Supplementary Submission No 147a

INQUIRY INTO RATIONALE FOR, AND IMPACTS OF, NEW DAMS AND OTHER WATER INFRASTRUCTURE IN NSW

Organisation: Slattery & Johnson

Date Received: 21 January 2021

Submission no.2 to the Portfolio Committee No. 7 – Planning and Environment inquiry: Rationale for, and impacts of, new dams and other water infrastructure in NSW

Thank you for the opportunity to make a submission into the inquiry into the rationale for, and impacts of, new dams and other water infrastructure in NSW.

Slattery & Johnson is a consultancy specialising in water policy and management in the Murray-Darling Basin. Our clients include the Lachlan Floodplains and Wetlands Group.

This submission provides information in addition to our original submission to the inquiry.

Introduction

The Wyangala dam expansion proposes to raise the wall height by ten metres and increase the storage capacity by 650 gigalitres, from 1,217 gigalitres to 1,867 gigalitres. The modelled average yield from this expansion is 21.02 gigalitres.[1]

The planning and delivery of the project was announced by the Prime Minister and Premier of NSW in October 2019.[2] Early works was intended to commence in late 2020, with main construction works commencing in October 2021.[3] The main construction work is expected to take four years to complete.[4]

This submission outlines the proposed upgrade and highlights the following issues with the proposed project;

- the requirement to operate the dam at a restricted water level, impacting water allocations for the duration of the works. This is to manage dam safety during the works and preserve Wyangala's flood mitigation function,
- existing on site quarries for rockfill are under water when the dam is above 55% capacity. Sourcing rockfill will require a further reduction to the operating water level, to less than 55% of total storage, and
- due to the significant volume of material required, sourcing material off-site would have considerable financial and community impact.

[1] Department of Agriculture, Water and the Environment. 2020. *EPBC Act Referral: 2020/8653 Wyangala Dam Wall Raising.* Canberra: Australian Government. http://epbcnotices.environment.gov.au/_entity/annotation/249e66ea-039b-ea11-a236-005056842ad1/a71d58ad-4cba-48b6-8dab-f3091fc31cd5?t=1599634141900

[2] WaterNSW. 2021. *Wyangala Dam Wall Raising*. https://www.waternsw.com.au/projects/new-dams-for-nsw/wyangala-dam

[3] WaterNSW. May 2020. *Critical State Infrastructure – Construction Industry Briefing*. https://www.waternsw.com.au/__data/assets/pdf_file/0006/156867/WaterNSW-CSSI-Dams-Construction-Industry-Briefing-Presentation-May-2020.pdf

[4] WaterNSW. 2021. *Wyangala Dam Wall Raising*. https://www.waternsw.com.au/projects/new-dams-for-nsw/wyangala-dam

Outline of proposed upgrade

Embankment to be raised by 10 metres

The original Wyangala dam was a 61 metre high concrete gravity dam built in 1936. The dam was raised to its current height in 1971 by constructing a rockfill embankment dam downstream of and partially against the existing concrete gravity structure.[5]

The proposed ten metre raising of the embankment is to be completed by placing additional material on the downstream face of the existing rockfill embankment, leaving the upstream face largely unchanged (refer Figure 1). This is to avoid placing additional load on the upstream concrete gravity dam.[6]

