Dubbo Zirconia Project

Review Report

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Executive Summary

The Planning Assessment Commission has been directed to review the Dubbo Zirconia Project and its supporting studies to assess the merits of the project as a whole particularly paying attention to the likely air quality impacts (including exposure to radioactive material), water impacts, transport impacts and long term land use impacts (including suitability and feasibility of the proposed rehabilitation strategy). Further the Commission has been directed to recommend any measures to further avoid, minimise and / or manage the potential impacts of the project (as required).

The Commission to undertake the review was constituted by Mr Paul Forward, with Mr Joe Woodward PSM and Mr Gordon Kirkby.

The proposal is for a new rare metals and rare earths mine with processing facilities adjacent to the small village of Toongi approximately 20km south of Dubbo in western NSW. The mine would extract up to 19.5 million tonnes of rare metals and rare earths ore from a small open cut mine over 20 years at a rate of 1 million tonnes per year. Processing on site is also proposed to produce 75,000 tonnes of concentrate to be transported for export to Port Botany or Newcastle. The mine has an estimated capital investment value of $1.06 billion and would employ up to 400 people during construction and 250 people during operations.

The Commission held public hearings on the project on the 4 November 2014 at the Dubbo RSL. The Commission heard arguments both for and against the project.

The Commission notes that concerns have been raised by a number of parties in relation to the potential for the mine to result in uranium mining. In this regard it notes that the proposal does not include uranium mining which is prohibited in NSW under the *Mining Act 1992*. The material to be extracted from the site will however include small amounts of naturally occurring uranium, which will end up in the processing waste streams. This waste (containing low levels of uranium) will remain on the project site, emplaced in containment cells. The Commission accepts the proposition that this risk can be managed satisfactorily.

The proposal is unique in nature and would result in a range of social and economic benefits for both the state of NSW and the Dubbo region. In particular these benefits (as outlined in the SEAR) include:

- Developing a new resource in NSW that is in demand internationally for the manufacture of technologically advanced products
- Capital spending of $1.06 billion
- Annual spending of around $50 million in the local economy
- Providing jobs for up to 250 people during operations and 300 – 400 during the establishment and construction phase
- The payment of around $600,000 per annum to Dubbo Council for community enhancement (through a voluntary planning agreement); and
- The payment of around $12 million to the State each year in royalties.

The Commission also notes that the proposal includes value added benefits to the local region and State as a result of the processing of the ore on site, including skills development for the local workforce.

The Commissions terms of reference require particular consideration of the likely air quality impacts of the project including any exposure to radioactive material. The Commission notes that in addition

to dust emissions generated from mining activities and associated crushing and grinding on site, the processing facility will also produce other air emissions associated with the processing of the ore. Emission limits for these activities are prescribed in the *Protection of the Environment Operations (Clean Air) Regulation 2010*. As amended (through the Response to Submission Report) the Commission notes that application indicates compliance with relevant criteria at surrounding residential receivers. However some emission sources do not appear to have been included in the modelling. The Commission notes that the application has proposed to defer revised modelling to include these sources until it applies for an Environmental Protection Licence (EPL) from the EPA. This is due to the unique nature of the project and the ongoing refinement of processing methods. The EPA has accepted this approach requiring that a revised Air Quality Impact Assessment be provided following development of the final design and prior to submitting its application for an EPL. Given the indicated compliance with impact assessment criteria, the availability of further mitigation measures and the EPA's agreement to the proposed approach, the Commission is satisfied that the project would be approved to be built and managed to meet accepted air quality standards subject to recommended conditions.

Water impacts including water supply and balance, management of contaminated water during the life of the project and containment of waste products on site, particularly in the proposed containment cells have been raised as significant concerns. In relation to water supply the Commission notes that significant volumes of water will be required (up to 4.13GL / year) to process the ore and that the applicant currently has access to less than half this requirement through its current water entitlements. The applicant has explored options to improve water efficiency and indicated that significant commercial incentives exist to reduce water use on site. The Department's assessment concludes that securing sufficient water for the project is a commercial risk for the applicant and that standard conditions would be applied requiring adjustment of the intensity of operations on site to match available water supply. The Commission accepts the approach but notes that it is important to ensure water supply constraints do not compromise the environmental performance of the project particular in relation to dust suppression. Recommendations have been made in this regard.

Detailed consideration has been given to the management of surface water on site. Different levels of capture and containment are proposed for different areas of the site depending on the level of contamination present. The surface water management approach adopted directs contaminated water to the Liquid Residue Storage Facility in the event of a severe storm event with the LRSF having the highest level of protection; being designed to capture the probable maximum flood event (PMF) and an additional 1m freeboard. With the combined flows from a number of areas on the site, as well as ongoing requirements to handle the liquid waste products, concerns were raised about the facility's capacity to handle all this water during significant periods of rain, when evaporation rates would be low. The Commission recommends that the water management plan for the site be required to demonstrate that the design has sufficient capacity to contain the combined catchment runoff (from the Liquid, Solid and Run of Mine Storage areas), while continuing to handle the liquid waste stream.

