.

118. The Commission notes the Applicant's advice that it seeks to maximise the efficient recovery of metallurgical coal resources through the continued use of 305-metre-wide panels (see paragraph 95).

119. The Commission agrees with the IAPUM's advice that no justification on technical or environmental grounds has been provided for panel widths of 305 m, with the IAPUM being advised by the Proponent that it is based on experience with this width at Dendrobium Mine and economic returns (paragraph 110). The Commission further notes that there was no environmental assessment of mine design alternatives undertaken by the Applicant, despite repeated requests by WaterNSW and BCS.

120. The Commission notes that the IAPUM and public submissions have raised significant concerns about the mine design for the Project.

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121. The Commission acknowledges that the Applicant does not disagree with the IAPUM's suggestion that surface water loss would be reduced if the mine was designed with the sub-surface fracture network remaining below the Bald Hill Claystone (paragraph 96). However, the Applicant believes the impacts of the fracture network extending to the surface would have negligible impacts at the catchment scale and would be offset in accordance with the terms of the proposed planning agreement.

122. The Commission agrees with the IAPUM and other submissions that inadequate consideration has been given in the EIS to the environmental assessment of alternative mine designs, the risk evaluation of options and associated environmental impacts. The Commission notes that this was required in the SEARs, under the EP&A Act and the principles of Ecologically Sustainable Development (**ESD**) and was identified by statutory agencies during the EIS preparation and public exhibition.

123. With respect to the principles of ESD, the Commission is of the view that the mine design is not consistent with the precautionary principle and the principles of inter-generational equity and conservation of biological diversity and ecological integrity or with the Objects of Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c) and (e). The Commission has given further consideration to the principles of ESD and the Objects of Act in section 4.19 of this report.

124. For the reasons set out above, the Commission does not consider the mine design and predicted impacts of this Application to be acceptable in the Metropolitan Special Areas. Consequently, the Commission's findings on the proposed mine design of the Project before it form part of the Commission's reasons for refusing the present Application, along with the other findings set out in this Statement of Reasons.

4.10 Key Issue - Subsidence

Public Comments

125. Concerns relating to mine subsidence effects, and particularly associated impacts on hydrology, aquatic ecology and biodiversity in the Metropolitan Special Area have been raised by regulatory authorities, members of the public and some non-government organisations.

126. Many submissions raised the issue of subsidence and its impacts on the Metropolitan Special Area. Consequential impacts raised included the destruction of the landscape, sandstone cliff collapses, degradation of sacred Aboriginal sites and cultural values, watercourses, upland swamps, habitat and biodiversity; loss of water supply (surface and ground water); impacts on water quality; impacts on the edges and dam walls at Avon Dam and Cordeaux Dam; and increased bushfire risks.

Council & Government Agency Comments

127. In Wollongong City Council's (**WCC**) submission dated 18 September 2019, Council referred to:

- The EIS (page ES-13) further indicates that South32 would avoid the direct undermining of mapped "key stream features" (i.e., pools >100 cubic metres [m^3] and permanent, waterfalls >5 m and with a permanent pool at the base) as identified during site investigations of all mapped streams overlying the Project underground mining Areas 5 and 6.

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- However, the ephemeral streams directly above the proposed longwalls in Areas 5 and 6 will be affected by subsidence related issues. The Hydro Engineering & Consulting surface water assessment report in the EIS (page 26) confirms that "Sections of streams that are directly undermined could experience the full range of subsidence impacts, including cracking, associated diversion of flows (when they are present in ephemeral streams) and localised pulses of iron / manganese that may potentially affect water quality." This report notes that there would likely be a reduction in flow durations in the ephemeral streams overlying the longwalls as a result of surface flow diversion to groundwater and/or downstream.
- The Hydro Simulations groundwater assessment report in the EIS (page 66) further notes that the fracturing of creek beds is likely to include streams directly above the proposed longwall mining in Area 5 (in particular) and Area 6, based on previous effects in Areas 3A and 3B in the Dendrobium Mine area. The report acknowledges that "Fracturing of creek and riverbeds is an observed phenomenon around the Southern Coalfield (e.g., at Dendrobium, Tahmoor, Appin and Metropolitan). At Dendrobium, the stream known as WC21 (in the northeastern part of Area 3B) has had a fracture network develop sufficient to divert all but flood flows. Other streams e.g., tributaries LA4 and DC13, and the upper part of Donalds Castle Creek, have also experienced changes or reductions in flow, as reported in the End of Panel Reports."
- The Hydro Simulations report (page 67) also states that given the similarity in geology and longwall geometry, the effects of longwall mining on the upland swamps in Areas 5 and 6 are likely to be similar to those observed in Areas 3A and 3B of Dendrobium Mine. It is expected that the swamps that are located directly above or within 60 metres distance will be at a high risk of being affected by a reduction in water levels and/or an increase in the rate of drainage of these features after heavy rainfall events. These effects are a result of fracturing of the sandstone base of swamps and enhanced rates of groundwater shallow drainage beneath the swamp deposits.
- The Independent Expert Panel produced the "Initial Report on Specific Mining Activities at the Metropolitan and Dendrobium Coal Mines" as the first part of their Terms of Reference. This report found that up to 3 megalitres per day of surface water and groundwater seepage occurred into Dendrobium Coal Mine workings instead of the creeks and reservoirs. At Metropolitan Coal Mine, approximately 500,000 litres per day of surface water and groundwater seepage may be going into the mine workings instead of Woronora Reservoir or creeks. The report also notes that groundwater, surface water and subsidence issues are very complex and difficult to understand.
- In light of the above, Council is concerned about the extent of subsidence related impacts upon streams and coastal upland swamps within the project area as a result of the proposed mine layout for Areas 5 & 6. Council is specifically concerned about the cumulative loss of water to reservoirs, creeks and upland swamps due to mining activities. Council does not want to see any further water losses to reservoirs, creeks and upland swamps as a result of mining activities.

128. The submission to the Commission by WaterNSW provides the following comments in relation to subsidence:

- 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 Mining Panel 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.

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- 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 Catchment Panel and the Mining Panel 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 the Applicant'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 Mining Panel 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 Mining Panel specifically referred to a MSEC report from 2016 (not provided in the EIS documentation), which notes that that "there was a series of cracks up to 1.5 metres wide located above the commencing end of Longwall 3".
- 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.

Applicant's Consideration

129. Section 6.3 of the EIS describes the range of subsidence investigations which were conducted for the Project. Further details are contained in Appendix A of the EIS.

130. From the information provided in Table 6-3 of the EIS, for conventional subsidence, the maximum predicted total vertical subsidence is 2,050mm in Area 5 and 2,450mm in Area 6 (see below).

Table 4 – Predicted Conventional Subsidence Effects for the Project Underground Mining Areas (Source: Applicant's EIS, Table 6-3)

Location	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Total Hogging Curvature (km^{-1})	Maximum Predicted Total Sagging Curvature (km^{-1})
Area 5	2,050	25	0.5	0.6
Area 6	2,450	20	0.3	0.5
Area 3A	3,600	50	1.4	1.4
Area 3B	3,600	50	1.4	1.4

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131. The drainage lines are located across the Project underground mining area and, therefore, are expected to experience the full range of predicted subsidence movements. Potential subsidence impacts to the drainage lines include increased levels of ponding, flooding and scouring due to mining-induced tilt. There is also likely to be cracking, fracturing and dilation of bedrock in the creek beds, leading to surface water diversion and reduced pool water levels (Page 6-9 of the EIS).

132. There are 40 cliffs that have been identified directly above the proposed longwalls in Area 5. There are no cliffs located directly above the proposed longwalls in Area 6. Potential subsidence impacts on cliffs located directly above the proposed longwalls (i.e., cliffs in Area 5) include fracturing, and where the exposed rock face is marginally stable, cliff instabilities (Page 6-10 of the EIS). Furthermore, according to Appendix A of the EIS, there are 46 cliffs located outside the extent of the proposed longwalls and are within the 35^0 angles of draw.

133. Section 4.7 of Appendix A of the EIS provides the following details regarding non-conventional ground movements.

- It is likely non-conventional ground movements will occur within the Study Area, due to near surface geological conditions, steep topography and vallet related movements, which are discussed in Section 3.4. These non-conventional movements are often accompanied by elevated tilts and curvatures that are likely to exceed the conventional predictions.
- Specific predictions of upsidence, closure and compressive strain due to the valley related movements are provided in Section 5.2 to 5.6. The impact assessments for the streams are based on both the conventional and valley related movements. The potential for non-conventional movements associated with steep topography is discussed in the impact assessments for the steep slopes provided in Section 5.9.
- In most cases, it is not possible to predict the exact locations or magitudes of the non-conventional anomalous movements due to near surface geological conditions. For this reason, the strain predictions provided in this report are based on a statistical analysis of measured strains in the NSW coalfields, including both conventional and non-conventional anomalous strains, which is discussed in Section 4.4. In addition to this, the impact assessments for the natural features and items of surface infrastructure, which are provided in Chapters 5 and 6, include historical impacts resulting from previous longwall mining which have occurred as a result of both conventional and non-conventional subsidence movements.

Department's Assessment

134. The Department accepts that reducing longwall width would not prevent the most critical surface subsidence impacts (i.e. cracking of watercourses and/or the floors of swamps) and states:

- while reductions in longwall width would be expected to reduce the number and severity of impacts, including these key impacts, the potential benefit of a small reduction in longwall width (say to 275 m or even 250 m) is likely to be illusory. Even at void widths of 200 m or 150 m, significant cracking of watercourses and swamps would be expected to occur and the need for the Applicant to either remediate or offset such impacts would arise. (ARP 6.2.22)

135. The Department's assessment found that very substantial reductions in panel width would produce only limited environmental benefits, but at great economic cost. Minor reductions in panel width produced no appreciable environmental benefit at all (ARP 6.2.42).

136. The Department concludes that reducing longwall void width is not an effective means of reducing, much less eliminating, the environmental impacts of the Project.

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IAPUM Comments

137. The IAPUM makes the following conclusions on page 37 of its report:

- 17) While the same type of impact (cracking) due to conventional subsidence may occur as longwall panel widths become narrower, the intensity of the impacts (fracturing width, frequency and depth) can be expected to reduce. 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.
- 18) The Subsidence Impact Assessment includes an environmental impact assessment of valley closure for Avon River, Cordeaux River and Donalds Castle Creek based on an impact model developed by the expert subsidence consultant.
- 19) Environmental impact assessment for all other significant watercourses has not been undertaken in either the Subsidence Impact Assessment or the Surface Water Assessment. Rather, both reports defer to the Proponent's identification of which key stream features are significant and the nomination of setback distances to support the Proponent's stated purpose of reducing the potential impacts of subsidence. The setback distances are not based on the level of risk of impact (where risk is a combined measure of likelihood of an impact and the consequences of the impact) but are fixed and intended to reduce potential subsidence impacts rather than to prevent environmental impacts.

138. The IAPUM on page 36 of its report provides the following concluding statements in relation to non-conventional subsidence:

- 1) At Dendrobium Mine, longwall panel width is not the key control when considering environmental impacts on natural surface features due to mining-induced non-conventional subsidence, in particular, valley closure. This is because environmental impacts due to non-conventional surface subsidence start to plateau at longwall panel widths that are reported to be too narrow to be economic at Dendrobium Mine.
- 2) Rather, the key control for limiting environmental impacts on natural surface features due to nonconventional subsidence is, as reflected in the mine layout proposed for Areas 5 and 6, the setback distance of longwall panels from natural surface features.
- 3) Therefore, in respect of non-conventional subsidence, project assessment needs to have a focus on the rigour in identifying the nature and scale of environmental impacts, the appropriateness of the limits selected for environmental impacts, the reliability of setback distances of longwall panels proposed for preventing these limits being exceeded, and the suitability of the mine layout to adaptive management as a control for preventing exceedances of predicted impacts.

139. The IAPUM on page 36 of its report provides the following concluding statements in restates in relation to conventional subsidence:

- 4) Environmental impacts associated with conventional subsidence are of both a surface and subsurface nature and include the height of connective fracturing. Environmental impacts due to conventional subsidence are particularly sensitive to changes in longwall panel width and extraction height, as well as some parameters over which there is limited control, such as depth of mining.
- 5) There continues to be much conjecture and uncertainty as to both how to predict the height of connective fracturing and how to confirm this height in the field.
- 6) The conservative approach by the Proponent to assume connective fracturing to surface and to utilise offsets and compensatory provisions for impacts in the Sydney Water Catchment is a pragmatic means of setting performance measures that are consistent with the recommendation of the Catchment Panel (OCSE, 2019b) that "Government should seek opportunities to improve the effectiveness of performance measures, especially for watercourses and swamps, by specifying them in unambiguous, quantifiable and measurable terms."

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- 7) Should this approach for dealing with connective fracturing due to conventional subsidence not be assessed as appropriate or adequate, changes in longwall panel widths and/or extraction height may be required, rather than (as in the case of non-conventional subsidence impacts) changes in the offset distances to longwall panels.

Commission's Findings

140. The Commission finds that the likelihood of significant subsidence (cracking) impacts from the proposed longwall mining in Area 5 and Area 6 is high, largely due to the mine design. The Commission finds that the consequences of subsidence impacts are long term and the severity of damage to the landscape, water resources (ground water, surface water and watercourses), biodiversity (including upland swamps) and Aboriginal cultural heritage values are potentially irreversible. These aspects are further addressed in Sections 4.11 to 4.14 of this Statement.

141. The Commission agrees with the IAPUM's conclusions (paragraphs 137 - 139) and acknowledges the concerns raised by WaterNSW (paragraphs 128) regarding stream flow losses, impacts upon upland swamps and Dendrobium Mine being the only mine in the Southern Coalfields to have recorded valley closure over 650mm and a series of cracks up to 1.5 metres wide at the commencing end of Longwall 3, as stated on page 8 of the IAPUM's report. The Commission notes that Wollongong City Council also raised concern regarding to the extent of subsidence related impacts upon streams and coastal upland swamps.

142. The Commission acknowledges WaterNSW's concerns in paragraph 128 that the Project 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 which are inconsistent with WaterNSW's statutory role "to protect and enhance the quality and quantity of water in declared catchment areas" and its Mining Principles. The Commission is of the view that the concerns raised by WaterNSW are valid and finds the predicted impacts to be unacceptable.

143. The Commission notes that there are 40 cliffs identified above the proposed longwalls in Area 5 and potential impacts include fracturing and cliff instabilities. There are also 46 cliffs located outside the extent of the proposed longwalls and within the 35^0 angle of draw. The Commission finds that there is uncertainty in relation to the number of cliffs impacted by the Project and the extent of impact.

144. The Commission agrees with the IAPUM's conclusion 17 in paragraph 137 regarding the expected reduction in the intensity of conventional subsidence impacts including fracturing width, frequency and depth from narrower longwall panel widths. The Commission agrees with the IAPUM that this has important implications for the volume of surface water that can be diverted in the subsurface and the mine through connected fractures.

145. The Commission agrees with the IAPUM's conclusions 18 and 19 in paragraph 137 regarding the subsidence impact assessment for watercourses. Environmental impact assessments of valley closure were conducted for Avon River, Cordeaux River and Donalds Castle Creek but not for other significant watercourses. As concluded by the IAPUM, the setback distances are not based on the level of risk of impact (where risk is a combined measure of likelihood of an impact and the consequences of the impact). The Commission agrees with the IAPUM's conclusion in paragraph 139 that there continues to be much conjecture and uncertainty as to both how to predict the height of connective fracturing and how to confirm this height in the field.

146. For the reasons set out above the Commission finds that the extent and nature of the predicted subsidence, the lack of adequate risk assessment and uncertainty as to appropriate setbacks and impacts of alternative mining panel widths is unacceptable and incapable of being sufficiently addressed by conditions of consent.

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147. Further, the Commission is of the view that the risk of significant and irreversible subsidence impacts is not consistent with the principles of ESD and the Objects of Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c), (e) and (f).

148. The Commission therefore finds that the subsidence risk (including its uncertainty and potentially significant and irreversible consequences) of the Project, taken with the other findings of the Commission, is a reason for the refusal of the present Application.

4.11 Key Issue - Groundwater

Public Comments

149. Many submissions raised the issue of negative impacts on groundwater and its consequences on the water supply catchment. Concerns raised included: water loss and contamination of water resources for future generations, that it would take 100 – 200 years to stabilise groundwater levels in Areas 5 and 6 respectively and detrimental impacts upon ecosystems.

150. The submission made on instructions from the Environmental Defenders Office Inc on behalf of POWA supplementing the oral submissions made to the Commission on 4 December 2020 provides the following statements:

- The widespread damage proposed for the Extension Project is consistent with the still-unfolding functional destruction of streams WC21 and WC15 which overlie existing Dendrobium Area 3B, due to the widespread surface-to-seam fracturing and consequent groundwater level reductions caused by recent Dendrobium Mine longwalls.
- The Extension Project will significantly further deplete the already impacted groundwater regime between the Avon and Cordeaux Reservoirs.
- At Dendrobium Mine it appears that the groundwater levels are still subsiding unevenly (Parsons Brinckerhoff, 2015). This extensive cracking of the entire rock column will or has caused the full desaturation of the rock column (Hgeo, 2020). As there is no regional water table to support the subsidence-affected streams, water which is intercepted by the extensive surface cracking network is diverted into the rock beneath the streams and swamps, meaning that the whole catchment underlain by longwalls is still in the process of drying out.
- The truth is that no one really knows how close to pre-mining levels the regional groundwater table, which support the surface water flows, will return to after mining or how long this will take.
- Given the mostly intact nature of the coal strata to the west and the mostly fractured (behind longwalls) and/or open (in access and bord and pillar voids) state imposed by mining, hydrostatic pressures once the mine pumps are turned off will push groundwater towards the escarpment as groundwater levels start to recover. This will likely cause ironsprings to emerge from the escarpment – creating major water quality issues along the coast as well as within the Special Area catchments. Subsequent rises in groundwater levels within the Special Area will largely depend on whether these westward flows can be stemmed.
- The most important implication of our new understanding of the extent of cracking and groundwater level reductions overlying these super-wide longwalls (e.g., IEPMC 2019a; 2019b) is that the surface water losses from the Special Area catchments are likely to be permanent, with the possible exception of iron-laden springs emerging when groundwater levels finally return to their reduced post-mining equilibrium conditions.

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- Eventually, a new equilibrium groundwater regime will be established around the Dendrobium Mine. I predict that this equilibrium will be much lower (perhaps hundreds of vertical meters) than pre-mining levels. Without groundwater providing baseflow and with the stream surfaces connected to deep cracking, surface flows over the mined regions are unlikely to ever return to functional streams again.
- On this basis, I predict that groundwater will never return to pre-mining piezometric levels, and is very unlikely to ever return to post-mining equilibrium levels high enough to support the surface water streams. The implication of this is that at least some, and potentially all, of the surface water volumetric losses experienced in these catchments will be permanent. Where groundwater does ultimately return to levels high enough to enable it to return to the surface as baseflow lower down the catchments (and possibly outside WaterNSW's capture system), it will be heavily loaded with metals and salt.
- One of the key questions in regard to the volumetric offsets is how the total and per-year rate water losses will be firstly estimated, for the purposes of setting compensation packages, and secondly measured, for payment or replacement of water. WaterNSW engaged groundwater hydrologist Paul Tammetta in 2017/2018 to develop a defensible and accurate method for calculating losses. Tammetta's 2018 report on catchment hydrological responses was peer reviewed by an eminent academic and used by WaterNSW staff to estimate the surface water take from existing and past mines. It is unfortunate that WaterNSW has still not published the project report nor the internal findings, as it is important pioneering work which should be shared.

Council & Government Agency Comments

151. WCC's comments on groundwater are set in out in the Key Issues – Subsidence section in paragraph 127 above.

152. Page 3 of the submission to the Commission by WaterNSW provides the following comments in relation to groundwater:
    - 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.
    - 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.
    - See WaterNSW comments on predicted catchment water losses under Key Issues – Surface Water (paragraph 182).