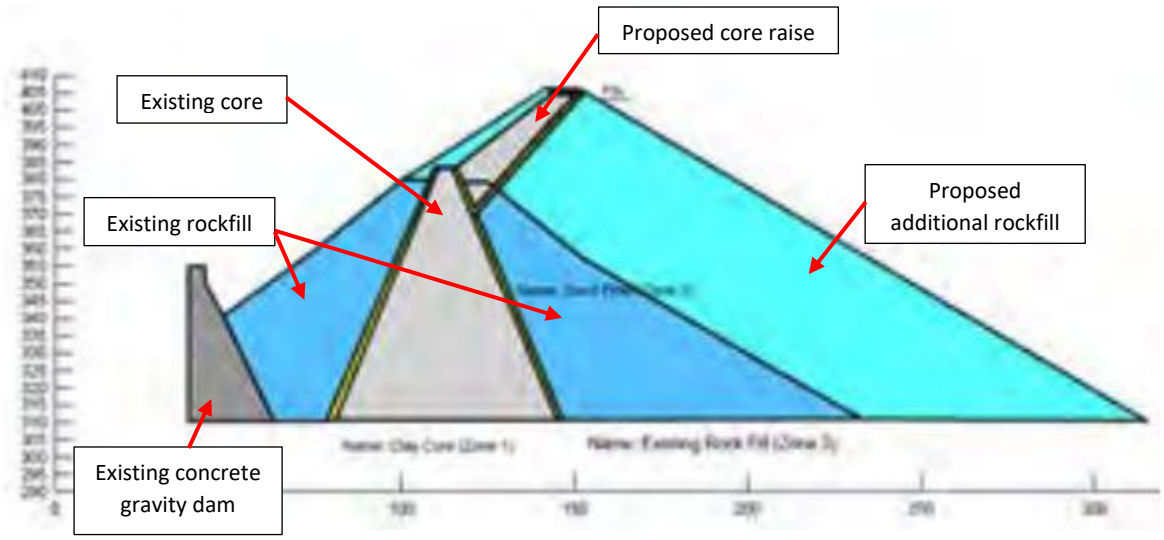

Figure 1 – Section of proposed embankment raise. Dark grey on far left – existing concrete gravity dam, dark blue in centre – existing embankment, light blue on right hand side – proposed additional rockfill.[7]

[5] ANDCOLD. 2010. *Register of Large Dams.* https://www.ancold.org.au/?page_id=24
[6] WaterNSW. 2014. *Water Security for Regions: Belubula and Lachlan River Dam Investigation Report.* https://www.waternsw.com.au/__data/assets/pdf_file/0016/118006/Belubula-and-Lachlan-Dam-investigation-report.pdf
[7] Ibid

Construction of a new saddle dam

The raising the Full Supply Level (FSL) of the reservoir by ten metres will require construction of a new saddle dam to retain the higher lake water levels. The saddle dam is to be located approximately 600 metres to the north east of the existing embankment and will be approximately six metres tall and 150 metres long (refer Figure 2).

Figure 2 – Extract of proposed project footprint, including the new saddle dam. Purple lines show inundated extent post upgrade.[8]

[8] WaterNSW. 2020. *Wyangala Dam Wall Raising Project – Scoping Report.* https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-10047%2120200729T232003.428%20GMT

Spillway widening and raising of intake towers

The existing spillway is proposed to be raised by ten metres and widened by 110 metres by excavating into the natural hill to the south (refer Figure 3).

The existing intake towers will also need to be raised by 10 metres. It is reasonable to assume strengthening of the existing tower structures would also be required.

Figure 3 – Extract of proposed project footprint, including extent of spillway works[9]

It is noted that the Wyangala dam spillway is currently not compliant with NSW Dam Safety Committee requirements.[10] The capacity of the spillway does not meet the requirement to pass the maximum design flood.[11] It is expected the spillway expansion would increase the capacity of the spillway and render Wyangala dam compliant with NSW Dam Safety Committee requirements.

[9] WaterNSW. 2020. *Wyangala Dam Wall Raising Project – Scoping Report.* https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-10047%2120200729T232003.428%20GMT

[10] WaterNSW. 2014. *Water Security for Regions: Belubula and Lachlan River Dam Investigation Report. https://www.waternsw.com.au/__data/assets/pdf_file/0016/118006/Belubula-and-Lachlan-Dam-investigation-report.pdf*

[11] The maximum design flood is the largest possible flow expected to pass through the spillway. This is calculated based on hydrological modelling of the catchment.

Reservoir water level and storage volume

Figure 4 plots the water level against storage volume for Wyangala, based on data obtained from NSW DPIE.