The waste products to be emplaced on the project site pose some long term contamination risks which will need to be resolved. While the containment cells are proposed to be double lined, capped and include monitoring equipment; the financial and legal mechanisms for monitoring and maintaining this infrastructure in the long term need to be developed prior to the determination of the application.

Transport impacts were also significant issues raised by public submissions and at the public hearing. Three transport options have been included in the proposal with Option C (Road only transportation)

being proposed until such time as detailed consideration can be given to Options A (Rail to Toongi and minor road transport) and B (Rail to Dubbo and Road to Toongi). The Commission notes that the transport impacts of Option C are acceptable subject to recommended conditions. However the Commission supports Option A as the preferred option as it would significant reduce the number of truck movements to and from the site (and improve safety of transportation of dangerous goods) although it notes that the consideration of this option should not delay mine construction. It therefore recommends that a feasibility study of Option A be undertaken within 3 years of commencement of operations on site. The Commission also notes that Option B (Rail to Dubbo and Road to Toongi as amended to allow B doubles to be used to transport goods to and from the site from Fletchers Intermodal Terminal) is preferable to the long term use of Option C (road only transportation). The Commission also notes that proposed road upgrades are appropriate however it recommends further requirements in relation to section 94 contributions, a traffic safety audit of the Newell Highway / Obley Road intersection, and the preparation of a construction and operation traffic management plan.

The Commission has further given detailed consideration to the long term landform and land use impacts follow cessation of mining on site however notes that whist approval is sought for a mine life of 22 years (2 years construction and 20 years operation) the site includes additional resources that could enable mining to continue for up to 70 years. In relation to final land use the Commission agrees with DRE that the final land uses on site should be limited to agriculture / biodiversity conservation as part of the current project and that consideration of any other uses should be subject to Council's strategic planning process. Further it agrees that a rehabilitation plan should be prepared prior to commencement of surface disturbing activities for approval by the Secretary NSW Trade and Investment. A requirement is also that the rehabilitation plan provide for progressive site rehabilitation. In terms of the final landform the Commission considers that leaving the final void as proposed is acceptable in this case given the cost of backfilling and disturbance of material for backfilling, the low potential for agricultural productivity and the substantial value of the mineral resource below the pit. The Commission also agrees that the revegetation strategy is appropriate and that ongoing monitoring and maintenance post mining should be in accordance with an approved monitoring and maintenance program to continue until the Department of Planning and Environment and Department of Resources and Energy direct. In relation to concerns raised about the rehabilitated agricultural class of the land, the Commission is satisfied that the proposed Class 4 is appropriate given the existing and future proposed uses however it recommends a requirement to maintain the agricultural productivity of the land surrounding the project through the life of the project (and to decommission the processing plant upon completion of mining).

While the Commission notes the potential for continued mining of the resource beyond the life of this project, such a proposal would require a separate assessment and approval.

Other issues considered in detail in the attached report include impacts on Taronga Western Plains Zoo, the pink-tailed worm lizard and Fossil Hill, hazards and risk (including radiation) and loss of agricultural land for biodiversity offsets.

In conclusion, the Commission is generally satisfied that the project is approvable subject to further detail on a number of matters and stringent environmental requirements. The Commission recognises that the project is unique in nature and accordingly some flexibility should be allowed to enable further design development prior to construction and commencement of operations on site, but it will nonetheless need to demonstrate compliance with all health, amenity and environmental standards. The Commission also recognises the significant economic benefits of the project for both the state of NSW and the region. It considered that the proposal is unlikely to result in significant environmental impacts and that on balance the benefits of the project outweigh its impacts.

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Glossary

ANSTO:	Australian Nuclear Science and Technology Organisation
The applicant:	The applicant under Part 4 of the EP&A Act 1979, in this report being Australian Zirconia Limited (AZL). 'Applicant' includes the applicant's EIS consultants.
AZL:	Australian Zirconia Limited (the applicant)
Bq:	Becquerel, the Standard International unit of measurement of radioactivity
Commission:	Planning Assessment Commission
Department:	Department of Planning and Environment
DRE:	NSW Trade and Investment, Regional infrastructure & Services, Division of Resources & Energy
DZP:	Dubbo Zirconia Project
EIS:	Environmental Impact Statement.
EP&A:	Environmental Planning and Assessment.
GL:	Gigalitres
LGA:	Local Government Area.
LRSF:	Liquid Residue Storage Facility.
mg/m^3	Milligrams per cubic metre
ng/m^3	Nanograms per cubic metre
NORM:	Naturally Occurring Radioactive Material.
NOW:	NSW Office of Water.
OEH:	Office of Environment and Heritage.
PAC:	Planning Assessment Commission.
The proposal:	The subject of the application under Part 4 of the EP&A Act 1979, in this report being the Dubbo Zirconia Project.
RMS:	Roads and Maritime Services
RTS:	Response to Submissions
SEC:	Salt Encapsulation Cell
SRSF:	Solid Residue Storage Facility
TfNSW:	Transport for NSW
TSP:	Total suspended particulate matter
VPA:	Voluntary Planning Agreement