Applicant's Consideration

153. Section 6.5 of the EIS describes the groundwater investigations which were conducted for the Project. The following key statements were made:
    - Groundwater inflows to Area 5 are predicted to peak at approximately 18 ML/day in 2033 and 2037, averaging approximately 12 ML/day. Inflows to Area 6 are predicted to peak at approximately 4 ML/day in 2047, averaging approximately 3 ML/day.

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- The total inflow for the Project and Dendrobium Mine is predicted to peak at approximately 26 ML/day in 2032 and 2036, averaging approximately 22 ML/day for the period 2023 to 2049 (of which approximately 10 ML/day is due to inflows from Areas 1 to 3).
- Predicted drawdown within Areas 5 and 6 is expected to be most significant in the coal seams (i.e., approximately 300 m due to extraction of the Bulli Seam in Area 5 and 320 to 350 m due to extraction of the Wongawilli Seam in Area 6).
- Due to the conservative approach adopted with respect to the heights of sub-surface fracturing and the depths of surface cracking, the groundwater modelling assumes the predicted surface water losses report to the groundwater system. However, a portion of the predicted surface water losses are likely to re-emerge downstream, rather than report to the groundwater system.

154. In the Applicant's submission to the Commission dated 15 December 2020, the following statements were provided in relation to groundwater:

- For the post-mining losses, the EIS groundwater model assumes dewatering of mine workings ceases once mining is complete. The model conservatively does not consider underground hydraulic seals in the main headings (as per the current Closure Plan for the Dendrobium Mine). The model accounts for some outflow of groundwater via the Illawarra Escarpment (i.e., based on the hydraulic conductivity properties of the outcropping coal seam and other geology of the Escarpment) – as would have occurred pre-mining.
- The model predicts that groundwater levels would slowly recover post-mining and predicts ongoing surface water losses post-mining, with surface water losses decreasing as groundwater levels recover.
- This (slow recovery of groundwater) would occur even if it is agreed with Government and other stakeholders not to seal the mine (e.g., beneficial use of water stored in the underground workings by 3rd parties following the cessation of mining may be a preferred scenario), as re-pressurisation of the Hawkesbury Sandstone above Area 3 longwalls is already being recorded by groundwater monitoring bores following the completion of mining despite the ongoing dewatering of the mine workings.
- Post-mining surface water losses were predicted using the EIS groundwater model out to the year 2150. At 2150 the modelled losses are 355 ML/annum, which represents a negligible loss at the catchment scale.
- The predicted post-mining surface water losses were provided to Government, and the 2150 rate of loss was then extended for another 170 years (i.e., to the year 2319) to calculate the value of the surface water offsets for the Project based on the IPART retail price (1 in 10 years 'drought' price and 9 in 10 years 'non-drought' price).

Department's Assessment

155. The Department considers that the groundwater model does not require any further changes or adjustments prior to determining the Project and notes that the IAPUM is in general agreement with this position (ARP 6.5.34).

156. The Department's standard conditions for underground coal mines require development of a Water Management Plan which includes a "program to periodically validate the groundwater model for the development". The Department has proposed additions to this condition to implement DPIE-Water's proposed schedule for review. It has also proposed that conditions require the Applicant to carefully consider all comments on the groundwater modelling received from DPIE–Water, the IESC and the IAPUM and implement the recommendations of the IAPUM. Finally, the Department is proposing that each review of the groundwater model take place in consultation with both DPIE–Water and WaterNSW, to ensure that DPIE–Water's proposals for changes to the model are satisfactorily addressed

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and that WaterNSW's interests (particularly in regard to modelling of surface water losses) are adequately catered for (ARP 6.5.38).

157. Subject to these important additions to standard conditions, the Department accepts that the groundwater model is fit for purpose, appropriately conservative, adequately informs assessment of the Project and can be relied upon for the ongoing adaptive management of the Project (ARP 6.5.39).

158. The Department considers that the Applicant has addressed any uncertainty as to where and how much surface to seam drainage would occur by assuming it would occur generally across the mining domains and then propose that the resulting modelled loss of water is fully offset (ARP 6.5.55).

159. The Department states that surface to seam drainage is not the key determinant of environmental consequences for the surface environment. The key determinant is the extent of surface cracking, which is related mostly to valley closure effects and then to conventional compressive and tensile strains. Surface to seam cracking affects loss of surface water, via percolation of infiltrating surface water through the column of cracked geological strata to the mine below (ARP 6.5.56).

160. The Department considers that the groundwater model's predictions of groundwater drawdown, including in the water table, the regolith and the three layers modelled in the Hawkesbury Sandstone, are reasonable and can be relied upon for assessment purposes. However, the IAPUM in two of its conclusions cast doubt on the reliability of the model in the post-mining period, i.e., during repressurisation of sub-surface aquifers. The IAPUM considered that these uncertainties and model improvements could be dealt with at the post-approval stage, through development of detailed mine closure planning and ongoing review and development of the groundwater model. The Department agrees with this position (ARP 6.5.66 to 6.5.68).

161. The Groundwater Assessment (**GA**) contained an assessment of the predicted impacts of the Project against the requirements of the AIP. The water sources within which the Dendrobium Mine and Project are located and managed under the Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011. The Mine and Project lie almost completely within Management Zone 2 (MZ2) of the Sydney Basin Porous Rock (Nepean Sandstone and Sydney Basin – South Groundwater Sources). This Management Zone is classified as 'Highly Productive' under the AIP (ARP 6.5.79).

162. The GA concludes that the Project meets the minimal impact requirements of the AIP. The Department accepts this conclusion as does DPIE–Water (ARP 6.5.81).

IAPUM Comments

163. The IAPUM on Page 38 of its report provides the following concluding statements in relation to groundwater:

- 22) During mining, inflows have been estimated to be a peak of 18 ML/day reducing to 8 ML/day by the end of mining for Area 5 and a peak of 3.5 ML/day shortly before the end of mining for Area 6. The estimated rates of inflow are stated to be conservative (i.e., at the high end of the possible range). The level of conservatism cannot be determined from the available modelling but the inflows appear to be an acceptable first estimate of the likely impacts. Therefore, the figures provided should be adopted in determining any approval for the mine. In the long term the mine inflows will be fully derived from surface recharge. At this stage, because there is a lack of clarity as to if and how Dendrobium Mine can be sealed, it should be assumed that surface losses from the catchment will occur over the long term and potentially in perpetuity.

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- 23) The groundwater modelling of the post mining period is not based on a clear, technically feasible description of mine sealing. As a consequence, it is not possible to assess the risks and impacts of groundwater recovery on the surface water environment or on the pattern of discharges of mine water and potential contamination from the mine at this time.
- 24) There are uncertainties associated with groundwater pressure recovery and mine outflow volumes and quality following mine closure, which are not addressed in the EIS and which require considerable investigation and planning, including analysis of the feasibility of sealing Dendrobium Mine, whether or not the Dendrobium Extension Project is approved.

164. The IAPUM on Page 34 of its report provides the following comments:

- The IEPMC identified two fundamental aspects associated with connective fracturing to surface, namely water inflow to the mine from the catchment when the mine is operating and contaminated water outflow from the mine into the catchment after the mine has been sealed and flooded. On the latter aspect, the IEPMC noted that much depends on whether it is physically possible to confine water in the mine and the extent to which the water table can be re-established in order to reverse depressurisation. Thus, the importance of assessing whether it is physically and technically feasible to seal Dendrobium Mine, such that there are no ongoing (in perpetuity) cumulative impacts of its mining operations on water quality and quantity.
- The Panel has serious reservations on the issue of outflow from the mine post-closure based on its review of mine plans and inquiries on whether the mine can be effectively sealed by simply sealing its portals and shafts. This is based on factors such as the longwalls in Area 1 having undermined and subsided old workings in Mt Kembla Colliery, unknowns concerning hydraulic connections to the surface in Mt Kembla Colliery and to adjacent mines, and the magnitude of hydraulic pressures that may act on seals and rock strata in both mines in the long term.

Commission's Findings

165. Comments made by WaterNSW in paragraph 152 above detail the differences in estimates of the proportion of surface water in predicted mine inflows calculated between the Applicant, Dr Col Mackie and the IEPMC. This impacts upon the Applicant's groundwater model in predicting the surface water component of mine inflows. The Commission accepts there is uncertainty and acknowledges the estimates by Dr Col Mackie and the IEPMC are similar.

166. In paragraph 163 above the IAPUM concludes (#22) that in the long term the mine inflows will be fully derived from surface recharge and due to lack of clarity as to if and how the Dendrobium Mine can be sealed it should be assumed that surface losses from the catchment will be long term and potentially in perpetuity. The Commission agrees with this conclusion.

167. In paragraph 163 above the IAPUM concludes (#23) that the groundwater modelling of the post mining period is not based on a clear, technically feasible description of mine sealing and that as a consequence, it is not possible to assess the risks and impacts of groundwater recovery on the surface water environment or on the pattern of discharges of mine water and potential contamination from the mine. The Commission agrees with this conclusion.

168. In paragraph 163 above the IAPUM concludes (#24) that there are uncertainties associated with groundwater pressure recovery and mine outflow volumes and quality following mine closure, which are not addressed in the EIS and which require considerable investigation and planning, including analysis of the feasibility of sealing Dendrobium Mine, whether or not the Dendrobium Extension Project is approved. The Commission agrees with this conclusion.

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169. In paragraph 164 above the IAPUM provided comment by referring to the IEPMC's two fundamental aspects associated with connective fracturing to the surface. On the latter aspect, the IEPMC noted that much depends on whether it is physically possible to confine water in the mine and the extent to which the water table can be re-established in order to reverse depressurisation. Thus, the importance of assessing whether it is physically and technically feasible to seal Dendrobium Mine, such that there are no ongoing (in perpetuity) cumulative impacts of its mining operations on water quality and quantity. The IAPUM also has serious reservations on the issue of outflow from the mine post-closure. The Commission agrees with the comments above by the IAPUM and IEPMC.

170. The Commission therefore finds that there is uncertainty as to how close to pre-mining levels the regional groundwater table which support the surface water flows, will return to after mining or how long this will take.

171. The Commission also finds that there is uncertainty as to mine outflow volumes and quality following mine closure and repressurisation.

172. The Commission does not consider the uncertainties to be acceptable.

173. The Commission is of the view that the long-term and uncertain impacts upon groundwater quantity and groundwater quality are not consistent with the principles of ESD and the Objects of the Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c), (e) and (f).

174. The Commission's findings on the impact of the Project on groundwater, taken with the Commission's other findings in these reasons, form part of the reasons for the refusal of the present Application.

4.12 Key Issue - Surface Water

Public Comments

175. The following comments were provided on Day 3 of the hearing:

- In relation of the EIS statement that: "*There have been no reports of any measurable effect on water quality in downstream reservoirs in the southern coalfield*" to the effect that this is incorrect as, Water NSW report multi-decade rises in iron in the Cataract & Cordeaux reservoirs:
- "*Much higher iron and aluminium concentrations in the waters of the Cataract and Cordeaux reservoirs, which have had more mining, and contrasting them with the less undermined Avon catchment. So I disagree also with the statements in the EIS that impacts to the aquatic ecology in surface orders [sic] would be localised, short term and minor*" (para 40, p.24);
- "*When you have underground mining, longwall coal mining going on in an area – we know from lots and lots of experience within the Sydney drinking water catchment, that that leads to subsidence at the surface. That leads to cracking of – of bedrock and of the – the sandstone rocks that provide a seal, effectively, under our waterways, that it opens up new surfaces. And when you have new surfaces exposed to oxygen, you have new chemistry"*; and
- *"New chemical reactions going on, and chemicals become soluble in water that weren't otherwise available to become soluble in water, in more weathered, exposed rock. So we do see concentrations of iron and manganese increased. Aluminium, sodium, potentially others, such as, calcium, barium, chloride.*" (paras 35,40, pp.26).

176. The following extract from page 2 of Hunter Environment Lobby Submission relates to water loss from the catchment:

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- *The cracking and dewatering of watercourses, swamps and aquifers is expected to add the loss of many more millions of litres of water each day to the 10 million litres daily water loss from Dendrobium's current and past mining. Dendrobium's average daily water loss for the duration of the expansion project will be 22 million litres (ML). Water loss will peak around 2032 to 2036 at 26ML per day. This is equivalent to the daily water usage of 130,000 people!*
- *The existing water discharge into Allans Creek, Unanderra will double. This is the same discharge point that was recently identified as exceeding safe levels of heavy metals. The Applicant wants to purchase water licenses and pay cash compensation to WaterNSW for the water they take from the catchment. This cannot possibly compensate for irreversible damage to the Special Areas and for the legacy of water loss.*

177. The following extract from page 7 of the submission from Protect Our Water Alliance relates to water losses:
    - *The long-term 22 ML/day loss of both surface water and ground waters is unacceptable. The additional avoidable, as-yet-unapproved 12 ML/day water loss component of that 22 ML/day equates to the water requirements of about 60,000 people – equivalent to about 25 % of the Illawarra population in 2016, and 16 % of the forecast Illawarra population in 2041.*
    - *12 ML/day is equal to 4,383 ML/year. On December 12 last year, the Avon Dam (at 43.5 %) and the Cordeaux Dam (at 38.1 %) together held only 99,491 ML of water. DPIE-Planning consider it approvable that an additional 4,383 ML is removed from the Avon-Cordeaux catchment as mine inflows – depleting both surface and ground waters – affecting both what makes its way to reservoirs and what remains in reservoirs.*
178. The following extract from the submission from Protect Our Water Alliance is related to water pollution:
    - *Pollution impacts will be a significant ongoing problem after mining has ended as there is no sure way to seal off the mine, or to restore the original hydrological function to the catchment. Currently about 6.9 ML/day spills out of mine adits into Allan's Creek – by 2030 this polluted outflow will increase to 29 ML/day.*
179. The following extract from page 3 of the Lock the Gate submission relates to financial calculations to compensate water losses post mining:
    - *If water losses continue at roughly the same volume in the decade post-mining, then $17.3 million would represent a one-off payment for 2.3 years of water loss. For water losses that the government's own experts advise could last in perpetuity, 2.3 years of compensation would be an excellent deal for South32 ('gift' or 'subsidy in perpetuity' would perhaps be a more suitable description) but an extremely poor deal for NSW.*
180. A public submission provided the following comment:
    - *WaterNSW have made statements confirming that metal concentrations in two storages in two 'undermined' catchments have been increasing over several decades (Lake Cordeaux and Lake Cataract). The excerpt from a graph included in the WaterNSW submission to the Independent Expert Panel on Mining in the Catchment (page 24, WaterNSW, 2018) stated: "An issue which particularly concerns WaterNSW is that it is anticipated that any additional increases in iron, manganese and possibly aluminium and other species dissolved from undermined catchments will impact on raw water quality delivered to Sydney Water and other customers."*

Council & Government Agency Comments

181. WCC's comments on surface water are set in out in the Key Issues – Subsidence section in paragraph 127 above.

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182. Pages 3 and 4 of the submission to the Commission by WaterNSW raise the following concerns regarding the accuracy and reliability of the predicted catchment water losses:

- 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, the Applicant 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, the Applicant'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, the Applicant still does not accept the findings of the Catchment Panel 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 Mining Panel (Page.19) 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."
- Based on the discrepancy between the Catchment Panel and the Applicant in previous mining areas (and the Applicant'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 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.
- The Catchment Panel estimates that current surface water losses in the Special Areas are 8 ML/day, with 5 ML/day from Dendrobium. The Applicant 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.

Applicant's Consideration

183. Section 6.6 of the EIS describes the surface water investigations which were conducted for the Project.

184. Figure 6-6 of the EIS titled "Regional Surface Water Catchments" illustrates Area 5 and Area 6 along with other areas of the existing Dendrobium Mine Areas 1,2, 3A, 3B and 3C and historic mine workings (see Figure 6).

185. Figure 6-7 of the EIS titled "Surface Water Catchments – Project Area" shows the 21 intermittent streams and their catchments within Area 5 and Area 6. Area 5 contains 18 of the streams which form part of the Avon Dam, Avon River and Donalds Castle Creek catchments. Area 6 contains three streams which form part of the Cordeaux Dam catchment (see Figure 7). Including the four named watercourses (Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek) Areas 5 and 6 contain a total of 25 watercourses.

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Figure 6 – Regional Surface Water Catchments