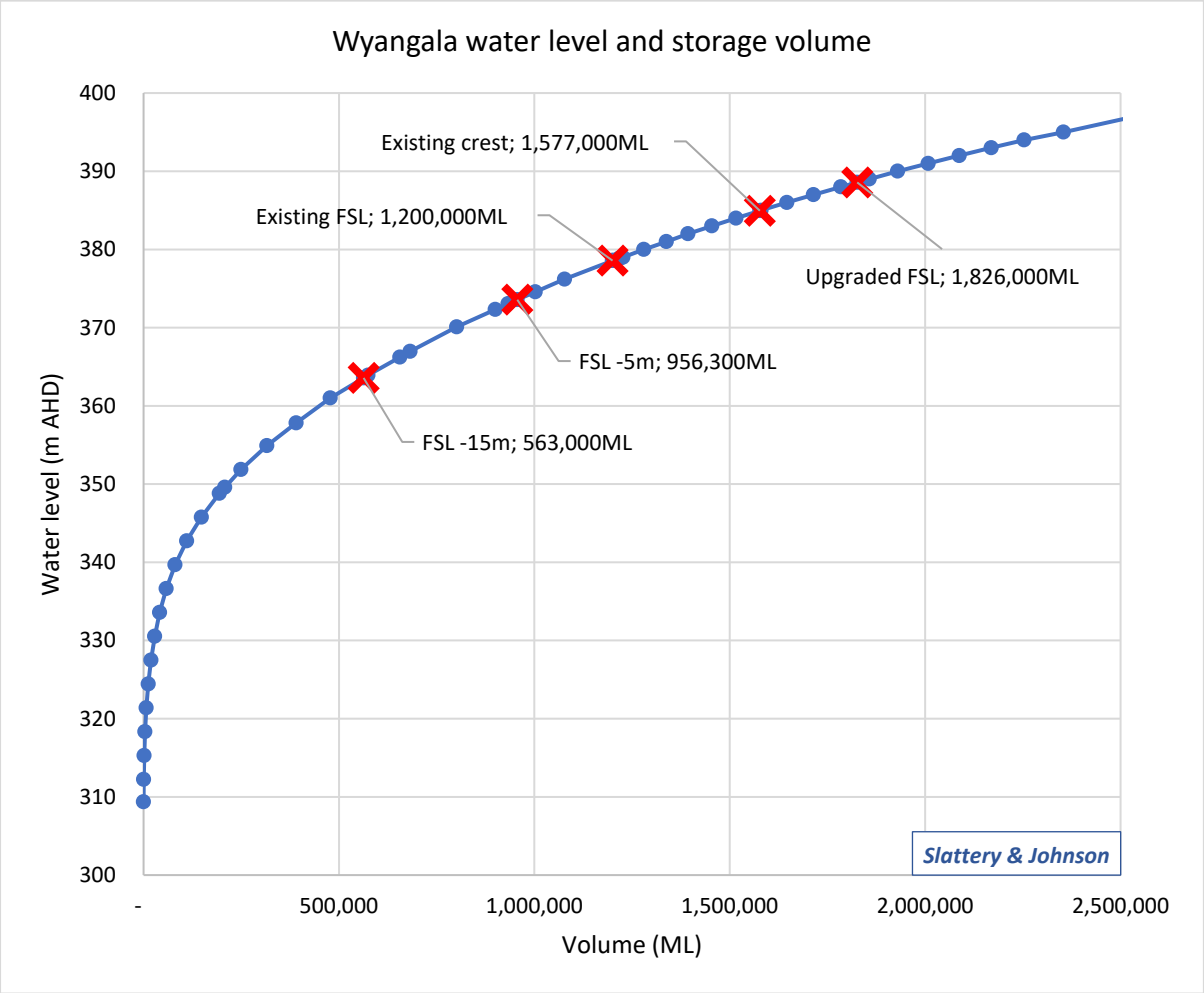

Figure 4 – Wyangala water level and storage volume, with indicative reduced operated levels[12].

It is expected the upgrade project will require a reduced water level to be imposed on Wyangala during the works. For context, some indicative reduced water levels are shown on the curve:

- A reduced operating level of five metres below current full supply level would restrict the storage to 956,300 megalitres (20% reduction of total volume),
- A reduced operating level of 15 metres below current full supply level would restrict the storage to 563,000 megalitres (53% reduction of total volume).

Any reduced water level will have an impact on allocations for downstream users for the duration of the project.

