Dendrobium Extension project

IPC Public Hearing

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Approvals & Licences

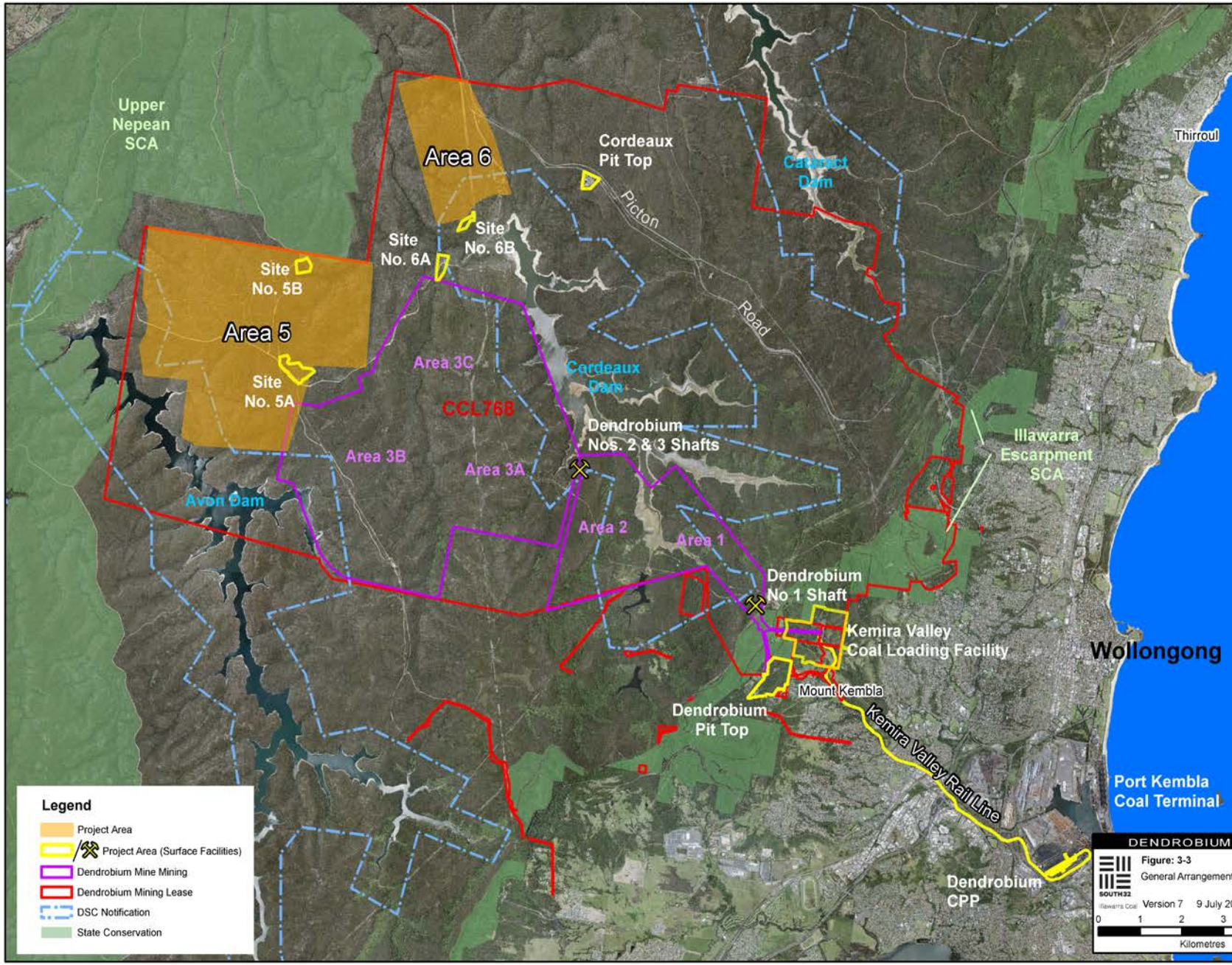
- Planning Approval (EP&A Act) – Independent Planning Commission
- Commonwealth Approval (EPBC Act) – Minister for the Environment
- Other Approvals:
  → Mining lease – *Mining Act 1992*
  → Environment protection licence – *Protection of the Environment Operations Act 1997*
  → Water access licences – *Water Management Act 2000*