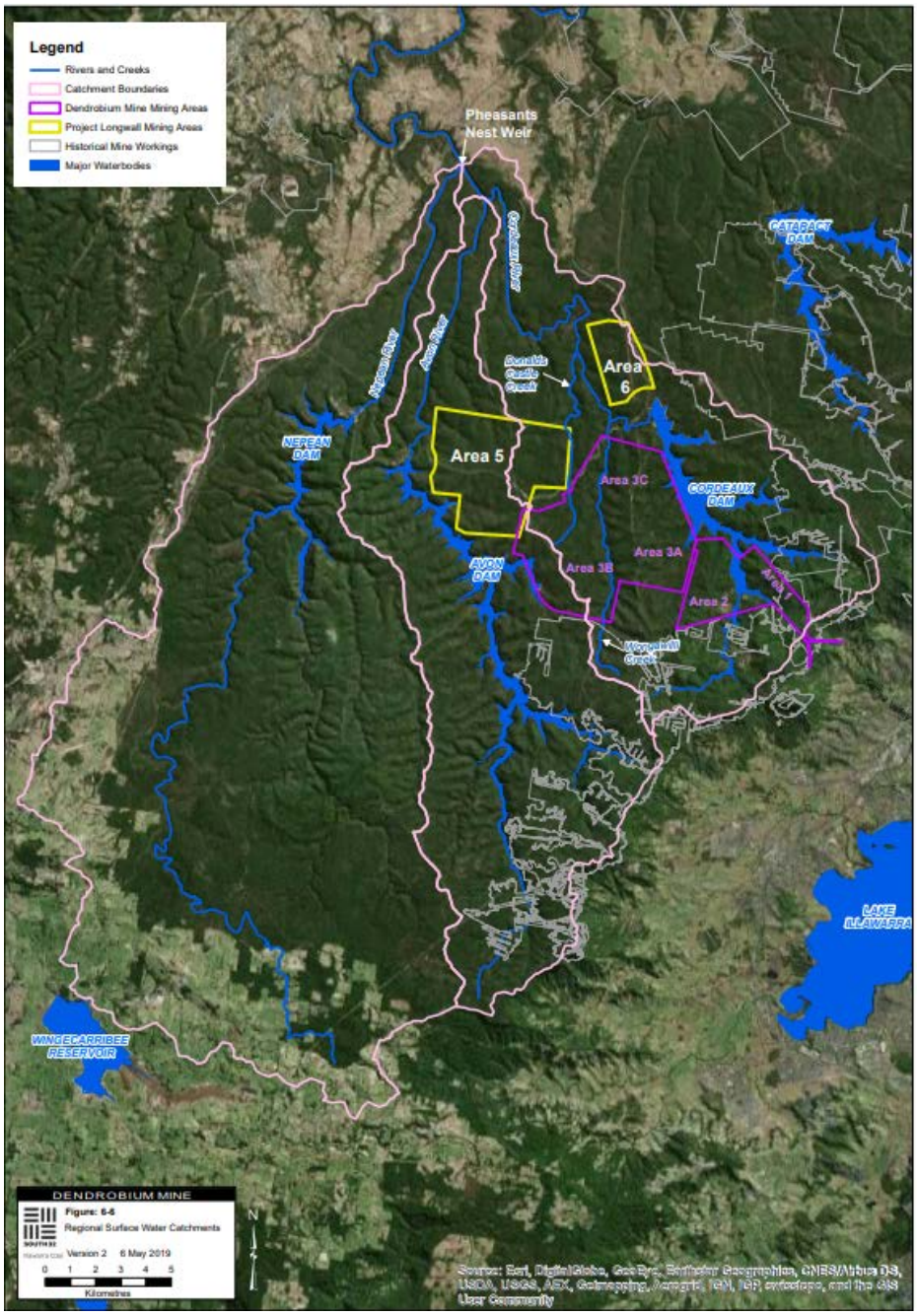

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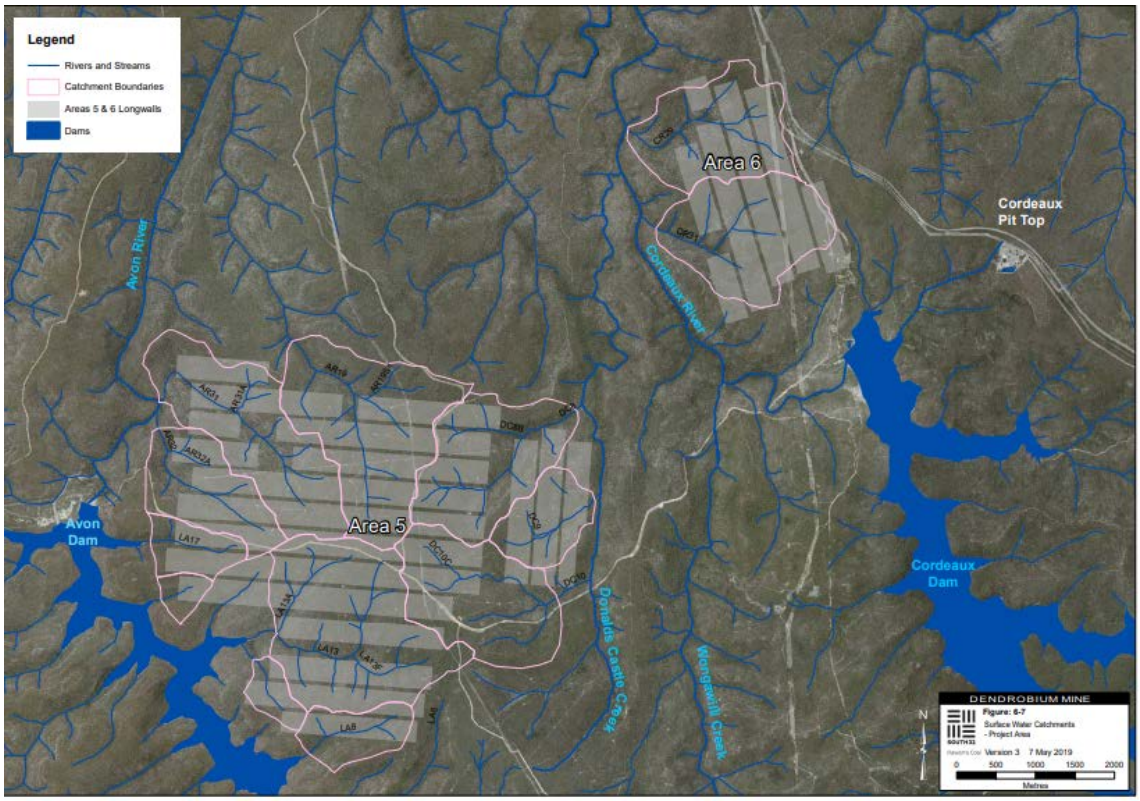
Figure 7 - Surface Water Catchment Project Area



186. In Section 5.2.5, Appendix C of the EIS, the estimated effects on streamflow at Lake Avon and Pheasants Nest Weir as a result of mining in Area 5 and Area 6 are presented as follows:

- The proportion of the Project Area reporting to Lake Avon is 3.9% of the total water supply catchment. With a 14% average reduction in streamflow under median climatic conditions, this equates to an estimated average of 0.55% reduction in yield to Lake Avon. Assuming that the streamflow contribution to Lake Avon is consistent for all sub-catchments, this represents a reduction in yield of approximately 384 ML/year in comparison to an estimated total yield of 70,111 ML/year to Lake Avon.
- The proportion of the Project Area reporting to Pheasants Nest Weir is 4.3% of the total water supply catchment. With a 9% average reduction in streamflow under median climatic conditions, this equates to an estimated average of 0.39% reduction in yield to Pheasants Nest Weir. Assuming that the streamflow contribution to Pheasants Nest Weir is consistent for all sub-catchments (i.e., no allowance has been made for water storage or environmental flow release), this represents a reduction in yield of approximately 1,036 ML/year in comparison to an estimated total yield of 267,400 ML/year to Pheasants Nest Weir

187. In the Applicant's submission to the Commission dated 15 December 2020, the following statements were provided in relation to surface water:

- Predicted surface water losses for the Project are addressed via the proposal to offset surface water losses to ensure the Project is a net contributor to the Metropolitan water supplies.
- The post-mining surface water losses for the Project have been calculated using the EIS groundwater model with the same conservative assumptions for predicted losses during mining (e.g., seam to surface fracturing, surface losses do not re-emerge downstream [which would occur in reality]).

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Department's Assessment

188. The Commonwealth's IESC provided extensive advice regarding surface water resources. The IESC noted that the Project would increase the area at Dendrobium Mine affected by subsidence, including undermining upland swamps and first, second and third order streams. This would result in considerable changes to surface water flows and water regimes within the impacted stream reaches and swamps (ARP 6.3.7).

189. The IESC concluded that "*the primary impacts from the proposed project will be to water-dependent ecosystems on-site*" (ARP 6.3.8).

190. The Department has recommended conditions of consent that require not only regular and ongoing review and development of the groundwater model but also that the Applicant give careful consideration to all comments made by the IAPUM (and the IESC and DPIE–Water) and implement the Panel's recommendations regarding review and further development of the groundwater and surface water models (ARP 6.3.28).

191. The Department considers that the groundwater model's predictions of losses from reservoirs related to the Dendrobium Mine and the Project are careful and reasonable and can be relied upon for assessment purposes. The Applicant has committed to both purchase and offset for the modelled loss of stored waters by the Project.

192. A key environmental impact would be the loss of stream function owing to cracking of creek beds, loss of pool holding capacity and loss of baseflow reporting to streams from upland swamps and near-surface aquifers. The Applicant's approach has been to recognise and accept this, to incorporate conservative assumptions into the groundwater modelling and surface water modelling, to provide for particular limits on impacts in the case of named watercourses and key stream features, to provide for some degree of remediation of impacts on these features, and to account for residual impacts by way of compensatory offsets for surface water losses and related ecosystem and fauna species losses (ARP 6.3.36 and 6.3.37).

193. The Department considers that remediation should be undertaken to a higher standard in the Avon and Cordeaux Rivers. Consequently, it has proposed a Project performance measure of not greater than "*negligible environmental consequences*" within these watercourses. The Applicant has also accepted this proposal (ARP 6.3.53).

194. The Department considers that the Applicant's proposed rehabilitation objective for named watercourses should be extended to 3rd order streams subject to subsidence impacts. That is, any consent granted should require the Applicant to remediate physical damage as soon as reasonably practicable, unless the environmental impacts of remediation exceed the environmental benefits (ARP 6.3.58).

195. All 57 of the key stream features identified in Areas 5 and 6 are subject to the Applicant's commitment to remediate any physical damage as soon as reasonably practicable, unless the environmental impacts of remediation exceed the environmental benefits. The Department proposes that additional information is required to be provided in conjunction with Extraction Plans. This information is required to inform decisions regarding the practicality of remediation (ARP 6.3.77 and 6.3.78).

196. The Department considers that very limited amounts of dissolved iron and related metals are expected to reach the stored waters in Lake Avon and Lake Cordeaux. This is not expected to lead to any water quality issues which inhibit the use of those waters for their principal purpose, which is the provision of safe, clean and crystal-clear drinking water for the people of Sydney and Wollongong (ARP 6.3.102).

197. The Department is satisfied that there is no known significant threat to water quality associated with mine closure following the Project. The Department is satisfied that the potential issue of water quality impacts following mine closure is best dealt with as a 'post-approval' matter, as recommended by the IAPUM (ARP 6.3.113 and 6.3.114).

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198. In April 2020, the Department sought further detailed information from South32 concerning its water offset proposals (ARP 6.3.143).

199. Notwithstanding the very substantial increases in the Applicant's offer, there were a number of aspects of this proposal which were not considered to be acceptable, in particular the lack of offsetting of surface water losses which would continue following completion of the Project (i.e., post mine closure). The Department therefore continued to discuss offsetting arrangements with South32. On 7 October 2020, South32 amended its surface water offsetting proposal to deal more explicitly and comprehensively with offsetting the surface water losses which would continue following mine closure. The key terms of this offer are as follow:

- annual payments during mine life, based on the actual surface water loss due to the Project for each water year (i.e., financial year), to be calculated at the end of each water year and priced at the actual IPART retail price for that water year, which would vary over time to reflect inflation and drought/non-drought year prices. Current IPART retail prices are $2,350/ML (base) and $3,180/ML (drought); and
- a single up-front payment of $16.7 million to cover post-mining water take, made upon approval of the first Extraction Plan for the Project (i.e., payment linked to when surface water losses from subsidence would be authorised to commence), with this amount based on the NPV of modelled post-mining losses and IPART prices, assuming drought price applies for 1 year in 10 (ARP 6.3.144).

200. The Applicant's commitment for annual payments is based on 'actual surface water losses' as calculated using the Project's groundwater model (which would be annually recalibrated with all available new monitoring data), rather than the predictions made in the EIS and GA. Actual surface water losses may therefore vary substantially from the EIS's predictions based on improved groundwater modelling, revised assumptions or modelling for surface to seam cracking, mining delays, changed mine inflows, reduced longwall void width/s or other changes to the mine plan (ARP 6.3.147).

201. The Department notes that the offset calculation includes modelled post-mining losses from 2048 until the year 2319 (171 years using the NPV of a weighted non-drought and drought price for water, with drought pricing applying for one year in ten (ARP 6.3.151). The Department is satisfied that this methodology is appropriately conservative. In addition, the proposal for it to be an up-front payment (and therefore accessible for early capital works) limits the opportunity for future review (ARP 6.3.151 and 6.3.152).

202. Arising from a question on notice to the Department during the meeting held on 16 November 2020, the Department advised the Commission on 4 December 2020 that the Applicant's modelled post-mining losses contained an error and actually extend from 2048 for 271 years after mining closure resulting in an increase in the upfront payment to approximately $17.3 million (i.e., an increase from $16.7 million). This was explained in the Applicant's accompanying revised offer dated 30 November 2020.

203. The Department considers that the Applicant's offsetting proposal is substantial (more than $100 million) and appropriately reflects the importance of Sydney's drinking water catchment and the recommendations of the IEPMC and IAPUMs. The draft conditions of consent make provision for the Applicant's water take and water quality offsetting offers to be delivered by way of a Planning Agreement, to be entered into by the Applicant with the Secretary and the Minister for Water, Property and Housing under Division 7.1 of Part 7 of the EP&A Act, within six months of commencing development under the consent (ARP 6.3.154 and 6.3.155).

204. The Department considers that its proposed requirements regarding monitoring, management and remediation of the subsidence impacts resulting from the Project are robust, reasonable, scalable, comprehensive and appropriate (ARP 6.3.165).

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IAPUM Comments

205. On page 24 of its report, the IAPUM notes the following with respect to surface flow losses:

The estimated flow losses are small in proportion to catchment water balance under median conditions. For example, losses are predicted to be 0.55% of the Lake Avon total yield under median annual rainfall and approximately 3.9% under a once-every-ten years low rainfall. The method of calculation is reasonable given current model and data limitations. The Panel questions the conclusion "This represents a likely indiscernible impact to Lake Avon inflow", since 3.9% may well be discernible under dry conditions. The significance of losses in extreme drought conditions that are relevant to security yield is not considered in this report [Appendix C - Surface Water Assessment of the EIS].

206. The IAPUM on Page 38-39 of its report provides the following concluding statements in relation to surface water:

Assessment of Impacts and Consequences on Rivers and Named Creeks

- 25) The assessment of environmental impacts on the three watercourses identified in the EIS as being the most significant, namely, Avon River, Cordeaux River and Donalds Castle Creek, is based on a single impact type (Type 3) and a valley closure threshold value nominated by the Proponent. There are inconsistent and, sometimes, incorrect interpretations of the rock bar model on which the impact assessments are based. This is a matter for consideration during project assessment.
- 26) Although the EIS is supported by a document titled Stream Risk Assessment it does not constitute a risk assessment that is consistent with the intent of recommendations over the past decade of a number of Panels concerned with mining in the Southern Coalfield or with Australian and international standards and guidelines for risk assessment (such as MDG-1010 (2011) and ISO 31000 (2009)).
- 29) The assessment of surface flow losses is based on the groundwater model. Due to the low resolution and accuracy of the groundwater model in the vicinity of watercourses, and the limited sensitivity analysis undertaken, the Panel does not consider the predicted losses from rivers and named creeks to be necessarily conservative. Nevertheless, they are likely to be very low relative to water supply yields from the catchment.
- 31) The assessment of potential for adverse consequences on stream and reservoir water quality lacks consideration of long term cumulative contaminant loads, including emergence of contaminated shallow and deep groundwater post-closure. It is not sufficient to assume, as the EIS does, that the current lack of evidence of water quality consequences will continue long term.

207. The IAPUM on Pages 38-40 of its report provides the following concluding statements in relation to surface water:

Assessment of Impacts on Drainage Lines (2nd to 3rd order streams)

- 33) The assessment of environmental impacts on streams identified as significant in the Surface Water Assessment is based on stream features, threshold values for these features, and fixed standoff distances all of which appear to have been nominated by the Proponent. The approach contrasts with that used to assess environmental impacts on the Avon River, Cordeaux River and Donalds Castle Creek.

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- 34) The impact assessments do not recognise that watercourses constitute systems that can rely on all stream features for their function and ecological integrity. The identification of the select stream features does not assure the full protection of streams from mining impacts. There is doubt about the biodiversity benefits of protecting localised stream features when cease-to-flow conditions in the associated sub-catchments are predicted to occur more than 70% more frequently in some streams under median climatic regimes. The PAC for Bulli Seam Operations concluded that it 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.
- 35) It appears that setback distances for key stream features have been based on Type 3 impacts having been observed in the pools along Drainage Line WC21 prior to the longwalls in Area 3B approaching within 50 m. The proposed setback distances are 50 m when mining is only undertaken on one side of the stream and 100 m when it is undertaken on both sides. These setback distances contrast with Type 3 impacts having occurred in Area 3B at Dendrobium Mine at distances of 115 m to 290 m from longwall panels. The setback distances for the select stream features are based on reducing the potential for environmental impacts, rather than total avoidance, and on facilitating their remediation should impacts occur. Remediation is confined to partially re-establishing the site-specific functionality of individual features. It is not intended to and will not restore the function and values of a stream system.

Commission's Findings

208. The Commission acknowledges the uncertainty about the accuracy and reliability of predicted catchment water that would be lost to subsidence from mining activities at Area 5 and Area 6 from the 25 watercourses described in paragraph 185.

209. The Commission acknowledges that the findings of the IEPMC, the IAPUM and WaterNSW regarding surface water losses differ markedly from that of the Applicant. However, it is apparent from the submission of WaterNSW that water loss estimates at existing Dendrobium mining areas have continuously been underestimated.

210. The Commission agrees surface water losses are derived from the groundwater modelling. Due to the reasons outlined in the Concluding Statement No. 29 of the IAPUM Report (see paragraph 206) the IAPUM does not consider the predicted losses from rivers and named creeks to be necessarily conservative. Nevertheless, the IAPUM considers they are likely to be very low relative to water supply yields from the catchment. According to the IAPUM the Project would result in a 3.9 percent reduction of the yield of the Avon Reservoir catchment during drought conditions. There is uncertainty about the quantity of surface water that would be lost due to subsidence from mining activities in Area 5 and Area 6.

211. The Commission acknowledges that the IAPUM and numerous submissions have raised concerns about the impacts of mining activities and subsidence on water quality.

212. The Commission notes that the IAPUM in Concluding Statement No. 34 of the IAPUM Report (see paragraph 207) states the impact assessments do not recognise that watercourses constitute systems that can rely on all stream features for their function and ecological integrity and that the identification of the selected stream features does not assure the full protection of streams from mining impacts. The Commission agrees with the IAPUM.

213. The Commission agrees there is uncertainty with mine closure planning for the Project. The Commission's concerns include whether it is possible to seal the mine and the long term and potentially irreversible impact upon the quantity and quality of surface water.

214. The Commission agrees there is uncertainty in accurately quantifying water losses and hence is of the view that it is not possible to assess the appropriateness of the Applicant's proposed financial offset for surface water losses and water quality impacts (paragraph 187).

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215. For the reasons set out above, the Commission is of the view that the long-term and uncertain impacts upon surface water quantity and quality are not acceptable and are unable to be adequately addressed by conditions of consent. The impacts are not consistent with the principles of ESD and the Objects of Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c), (e) and (f).

216. Consequently, the Commission's findings on the Project's impacts on surface water, taken with the other findings in this Statement, are a reason for the Commission's refusal of the present Application.