[12] Stantec and GHD Pty Ltd Joint Venture. 2020. *Wyangala Dam Wall Raising Project – River System Modelling Requirements*. Obtained under NSW Legislative Council Standing Order 52 – Order for Papers (NSW DPIE).

Excavation into the existing crest and reduced operating water levels

The WaterNSW Scoping Report identifies that raising of the embankment will require excavation into the existing crest;

> *The existing capping materials on the crest would require excavation (around the top three to four metres) to expose the core materials prior to raising of the embankment.*[13]

To reduce any dam safety risks associated with the excavation into the crest, a reduced reservoir operating water level will be imposed during the works. Based on the need to excavate four metres into the crest, it is expected the reduced water level will be at least 4 metres below the current full supply level.

This would restrict Wyangala's storage capacity to 1,002,000 megalitres, a reduction of 15%.

The reduced water level could be greater depending on other dam safety risks or constraints that are identified during the detailed design process.

Managing flood risk during construction

In addition to storing water for town and irrigation, Wyangala dam performs an important role in mitigating downstream flooding. This is achieved by maintaining 'airspace' in the reservoir, enabling Wyangala to store inflows during a flood event, and subsequently release the water in a controlled manner (if required). For example, releases in excess of 20,000 megalitres/day from Wyangala trigger minor flood levels at Forbes, Jemalong and Condobolin, so Wyangala is currently operated to avoid releases in excess of this flow.[14]

There is more than 300,000 megalitres of storage in Wyangala between the Full Supply Level and the embankment crest (refer Figure 4). This is the volume of airspace that is available for storing floodwaters in the event of large inflows. Upgrading of the spillway will require removal of the existing spillway gates. This will eliminate the ability to store any water above the sill level of the spillway.

To ensure Wyangala's flood protection function is maintained during construction, the reservoir will need to be operated at 6.3 metres below current FSL to ensure a minimum of 300,000 megalitres of airspace is maintained during the works. This would restrict the storage capacity of Wyangala to 900,000 megalitres, a reduction of 25%.

[13] WaterNSW. 2020. *Wyangala Dam Wall Raising Project – Scoping Report.* https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-10047%2120200729T232003.428%20GMT

[14] DPIE. 2020. *DPIE-EES_Lachlan LTWP EWR metrics for Wyangala Dam wall raising impact assessment.xlsx*. Obtained under NSW Legislative Council Standing Order 52 – Order for Papers (NSW DPIE).

Material requirements and impact on reduced operating water levels

The existing dam wall comprises 3,580,000 cubic metres of material[15]. It is estimated more than 1,400,000 cubic metres of rockfill will be required to construct the upgraded embankment. This assumes an embankment crest raise of ten metres by construction of a downstream rockfill buttress and maintaining the existing embankment batter slope of 1:1.7. This estimated volume is conservative and does not include material required for the core raise, embankment filters, or saddle dam. The proposed works would increase the total volume of the embankment by at least 40%.

Sourcing and transportation of the required material will be a key issue for the proposed project with significant cost implications. Hard rockfill for the downstream buttress will be majority of the material type required for the upgrade. Suitable core material (typically clay obtained in the vicinity of the dam) and filter sand with a material grading specifically matching the available core material will also be required.

It is noted some excavation will be required to widen the existing spillway, and this may yield some useful rockfill material. The spillway excavation volume is estimated to be approximately 145,000 cubic metres[16]. Even if this material were to meet the engineering specification for incorporation into the main works, it is not a significant volume given the amount of rockfill required.

Sourcing material on site

During construction of the current Wyangala dam, embankment rockfill material was obtained from quarries close to the embankment, within the inundated zone of the dam. At low reservoir water levels, some of these quarries are visible on satellite imagery (refer Figure 5 and Figure 6).

These existing quarries are very close to the existing embankment (approximately one kilometre) and would be ideal for supplying the required material. In Figure 5, where the water level is at 208,000 megalitres in the reservoir, the quarries and haul roads that were used to transport material can clearly be seen. In Figure 6 where the water level is at 656,000 megalitres, the quarries and roads are partially inundated.

This means reopening the existing on-site quarries would require the reservoir water level to be restricted below 656,000 megalitres. That is, Wyangala would be reduced by 45% of its total storage for the duration of the project, which is four years.