Existing Operations

- Existing underground longwall mine approved in 2002 following a Commission of Inquiry
- Consent allows extraction of 5.2 Mtpa of coal from the Wongawilli Seam
- Coal is blended with coal from South32's Bulli Seam Operations near Appin to produce premium hard coking coal
- Blended coal used to produce iron and steel at BlueScope's Port Kembla Steelworks and shipped from Port Kembla Coal Terminal for steelmaking operations in Whyalla and internationally
- Employs around 400 people
- Currently mining in Area 3B (see map)

Dendrobium Extension Project

- Continuation of existing longwall mining for another 18 years (to 2048)
- Two new areas (Areas 5 and 6)
- Additional 77.2 Mt of coking coal at up to 5.2 Mtpa
- Relying primarily on existing facilities
- Capital investment of almost $1 billion
- Continuing employment for 500 people plus 200 additional jobs during construction



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Engagement

- EIS exhibited for 56 days from July to September 2019
- 759 community and interest group submissions
  - → 603 in support (79.4%)
  - → 154 in objection (20.3%)
  - → 2 providing comments
- Advice from 16 State and local Government agencies and related entities
  - → one key objection (WaterNSW)
  - → Wollongong City Council and Wingecarribee Shire Council did not object
  - → Wollondilly Shire Council did object
  - → adopted agency recommendations, where applicable
  - → consulted all key State agencies on conditions

Independent Expert and Key Agency Advice

- Independent expert advice
  - → *Water Resources* - Commonwealth Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)
  - → *Subsidence Impacts* - Advisory Panel on Underground Mining (the Mining Panel)
  - → *Costs of alternative longwall layouts* - MineCraft Consulting Pty Ltd
  - → *Review of EIS's Economic Assessment* – BAEconomics
  - → *Review of the Key Economic Interactions between the Dendrobium Mine and Related Entities in the Wollongong Region* – BAEconomics
- Key agency advice
  - → WaterNSW and Dams Safety NSW
  - → Department's Division of Biodiversity Conservation and Water Group
  - → Resources Regulator, Subsidence Advisory NSW and Minerals Energy Geoscience
  - → EPA, Heritage Council, NSW Health, Roads & Maritime Services, Rural Fire Service

Mitigation Measures Built into Project Design

- South32 has adopted the following key *avoidance* measures in its mine design:
  - → choosing not to pursue mining in its Areas 4A, 4B and 4C (northeast of Lake Cordeaux and containing high concentrations of upland swamps)
  - → minimum 1,000 m setbacks from the walls of Avon Dam and Cordeaux Dam
  - → 300 m setbacks from the Full Supply Level (FSL) of Lake Avon and Lake Cordeaux
- South32 has adopted the following key *minimisation* measure in its mine design:
  - → 50 m and 100 m setbacks from all identified “key stream features”, ie all pools containing more than 100 m^3 of water or waterfalls or steps greater than 5 m in height with a pool at the base
- South32 has adopted the following *compensatory offset* measures in its Project:
  - → offsetting all surface waters taken as a result of mine subsidence
  - → offset package to compensate for water quality impacts
  - → offsetting all predicted impacts on Coastal Upland Swamp TEC as a result of mine subsidence
  - → offsetting all impacts on threatened fauna, endangered ecosystems and other native vegetation as a result of either mine subsidence or required clearing (mainly for new ventilation shafts)

Key Assessment Issues

1. *Mine Design* - particularly the proposed longwall void width of 305 m
2. *Loss of Water* – acceptability of water supply losses from Sydney drinking water catchment and whether these impacts can be reduced and/or offset
3. *Water Supply Infrastructure* - particularly the Cordeaux and Avon Dams
4. *Benefits of the project* - including the likely economic and social costs if the project does not proceed

Width of Longwalls

- This is the critical assessment issue, which the Department considered extremely carefully
- Most people think that by narrowing longwall void width, there is an automatic reduction in surface subsidence impacts
- The general perception is “the narrower the longwall, the better”, but this is not correct
- The reason is because subsidence impacts at the surface are caused by two separate mechanisms, and only one of these is directly proportional to longwall width
- It is true that the impacts of “conventional subsidence effects” (ie compressive and tensile strains and tilts) vary more or less proportionally to longwall void width
- On an entirely flat and regular surface, subsidence cracks resulting from “conventional subsidence” will reduce in number, width and depth when longwall void width is reduced
- However, on a surface which is incised with valleys, the other “non-conventional subsidence effects” (ie compressive strains associated with valley closure, also leading to “upsidence”) will dominate within all valleys, whether steeply incised or not.