4.13 Key Issue – Biodiversity & Upland Swamps

Public Comments

217. Submissions to the Commission, included the following statements:

- I expect that the Project is likely to have significant impact on aquatic ecology. I have conducted research on the impact of long-wall induced subsidence and stream channel fracturing at Redbank Creek, in the Picton area. I consider this to be a reasonable comparison as Redbank Creek Picton has a similar geology to the Project area. Based on my research on Redbank Creek, I expect that impacts from the Project on stream ecology are likely, and may include degradation of stream habitat, modification to natural flow regimes, and impairment of water quality.
- Other than very limited watercourse remediation of uncertain effectiveness and durability, the mining companies are not required to provide compensation for the damage to the watercourses and aquifers that supply and support the reservoirs supplying water to Greater Sydney and the Illawarra, and supply and support the biota of the Special Areas. The Special Areas contain some of the few remaining areas of pristine bushland in NSW, including swamp communities listed as endangered under State and Commonwealth legislation. Some 83% of the Coastal Upland Swamp are found on the Woronora Plateau and most are located in the Metropolitan and Woronora Special Areas. There are no known effective means of swamp remediation and 'like for like' offsets are difficult if not impossible.
- The Department of Planning Director General's June 2009 environmental assessment report [115] for the then proposed expansion of the Metropolitan Colliery describes iron spring activity along the Waratah Rivulet, initiated as a result of the mine's first longwall mining project:

  "Large areas of rocky substrate in the Waratah Rivulet and other watercourses have been observed to be covered by orange-red iron staining for many hundreds of metres downstream of mine subsidence fractures. If the iron concentration is sufficiently high, and the aquatic environment is suitable, then orange, bacterially-based iron flocs may also form in ponds. Potential ecological effects of such flocs are reported to include smothering of benthic habitat and biota and reduced light available for aquatic plants. Bacterially-catalysed oxidation of iron also consumes dissolved oxygen from the water column." (Page 13)

218. Day 3 of the Public Hearing included the following comments:

- *In a nutshell, along with my research collaborators, I've found very strong evidence that longwall mining is responsible for cumulative intergenerational loss of high value public ecosystem services provided by upland swamp". (para 15, p. 18)*
- *We have provided quantitative evidence of persistent hydrological impacts of longwall mining. We know that these impacts are largely irreversible because all documented industry attempts at restoration have failed to re-establish pre-mining hydrological function.*

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- *What is before the Commission involves extension of an already extant mine footprint. So swamp level hydrological disturbance is actually replicated across the landscape with each of the mining areas butting up against each other. With time the swamp woodland mosaic is lost across the entire mine footprint. It's unclear where the functional tipping point lies, but in my opinion this cumulative disruption of an endangered ecological community is ill-conceived and reckless (p.21).*
- *Based on piezometer data, a qualitative comparison is made of rainfall, soil moisture and groundwater level signatures in both unmined and mined swamps. "In the unmined swamp we see persistence of soil moisture and groundwater levels for prolonged periods. In the mined swamp we see a transition to rainfall responsiveness with spikes in moisture when rain falls, but a rapid return to low soil moisture.*
- *Based on research on the Newnes Plateau, NSW, the unmined swamps appear to be resilient to the fire and recovery is well and truly underway even 10 weeks after the fire; however, the mined swamps have, indeed, collapsed, and thinking about the explanation of that in terms of theory, we explain it by the longwall mining weakening the resilience of the ecosystem through the hydrological change. (pp. 83). A combination of longwall mining & fire caused ecosystem collapse.*

Council & Government Agency Comments

219. In WCC's submission dated 18 September 2019, Council stated:
    - The biodiversity assessment report (page 219) states that the coastal upland swamps of the study area which are to be mined beneath are likely to exhibit degrees of subsidence related impacts. This is readily detected in the swamp piezometer monitoring for the project. The report (page 219) further states that regardless of the monitoring results to date, there is a risk that the project would change the natural cycle of coastal upland swamps with the subject area. The report also acknowledges that it is possible that a change in swamp hydrological function from subsidence exposes coastal upland swamps above a longwall to a range of indirect impacts.
    - However, Council is not aware of any successful remediation strategies in the southern coalfield for coastal upland swamps damaged by subsidence related impacts. Therefore, in Council's view, the protection of the coastal upland swamps from subsidence related impacts is considered of critical importance. Further, Council does not consider that biodiversity offsetting (due to subsidence related impacts to upland swamps) is appropriate. The long term preservation of upland swamps is considered the most appropriate response. Accordingly, a redesign of the mine layout for Areas 5 & 6 is warranted, in order to ameliorate the subsidence related impacts on the upland swamps.
220. BCS's letter dated 3 March 2020 advising on the Response to Submissions (**RtS**) for the Project provided the following key comments:
    - The NSW Framework for Biodiversity Assessment (**FBA**) and Coastal Upland Swamp Offset Policy has been incorrectly applied in calculating the maximum predicted offset liability for Coastal Upland Swamps, and as a result the offset liability for Coastal Upland Swamp has been significantly under-estimated. The Upland Swamp Offset Policy requires calculation against a 'worst-case scenario' equating to total loss of swamps. This needed to be reflected in the applicant's approach.
    - We note that the offset strategy has been updated to demonstrate that a significant proportion of Coastal Upland Swamp offset liability (>90%) can, according to the proponent's calculations, be achieved along with other threatened species credits required to offset the project. However, as noted above, we maintain there are significant shortcomings with the application of the FBA to calculate the swamp offset requirement. This means that the offset liability for this threatened ecological community has been significantly under-estimated, and therefore not satisfactory in that the proposed offset package including the additional site would not meet the offset requirements.

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- The proposal to fund research programs within the Dharawal NPWS reserves is not an appropriate approach to meeting obligations for direct offsets, particularly with regard to Coastal Upland Swamps. Successful rehabilitation proposals relate to rehabilitation from the impacts of previous land uses only. Furthermore, supplementary measures such as management actions are only to be used in lieu of offsets as a last resort only, as per the NSW Biodiversity Offset Policy for Major Projects.
- The RTS notes that the Maddens Plains Strategic Biodiversity site, set aside as an offset for earlier major projects, will continue to be investigated for threatened amphibian species credits. Our understanding is that further biodiversity offsets for new projects such as the Dendrobium Mine Extension are not available from the Maddens Plains site.
- Issues remain with the FBA calculations for some threatened species, namely Koala, Powerful Owl and Eastern Pygmy Possum. Previous comments highlighted the inadequacy of assessment for areas where new surface infrastructure is proposed, and it is unclear why these have not been addressed.

221. BCS's letter dated 9 September 2020 in response to the Applicant's Amendment Report provides the following key comments:
    - There are only minor changes to the proposed longwall mining layout which was presented in the RtS. While this reduction is noted, the amended layout does not materially reduce the impact upon Coastal Upland Swamps in particular. In its current form the proposed mine layout remains likely to have a significant impact on threatened species and ecological communities and in our opinion, does not satisfactorily demonstrate the "avoid" principle has been met.
    - We note regarding mitigation that the proponent is relying on methods and approaches similar to previous conditions of consent. The information provided however does not detail the efforts to mitigate previous and more recent impacts, nor the success of such an approach. In the absence of supporting evidence, mitigation appears to be of unknown robustness.
    - We maintain our strong objection to the applicant's swamps assessment approach, which does not satisfactorily calculate impacts against a 'worst case scenario' of total loss of Coastal Upland Swamps as required by the Addendum to NSW Biodiversity Offsets Policy for Major Projects - Upland swamps impacted by longwall mining subsidence (Upland Swamp Offset Policy). Significant issues remain in applying the FBA and Upland Swamp Offset Policy addendum to calculate the maximum predicted offset liability for Coastal Upland Swamps, as detailed in our EIS and RtS submissions.
    - We note that the proponent's letter dated 4 September 2020 identifies that less than half of the swamp offsets can be sourced via the proponent's acquired offset property, with the remainder to be made up by payments into the NSW Biodiversity Conservation Fund. Payment into the Fund is only to be used in lieu of like-for-like offsets as a "last resort" only where offsets cannot be sourced, as per the NSW Biodiversity Offsets Policy for Major Projects 2014.
    - We note that the proponent's letter dated 4 September 2020 also includes an offer to secure swamp offsets within 1 year of project commencement, rather than incrementally over the life of the project as required by the Upland Swamp Offset Policy. However, we maintain that offsets have been significantly under-estimated for this threatened ecological community, even though according to the proponent's calculations a significant proportion of Coastal Upland Swamp offset liability can be achieved via the offset site.

222. In the WaterNSW submission to the Commission the following key points regarding upland swamps were raised:
    - 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.

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- 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*."

Applicant's Consideration

223. Section 6.7 of the EIS describes the aquatic ecology investigations, Section 6.8 of the EIS describes the upland swamp investigations and Section 6.9 of the EIS describes the terrestrial ecology and biodiversity offset strategy which were conducted for the Project.

224. The EIS identified the following impacts on aquatic ecology:
    - As a result of the adopted mining setbacks from named watercourses for the Project there would be a low likelihood (less than 10%) of subsidence-related fracturing resulting in diversion of flow in the short sections of the Avon River, Cordeaux River and Donalds Castle Creek within 400 m of the proposed longwalls.
    - Fracturing and flow diversion impacts to the majority of these named watercourses located beyond 400 m from the proposed longwalls are not expected. Associated impacts to aquatic ecology are expected to be localised and relatively minor compared to the extensive aquatic habitat in the broader region.
    - Wongawilli Creek is further than 600 m from the proposed longwalls and therefore is not predicted to experience impacts to aquatic ecology as a result of the proposed underground mining.
    - Ephemeral drainage lines located directly above the proposed longwalls have been conservatively assessed on the basis that the full range of subsidence movements occurs, irrespective of the mining setbacks for key stream features.
    - Associated changes in the availability of ephemeral aquatic habitat that would occur are not expected to result in any significant impacts to overall aquatic ecology, due to the limited value of habitat within ephemeral drainage lines.

225. The EIS identified the following subsidence impacts on upland swamps and associated environmental consequences:
    - A change to the hydrological regime of swamp sediments as a result of fracturing of downstream rockbars, fracture networks forming in the bedrock below the swamp and/or upsidence and dilation of bedrock below the swamp.
    - Alteration of surface drainage patterns due to subsidence-induced tilting, resulting in localised erosion or scour or alteration of water distribution.
    - Consequential impacts to vegetation composition (i.e., transition to a drier community) due to changes in the soil moisture regime.
    - Upland swamps require an offset under the EPBC Act.

226. The EIS identified the following impacts upon terrestrial ecology:
    - The Project would result in direct disturbance of approximately 28.5 ha of native vegetation for surface infrastructure.
    - Alteration of habitat following subsidence due to longwall mining is a Key Threatening Process under the BC Act.

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- Potential consequences of subsidence-related impacts to swamps, streams and cliffs to threatened species habitat for the Giant Burrowing Frog and Littlejohn's Tree Frog (for both streams and swamps), Giant Dragonfly (for swamps), Red-crowned Toadlet (for streams) and Broad-headed Snake (for cliffs) have been considered in Appendix D of the EIS.
- There is potential for vegetation dieback as a result of gas emissions from sandstone strata during mining.
- The Project requires a Biodiversity Offset Strategy that accounts for species credits for the Broad-headed Snake, Littlejohn's Tree Frog, Giant Burrowing Frog, Red-crowned Toadlet, Giant Dragonfly and Koala.
- Of the threatened biodiversity considered, the Littlejohn's Tree Frog, Giant Burrowing Frog require an offset under the EPBC Act.

Department's Assessment

227. Coastal Upland Swamps of the Sydney Basin Bioregion (**Upland Swamps**) are a native vegetation community listed as endangered under both the Biodiversity Conservation Act 2016 (**BC Act**) and Environment Protection and Biodiversity Conservation Act 1999 (**EPBC Act**) (ARP 6.6.42).

228. There are 46 Upland Swamps lying partly or wholly within 600 m of the Project's proposed longwall voids. Of these, 27 are partly or wholly located directly above the proposed voids or within 60 m of those voids, with 22 of these in Area 5 and five in Area 6 (ARP 6.6.43).

229. Not all Upland Swamps are constantly wet. In most cases, the perched water table within a swamp naturally recedes during extended dry periods and recovers during prolonged rainfall events. Some valley infill swamps have a continually high water table, but many swamps (particularly headwater swamps) are better characterised as being 'regularly waterlogged' following high rainfall events, rather than constantly wet. This regular waterlogging favours particular species (e.g., sedges and tea-trees) and prevents the seeds or seedlings of other species (particularly eucalypts) from surviving. Many such swamps can survive regular periods of dryness (ARP 6.6.45).

230. The Biodiversity Assessment Report prepared for the EIS also identified that two of the 27 affected swamps partly or wholly located above or within 60 m of proposed longwalls contain only Fringing Eucalypt Woodland (MU45), being Den107 and Den114. Consequently, there are only 25 Upland Swamps which satisfy the TEC listing and which require to be offset (ARP 6.6.50).

231. As noted above, BCS considered that the Project is likely to have a significant impact on Upland Swamps. WaterNSW's advice in respect of biodiversity matters also focused on the expected impacts to Upland Swamps due to fracturing of the bedrock beneath them, which WaterNSW considered would "make them more fire-prone and change their ecological functioning" (ARP 6.6.51).

232. The IESC considered that: "*Key potential impacts of the Project [include] major changes to water regimes and drying severity in swamps. … irreversible changes will occur in EPBC-listed swamps, instream and riparian environments (including major changes in important ecological processes such as organic matter decomposition and microbial activity in the hyporheic zones)*" (ARP 6.6.52). Despite there being substantial ongoing uncertainty about the extent of the long-term impacts caused by an extensive network of surface cracking to overlying Upland Swamps, South32 has accepted that the Project would impact on the full extent of all such swamps located above or within 60 m of proposed longwalls and has proposed to offset those impacts (ARP 6.6.68).

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233. The Department considers that a much more careful and field-tested identification of valley infill and headwater swamp characteristics is required. Valley infill swamps are more likely to include relatively deep accumulations of peaty sediments and are therefore more likely to be subject to erosion (scour and/or gullying events from heavy rainstorms) or possible peat burns ignited by bushfires. The results of these studies should be used to underpin and otherwise inform the required upland swamp monitoring program. The Department considers that this program should pay particular attention to the valley infill components of the Upland Swamps and has proposed conditions to this effect, including special consideration of swamps likely to be at increased risk of erosional scour, gullying or peat burns during bushfires (ARP 6.6.72).

234. BCS disagrees with South32's proposals to offset its impacts on Upland Swamps. South32 has consistently proposed a 'partial offset', as it considers that Upland Swamps impacted by subsidence would retain significant biodiversity values. BCS maintained that South32 should provide a complete offset (equivalent to Upland Swamps being cleared for construction of, say, a ventilation shaft or freeway) and further stated that this is a requirement of its Addendum to NSW Biodiversity Offsets Policy for Major Projects - Upland Swamps Impacted by Longwall Mining Subsidence (the Upland Swamp Offset Policy, OEH, 2016) (ARP 6.6.112).

235. The EIS contains an Aquatic Ecology Assessment (AEA) for the Project, prepared by Cardno, which includes the results of baseline studies and an assessment of the impacts of the Project on aquatic ecology (ARP 6.6.87).

236. Baseline aquatic ecology surveys were undertaken in Spring 2016 at seven sites in the Avon River, Cordeaux River and Donalds Castle Creek. The surveys included characterisation of aquatic habitat; surveys of aquatic flora, macroinvertebrates and fish; and targeted surveys for Macquarie Perch (*Macquaria australasica*), which is listed as an endangered species under the Fisheries Management Act 1994 (FM Act) and the EPBC Act. The Project area does not contain any critical aquatic habitat listed under either of these Acts (ARP 6.6.90).

237. No threatened aquatic ecology species listed under either the FM Act or the EPBC Act were recorded during the surveys. However, Macquarie Perch have been previously recorded within the Dendrobium Mine area, in Wongawilli Creek. Although there are no known records of Adam's Emerald Dragonfly (*Archaeophya adamsi*) or Sydney Hawk Dragonfly (*Austrocordulia leonardi*) in the Project area, the AEA considered that potentially suitable micro-habitat for these species does exist (ARP 6.6.95).

238. The AEA concludes that the Project is unlikely to result in a significant impact on any threatened aquatic species listed under the FM Act or the EPBC Act. The Project consequently would not require biodiversity offsets for threatened aquatic species (ARP 6.6.100).

239. The Department considers that the Project's impacts on aquatic ecology are limited, owing to the key setbacks incorporated in the Project's mine design (i.e., setbacks from the FSL of the two reservoirs, setbacks from the Avon and Cordeaux Rivers and Wongawilli and Donalds Castle Creeks and setbacks from key stream features). Known habitat for Macquarie Perch is at least 400 m from the Project's two mining areas and no Macquarie Perch were found during the baseline surveys for the Aquatic Ecology Assessment (ARP 6.6.106).

240. The Department also considers that the impacts on watercourses within and adjacent to the two mining areas (principally first and second order streams with a limited length of third order streams) are unavoidable should the Project proceed. It states that there is no evidence that the existing Dendrobium Mine has impacted on aquatic ecology other than in respect of the loss of habitat arising from the cracking of pools and rockbars, again principally in respect of first and second order streams. The Department considers it very unlikely that the Project would cause impacts to aquatic ecology greater than those associated with the existing Dendrobium Mine (ARP 6.6.107).

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241. DPIE–Water's advice in response to the RtS raised no ongoing concerns with the Aquatic Ecology Assessment and instead proposed a number of recommendations regarding post-approval aquatic ecology monitoring. The Department considers that these recommendations are best taken into account and applied during development of key management plans for the Project (particularly Extraction Plans and their component Biodiversity Management Plans). The recommended conditions require the Applicant to consult with both BCS and DPIE-Water during preparation of these plans (ARP 6.6.108 and 6.6.109).

242. The Department supports the Applicant's proposals regarding offset of its predicted impacts on Upland Swamps and has proposed conditions (ARP 6.6.130).

243. The Department proposes that conditions of any consent granted for the Project allow for some limited staging of Biodiversity Offset Strategy requirements. The Department has also proposed conditions requiring that all credits are retired in accordance with the requirements of the NSW Offset Policy, Upland Swamp Offset Policy and *2014 Framework for Biodiversity Assessment – NSW Biodiversity Offsets Policy for Major Projects* (FBA). Subject to these conditions, the Department is confident that the Applicant can satisfy its offset requirements (6.6.144 and 6.6.145).

IESC Comments

244. The IESC provided advice to DPIE on 14 October 2019 in relation to the Project. On pages 2 and 3, the IESC identified key areas in which additional work is required to better inform the key potential impacts. This work would be particularly relevant to assessing the possible benefits of a revised mine plan. These are summarised below:

- Given the evidence for irreversible impacts on upland swamps elsewhere in the Southern Coalfield then further information and evidence to support the likely success of proposed remediation measures for swamps and streams (e.g., grouting and flow dispersion structures) is needed. To the IESC's knowledge there are no peer-reviewed publicly available reports to indicate that any such remediation attempts have been successful.
- The irreversible impacts associated with near surface cracking and near surface ground movement requires further investigation, including additional monitoring, field investigations and analyses. For example, the limitations of using an equivalent porous medium (EPM) modelling approach in a highly disturbed or fractured area should be addressed.
- Further information regarding the groundwater impact predictive scenarios (HydroSimulations 2019, pp. 91 – 92) and sensitivity analysis (HydroSimulations 2019, pp. 104 – 108) should also be provided to allow comparison of predicted results from a revised mine plan.
- The characterisation of geological structures and lineaments requires further consideration. This is needed to fully understand potential impacts to water assets in the region, and to allow the development of appropriate trigger-action response plans (TARPs).
- The potential impacts from localised changes on ecological components of water resources also require further investigation and discussion to enable the development of appropriate monitoring, management and mitigation measures. The additional work should also consider how the predicted changes to water regimes will alter water quality.
- The potential for increased risk of bushfire impacts on individual swamps that have dried, and at the landscape scale given 26 swamps will be directly undermined and are at higher risk of drying, requires further consideration. Bushfires and the drying of swamps can increase the likelihood of erosion which can affect catchment yields and water quality.

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IAPUM Comments

245. The IAPUM on Pages 40 of its report provides the following concluding statements in relation to swamps:

- 36) The principal areas of concern regarding consequences for the ecological integrity of those parts of the Special Areas that are expected to be affected by the Project are the loss of stream habitat in low order streams, the potential impacts of widespread reduction in near-surface groundwater levels and the direct impacts on upland swamps.
- 37) Approval of any viable mine plan in Area 5 or 6 will require some proportion of the upland swamps to be undermined.
- 38) The swamps are predicted to experience impacts and consequences due to the cracking of the underlying sandstone and subsequent increased drainage of the swamp. The Project envisages undermining within 60 m of 25 swamps (19 in Area 5, 6 in Area 6), deeming this necessary to achieve an economically viable mine. The Applicant has provided for offsets to compensate for the consequences of mining over the full area of the Coastal Upland Swamp EEC.
- 40) The EIS envisages impacts along most of the 1st and 2nd order streams and sections of some higher order streams. The ecosystem values of these streams are unlikely to be protected by the setbacks around 'key stream features'.

246. The IAPUM report also recognised the difficulties of remediation as a management strategy (page 32). It reported that South32 considered that remediation grouting of WC21, a tributary of Wongawilli Creek, was unlikely to lead to recovery of natural flows but was "*limited to targeted pools draining more slowly following rainfall, which may allow these pools to provide some refuge for riparian fauna*". For grouting cracked bedrock either in a stream or below a swamp, site access may be difficult or impractical or may lead to considerable associated environmental damage; remediation may need to wait until subsidence has plateaued following extraction of adjacent longwalls; the appropriateness of materials (e.g., lime to correct acidity) may be questionable; and grouting is not always able to restore any baseflow to streams. The IAPUM advises that these difficulties need to be taken into account in assessing any reliance on remediation as a management strategy (Page 32).

Commission's Findings

247. The IESC noted that the Project would increase the area at Dendrobium Mine affected by subsidence, including undermining Upland Swamps and first, second and third order streams and that this would result in considerable changes to surface water flows and water regimes within the impacted stream reaches and swamps. The IESC concluded that "*the primary impacts from the proposed project will be to water-dependent ecosystems on-site*" (paragraphs 188 and 189). The Commission agrees that the subsidence effects of longwall mining would impact on the hydrological regime and hence result in drier conditions for up to 46 Upland Swamps and 25 watercourses in or near Area 5 and Area 6.