Utilisation of the existing on-site quarries would have a significant impact on water allocations from Wyangala for the duration of the project.

[15] ANDCOLD. 2012. *Register of Large Dams.* https://www.ancold.org.au/?page_id=24

[16] This is based on excavation down to the upgraded full supply level of 389m AHD within the extent of widening shown in Figure 3.

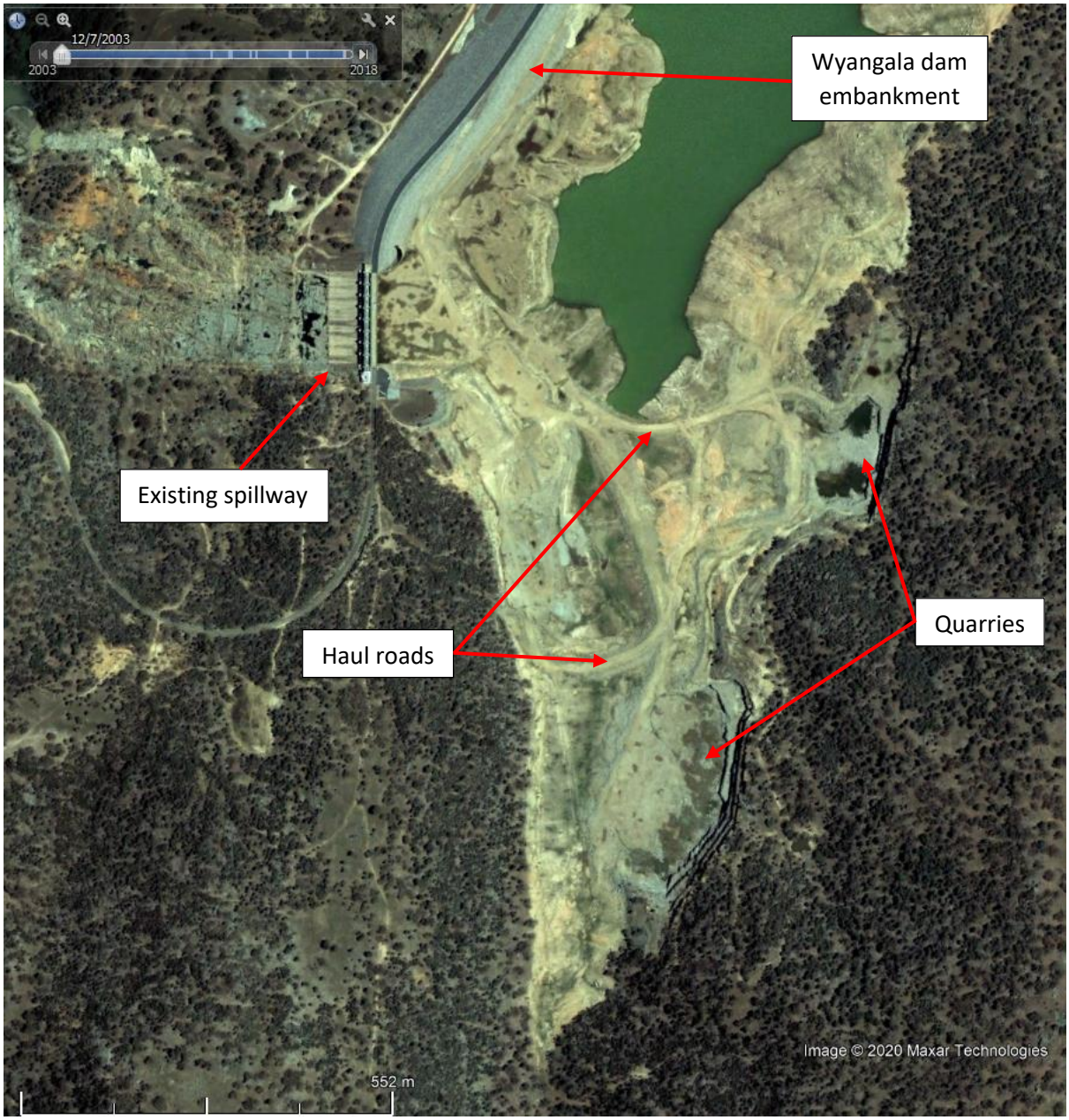

Figure 5 – Quarries used during construction of the existing Wyangala dam visible at low water levels (from Google Earth, image captured 7 December 2003). Reservoir level is 349.5m AHD (29m below FSL) or 208,000ML of stored water[17]. Wyangala total storage is 1,200,000ML.