Width of Longwalls

- This means that ALL watercourses would have significant cracking even with very narrow longwall width (~ 150 m)
- The same is true for all swamps located within valleys - whether “valley infill” swamps or headwater swamps on sloping valley sides
- This can be seen at Metropolitan Mine, which has resulted in some cracking of watercourses and swamps, even though void width is just 163 m, the mine is much deeper than Dendrobium and the height of extraction in the Bulli Seam is less than at Dendrobium in the Wongawilli Seam
- Therefore, the true environmental benefit of reduced longwall width is not to significantly reduce surface impacts
- Instead, it is reducing the “height of cracking” extending upwards from the mined coal seam, leading to a “constrained zone” of solid rock between the mine and the surface
- This prevents migration of surface water and groundwater down to the seam, but does not reduce surface cracking and drainage impacts
- Surface waters would still drain from waterways, but mostly to 10-30 m depth, rather than to the mine

Width of Longwalls

- Therefore, the Department's assessment was that reducing longwall width *would not* greatly reduce surface impacts above Dendrobium Mine, particularly in watercourses and swamps - which are the most valued features for many members of the community
- Once it was clear that the environmental impacts of the project were relatively fixed (apart from loss of surface water) the Department considered the economic impacts of narrowing longwall void width
- The Department sought assistance from MineCraft Consulting Pty Ltd, which is one of Australia's two foremost consultants in economic valuation of underground mining layouts
- MineCraft provided costings for every part of the longwall development and extraction process at Dendrobium. These costs vary significantly according to the longwall layout
- So called "development costs" (mains development and longwall gateroads) are always done at a loss and only the longwall itself actually produces a positive cash flow
- It therefore follows that narrower panels have higher development costs than wider panels
- The differences are very significant

Costs of Reducing Longwall Widths

Project Net Present Value – Panel Width vs Coal Sales Price *(Source: MineCraft)*

Panel Width	NPV_7 -10%	NPV_7
300 m	$329 M	$667 M
275 m	$238 M	$568 M
250 m	$139 M	$464 M
225 m	$45 M	$368 M
200 m	-$73 M	$244 M
175 m	-$304 M	$27 M
150 m	-$496 M	-$125 M

Average Sales Prices		
USD/t	99	110
AUD/t	141	157

Does reduced longwall width give better outcomes?

- So the bottom line from this assessment was that reducing panel width comes at a very significant economic cost – roughly $100 million per 25 m reduction down to 225 m and then steeply increasing until project NPV is fully absorbed at about 175 m
- The next key question is whether these costs are worth the environmental benefit that would result
- At all these widths, surface impacts would be largely similar and only catchment losses would be prevented
- But South32 has committed to offset (to pay compensation) for any loss of surface waters
- The current value of this compensation is $103 million
- Put another way, South32 has absorbed the cost of a 25 m reduction in panel width and is proposing to pay that money to the Government

Does reduced longwall width give better outcomes?

- The EIS's Groundwater Assessment modelled losses of surface waters on very conservative or worst-case assumptions to avoid concerns about any uncertainty in the predictions, including:
  - → "seam to surface" fracturing wherever void width is 305 m, regardless of seam extraction height or depth of cover
  - → applying the conservative Tammetta equation to estimate height of fracturing for the 2.5 longwalls with proposed narrower void widths
  - → modelling all surface drainage lines as "constantly flowing" (and therefore able to leak to the subsurface) even if those streams are ephemeral and would have ceased to flow
  - → no allowance for horizontal flow in the surface cracking zone and later re-emergence downstream

Does reduced longwall width give better outcomes?

- On this basis the Groundwater Assessment modelled project take of surface waters to increase to a maximum of 5.3 ML/day (just over 2 full Olympic-sized swimming pools) or 1,935 ML/year
- This is 0.7% of average annual inflows to Pheasants Nest Weir, which receives water from Avon, Cordeaux and Nepean Dams
- South32's proposed water offset package is based on Sydney Water's retail prices (*not* WaterNSW's wholesale price), as fixed from time to time by IPART. These prices are $2,300/ML (normal years) and $3,120/ML (drought years, estimated as one in ten). WaterNSW's current wholesale prices for water supply to Sydney Water vary from $69.49/ML to $108.16/ML, also fixed by IPART
- The Minister for Water would be able to use these offset payments to provide a "net benefit to Sydney's water supply", either in new water supply options or reducing water losses from the distribution network
- Given the conservative assumptions as to surface water losses, the Department considers the offset package to be very reasonable