248. The Commission agrees with the IESC at paragraph 244 that drier conditions for Upland Swamps would increase risks associated with bushfire and impacts upon their integrity and continuity.

249. The Commission acknowledges that the Applicant has placed particular limits on impacts in the case of four named watercourses and 57 key stream features, to provide for some degree of mitigation and remediation of impacts on these features as stated in paragraphs 97 and 195. However, the Commission notes the IAPUM's comments that the ecosystem values of these streams are unlikely to be protected by the setbacks around 'key stream features' (as stated in paragraph 245).

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250. The Commission agrees with the IESC's view that remediation is confined to partially re-establishing the site-specific functionality of individual features and that there is limited confidence in the ability to effectively remediate site specific individual stream features. To the IESC's knowledge there are no peer-reviewed publicly available reports to indicate that any such remediation attempts (for swamps and streams) have been successful. The Commission also agrees with the Department's conclusion in the report into *Mining Impacts at Dendrobium Coal Mine Area 3B (2015)* that "*remediation of swamps damaged by subsidence has not yet been proven to be viable*".

251. The Commission accepts BCS's findings as presented in paragraph 221 that the amended layout does not materially reduce the impact upon Coastal Upland Swamps and that in its current form the proposed mine layout remains likely to have a significant impact on threatened species and ecological communities. The Commission agrees with BCS's opinion that the proposed mine layout does not satisfactorily demonstrate the "avoid" principle has been met.

252. For the reasons set out above, the Commission is of the view that the significant and long-term impacts on biodiversity, including Upland Swamps, are unacceptable and not capable of being addressed by conditions. The impacts are moreover not consistent with the principles of ESD and the Objects of Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c) and (e).

253. Consequently, the impacts of the Project on biodiversity, including Upland Swamps, are a reason for the Commission's refusal of the present Application.

4.14 Key Issue – Aboriginal Cultural Heritage

Public Comments

254. The submission to the Commission by Illawarra Local Aboriginal Land Council (ILALC), states the following:

- We would like to record our objection to this development proceeding due to the significant cultural and environmental damage that would occur;
- Furthermore, the ILALC would contest that the economic impact which may be attributed to this project and its State Significant Status does not align with the cost that will be borne by the community in the future;
- To support our position on this matter we would like to draw attention to the following areas of concern, which we believe support our recommendation:
    - Impact to Aboriginal cultural heritage objects and landscape;
    - Impact on significant Endangered Ecological Communities (EEC), namely Coastal Upland Swamps and species such as Koala may be impacted by changes to vegetation;
    - Loss of habitat;
    - Lack of context or consideration relating to climate change impacts in particular extended dry periods followed by intensive rain events;
    - Damage to water ways above the mined area which will impact:
        - Aboriginal cultural heritage items
        - Drinking water reserves
        - Environmental biodiversity
    - Economic transition away from mining in the region over the foreseeable future and life of the mine.

255. The ILALC submission, also stated the need for

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- consideration of the listing of the Calga Aboriginal Cultural Landscape as State Significant Heritage item, as well as the 2015 Land and Environment Court decision in [Darkinjung Local Aboriginal Land Council v Minister for Planning and Infrastructure & Anor [2015] NSWLEC 1465]. In this case several key considerations relevant to this project were discussed and in our view have not been addressed in the current assessment. The Court reinforced the values of the Burra Charter (and other OEH policies) in highlighting the importance of the following principles when considering the nature and extent of cultural heritage:
    - Aboriginal cultural heritage encompasses both tangible and intangible elements, and the principles of ecologically sustainable development (ESD), including the precautionary principle, apply to both of these values.
    - In accordance with OEH guidelines, Aboriginal witnesses are the determinants of Aboriginal culture.
    - Cultural values are dynamic, not static, and may not be captured at any one time.
    - [F]or Aboriginal people the significance of individual features is derived from their interrelatedness within the cultural landscape. This means that features cannot be assessed in isolation and that assessments need to consider the feature and its associations in a holistic manner.

256. The submission by ILALC, also stated:

- In highlighting and providing support for this view we acknowledge that the works undertaken during the assessment have identified potential areas of impact to Aboriginal heritage. The view of this Land Council and Aboriginal people generally is that any site impact is of high or more appropriately extreme significance. We would also extend this to pointing out that, if any site in an area is impacted this actually impacts all other sites. Direct impact to cultural sites needs to be connected and recognised with indirect impact to surrounding sites, as it destroys the complete context of the sites. While the objects and artefacts are important, the Darkinjung case highlights the importance of the intangible values, which also includes ecologically sustainable development in accordance with the living values and traditions of Aboriginal people.

257. The submission by ILALC includes the following concluding statements:

- The cultural assessment for this project has failed to demonstrate any attempt to protect and conserve the values of Aboriginal people. At each point in the process it would appear to seek destruction of sites and objects and most importantly in this case the environment, without what Aboriginal people would view as appropriate mitigation, which would be complete avoidance of the area.
- Following the Darkinjung case, it is the view of this Land Council that archaeologists should not only be searching for the historical connection and possibly the continuing link to the project area combined with recognition for the sites and objects within these areas, but also seek to understand the contemporary approach and value of the location to the Aboriginal community. The approach taken during the Aboriginal cultural assessment and their assertions pertaining to the codes they followed, fails to recognise that the practice undertaken has been identified by the courts as insufficient.

258. The following extract from page 10 of the submission from the Nature Conservation Council is related to Aboriginal Cultural Heritage:

- The proposed project will be incredibly destructive to Indigenous heritage of the Illawarra Escarpment. The Aboriginal Heritage Assessment completed by Niche for South32 found that 58 sites of cultural heritage are susceptible to subsidence in the area. These include cave shelters with artworks.
- These sites are all at risk of destruction. Cave shelters are susceptible to collapse, leading to demolition of the shelter itself, any artifacts within it and culturally significant artworks.

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- Niche's report for South32 found three sites of moderate significance and a further six of high significance. It reports that the Registered Aboriginal Parties (RAPs) have advised that all sites have cultural significance.

Council & Government Agency Comments

259. On Page 6 of WCC's submission dated 18 September 2019, Council provides numerous comments regarding Aboriginal cultural heritage. Some of the issues raised are as follows:

- The Niche report appears to contain a number of inconsistencies which should be clarified, to ensure that the Aboriginal Community is properly informed about the material impacts of the project. In this regard, the Niche report (page 79) states that "When considered against the principles of Inter-generational equity and ecologically sustainable development, the potential impacts of the Project can be considered relatively minor because they directly harm only a relatively small number of sites, one of moderate scientific value, one of high significance and the remaining being of low scientific value." However, Table 22 notes that all 58 sites will either be directly or indirectly impacted by the project. Part 12.3.3 of the report also notes that 11 axe grinding sites are located directly above the longwalls and that they are likely to experience fracturing and cracking due to the fracturing of bedrock directly below them and along waterways.
- Part 12.5 of the report (which deals with the cumulative impacts of the project) states the project will only "directly harm only a relatively small number of sites" and that "there is no significant detrimental effect to quality or benefit that the Aboriginal history and archaeology of the subject area may provide to future generations." However, subsidence related impacts (either directly or indirectly) to 100% of sites cannot be considered a small number. Accordingly, it is considered that this part of the report fails to provide an adequate assessment of the cumulative impacts of the project. Subsidence related impacts to such a large number of sites is also not considered an acceptable Aboriginal Heritage outcome.
- Given the above issues, Council considers that a major redesign of the project mine layout for Areas 5 & 6 is required, in order to mitigate the subsidence impact upon the majority of Aboriginal sites within the subject area. This would also necessitate a revised Aboriginal cultural heritage assessment report to be prepared and assessed.

260. BCS's letter dated 3 March 2020 advising on the RtS for the Project provided the following key comments:

- We maintain that the proposed longwall layout is likely to harm multiple Aboriginal cultural heritage sites, including a number of sites of high Aboriginal cultural and scientific significance, due to subsidence from undermining. Previous comments requested further clarity on Aboriginal community consultation and updates to the Aboriginal cultural heritage assessment so it is unclear why these have also not been addressed.
- The proposed mine layout and extraction method remains unchanged from the EIS. The feasibility aspect is not detailed nor demonstrated beyond a claim. Hence, there is no capacity to understand alternatives and what balances there are to any decision making beyond such a claim.
- No measures to reduce subsidence are proposed. No alternatives have been detailed. Subsidence predictions for all of the sites predicted to be harmed in the Aboriginal Cultural Heritage Assessment Report (ACHAR), as requested in our detailed comments, have not been provided in the RtS.

Applicant's Consideration

261. Section 6.10 of the EIS describes the Aboriginal cultural heritage investigations which were conducted for the Project. Key findings are presented below:

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- For areas where the landscape is comprised of rock formations (e.g., sandstone and rock outcrops), the risks of harm to Aboriginal heritage sites are greater than those for open sites on soil landscapes. Rock buckling and deformation, block fall, cracking and overhang collapse have the potential to impact Aboriginal heritage sites (e.g., grinding grooves and sandstone shelters). Cracking, exfoliation and block fall (and in some cases overhang collapse, although this has not been documented within the existing Dendrobium mining area) are all typical of natural weathering processes however, subsidence effects have the potential to exacerbate these processes (e.g., bring forward the timing of block fall).
- Subsidence-induced ground movements can potentially result in soil cracking, changes to surface or sub-surface drainage or mass movement effects on steep slopes (e.g., large surface cracking) in areas with a soil profile. However, subsidence-induced ground movements would result in stresses and strains generally within the tolerance limits of the soil profile and hence Aboriginal heritage sites at the surface in these areas are predicted to have little to no impact. Isolated cracking of soils at the surface may also occur, and impacts may occur to an Aboriginal heritage site if the site is coincident with the precise location of soil cracking.
- All 58 Aboriginal heritage sites identified have the potential to be impacted by subsidence due to their location on the surface relative to the proposed Project underground mining area.
- For the nine sites assessed as having moderate or high scientific significance, there is potential for partial loss of value (aesthetic/visual) due to predicted subsidence effects.

Department's Assessment

262. The principal risk to Aboriginal cultural heritage from the Project arises from subsidence impacts associated with the two new mining areas, Area 5 and Area 6. The Aboriginal Cultural Heritage Assessment (ACHA) considered Aboriginal heritage directly above these two areas and also within a much larger boundary representing their predicted 20 mm subsidence contours. Within this larger area, the ACHA reported a total of 58 heritage sites, of which 52 were known from previous surveys (ARP 6.12.5).

263. These 58 sites include:
    - 23 axe grinding groove sites;
    - 34 sandstone shelters with art and/or archaeological deposits; and
    - a single isolated artefact (ARP 6.12.6).

264. Of the 34 sandstone shelters, six were identified as having 'high' scientific (i.e., archaeological) significance. Each of these sites contains Aboriginal art and one contains a potential archaeological deposit. Of the axe grinding groove sites, three were identified as having 'moderate' archaeological significance. All other sites were identified as having 'low' archaeological significance. The ACHA notes that the Registered Aboriginal Parties (RAPs) participating in the ACHA consider that all Aboriginal heritage sites hold cultural significance, regardless of archaeological value (ARP 6.12.7).

265. The ACHA reports that all Aboriginal heritage sites within the subsidence footprint (i.e., all 58 sites) have a risk of being impacted. This is particularly the case since 57 sites are found in sandstone overhangs or on rock slabs close to watercourses. Solid rock is much more prone to subsidence impacts (such as cracking, block fall or collapse) than are soil-based sites (ARP 6.12.8).

266. However, it is not expected that all sites would be impacted. Firstly, the EIS reports that 15 of the 58 sites are outside the 35^0 'angle of draw' of the longwall voids and therefore have a relatively low risk of impact (ARP 6.12.9).

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267. The only State agency that expressed significant concerns relating to predicted or potential Aboriginal heritage impacts was BCS, which stated in its submission that vertical subsidence of 1 to 2 m "*would*" impact key sites and that such sites were "*unlikely to survive*". BCS proposed that: "*Measures be put in place to reduce subsidence levels to a minimum or imperceptible level at all affected Aboriginal heritage sites, particularly at sites 52-2-1780, 52- 2-1752 and 52-2-1456. … As a minimum, we recommend the applicant is required to reduce the impacts of these long walls on Aboriginal heritage sites:*

- *LW 514 – likely to harm sites 52-2-1780, 52-2-1779 and 52-2-1782;*
- *LW 516 – likely to harm site 52-2-1752;*
- *LW 603 – likely to harm sites 52-2-1456 and 52-2-1466*." (ARP 6.12.16)

268. The Applicant responded to these concerns in its RTS. However, BCS considered that this response did not satisfactorily address Aboriginal heritage and reiterated its concerns. For this reason, the Department sought an additional, more detailed response from the Applicant, as indeed it did in respect of a number of other agency submissions. The Applicant responded in correspondence dated 3 July. The Applicant also met with BCS on 27 August 2020 (ARP 6.12.17).

269. The Department has given consideration to BCS's proposals regarding the six sites that it proposed for particular protection. As noted in the AR, site 52-2-1752 has been substantially protected by South32's Project amendment to set back LW 516 by 290 m (ARP 6.12.18).

270. The five remaining sites all sit centrally above longwall panels (either LW 514 or LW 603). Three (one rock shelter and two sets of axe grinding grooves) were judged in the ACHA as having low scientific significance. The two remaining sites (sites 52-2-1780 and 52-2-1456) were judged in the ACHA as having high and moderate scientific significance, respectively (ARP 6.12.19).

271. However, all five sites are in locations that do not readily lend themselves to shortening the relevant longwall. The two sites of particular significance would each require substantial mid-panel pillars (solid coal pillars such as are proposed by South32 to protect identified 'key stream features') to significantly reduce, although certainly not eliminate, the risk of cracking and other subsidence impacts (ARP 6.12.20).

272. The Department considers that the Project's overall impacts on Aboriginal cultural heritage are unlikely to be significant or widespread. Based on previous experience in the Southern Coalfield, it is possible that a small number of axe grinding groove sites would be impacted by subsidence cracking and/or a small number of shelters with art or deposits may be impacted by subsidence cracking or limited block falls. Sites 52-2-1780 and 52-2-1456 are the only sites with recognised scientific significance amongst the sites that may be impacted (ARP 6.12.21).

Commission's Findings

273. As stated in paragraph 140 the Commission finds that the likelihood of significant subsidence (cracking) impacts from the proposed longwall mining in Area 5 and Area 6 is high. The Commission acknowledges BCS's concerns raised in paragraph 260 relating to the proposed longwall layout and that it is likely to harm multiple Aboriginal cultural heritage sites, including a number of sites of high Aboriginal cultural and scientific significance, due to subsidence from undermining. The Commission notes that the BCS is of the view that vertical subsidence of 1 to 2 m "would" impact key sites and that such sites were "unlikely to survive" as referenced in paragraph 267 above.

274. The Commission also acknowledges that the ILALC is of the view that the Project's subsidence impacts in Area 5 and Area 6 upon Aboriginal cultural heritage values and the landscape have not been adequately considered.

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275. At the Commission's Site Inspection on 24 November 2020, a representative of the ILALC highlighted the importance of the understanding of Area 5 and Area 6 in the context of its place in a wider cultural landscape where Aboriginal people had camped, hunted, fished and held ceremonies, and pointed out that physical presence of artefacts was only one aspect of a long connection to, use and responsibility for that wider landscape. The Commission respects and acknowledges the importance of Aboriginal Cultural Heritage and its greater significance than the presence of artefacts might indicate.

276. The Commission agrees with BCS that the Project is likely to harm multiple Aboriginal cultural heritage sites, including a number of sites of high Aboriginal cultural and scientific significance.

277. For the reasons set out above, the Commission is of the view that the Project is likely to have unacceptable impacts on items/areas of Aboriginal Cultural Heritage. The Commission is therefore of the view that the significant, long-term and uncertain impacts upon Aboriginal Cultural Heritage are not consistent with the ESD principles (precautionary principle and inter-generational equity) and the Objects of Act contained in Section 1.3 of the EP&A Act, particularly object (f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).

278. Consequently, the Commission finds that the impact on Aboriginal Cultural Heritage is, taken with the other findings of the Commission, a reason for refusal of the present Application.

4.15 Key Issue – Greenhouse Gas Emissions

279. GHG emissions are categorised into three different types:

- Scope 1: direct emissions from owned or controlled sources of an organisation/ development;
- Scope 2: indirect emissions from the generation of purchased energy electricity, heat and steam used by an organisation/ development; and
- Scope 3: all other upstream and downstream emissions related to an organisation/ development.

280. Clause 14(1) of the Mining SEPP requires the Commission to consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure that greenhouse gases emissions are minimised to the greatest extent practicable. Clause 14(2) requires the Commission to consider an assessment of the greenhouse gas emissions (including downstream emissions) of the development, and to do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions. Other provisions of the Mining SEPP are considered in Sections 4.2, 6.2 and 6.9 and Appendix G of the Department's AR. The Commission has given further consideration to GHG emissions below.

Public Comments

281. The Commission heard concerns from speakers at the Public Hearing and received written submissions regarding the greenhouse gas impacts of the Project. Greenhouse Gas Emissions (**GHGEs**) were frequently raised in submissions that objected to the Project. The key concern was the contribution of greenhouse gases from the Project to climate change.

282. Public submissions raised concerns about the environmental impacts of Scope 1, 2 and 3 greenhouse gas emissions from the Project in contributing to global climate change.

283. In the Lock the Gate submission dated 15 December 2020 the following statements were made:

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- Scope 1 emissions from Dendrobium will be larger than the combined total of Scope 1 emissions from all six coal mines determined by the Commission to date (17 – 22 Mt compared to 13.4 Mt). In refusing consent for KEPCO's Bylong Coal Project, the Commission on Page 145 of its Statement of Reasons for the Bylong Coal Project found that "it is rational to refuse fossil fuel developments with greater environmental, social and economic impacts than fossil fuel developments with lesser environmental, social and economic impacts as this not only achieves the goal of not increasing GHG emissions by source, but also achieves the collateral benefit of preventing those greater environmental, social and economic impacts."
- Dendrobium's Scope 1 emissions would be very large compared to other coal mines recently approved (see Table 5 submitted by Lock the Gate)

Table 5 – Coal Projects Determined by IPC and Scope 1 Emissions
(Source: Lock the Gate Submission)

Coal projects determined by the IPC	Status	Date of approval	Total Scope 1 GHG Mt CO2~e
Dendrobium			**17 - 22**
United Wambo (new mine)	Approved	29/08/19	5.8
Vickery Coal Project (new mine)	Approved	12/08/20	3.1
Bylong (new mine)	Refused	18/09/19	2.1
Russell Vale	Approved	8/12/20	1.4
Rix's Creek South Mine (expansion)	Approved	12/10/19	0.8
Glendell Coal Mine pit (expansion)	Approved	4/03/20	0.1

- Total Scope 1 emissions over the life of the Project will be substantial at approximately 17 to 22 Mt of CO2-e (0.59 and 0.77 Mt CO2-e per annum). On their own, Scope 1 emissions from this Project will comprise about 0.5% of NSW's total GHG inventory. Scope 1 emissions alone would put Dendrobium at 58th or 64th place on the list of Australia's top 100 emitters of Scope 1 CO2-e. These are new and additional emissions that would occur in NSW at a time when the NSW Government requires a reduction in emissions of 35% by 2030.
- Clause 14 of the Mining SEPP says that before granting consent for a development, the consent authority must consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure "that greenhouse gas emissions are minimised to the greatest extent practicable".
- Conditioning of Scope 1 and Scope 2 emissions in NSW is typically weak and ineffective. This is likely to be the case with this Project, should it be approved. Scope 1 and Scope 2 emissions - which cannot be avoided or mitigated - should be offset. In the Bylong Coal Project Statement of Reasons for the decision to refuse consent, the Commission noted that no offsets were proposed by KEPCO:

> *"[T]he Commission is of the view that the Applicant has not minimised Scope 1, 2 and 3 GHG emissions to the greatest extent practicable as required under Clause 14(1)(c) of the mining SEPP. The Commission also finds that there are no offset measures proposed by the Applicant …"*

284. The submission from page 4 of Hunter Environment Lobby Submission provided the following comment related to greenhouse gas emissions and the role Upland Swamps play in capturing and storing carbon:

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- Coastal upland swamps also provide carbon capture and storage ecoservices. [21] Neither South32 or DPIE have considered or estimated greenhouse gas emissions associated with expected swamp destruction, or loss of carbon uptake that the swamps currently perform.