[17] WaterNSW. 2021. *Real Time Data – Major Dams. Wyangala Storage.* https://realtimedata.waternsw.com.au/

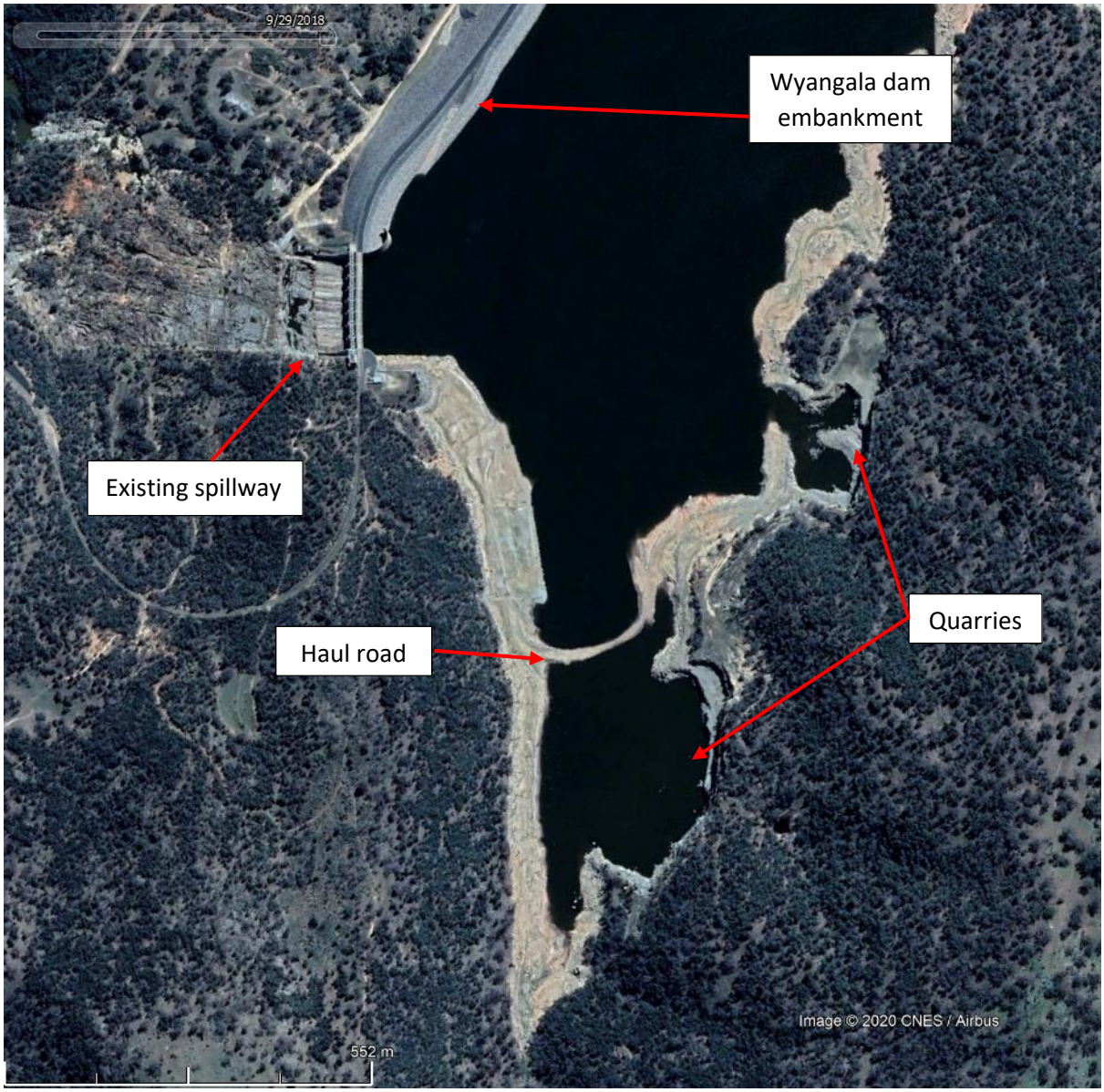

Figure 6 - Quarries used during construction of the existing Wyangala dam visible at low water levels (from Google Earth, image captured 29 September 2018). Reservoir level is 366.2m AHD (12.4m below FSL) or 656,000ML of stored water[18]. Wyangala total storage is 1,200,000ML.

[18] WaterNSW. 2021. *Real Time Data – Major Dams. Wyangala Storage.* https://realtimedata.waternsw.com.au/

Sourcing material off-site

An alternative to using the quarries within the Wyangala dam inundation zone is to source material from an existing commercial quarry, or open new quarries elsewhere. Transport routes have been identified by WaterNSW as an issue for consideration:

> *Major transportation routes during construction may include Darby Falls Road from the south and Reg Hallstone (sic) Way from the north (…) The project is likely to result in an increase in light and heavy vehicle traffic surrounding the inundation extent, mostly within the vicinity of the Wyangala Dam wall. The heavy vehicle traffic would serve to transport construction materials to the site, and to take waste materials away from the site.*[19]

A standard road truck (truck and trailer) for transporting quarry material is approximately 30 cubic metres. Assuming all the material from the spillway excavation was suitable for incorporation into the works, 42,000 truck movements would be required to import the required fill. If the project was under construction for four years, working six days a week and nine hours a day, this would equate to one truck and trailer movement every 16 minutes.

Sourcing material off-site may involve long travel distances. This would impact communities located along the transport route due to increased noise, traffic, and potentially dust. Public roads that are not constructed to withstand high frequency heavy vehicle loading will likely be damaged and will require maintenance and re-instatement to original condition. It is unclear if the responsibility and cost for road maintenance and reinstatement will be borne by the local councils (Hilltops and Cowra) or the project.