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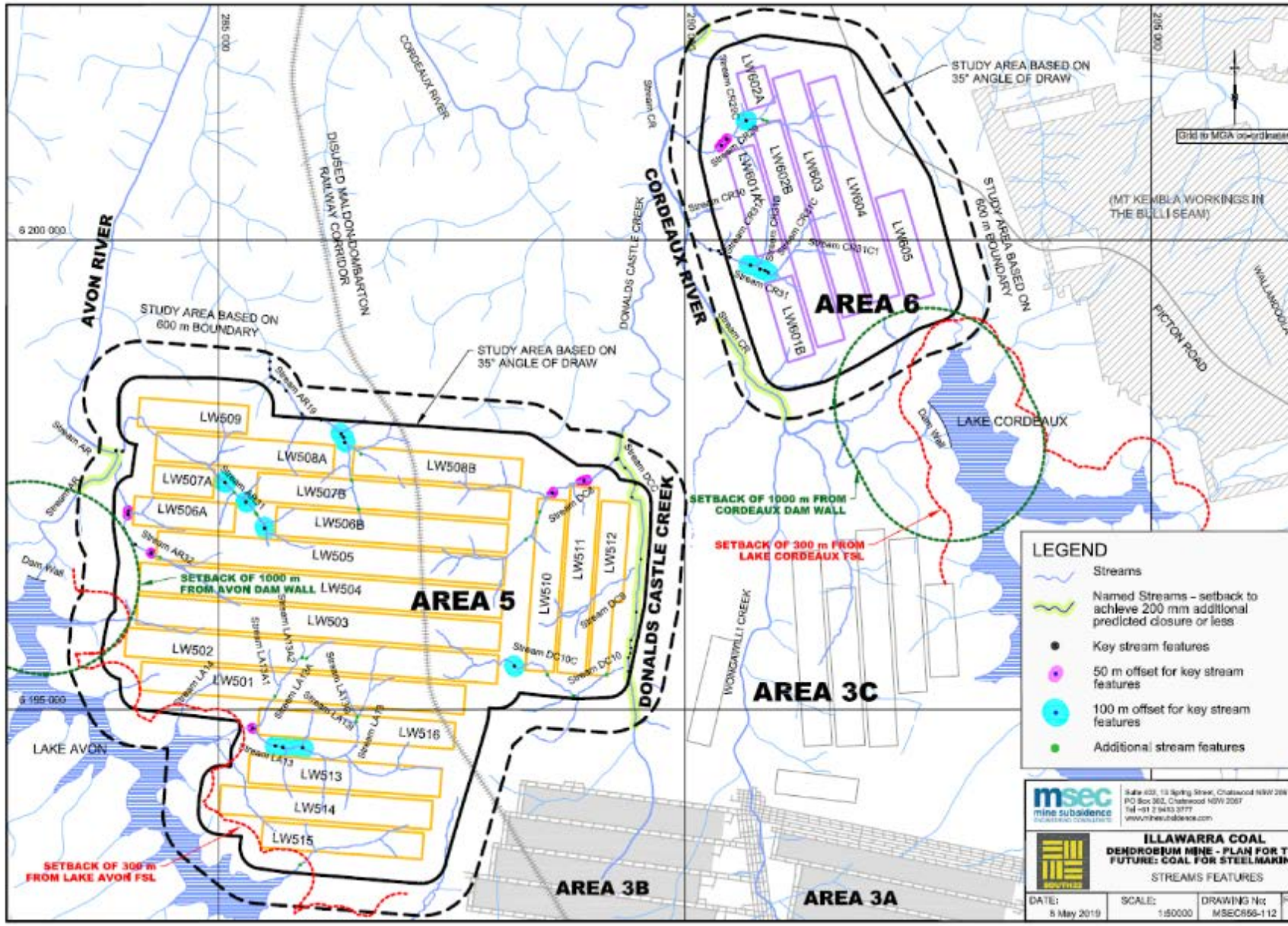
Does reduced void width give better outcomes?

- WaterNSW has continued its objections to the project throughout the assessment process and has recommended that narrower longwall widths be considered (perhaps variable widths between 200 to 275 m)
- This would lead to a substantial “constrained zone” but not greatly reduce surface impacts
- The constrained zone would reduce catchment losses and potentially allow easier remediation of surface cracking, but may increase water quality issues in runoff (as water percolating through the fresh surface cracking zone would collect iron and other naturally occurring metals which may emerge downstream)
- If this option was pursued, then it follows that there would be no significant water offset package, since surface water would be prevented from infiltrating to the mine and it would be assumed to return to the surface, down-gradient from the surface cracking zone. There also would be complexities in measuring the success of this “constrained zone”, which are avoided by the project’s worst-case approach to modelling surface water losses
- Based on the MineCraft report, project NPV would be reduced by approximately $200 million and the Government would receive no $100 million offset package
- The Department does not consider that this is a better option or that it should be pursued