285. The following extract from the submission from Protect Our Water Alliance is related to climate change:

- Indigenous Australians and then earlier NSW governments recognised the importance of water and water protections in this country – the driest country on Earth. They thought about their responsibilities and obligations long-term. Our generation has benefited from the water catchment and its associated ecoservices, and also from a liveable climate. Now is it our turn to think long-term about our responsibilities and obligations. We need to ensure that we do not take away future generations' access to water, a liveable climate and nature. In line with ESD principles, we need to consider both residents of the Greater Sydney/Illawarra region and others more geographically distant from us.

Council & Government Agency Comments

286. In WCC's submission dated 18 September 2019, Council referred to:

- Its Ordinary Meeting of Council on 12 August 2019 considered a Notice of Motion concerning a Declaration of Climate Emergency. In light of the above Council resolution, Council is of the view that any new mining project (including the subject Dendrobium extension project) should thoroughly review its likely operational performance, in order to ameliorate any potential climate change impacts by minimising greenhouse gas (GHG) emissions;
- Clauses 14(1) and 14(2) of the Mining SEPP; and
- Gloucester Resources Limited v Minister for Planning [2019] for a proposed coal mine in Gloucester, Preston, CJ held that a consent authority, in determining a development application, is also required to take into consideration the likely impacts of the development, including environmental impacts on the natural and built environments. The likely impacts of a development include both direct and indirect environmental impacts.

287. In WCC's submission dated 2 March 2020 it advised that the Response to Submissions report also does not adequately address the downstream greenhouse gas emissions relating to the end use of coal by third parties elsewhere in Australia and the rest of the world. This assessment should be undertaken given the NSW Land and Environment Court decision in *Gloucester Resources Limited v Minister for Planning, Preston CJ [2019]*. This is consistent with Council's resolution of 12 August 2019 which declared a climate emergency and required all levels of government to take urgent action.

Applicant's Consideration

288. Section 6.21 of the EIS describes the greenhouse gas emissions investigations which were conducted for the Project.

289. In the EIS and the Amendment Report the GHGEs for the Life of Mine are quantified as follows:

- Scope 1: 22,285,330 tonnes CO2-e (if pre and post gas drainage is vented) or 17,183,752 tonnes CO2-e (if pre and post gas drainage is flared);
- Scope 2: 1,653,648 tonnes $CO_{2\text{-}e}$; and
- Scope 3: 235,900,000 tonnes $CO_{2\text{-}e}$

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Department's Assessment

290. Annual average Scope 1 emissions are expected to be between 0.59 and 0.77 Mt $CO_{2\text{-}e}$ per annum over the life of the Project. Annual average Scope 1 emissions would be approximately 0.5% of NSW's and 0.1% of Australia's annual GHGEs (ARP 6.9.6).

291. Total Scope 2 emissions over the life of the Project are estimated to be approximately 1.7 Mt $CO_{2\text{-}e}$, or an average of about 0.1 Mt $CO_{2\text{-}e}$ per annum (ARP 6.9.7).

292. South32's Amendment Report included a revised estimate of the Project's Scope 3 GHGEs. Based on the proposed reduction in RoM coal production of 0.5%, Scope 3 emissions over the life of the Project were estimated to reduce (by the same proportion) to 235.9 Mt $CO_{2\text{-}e}$ and annual average emissions to about 8.1 Mt $CO_{2\text{-}e}$ (ARP 6.9.9).

293. No State agency expressed significant concerns relating to the GHGEs associated with the Project. However, GHGEs were a matter of significant concern to a large number of special interest groups and members of the community and to WCC. Of the 152 public objections to the Project, 104 raised concerns over GHGEs, which was the second most frequent ground for objection. WCC provided detailed commentary on the EIS's assessment of GHGEs and considered that the Applicant should prepare a revised greenhouse gas assessment report. WCC's position was based on a resolution of its Council in August 2019 that "*Council recognises we are in a state of climate emergency that requires urgent action by all levels of government*" (ARP 6.9.10).

294. In terms of Scope 1 and Scope 2 emissions, the Department considers that the Project's direct GHGEs and bought-in electricity use would make a very small contribution towards anthropogenic climate change at either the State, national or global scales. The Project contains proposals by which its direct GHGEs from drained mine gas may be substantially mitigated through flaring, which through combustion turns methane into CO2, with its substantially reduced greenhouse intensity (ARP 6.9.16).

295. The EIS reports that analysis and modelling of potential gas liberation in Areas 5 and 6 indicates that this gas is expected to be highly variable in both quantity and composition; i.e., the flow of gas would not be constant and the methane percentage would be variable. On this basis, South32 considered that using the gas for electricity generation would not be feasible (ARP 6.9.19).

296. However, the Department considers that the Applicant should do more work to identify whether a reduced number of gas engines can safely be installed and operated in Area 5 (Bulli Seam) and/or both Area 5 and Area 6, to combust what could be considered to be a constant (or increasing) 'baseload' of methane, with any additional quantity of drained methane fluctuating above this baseload diverted to flare stacks. It may be possible that electricity so generated could be delivered directly underground through the same means by which drained gas is brought to the surface (i.e., through infrastructure installed in the ventilation shafts) (6.9.20).

297. Even so, it would be a number of years before mining in Area 5 is likely to produce sufficient drained methane as might support installation of a small number of gas engines. Dendrobium Mine has an existing "Greenhouse Gas & Energy Efficiency Management Plan", which already makes provision for flaring of drained mine gases. However, the Applicant is yet to install flaring infrastructure in any of the mine's current five mining areas. The Applicant has stated that the reason for this is that the gas content (including methane) is low in Areas 1, 2, 3A and 3B (Wongawilli Seam) and that the demonstration of this is that no gas drainage infrastructure has been needed. Area 3C (Wongawilli Seam) has a high gas content, but the gas is rich in CO2, not methane. While gas drainage will be required for mine safety reasons in Area 3C, it may not be possible to flare any of this gas because it is so low in methane (ARP 6.9.21)

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Commission's Findings

298. Clause 14(1)(c) of the Mining SEPP requires the Commission, "before granting [any] consent" to "consider whether or not the consent should be issued subject to conditions aimed at ensuring that the development is undertaken in an environmentally responsible manner, including conditions to ensure… that greenhouse gases are minimised to the greatest extent practicable".

299. Given that the Commission has determined on other grounds to refuse the Application, no conditions of consent regarding GHGE are required.

300. Clause 14(2) of the Mining SEPP requires the Commission, "in determining a development application" to "consider an assessment of the greenhouse gas emissions (including downstream emissions) of the [Project], and to do so having regard to any applicable State or national policies, programs or guidelines concerning greenhouse gas emissions".

301. The Commission has considered the Applicant's and Department's assessment of GHGE and agree with Lock the Gate's submission (see paragraph 283) that predicted Scope 1, Scope 2 and Scope 3 GHGEs from the Project would be significant.

302. The Commission notes that the Applicant is yet to install flaring infrastructure in any of the mine's current five mining areas as stated by the Department in paragraph 297 above.

303. In applying clause 14(2) of the Mining SEPP is the CCPF, the aim of which is to achieve net-zero emissions by 2050 and to ensure that NSW is more resilient to a changing climate. The Commission notes that the CCPF does not set prescriptive emission reduction standards but does set policy directions for government actions. The Commission also notes that in March 2020 the NSW Government released the Net Zero Plan, which builds on the CCPF and sets out a number of initiatives to deliver a 35% cut in emissions by 2030, compared to 2005 levels. The Net Zero Plan provides that *'Mining will continue to be an important part of the economy into the future and it is important that the State's actions on climate change does not undermine those businesses and the jobs and communities they support'.*

304. The CCPF is not directive as to whether a mining project must or must not be refused by reason of GHGE. The Commission considers that in order to reduce emissions, the Project could be conditioned in a manner to ensure methane emissions are flared or that offsets are provided accordingly which in the Commission's view could address the objectives of the CCPF.

305. The Commission has had regard to the predicted extent of the GHGE resulting from the Project, and the matters raised by the Department in its assessment referred to in paragraphs 290 - 297 above.

306. The Commission finds that, on balance, and when weighed against clause 14(1)(c) and clause 14(2) of the Mining SEPP, the relevant climate change policy framework, the objects of the EP&A Act, ESD principles and the socio-economic benefits of the Project, the impacts associated with the GHGE of the Project would be capable of being appropriately addressed if consent were to be granted to the present Application.

4.16 Key Issue – NorBE Test

307. Under the *State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011* (**SDWC SEPP**) 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).

308. The SDWC SEPP requires the consent authority for the Project (i.e. the Commission) to be satisfied that the carrying out of the proposed development would have a 'neutral or beneficial effect' on water quality, commonly known as the NorBE test.

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Public Comments

309. The submission made on instructions from the Environmental Defenders Office Inc on behalf of Protect Our Water Alliance (POWA) supplementing the oral submissions made to the Commission on 4 December 2020 provides the following statements:

- The project will have unacceptable impacts on the quality and quantity of groundwater and surface water in the Sydney drinking water catchment and will not meet the modified neutral or beneficial effect of water quality (NorBE) test under the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011
- Two key questions of interpretation of clause 11A arise in relation to the project:
  - a. Is the project "continuing development" for the purposes of clause 11A(2)?
  - b. How does the modified neutral or beneficial effect (NorBE) test in clause 11A(3) apply to the project?
- The definition of continuing development includes the phrase "was likely to be the subject of future applications for consent for its extension or expansion". This raises the question: at what point in time is it to be considered whether or not it is "likely" that future applications will be made? POWA submits that the appropriate time for assessing whether future applications for consent were likely was when the original consent for the development was granted. This is because the start of the definition refers to "development consent was limited to the carrying out of the development for a particular time or to a particular area or intensity". In this case, the relevant development consent was granted in 2001.
- The relevant question, then, is whether future applications for consent to expand or extend the mine were likely as at 2001. The mining lease was granted well before 2001. The Assessment Report does not identify when it was first granted but notes that it was consolidated (from previously granted mining titles) pursuant to the 1973 mining legislation, which was repealed in 1993. The grant of the mining lease is therefore irrelevant to the question of whether, as at 2001, it was "likely" that there would be future applications for consent to expand or extend the mine.
- The 2001 consent authorised mining until 2030. Mining authorised by that consent has not been completed. Area 3C has not been mined (due to high levels of gas). The fact that mining was authorised until 2030 is relevant to consider in determining whether future applications were likely as at 2001.
- The modified NorBE test in clause 11A(3) requires a comparison between the proposed development and a continuation of the impact of the existing development under similar conditions as the existing development consent.
- The distinguishing feature of this project as compared with the Springvale mine decision (4nature Incorporated v Centennial Springvale Pty Ltd [2017] NSWCA 191) is that the impacts of the existing Dendrobium mine will in fact continue, whereas at Springvale, the saline discharge would have ceased if the mine was not extended. The project will have a negative impact on water quality in the catchment according to the modified NorBE test because it increases the impacts above the continuing impacts of the existing mine.

Council & Government Agency Comments

310. In WaterNSW's submission to the Commission dated 15 December 2020, the following statements are provided:

- Uncertainty remains about whether the project would meet the NorBE test for water quality, particularly in relation to post-closure groundwater repressurisation;
- 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.

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- 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.

Applicant's Consideration

311. In the Applicant's submission dated 15 December 2020, the following statements are provided in relation to clause 11A:
    - This is supported by South32's confirmation that there has long been an intention to pursue approval to extract coal from Areas 5 and 6 (including prior to the approval of the Dendrobium Mine in 2001), noting:
        - Exploration drilling of the areas was originally undertaken in the 1960s and 1970s and demonstrated the metallurgical coal resources in Areas 5 and 6.
        - Consolidated Coal Lease (CCL) 768 has been held since 29 October 1991 (which covers the approved Areas 1, 2, 3A and 3B as well as proposed Area 5 and Area 6 for the Project).
        - BHP Group (South32's predecessor) publicly reported coal resources and reserves in Areas 5 and 6 in its Annual Report in 2004 (and within internal resource reports prior to this).
        - BHP Group re-commenced exploration activities in Areas 5 and 6 in 2009, with these exploration activities continuing to the present day.
        - South32 (and formerly BHP Group) has entered into long-term agreements (including agreements which extend beyond the current Dendrobium Mine approval) regarding the supply of coal to BlueScope and the ongoing use of the Kemira Valley Railway, which necessitates the need for the Project to maintain continuity of supply from the Dendrobium Mine.
        - Public consultation specific to the Project commenced in 2016, some 14 years before the end of approved mining operations of the Dendrobium Mine.

312. Schedule 3, Condition 3 of the existing Dendrobium Mine Development Consent (DA 60-03-2001) states in regard to water quality:

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> 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.

313. A similar condition has been imposed in the recommended Development Consent for the Project (Condition C1), therefore, the Project would be expected to continue to comply with such a condition given:
    - Studies and audits to date indicate the Dendrobium Mine complies with this condition.
    - Studies conducted for the Project indicate there would continue to be no greater than negligible reduction in the water quality in the Avon and Cordeaux Reservoirs.

314. Notwithstanding the above, given the proposed water quality offsets, the Project would satisfy the NorBE test even in the absence of clause 11A of the Sydney Drinking Water Catchment SEPP applying to it (i.e., if the view was taken that it was not "continuing development").

315. This is supported by the Surface Water Assessment (Appendix C of the EIS), which concluded (with no reference to the Project being “continuing development” and that clause 11A applied to it) that the Project would have a net neutral or beneficial effect on surface water quality.

316. In summary, the NorBE test is considered satisfied, regardless of whether or not the project is “continuing development”, given:
    - The Project subsidence-related impacts to water quality can be considered environmentally neutral, given spikes in metal concentrations occur naturally in the catchment, and the lack of evidence that localised effects to date have resulted in adverse impacts to drinking water supplies.
    - The proposed Project water quality offsets will be beneficial to water quality in the catchment.

Department’s Assessment

317. The SDWC SEPP requires the consent authority for the Project (i.e., the Commission) to be satisfied that the carrying out of the proposed development would have a ‘neutral or beneficial effect’ on water quality, commonly known as the NorBE Test (ARP 6.3.115)

318. WaterNSW’s advice stated that the EIS did not contain an adequate assessment against the NorBE test in respect of loads or concentration of metals in streams or reservoirs. South32 addressed WaterNSW’s concerns in its RTS and in later correspondence dated 15 June 2020 to the Department. However, WaterNSW expressed continuing concerns (ARP 6.3.116).

319. Changes to the Drinking Water SEPP in October 2017 clarified the standard that a development such as the Project must meet in order to satisfy the NorBE test. Since that date, the SEPP has provided for ‘continuing development’. Clause 11A(2) provides that:

> ***Continuing development*** *is any development (such as mining) for which development consent was limited to the carrying out of the development for a particular time or to a particular area or intensity, but which was likely to be the subject of future applications for consent for its extension or expansion.* (ARP 6.2.117).

320. The Department considers that the Project passes the ‘likelihood’ test that is embedded in this provision and accepts that the Project is continuing development under the Drinking Water SEPP. In this regard, the Department notes that South32’s current mining lease (CCL 768) is very much larger than the area for which it received development consent coal in 2002. The coking coal resources within CCL 768 have been known as a large scale and valuable resource since well before the grant of CCL 768 under the Coal Mining Act 1973 (ARP 6.2.118).

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321. Clause 11A(3) provides that "the carrying out of the proposed development will have a neutral or beneficial effect on water quality if it will have the same or a lesser adverse impact on water quality when compared to the adverse impact that the continuing development would have if it were extended or expanded under similar conditions as the existing development consent." (ARP 6.3.119)

322. In simple terms, clause 11A(3) requires that any new development consent to extract coal in Area 5 and Area 6 must be granted under conditions that do not cause a greater impact on water quality than the existing conditions of DA 60-3-2001. This test must be met in the context of an "extension or expansion", as set out in clause 11A(2) (ARP 6.3.120).

323. The Project involves an extension of the existing Dendrobium Mine, using the same extraction methods (i.e., longwall mining involving void widths of up to 305 m). No evidence has been provided by any agency or submitter to suggest that the proposed extraction would lead to different or greater water quality impacts than those associated with the existing mine (ARP 6.2.121).

324. Even if that were to be the case, the test required by the Drinking Water SEPP is not the nature, scale or extent of the water quality impacts (either during mining or following mine closure), but rather that the conditions of consent which apply to the existing mine must be (at least) maintained for the expansion or extension. That is, while consent conditions governing water quality may be maintained or strengthened, they cannot be weakened (ARP 6.3.122).

325. The existing consent for Dendrobium Mine (as modified) contains particular performance measures relating to water quality (ARP 6.3.123).

326. The Department is recommending conditions that have the same effect (ARP 6.3.124).

327. Based on the information contained in ARP 6.3.115 to 6.3.129 the Department is satisfied that the Project meets the NorBE Test.

Commission's Findings

328. The Commission has given consideration to the Drinking Water SEPP and whether the Project can be considered to be 'continuing development' under clause 11A(2).

329. The Commission notes that 'continuing development' under the clause 11A(2) of the SDWC SEPP is "*any development (such as mining) for which development consent was limited to the carrying out of the development for a particular time or to a particular area or intensity, but which was likely to be the subject of future applications for consent for its extension or expansion*".

330. The Commission accepts that the Project is an extension or expansion of the development the subject of the Development Consent under DA 60-03-2001 approved 20 November 2001 (July 2018 modification (MOD 8)) (**Existing Approval**).

331. In the Commission's view, the appropriate time in which to test the "likelihood" of the Project was as at the grant of the Existing Approval.

332. The Commission notes that Section 5.5 of the Applicant's EIS dated March 2001 stated that:

- *For the area covered by this application, pre-mining gas drainage is most unlikely to be required. Beyond this current area, **future mining will occur** in areas where gas drainage will be required unless technologies, which make it unnecessary, are developed. [Emphasis added]*

333. The Commission finds that this reference in the March 2001 EIS indicates that the extension or expansion of the development the subject of the Existing Approval was 'likely' for the purposes of clause 11A(2) of the SDWC SEPP.

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334. Given the Commission's findings that the Project was "likely", the Project meets the definition of 'continuing development' under clause 11A(2) of the Drinking Water SEPP.

335. Consequently, the applicable test under the Drinking Water SEPP is that at clause 11A(3), which requires the Commission to be satisfied that the carrying out of the Project will have the same or lesser adverse impact on water quality when compared to the adverse impact that the Project would have if extended or expanded under similar conditions as the Existing Approval.

336. In practical terms, the Commission's interpretation of clause 11A(3) of the Drinking Water SEPP applies this test by comparing how:

- the Project would impact water quality if it formed part of the development the subject of the Existing Approval and was subject to similar conditions to those in the Existing Approval (**Base Case**); and
- the water quality impacts if the Project were to be approved subject to conditions lawfully imposed by the Panel on the present Application mitigating and managing such impacts.

337. The Commission considers that given the broad scope of its conditioning power under the EP&A Act, if it had determined to grant consent to the Project, the Commission would be able to condition the Project in such a manner that it would not have any greater adverse effect on water quality than the "Base Case".