[19] WaterNSW. 2020. *Wyangala Dam Wall Raising Project – Scoping Report.* https://majorprojects.planningportal.nsw.gov.au/prweb/PRRestService/mp/01/getContent?AttachRef=SSI-10047%2120200729T232003.428%20GMT

Summary

The Wyangala dam expansion project proposes to add 650 gigalitres of storage and provide an additional annual yield of 21.02 gigalitres to downstream users. The proposed works comprise;

- raising the existing embankment and intake towers by 10m,
- constructing a new saddle dam approximately six metres high and 150 metres long, and
- widening the existing spillway by 110 metres.

The project will require at least 1,400,000 cubic metres of material to be imported to site to complete the embankment raising. This is the equivalent of 41,000 truck and trailer movements, or one truck and trailer movement every 16 minutes over the four year construction period.

Sourcing the required material off site would be at significant financial cost. It would result in noise, traffic, and potentially dust impact to communities located along the transport route. Public roads would likely require additional maintenance and reinstatement due to the additional heavy vehicle
e loads. Sourcing the material on site is likely to be the preferred option.

A number of issues will require the storage level in Wyangala to be reduced during the project. These are summarised in Table 1 below.

Table 1 – Wyangala upgrade construction issues and associated impact on storage levels.

Issue	Management action	Consequence
Excavation into the embankment crest	Reduce water level by 4m	182,000ML or 15% reduction of total storage
Management of flood risk during construction	Reduce water level by 6.3m to maintain airspace in Wyangala	300,000ML or 20% reduction of total storage
Sourcing rockfill from on site quarries within the Wyangala inundation zone	Reduce water level by 12.4m to expose inundated quarries	544,000ML or 45% reduction in total storage

Reduction in dam levels during construction will significantly disrupt water allocations, particularly general security, during the project which is expected to take four years.[20]

[20]WaterNSW. 2021. *Wyangala Dam Wall Raising.* https://www.waternsw.com.au/projects/new-dams-for-nsw/wyangala-dam