Dam Walls, Named Watercourses and Key Stream Features

- Other key issues related to the proposed mine layout include impacts on:
  - ***upland swamps***
  - ***watercourses***
  - ***stored waters***
  - ***dam walls***
  - ***Aboriginal heritage***
- Once the question of longwall void width is settled, the critical control to avoid impacts on sensitive features is a setback of the longwall by between 50 and 400 m, depending on the selected level of risk avoidance



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Upland Swamps and Watercourse

- South32 has not proposed setbacks from any ***upland swamp,*** although it has avoided impacts on the much larger swamps in its potential Area 4, northeast of Lake Cordeaux and transected by Picton Road
- Instead, South32 has proposed to offset its projected impacts on upland swamps, principally through retiring ecosystem credits via a recently purchased property containing 51.3 ha of upland swamps
- The project involves setbacks of 50 m or 100 m from all identified “key stream features” on both 2nd and 3rd order **watercourses**, which are pools containing more than 100 m^3 of water or waterfalls or steps greater than 5 m in height with a pool at the base
- Identifying key stream features led to several “cut-outs” from the longwall layout, broader inter-panel pillars and shortening of longwalls. There are no readily identifiable options for additional reductions. However, several short lengths of relatively small 3rd order streams remain impacted.

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Water Supply Infrastructure

- The project involves setbacks from ***stored waters*** and key water supply infrastructure ***(ie dam walls)***:

  → 300 m from the Full Supply Level (FSL) of both Lake Avon and Lake Cordeaux

  → at least 1,000 m from the walls of Avon Dam and Cordeaux Dam

- Dams Safety NSW and WaterNSW have accepted the proposed setbacks.
- However, further detailed modelling may lead to extending the 1,000 m distance from either dam wall and these authorities have the ability to increase the setback if required.

Aboriginal Cultural Heritage

- For ***Aboriginal heritage***, experience in the Southern Coalfield suggests that risks are low
- Most shelters and grinding groove sites are not impacted by mine subsidence
- A 2017 study of 206 Aboriginal cultural sites subject to subsidence since 1990 indicated that only 10.7% showed any impact from mine subsidence and that these impacts were relatively minor
- Only two of the 206 sites showed evidence of subsidence impacts that directly or indirectly impacted Aboriginal art
- There are two Aboriginal heritage sites at risk of subsidence impacts which are judged to have either a ‘high’ or ‘moderate’ scientific significance
- As neither of these are located close to the end of a longwall panel, the setbacks required to substantially reduce risks would sterilise significant areas of coal resource
- However, impacts on these two sites would be monitored closely during mining in consultation with Aboriginal stakeholders to minimise and manage any impacts.

Catchment Water Quality

- The Sydney Drinking Water SEPP requires that new development applications within Sydney's Drinking Water Catchment demonstrate a "neutral or beneficial effect on water quality" (NorBE)
- However, for continuing development (such as this project, which is a continuation of the existing Dendrobium Mine) the NorBE test is satisfied if the development "*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*"
- That is, if the existing development consent (particularly its water quality conditions) were to be applied to the project, then the NorBE test would be satisfied
- The Department considers that its proposed conditions for the project are either the same as or stronger than in the existing consent, and that therefore the NorBE test is satisfied.

Mine Closure

- Mine closure planning for all underground coal mines in the Southern Coalfield is a key issue which was identified by the Government's Independent Expert Panel on Mining in the Catchment (Catchment Panel) in its Final Report
- The Department, South32 and all agencies accept the significance of this issue, but note that it applies to the existing Dendrobium Mine as much as it would for the project
- Proposed conditions would require South32 to develop a full Mine Closure Plan and strategy for Dendrobium Mine (including the project) within 3 years of any approval. The Plan would have to be peer-reviewed and be fully revised every 3 years
- The Plan would need to examine all options regarding mine closure for existing and proposed mine workings and options if mine sealing is not completely practicable. The first Plan would be complete before project longwall extraction would commence
- It is important to note that the groundwater modelling does not require mine sealing to achieve the predicted outcomes, and if the mine is not able to be fully sealed there would still be partial re-pressurisation of the aquifers because the workings are at least 100 m below the level of the mine adits and the overlying geology would re-pressurise which would restore baseflows to the catchment over time.