338. It is unnecessary to provide detailed hypothetical conditions on a hypothetical consent, but such conditions could include, inter alia, requiring the works the subject of the Applicant's terms of offer for the VPA to be carried out by the Applicant as a condition of consent.

339. Accordingly, the Commission finds that the NorBE test in the Drinking Water SEPP is satisfied with respect to the Project, notwithstanding the Commission's determination, on other grounds, to refuse consent.

4.17 Key Issue – Economic Considerations

Public Comments

340. Many public submissions highlighted the economic benefits of the Project being granted approval. Many Project supporters were employees, contractors or establishments related to the operations of the existing Dendrobium Mine. Other Project supporters were associated with coal mining and associated industrial and commercial activities within the Illawarra region.

341. In submissions from the Applicant's employees some of the following key points in relation to the Project were raised:

- Vital for keeping jobs and money in the Illawarra region for years to come
- Keep approximately 300 people employed for a substantial amount of time and indirectly employing thousands of other people
- Economic benefits to the Illawarra and surrounding communities
- Safe, sustainable mining
- Due diligence regards environmental impacts taken seriously
- Expansion will benefit the country
- As we transition to cleaner power generation it would be great to be able to use quality Australian steel to build the solar farms and wind turbines and corresponding infrastructure
- Keep Illawarra coal and Bluescope steelworks going
- The expansion will allow people to raise a family locally and continue growth in the region and spend money locally

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- Community groups benefit from donations
- A great place and company
- The country needs the money and the workers need the work
- Employment for future generations
- Mining practices are very community and environmentally sound, enabling safe and effective mining. Not impacting community or environment.

342. The following points were raised in the submission from Port Kembla Coal Terminal (PKCT):
    - PKCT is the region's only coal export terminal and employs around 100 employees and contractors, the majority of whom live in the Illawarra.
    - South32's Appin and Dendrobium operations export significant volumes of coal through PKCT each year and the loss of Dendrobium Mine as a PKCT user would have a demonstrable impact on the economic viability of our operation.

343. The following points were raised in the submission from the Illawarra Business Chamber (IBC), a peak business organisation and the regional chamber that supports businesses and local chambers across the Illawarra-Shoalhaven, primarily, as well the South Coast and Capital regions, and is a division of Business NSW:
    - The IBC supports the Project.
    - Mining is a critical contributor to the NSW economy
    - The IBC therefore considers it critical that the economic impact of the South32 proposal be considered by the Commission
    - The IBC notes the projected contributions to the state and local economies, as well as the potential additional economic opportunities into the future
    - In the Illawarra, the economic and employment benefits of mining are already significant. Alongside the four currently operating mines in the Southern Coalfields, BlueScope Port Kembla Steelworks, exports from Port Kembla and the businesses that support them are integral to the Illawarra's economy and the state. BlueScope's Port Kembla Steelworks and Springhill Works are reliant on ongoing and competitive supplies of coal for its continued viability.
    - The IBC trusts that the Commission is the appropriate body through which to reconcile contrasting views on the environmental impact of mine design and operations, and water management and impacts.
    - There is a long history of coal mining across the Illawarra. The proximate availability of metallurgical coal is integral to the Illawarra economy, as the operations of mining companies and steelmakers have significant downstream benefits in terms of jobs and investment.
    - While the mining industry does not represent a large portion of the Illawarra's workforce, its value creation through high wages and significant operational expenditure positions it as a cornerstone industry in the Illawarra and a key driver of the region's economic prosperity.

344. The following extract from page 6 of the submission from Australian Parents for Climate Action is related to the economics of the project:

    The majority (estimated at around two thirds) of Dendrobium's product is destined for remote markets, which substantially undermines the claim that proximity is a critical factor.

    We contend that BlueScope's Port Kembla facility could continue to thrive with substantially smaller local mining operations.

345. The following extract from page 5 of the submission from Undermined Inc is related to economics of the project;

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Undermined Inc submits the Dendrobium Extension Project unduly considers the short term economic benefits to mine owners South32 and Illawarra Metallurgical Coal, mine employees and NSW Government royalties at the cost of our publicly owned environment.

346. The following extract from pages 16 and 17 of the Lock the Gate submission related to economics:

In the 12-month period ending 30 June 2020, Dendrobium produced 3,767,563 tonnes of saleable coal. For the previous year, saleable coal produced at Dendrobium was 3,610,034 Mt. DPIE's AR reveals that in 2019 Dendrobium sold 0.505 Mt to Bluescope. Based on these numbers, the actual breakdown of saleable coal sold to Bluescope from Dendrobium for steel making would be around 13%. In other words, that year, 87% of the saleable coal went somewhere other than Bluescope.

347. The following extract from page 22 of the Lock the Gate submission related to the Wongawilli Seam extraction:

Coal mined from the Wongawilli Seam coal is a desired part of Bluescope's blend. Dendrobium is the only mine in the Southern Coalfield that currently produces Wongawilli Seam coal, however the Russell Vale UEP – if approved – would also produce Wongawilli Seam coal. The Dendrobium Extension Project would cease extraction from the Wongawilli Seam sometime "around 2024", when production would move to Area 5, which would extract coal solely from the Bulli Seam. South32 does not currently plan to recommence until around 2033." (BAEconomics report)

348. The following is an extract from a submission related to economics and climate change;

Based on the figure of $13.52 per tonne, the CBA [Cost Benefit Analysis] estimates that the total cost of GHG emissions from the Dendrobium extension will be $111 million (always remembering that this excludes scope 3 emissions). But the CBA is concerned with cost and benefits to NSW. It calculates the population of NSW is roughly one thousandth of the world's population. On this basis it attributes one thousandth of this cost to NSW. This implies that the other 99.9% of the costs will be borne by the rest of the world, including other states of Australia. In this way the economic benefits of the mine extension accrue to the population of NSW but the emissions costs are almost entirely externalised. This is, to say the least, a bizarre outcome. But in any case, it makes no sense from a climate change point of view. We are all in this together. The cost to humanity of climate change, if we fail to check it, will be enormous and quite incalculable.

Council & Government Agency Comments

349. In WCC's submission dated 18 September 2019, Council provided the following comments:

- Council recognises that the ongoing supply of metallurgical coal to BlueScope Steel's Port Kembla Steelworks is essential to the Illawarra economy. The steelworks at Port Kembla were originally developed due to proximity to the Southern Coalfields of the Illawarra.
- The EIS states that there is currently no economically viable, commercial-scale alternative to the use of metallurgical coal in the blast furnace method of steelmaking, which is employed at the Port Kembla Steelworks operated by Bluescope Steel.
- The steelworks consume around 3 million tonnes per annum of coal, 90 percent which is sourced from mines in the Illawarra region. The principal mines are South32's Dendrobium and Appin mines, Peabody's Metropolitan mine and the SIMEC Tahmoor mine.

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- Currently, the coal mined at Dendrobium (Wongawilli seam) is blended with coal from South32 Appin's mine (Bulli seam) to produce the 'Illawarra Blend' which is purchased by local and international steelmakers. However, it is unclear whether South 32 will continue to produce the 'Illawarra Blend' since the Bulli seam coal in the subject Dendrobium project (Area 5) appears to be the same composition as the Bulli seam coal from Appin mine.
- South32 currently supply around 60% of BlueScope Steelworks' metallurgical coal. Surplus coal is currently transported to the Port Kembla Coal Terminal, where it is transported to Liberty Primary Steel Whyalla Steelworks or for export. South32's operations also currently account for approximately 50% of throughput at the Port Kembla Coal Terminal.
- The Cadence Economics Economic Impact Assessment (EIA) report was included within the EIS. The Cadence report found the following potential benefits of the Project:
  - Continued employment for the existing Dendrobium workforce of 400 employees, and employment of a further 100 people for the Project.
  - The creation of 200 jobs during Project construction.
  - Continued support for local suppliers.
  - Continued payment of royalties, taxes and rates.
  - Contribution to the viability of Port Kembla Coal Terminal, as the majority of throughput is from South32's operations.
  - Benefits to the NSW Economy and Greater Wollongong region.
- Notwithstanding this, the current mine layout for the Project is likely to cause a number of adverse issues and impacts. In Council's view, the issues warrant a major redesign of the mine layout. This would enable the Project to minimise its impact, whilst allowing South 32 to continue to supply metallurgical coal to BlueScope Steel's Port Kembla Steelworks, Whyalla Steelworks and to the Port Kembla Coal Terminal for exporting of coal.

Applicant's Consideration

350. The approach taken by the Applicant's consultant Cadence Economics in preparing the Economic Assessment is described in the EIS.

351. The NSW Government *Guidelines for the economic assessment of mining and coal seam gas proposals, December 2015* (**Guidelines**) set out the CBA framework to measure the net benefits of a proposed mining project to the NSW community. This approach has been adopted in the economic analysis outlined in the Cadence Economics report.

352. Consistent with these guidelines, the EIA includes a Cost Benefit Analysis (CBA) and a Local Effects Analysis (LEA). The CBA provides an estimate of the net benefits of the proposed development to NSW. The LEA is based on analysis for the Dapto – Port Kembla local region (as defined by the Australian Bureau of Statistics SA3 (10701) region).

353. As detailed on Page 8, Appendix L-Economic Analysis of the EIS, the costs and benefits outlined in the Cadence Economics report include the costs and benefits from the operation of the Project only. These benefits may include the output and employment in sectors like the iron smelting and steel manufacturing industries that use coal as key inputs to the manufacturing process. Various mines in the Illawarra region, including the Dendrobium Mine, supply coal to the BlueScope Steelworks at Port Kembla. In addition, the analysis does not include any of the costs associated with coal use in NSW, including scope 3 greenhouse gas emissions.

354. Key findings of the Cadence Economics report are:

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- Based on the CBA methodology outlined in the Guidelines, and information provided by Illawarra Coal, the proposed development is estimated to provide a net benefit to NSW. This net benefit is estimated to be $1,073.2 million in net present value (NPV) terms. This is comprised of $497.8 million and $583.4 million in direct and indirect benefits respectively. The incremental indirect costs are estimated at $8.1 million. These estimates are based on central case assumptions in relation to the proposed $731.6 million capital expenditure (both mine development capital and replacement and sustaining capital) and average coal prices of $173.7 per tonne for metallurgical coal, $92.8 for thermal coal and $136.5 for Pulverised Coal Injection (PCI).
- The LEA considers the costs and benefits of the proposed development on residents of the Dapto – Port Kembla region of NSW. The analysis shows an estimated net benefit of $116.1 million to the Dapto Port Kembla region in NPV terms.
- In total the Project is projected to provide significant positive economy-wide impacts to both the local region of Dapto-Port Kembla and to NSW. In the Dapto-Port Kembla region, the Project is projected to increase gross regional product (GRP) by $2,382.8 million in NPV terms. For NSW, the projected increase in gross state product (GSP) is $2,285.8 million in NPV terms.
- Total employment in the region is projected to increase by 294 Full Time Equivalent (FTE) workers on average. The Project will employ 265 FTE workers on average, as a result 29 additional workers will be employed in other sectors of the economy in the Dapto-Port Kembla region, taking into account employment in supplier industries and any crowding out effects. Across NSW, employment is projected to increase by 329.9 FTE comprising 265 direct FTE and around 65 flow on FTE.

Department's Assessment

355. The Department noted that the Economic Assessment (EA) included with the EIS for the Project includes a Cost Benefit Analysis (CBA) and a Local Effects Analysis (LEA).

356. The Cost Benefit Analysis evaluated the potential net benefits of the Project to the State of NSW. With the exception of environmental costs, all benefits listed above were determined using market prices, as prescribed in the Guidelines. The environmental costs were assessed in accordance with the Technical Notes (ARP 6.10.8 and 6.10.9).

357. The Department obtained an independent review of the EA by BAEconomics, whose principal is Dr Brian Fisher, a previous director of the Australian Bureau and Agricultural and Resource Economics. Overall, BAEconomics concluded that the EA "is comprehensive and the analysis is of high quality" (ARP 6.10.6). Dr Fisher concluded that the EA is well presented, logically set out, comprehensive and consistent with the Government's *Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals (Guidelines) and its supporting Technical Notes* (ARP 6.10.20).

358. Based on the review by BAEconomics, the Department accepts that the EA is a comprehensive and detailed assessment that has been undertaken in accordance with the applicable Guidelines and accompanying Technical Notes (ARP 6.10.69).

359. The Project's potential downstream economic costs and benefits on BlueScope Steel and PKCT were not assessed in the EIS or the EA in any degree of detail because such specific impacts are outside the scope of the Guidelines. The Department considered that the potential implications of approval or refusal of the Project on other key economic entities in the Illawarra Region should be examined carefully as part of the Project's assessment. The Department therefore engaged BAEconomics to undertake a separate study of these potential implications (ARP 6.10.31).

360. Page 2 of the Review of the Key Economic Interactions between the Dendrobium Mine and Related Entities in the Wollongong Region dated July 2020 by BAEconomics states the following purpose of the study:

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- BAEconomics Pty Ltd was commissioned by the Planning & Assessment Group of the NSW Department of Planning, Industry and Environment (the Department) to prepare a detailed and expert assessment of the key economic interactions between the Dendrobium Coal Mine and the Appin Mine, BlueScope's steel-making operations at Port Kembla and Port Kembla Coal Terminal. In particular the assessment 'must assess the risks and uncertainties associated with disruption to these interactions, should the current approval for the Dendrobium Coal Mine (which expires in December 2030) not be extended through approval of the Project (proposed to finish coal extraction in December 2048).'

361. BAEconomics considered that there was a 'worst-case scenario' where 'cascading closures (of the Applicant's two mines) lead to both the cessation of coal exports through PKCT and the production of primary steel at BlueScope'. Using its derived multipliers, BAEconomics sought to estimate the overall cost to the economy should this happen (ARP 6.10. 55).

362. BAEconomics estimated that the total output loss for the economy, including flow-on effects, would increase to around $10.7 billion per year (ARP 6.10.58).

363. For the whole economy, the total job loss would increase to just under 25,000 workers. This is the sum of nearly 19,000 job losses induced by the output loss of 3 Mt of crude steel and 6,000 job losses induced by the output loss of coking coal (ARP 6.10.60).

364. The BAEconomics report identified that most of the major industrial entities in the Wollongong region are highly integrated and interdependent. While loss of any one of these key entities would hold significant ramifications for the others, the most critical interdependencies relate to the key inputs to the industrial chain. In this case, the Applicant's coking coal production is the key input to both BlueScope and PKCT. Of the Applicant's two mines, production from Dendrobium Mine (i.e., Wongawilli Seam coal) is the most difficult to replace (ARP 6.10.71).

365. In the absence of approval of Wongawilli Seam production from any other mine, the Department concluded that approval of the Project is critical to the ongoing health and productivity of the key industrial entities of the Wollongong region and to the overall health of its economy and employment (ARP 6.10.72).

Commission's Findings

366. The approach taken by the Applicant's consultant Cadence Economics in preparing Economic Analysis is described in the EIS and summarised above. The Department commissioned BAEconomics to undertake an independent review. Overall, BAEconomics concluded that the EA "*is comprehensive and the analysis is of high quality*" (ARP 6.10.6). The Commission accepts this conclusion.

367. The Commission notes the Project's significant economic benefits identified in the Cadence Economics report and summarised in paragraph 354 above.

368. As stated by the Department in paragraph 359 above, the Project's potential downstream economic costs and benefits on BlueScope Steel and PKCT were not assessed in the EIS or the EA in any degree of detail because such specific impacts are outside the scope of the Guidelines. The Department considered that the potential implications of the Project on other key economic entities in the Illawarra Region should be examined carefully as part of the Project's assessment in the event of the Dendrobium Mine not being extended to 2048 and therefore commissioned BAEconomics to investigate this issue.

369. The Commission notes the BAEconomics report had a very specific scenario to assess for the Department, which was beyond the requirements of the Guidelines. The Commission also notes the economic benefits of the water supply catchment to the Illawarra and Greater Sydney regions and the costs of scope 3 GHGE are equally important considerations.

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370. The Commission notes that Dendrobium Mine supplied 0.505 Mt of coking coal to BlueScope Steelworks in Financial Year 2019 and that this represented approximately 20% of the 2.5 Mt required by BlueScope Steelworks in Financial Year 2019 as stated by the Department in paragraph 19 above.

371. The Commission notes that in Financial Year 2019 Dendrobium Mine trucked 1.7 Mt of coking coal from Dendrobium CPP to PKCT for export and supplied BlueScope Steel with 0.505 Mt of coking coal (as stated by the Department in Paragraphs 21 and 22 above). This indicates that, based on the combined coking coal volume of 2.205Mt from Dendrobium Mine, approximately 77% was exported for use outside the Illawarra Region.

372. The Commission found the coking coal volumes to be consistent with statements in the ACCC document titled 'Statement of Issues – South32 proposed acquisition of Metropolitan' dated 23 February 2017, which is referenced in the EIS, as follows:

- Paragraph 16 of the document states that in Financial Year 2015-2016 "*approximately 70-80 per cent of the coking coal produced by South32 is exported*" (Paragraph 16)
- "*Australia accounts for approximately 60 per cent of global coking coal exports and produced an estimated 188 million tonnes in the 2015-16 financial year*" (Paragraph 32).
- "*A vast majority (95 per cent) of the coking coal produced in Australia is exported to international customers, including to China, Japan, South Korea, Europe and India*" (Paragraph 33).

373. The Commission agrees with the statements in paragraphs 370 and 371 that the coal from Dendrobium Mine does contribute to steel making at Bluescope Steelworks but is primarily destined for other markets beyond the Illawarra Region.

374. Based on Figure 3-4 Indicative Project Schedule contained in the Applicant's Amendment Report dated August 2020, development of the Wongawilli Seam (Area 6) is scheduled to commence in 2037 and longwall mining of the Wongawilli Seam (Area 6) is scheduled to commence in 2043. The Applicant's Project Schedule does not correlate with the significance of Wongawilli Seam coal as suggested in ARP 6.10.71 and ARP 6.10.72.

375. The extract of the BAEconomics report *Review of the Key Economic Interactions between the Dendrobium Mine and Related Entities in the Wollongong Region* (Page 8) prepared for DPIE and referred to in the Lock the Gate Submission in paragraph 347 above also indicates that the Applicant would cease extraction from the Wongawilli Seam sometime "around 2024".

376. The Commission is of the view that the dependence of Bluescope on Wongawilli seam coal from the Dendrobium Mine is unclear given that an alternative source of Wongawilli seam coal would need to be found after the proposed cessation of longwall mining at Dendrobium Mine in 2024 even if the Project was approved. This is based on the Applicant's mining schedule of Area 5 (Bulli seam) from 2024, followed some 19 years later by Area 6 (Wongawilli seam).

377. For the reasons set out above, the Commission does not accept the Applicant's characterisation of the ongoing economic contribution of Wongawilli Seam coal from the Dendrobium Mine.

378. The Commission finds that the Project will have beneficial economic impacts, but that these beneficial impacts do not sufficiently outweigh the adverse environmental and other impacts of the Project if approved, as set out in the Commission's other findings in these reasons. Consequently, the Commission has determined to refuse the present Application before it.

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4.18 Key Issue – Bushfire

Public Comments

379. A presentation on Day 3 of the Hearing provided comment regarding the study of ecosystem collapse with particular reference to Upland Swamps. This can be found in paragraph 218.

Council & Government Agency Comments

380. In the WaterNSW submission to the Commission the following key points regarding bushfire were raised:

- 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 Mining Panel (including its swamp expert) did not comment on the Applicant's estimate of maximum potential impact (including fire risk) or the quantum of proposed offsets.

381. BCS's letter dated 3 March 2020 advising on the RtS for the Project provided the following key comment:

- Undermined swamps impacted by a significant fire event are extremely likely to be desiccated and incapable of rehabilitation, as informed by recent site visits to impacted swamps on the Newnes Plateau (Attachment B of submission).

Applicant's Consideration

382. Bushfire risk and management is discussed in the EIS. Section 6.22 – Hazard and Risk addresses this issue. Key points identified include:

- The proposed ventilation shaft sites as well as the majority of proposed Area 5 and Area 6 are within the jurisdiction of the Wollondilly/Wingecarribee Bush Fire Management Committee.
- Major fire activity in the vicinity of the Dendrobium Mine, including the Illawarra Escarpment and WaterNSW Special Areas occurred on a number of occasions since September 1939, with the most recent uncontrolled bushfire event occurring in the area proximal to existing Shaft No. 1 in September 2003. These fires coincided with extended dry periods coupled with hot and windy conditions.
- Bushfire risk management measures are currently employed at the Approved Mine as part of the existing Bushfire Management Plan.
- The Applicant would continue to consult with WaterNSW with respect to management of bushfire risk activities within the Special Areas.

Department's Assessment

383. Some swamps may also be at greater risk of erosional scour and gullying or even burning out during bushfires in very dry periods (AR, page viii)

384. The IESC sought further information (which does not appear to have been provided) in relation to:

- further consideration of the potential risk of increased bushfire impacts on dried upland swamps, both individually and at the landscape scale, given that 25 upland swamps would be undermined and therefore at higher risk of drying (ARP 6.6.53).

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385. In respect of bushfire risks to swamps, the RtS stated the Applicant would continue its existing bushfire risk management activities, in accordance with the Mine's existing Bushfire Management Plan and consult with WaterNSW. The Department considers that Swamp Monitoring Programs (required as a component of each Extraction Plan) should pay special attention to the risk of erosional scour, gullying and risk of peat burns (ARP 6.6.58).

386. While BCS's advice contains statements regarding the possibility of significant scour events in undermined swamps and refers to the recent total loss of two upland peat swamps (Carne West and Gang Gang) above the Springvale Coal Mine on the Newnes Plateau in the Western Coalfield, following a sequence of undermining, drainage, desiccation, drought and bushfire; it has not made out the case that all Upland Swamps undermined by the Project (or indeed elsewhere at Dendrobium Mine or in the Southern Coalfield) are likely to suffer the same fate (ARP 6.6.21).

IAPUM Comments

387. The IAPUM made the following conclusion with respect to bushfires and swamps:

- 39. The risks of permanent loss of swamps due to the combination of mining impacts and severe bushfire need to be further considered in the context of the impacts of the 2019-2020 bushfires observed at other locations.

Commission's Findings

388. The Commission understands that the Applicant's approach towards bushfire risk for the Project would be the same as the approach for its existing operations.

389. The Commission finds that insufficient consideration has been given to long term climatic predictions using sources such as the NSW and ACT Regional Climate Modelling (NARCliM) project and how this can impact the risks of bushfire.

390. The Commission also finds that insufficient consideration has been given to comparable scientific research regarding the impacts of bushfire on Upland Swamps impacted by mining subsidence.

391. The Commission therefore finds that the Applicant's and the Department's assessment of bushfire risk is inadequate. The Commission acknowledges that as a result of potential changes in climate, bushfires are likely to be more severe and more frequent.

392. The Commission is therefore of the view that the assessment of bushfire risk does not sufficiently address the potential bushfire impacts of the Project on the Metropolitan Special Area. Moreover, the assessment of bushfire risk is not consistent with the principles of ESD and the Objects of Act contained in Section 1.3 of the EP&A Act, particularly objects (a), (b), (c) and (e).

4.19 Objects of the EP&A Act and Public Interest

4.19.1 Objects of the EP&A Act

393. The Commission has assessed the Project against the relevant Objects of the EP&A Act in Section 1.3 which are as follows:

(a) to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources;

(b) to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment;

(c) to promote the orderly and economic use and development of land;

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(e) to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats; and

(f) to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage),

394. Special Areas are the protected catchment lands surrounding the water storages and are critical controls in the supply of quality water. They also play a key role in protecting Aboriginal cultural heritage values and ecological integrity. The Project's coal reserves are located beneath the Metropolitan Special Area, which is critical to water supply for the existing and future populations of the Macarthur and Illawarra regions, the Wollondilly Shire and Metropolitan Sydney. The Special Areas promote the social and economic welfare of the community and a better environment. They also manage and conserve the State's natural and other resources including water, biodiversity and Aboriginal cultural heritage resources. The function of the Special Areas is in accordance with objects (a) and (f) as described in paragraph 355.

395. It is proposed to extract the coal using the mine's current longwall mining method with panel widths up to 305 metres wide (for 18 of the 21 panels) and up to 3.9 metres high. Significant conventional and non-conventional subsidence and surface to seam cracking is predicted to significantly impact the existing landscape, surface and groundwater environment, biodiversity and Aboriginal cultural heritage. The impacts identified are potentially significant, long term (possibly in perpetuity) and irreversible. Avoidance and minimisation measures in the mine design have primarily been limited to Avon and Cordeaux Dams, four named watercourses (Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek) and 57 "key stream" features as identified by the IAPUM (conclusion 33, paragraph 207) appear to have been nominated by the Applicant. Remediation measures have been found to have limited benefit. Mitigation measures such as financial compensation and biodiversity offsets have been proposed. There has been difficulty in confidently quantifying the extent of these impacts and the appropriateness of the mitigation measures. By adopting this mine design, the Applicant is placing a greater importance upon maximising coal resource extraction over the enduring need to protect the catchment lands to secure a quality water supply for Greater Sydney and the Illawarra and the other important roles that Special Areas play. This is contrary to object (b), as described in paragraph 393, and the principles of ESD.

396. In terms of achieving a better environment by proper management of the State's natural resources as required by object (a), as described in paragraph 393, this Project fails to protect the landscape, biodiversity and Aboriginal cultural heritage given the extensive cracking and subsidence proposed. The water resources are as important as the coal resources (if not more so). This outcome for the social and economic welfare of the community and the State's natural resources are not proposed to be well managed. The significant environmental impacts that would result if the Project proceeds as proposed do not promote the orderly and economic use of the Metropolitan Special Area's important functions and is contrary to object (c), as described in paragraph 393.

397. Object (e), as described in paragraph 393, is not achieved as much of the environment is not protected. Rather the environment is proposed to be negatively impacted from cracking and subsidence which would especially impact threatened and other native species. It is not possible to effectively remediate the values and functions of waterways impacted by subsidence. It is doubtful it is possible to provide like for like offsets for Upland Swamps.

398. Object (f), as described in paragraph 393, is not achieved as Aboriginal cultural heritage is not proposed to be sustainably managed. BCS raised these concerns during the assessment process. It is also evidenced by the feedback provided in the Illawarra LALC submission. The negative impacts on the landscape are of great concern and importance to indigenous Australians.

399. For the reasons set out above, the Commission is of the view that the Project is not consistent with these Objects of the EP&A Act.

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4.19.2 The Public Interest

400. Through the Public Hearing and submissions process, the Commission received a large number of submissions in support of the Project. Many of these submissions were from employees, contractors and establishments associated with the operations of the Applicant. Objections were submitted by directly-impacted community members, other individuals, experts, interest groups and bodies, and from within the local area, across NSW and from other jurisdictions. The Commission, like all consent authorities, must consider community concerns regarding development applications, however, the number of submissions that support or object to a proposed development is not the only measure of the public interest which the Commission is bound to consider.

Ecologically Sustainable Development

401. The Commission was also encouraged in public submissions to refuse the Application on the grounds it does not satisfy the principles of ESD. It was submitted that a range of risks to the environment triggered or engaged the precautionary principle in a way that the proportionate response to those risks was said to be a determination of the Project by a refusal. As outlined in this Statement of Reasons, the Commission agrees that the risks of the Project warrant refusal.

402. Section 4.15 of the EP&A Act sets out matters that the Commission as decision maker is bound to take into account to the extent they are relevant to the determination of the Project. Included in the relevant matters are the likely impacts of the Project, including "environmental impacts" (s 4.15(1)(b)), and the "public interest" (s 4.15(1)(e)). The principles of ESD are relevant to the Commission's determination on an assessment of the "Key Impacts" (see from Section 4.6 to Section 4.14), as is reinforced by the objects of the EP&A Act which include the facilitation of ESD (s 1.3(b)), and the protection of the environment (s 1.3(e)). The EP&A Act adopts the definition of ESD found in the Protection of the Environment Administration Act 1991, as follows:

ecologically sustainable development requires the effective integration of social, economic and environmental considerations in decision-making processes. Ecologically sustainable development can be achieved through the implementation of the following principles and programs:

(a) the precautionary principle…
(b) inter-generational equity…
(c) conservation of biological diversity and ecological integrity…. and
(d) improved valuation, pricing and incentive mechanisms.

403. The Commission has given consideration to the principles of ESD in its assessment of each of the "Key Impacts" as set out in sections 4.9 to 4.18. The aspects of ESD considered include those set out in the paragraphs immediately following:

a) the precautionary principle;

The precautionary principle is triggered where both of the following preconditions are satisfied:

(a) There is a threat of serious or irreversible environmental damage; and

(b) There is scientific uncertainty as to the environmental damage.

404. The Commission finds that both of these preconditions are met in respect of the present Application.

405. Appendix G of the Department's AR, states that the EIS contains a substantial number of specialist environmental impact assessments and also an Environmental Risk Assessment and a Preliminary Hazards Assessment. The Project would result in a number of environmental impacts, with the key impacts that could cause serious or irreversible environmental damage being impacts on important water resources and biodiversity values.

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406. The Department considers that the recommended performance measures and other conditions of consent would provide appropriate protection for the sensitive water resource and environmental values of the Metropolitan Special Area, including the catchments and dam walls of the Avon and Cordeaux Dams, and minimise the potential for any serious or irreversible environmental damage. The Commission does not agree.

407. The Department claims that there is "*sufficient scientific certainty*", yet as the IAPUM points out while ever the sealing of the mine after closure is doubtful, there is significant uncertainty relating to a range of issues including the potential loss of surface water from the catchment in perpetuity.

408. The evaluation of alternative mine plan options presented in the EIS seeks to maximise the efficient recovery of coal resources and has not sought to avoid or minimise to the greatest extent practical the significant subsidence impacts which have been identified.

409. The Commission has considered the evidence before it with respect to the potential for serious or irreversible harm, predominantly in association with the mine plan's subsidence and related impacts upon surface and groundwater, biodiversity, Upland Swamps and Aboriginal cultural heritage. Based on the material before it, the Commission is of the view that the risk of the Project causing serious or irreversible environmental damage is considerable. The high level of threat is such that the Commission considers that a proportionate response – in light of the benefits of the Project – would be refusal of the Project. The threats or risks to the environment in the material and submissions before the Commission raise serious concerns about their ability to be mitigated and monitored by conditions.

410. The Commission notes that the nature of this Project means there is a high degree of uncertainty relating to its impacts due to the information available on the extent of subsidence and resultant impacts upon surface and groundwater, biodiversity, Upland Swamps and Aboriginal cultural heritage.

411. The Commission is not satisfied that the range and magnitude of the impacts has been appropriately categorised and assessed.

412. In this case, a monitoring and adaptive management approach is not capable of properly reducing or mitigating areas of uncertainty in respect of the present Application.

(b) inter-generational equity;

413. There are three principles that underpin intergenerational equity, namely the conservation of options (maintain the natural and cultural diversity), the conservation of quality (maintain the quality of the earth) and the conservation of access (maintain access to the natural and cultural resources of the earth).

414. The Commission is of the view that maintaining the unique values and functions of the Metropolitan Special Area as detailed in Section 4.2 have contributed and will continue to contribute to inter-generational equity.

415. The Commission is of the view that the Metropolitan Special Area is subject to strict development and access controls which respond to the inter-generational equity and:

- maintain conservation options for natural diversity and cultural diversity of sites of Aboriginal cultural heritage sites and the contextual landscape
- respond to conservation of quality through maintaining the quality of the earth
- respond to conservation of access to the natural and cultural resources of the earth.

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416. Appendix G of the Department's AR states: the Department accepts that it is important to protect the very sensitive environmental, water resource and cultural values of the Metropolitan Special Area for the benefit of future generations; acknowledges that the mining of coal and its combustion is a major contributor to anthropogenic climate change, which has the potential to impact future generations and that the Scope 3 emissions for the Project are significant.

417. In relation to intergenerational-equity, again the loss of good quality water for future generations of Greater Sydney and the Illawarra Regions, the loss of biodiversity and Aboriginal cultural heritage all combine to a significant loss that one generation would be passing on to future generations. The present Application is therefore not consistent with the principle of inter-generational equity.

(c) conservation of biological diversity and ecological integrity

418. Appendix G of the Department's AR states: the Project's potential impacts on biodiversity have been an important consideration in the Department's assessment of the Project. The Department considers that these impacts can be mitigated and/or offset to achieve beneficial long-term biodiversity outcomes in the region. South32 has committed to provide an offset package, comprising retirement of the required ecosystem and fauna species credits and residual payments into the Biodiversity Conservation Trust's (BCT's) Biodiversity Conservation Fund (BCF) for its biodiversity impacts. The Commission does not consider the Applicant's proposed offset package to fully address the impacts of the Project.

419. In respect to biodiversity and ecological integrity the Department argues that the Applicant's offsets and mitigation measures are adequate. However, the lack of like for like offset for the loss of Upland Swamps and the issues raised by BCS in paragraphs 220 and 221 raises concerns about whether the offsets and mitigation measures proposed are sufficient.

420. Remediation of stream features have been found to be of limited benefit and are clearly not effective in restoring stream values and functions.

421. For the reasons outlined above, the Commission is satisfied, the present Application will have significant impacts on listed threatened species and threatened ecological communities. The draft conditions do not provide appropriate mechanisms by which to identify, avoid and mitigate biodiversity impacts.

(d) improved valuation, pricing and incentive mechanisms

422. Appendix G of the Department's AR states; the Department's assessment has sought to apply the 'polluter pays principle', insofar as South32 would be required to pay to offset its biodiversity impacts and remediate its potential significant environmental impacts. The environmental costs of the Project have been addressed in detail and quantified to the degree possible in the CBA prepared as part of the EA for the Project. The direct environmental effects of the Project would be internalised through the adoption and funding of the mitigation measures proposed by South32 or otherwise required by conditions to mitigate, remediate or offset them.

423. The Improved Valuation ESD Principle is addressed by the Department by referring to the Polluter Pay Principle and referencing compensation and offsets. Again, this argument is flawed if for example the water offsets are not able to be quantified accurately and extend in perpetuity. In these circumstances the monetary compensation cannot be comprehensibly and appropriately calculated.

Commission's findings regarding the public interest

424. In summary, the Commission finds that the Project is not consistent with the Objects of the EP&A Act, the Public Interest and the principles of ESD, because the Project, if approved, would not achieve an appropriate balance between relevant environmental, economic and social considerations.

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425. The Commission finds that on balance, and when weighed against the relevant objects of the EP&A Act and ESD principles, the impacts associated with the Project are not appropriately manageable, and the risks of adverse impacts on the environment are high and likely to be irreversible. Therefore, the Commission finds, notwithstanding the likely benefits, that a refusal of the present Application is in the public interest.

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5 CONCLUSION: THE COMMISSION'S FINDINGS AND DETERMINATION

426. The views of the community were expressed through public submissions and comments received (as part of exhibition and as part of the Commission's determination process), as well as in oral presentations to the Commission at the public hearing. The Commission carefully considered all of these views as part of making its decision. The way in which these concerns were taken into account by the Commission is set out in Section 33.

427. Area 5 and Area 6 are located in the Metropolitan Special Area. Special Areas are lands declared under the *Water NSW Act 2014* for protecting the quality of stored waters, whether intended for drinking or other purposes, and maintaining the ecological integrity of that land. The Commission acknowledges that this is a highly sensitive and significant receiving environment and is of great importance to NSW and its citizens.

428. The Commission has carefully considered the Material before it as set out in Section 4.6. Based on its consideration of the Material, the Commission finds that the Project must be refused for reasons set out in this Statement, including:

Mine Design

- the mine design is a primary determinant of impact for the Project and subsidence cracking would cause infiltration of surface water from Upland Swamps, watercourses, and the water table. A significant proportion of this water would continue to infiltrate through fractured rock strata and reach the mine;
- inadequate consideration has been given in the EIS to the environmental assessment of alternative mine designs, the risk evaluation of options and associated environmental impacts;
- the Commission does not consider that the mine design and predicted impacts of this Application to be acceptable in the Metropolitan Special Area;

Subsidence

- the likelihood of significant subsidence (cracking) impacts from the proposed longwall mining in Area 5 and Area 6 is high, largely due to the mine design. The Commission finds that the consequences of subsidence impacts are long term and the severity of damage to the landscape, water resources (ground water, surface water and watercourses), biodiversity (including Upland Swamps) and Aboriginal cultural heritage values are potentially irreversible;
- the Project would cause 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 which are inconsistent with WaterNSW's statutory role to protect and enhance the quality and quantity of water in declared catchment areas and its Mining Principles;
- the extent and nature of the predicted subsidence, the lack of adequate risk assessment and uncertainty as to appropriate setbacks and impacts of alternative mining panel widths is unacceptable and incapable of being sufficiently addressed by conditions of consent;

Groundwater

- there is uncertainty as to how close to pre-mining levels the regional groundwater table which support the surface water flows, will return to after mining or how long this will take. The Commission also finds that there is uncertainty as to mine outflow volumes and quality following mine closure and repressurisation. The Commission does not consider the uncertainties to be acceptable.

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Surface Water

- there is uncertainty with mine closure planning, including whether it is possible to seal the mine and the long term and potentially irreversible impact upon the quantity and quality of surface water in perpetuity;
- there is uncertainty in accurately quantifying water losses and hence it is not possible to assess the appropriateness of the Applicant's proposed financial offset for surface water losses and water quality impacts;

Biodiversity & Upland Swamps

- the subsidence effects of longwall mining would impact upon the hydrological regime and hence result in drier conditions for up to 46 Upland Swamps and 25 watercourses in or near Area 5 and Area 6;

Aboriginal Cultural Heritage

- the Project is likely to harm multiple Aboriginal cultural heritage sites, including a number of sites of high Aboriginal cultural and scientific significance;

Economic Considerations

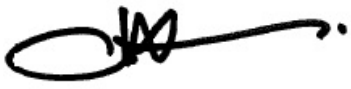
- the dependence of BlueScope on Wongawilli Seam coal from the Dendrobium Mine is unclear given that an alternative source of Wongawilli Seam coal would need to be found after the proposed cessation of longwall mining at Dendrobium Mine in 2024 even if the Project was approved;
- the Project will have beneficial economic impacts, but these beneficial impacts do not sufficiently outweigh the adverse environmental and other impacts of the Project if approved;

Objects and Public Interest

- the two preconditions of the precautionary principle are met by the Project and monitoring and adaptive management is not capable of properly reducing or mitigating areas of uncertainty in respect of the present Application;
- in relation to intergenerational-equity, the loss of water for future generations of Greater Sydney and the Illawarra Regions, the loss of biodiversity and Aboriginal cultural heritage all combine to a significant loss that one generation would be passing on to future generations. The present Application is therefore not consistent with the principle of inter-generational equity;
- the Project is not consistent with the Objects of the EP&A Act, the Public Interest and the principles of ESD, because the Project, if approved, would not achieve an appropriate balance between relevant environmental, economic and social considerations;
- on balance, and when weighed against the relevant objects of the EP&A Act and ESD principles, the impacts associated with the Project are not appropriately manageable, and the risks of adverse impacts on the environment are high and likely to be irreversible. The uncertainty of the impacts of the Project, notwithstanding the likely benefits, warrant the conclusion that a refusal of the present Application is in the public interest.

429. The reasons for the Decision are given in the Statement of Reasons for Decision dated 5 February 2021.

Mr Stephen O'Connor (Chair)
Member of the Commission



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