Independent Advisory Panel on Underground Mining

- The Catchment Panel recommended establishment of a standing independent expert panel to advise Government on mine subsidence impacts and their management
- The Independent Advisory Panel on Underground Mining (the Mining Panel) was established in August 2020, with its first task being to advise the Department concerning the project
- The Mining Panel's advice contained 45 conclusions and made 14 recommendations
- South32 has accepted all of the Mining Panel's recommendations
- The Department also accepted all of the Mining Panel's recommendations and has reflected them in its report and the proposed conditions for the project, including:
  - → further review and continuing development of the project's groundwater model
  - → development of a detailed mine closure plan for the project and existing Dendrobium Mine

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Economic Risks and Benefits

- Apart from seeking advice from the Mining Panel and MineCraft Consulting, the Department also sought advice from an independent economic analyst, BAEconomics
- BAEconomics reviewed the EIS's Economic Assessment and found that to be "comprehensive and the analysis is of high quality"
- BAEconomics also did a detailed review of the Project's downstream economic risks and benefits, titled "*Review of the Key Economic Interactions between the Dendrobium Mine and Related Entities in the Wollongong Region"*
- This review focussed on what would happen to industry, employment and the economy in the Wollongong Region if the project was not approved

Economic Risks and Benefits

- BAEconomics considered that the coal and steelmaking industries of the Wollongong Region are highly integrated
- That is, coal from Dendrobium is blended with that from South32's Bulli Seam Operations to make a blended product which is better and more valuable than coal from either mine
- This blended coal from a local source is a key economic support for BlueScope's Port Kembla Steelworks
- South32's products are the major throughput at the Port Kembla Coal Terminal and support its cost structure
- BAEconomics foresaw a serious risk that refusal of the Dendrobium project would lead to major knock-on effects

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Economic Risks and Benefits

- BAEconomics' worst-case scenario would be for closure of South32's two mines to lead to a cessation of coal exports through PKCT and the production of primary steel at BlueScope
- This would lead to direct job losses estimated to be about 6,586 workers. It would also result in an estimated direct loss of annual output of $3.89 billion per year for the domestic economy, and a total output loss for the economy, including flow-on effects, or around $10.7 billion per year
- These matters were not well-explored in the EIS and have therefore not been in the public's consciousness until publication of the Department's Assessment Report
- Nonetheless, it is worthwhile recalling that nearly 80% of public submissions were in support of the project. The major issue identified in the 20 community group submissions and the 583 individual submissions which supported the project was its positive socio-economic benefits

Benefits of the project

- Employment:
  - → 200 construction jobs
  - → 500 operational jobs over the project life
- Net economic benefit to NSW of about $1.07 billion (NPV)
- Total local labour expenditure benefits of gross income of $1.80 billion and a worker benefit of $366 million (NPV)
- Total local supplier benefits of $218 million (NPV)
- Net benefit to the greater Wollongong area of $431 million (NPV)
- State and local government income (primarily coal royalties) of $272 million (NPV)
- Continued support of the BlueScope steelmaking operations at Port Kembla
- Continued support for PKCT, South32's Bulli Seam Operations mine (high costs) and other mines in the Southern Coalfield

Conclusion

- The Department's assessment has given very careful consideration to the project's key environmental impacts, particularly subsidence impacts on water catchment values
- There is no opportunity to "avoid" subsidence impacts in the catchment
- The costs of "minimising" subsidence impacts are also very high. No submitter has provided substantive evidence that environmental benefits would outweigh or even approach these costs
- South32's mine design, based on setbacks from key water supply assets, all named watercourses and all identified key stream features, is considered to be generally sound
- It has substantially reduced environmental impacts and risks, particularly for stored waters
- The Department considers that there is no straightforward opportunity to improve mine design

Conclusion

- Therefore, the Department supports approval of the project as set out in the EIS and Amended project Report, subject to strict conditions of consent
- These conditions require:
  - → a very substantial cash compensation payment to offset the Project's surface water take from the catchment
  - → detailed mine closure planning to be undertaken within 3 years of approval
  - → offsets for impacts on upland swamps and other threatened and non-threatened ecosystems and threatened fauna
  - → continuing review of the Project's groundwater modelling, including careful consideration of all advice received from the Commonwealth IESC, DPIE Water and the Mining Panel and implementation of the Mining Panel's recommendations
  - → strict performance measures to control subsidence impacts
  - → detailed Extraction Plans to adaptively manage the mine and demonstrate compliance with performance measures as mining progresses

Questions?

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