1. Introduction and Terms of Reference

On 7 July 2014 the Minister for Planning, the Honourable Pru Goward MP, issued a request to the Planning Assessment Commission in relation to the Dubbo Zirconia Project. The Minister's request was made under section 23D of the *Environmental Planning and Assessment Act 1979* and Clauses 268R and 268V of the *Environmental Planning and Assessment Regulation 2000*. The Minister's request is as follows:

1. *Carry out a review of the Dubbo Zirconia Project, and:*
   - a) *consider the EIS for the project, the issues raised in submissions, the formal response to submissions, the Department of Planning and Environment's preliminary assessment report for the project, and any other relevant information provided on the project during the course of the review;*
   - b) *assess the merits of the project as a whole, paying particular attention to the likely*
     - *air quality impacts, including any exposure to radioactive material;*
     - *water impacts;*
     - *transport impacts; and*
     - *long term land use impacts of the project, including the suitability and feasibility of the proposed rehabilitation strategy; and*
   - c) *recommend any measures to further avoid, minimise, and/or manage the potential impacts of the project (if required).*

2. *Conduct public hearings after the Department of Planning and Environment provides a copy of its preliminary assessment report for the project to the Planning Assessment Commission.*

3. *Submit its final report on the review to the Department of Planning and Environment within 2 months of the public hearings, unless the Secretary of the Department of Planning and Environment agrees otherwise.*

The Department's preliminary assessment report was received by the Commission on 3 September 2014. Mr Paul Forward, with Mr Joe Woodward PSM and Mr Gordon Kirkby constituted the Commission to review this application.

2. Project Description

The applicant Australian Zirconia Limited (AZL) a wholly owned subsidiary of Alkane Resources Ltd proposes to develop the Dubbo Zirconia Project (DZP) adjacent to the small village of Toongi, approximately 20km south of Dubbo (refer location plan at Figure 1 below). The Project is classified as a State Significant Development under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The project involves:

- The extraction of up to 19.5 million tonnes of rare metals and rare earths ore from a small open cut mine on the site over 20 years at a rate of up to 1 million tonnes of ore per year with maximum extraction depth of 5-32m below ground surface
- Processing of the ore on site to produce up to 75,000 tonnes of rare metals and rare earth concentrate, which is to be transported by truck and/or rail to Port Botany or Newcastle for export
- Storing and disposing of the processing waste produced on site, including:
  - Up to 2 million tonnes of solid residue waste a year, which would be put in a specially designed Solid Residue Storage Facility (SRSF)
  - Up to 2.5 gigalitres of liquid residue waste a year, which would be put in one of four Liquid Residue Storage Facilities (LRSFs) and
  - Up to 7 million tonnes of salt over the life of the project, which would be collected from the LRSFs and put in one of six Salt Encapsulation Cells (SECs);
- The development of a range of infrastructure to support the facility, including a:
  - Large processing facility, including storage tanks, crushing, milling, roasting and refining plant and a 90 m high stack
  - 30 km gas supply pipeline to Dubbo; and
  - 7.5 km water supply pipeline to the Macquarie River; and
- Progressive rehabilitation of the site for a combination of agricultural and conservation uses, with the exception of the site administration area which could be used for future commercial or industrial uses and final void which may be subject of a future application for continued mining .

The project has an estimated capital investment value of $1.06 billion and would employ up to 400 people during construction and 250 during operations.

The proposal seeks to extract rare metals and rare earths ore for use in the production of a range of products for the computing, renewable energy, automotive, medical and military uses. Products include catalytic convertors, magnets, oxygen sensors, ceramics, speciality glasses, paints, LED light and hybrid car batteries.

Rare metals to be extracted include zirconium, niobium, hafnium, tantalum, yttrium, europium and rare earths include dysprosium and neodymium. Low levels of Uranium and Thorium also occur in the deposit. The Uranium and Thorium isotopes are not proposed to be removed from the site, but radiation risks associated with the disturbance and processing of the ore deposit and the management of the waste streams containing the radionuclides would need to be carefully controlled.

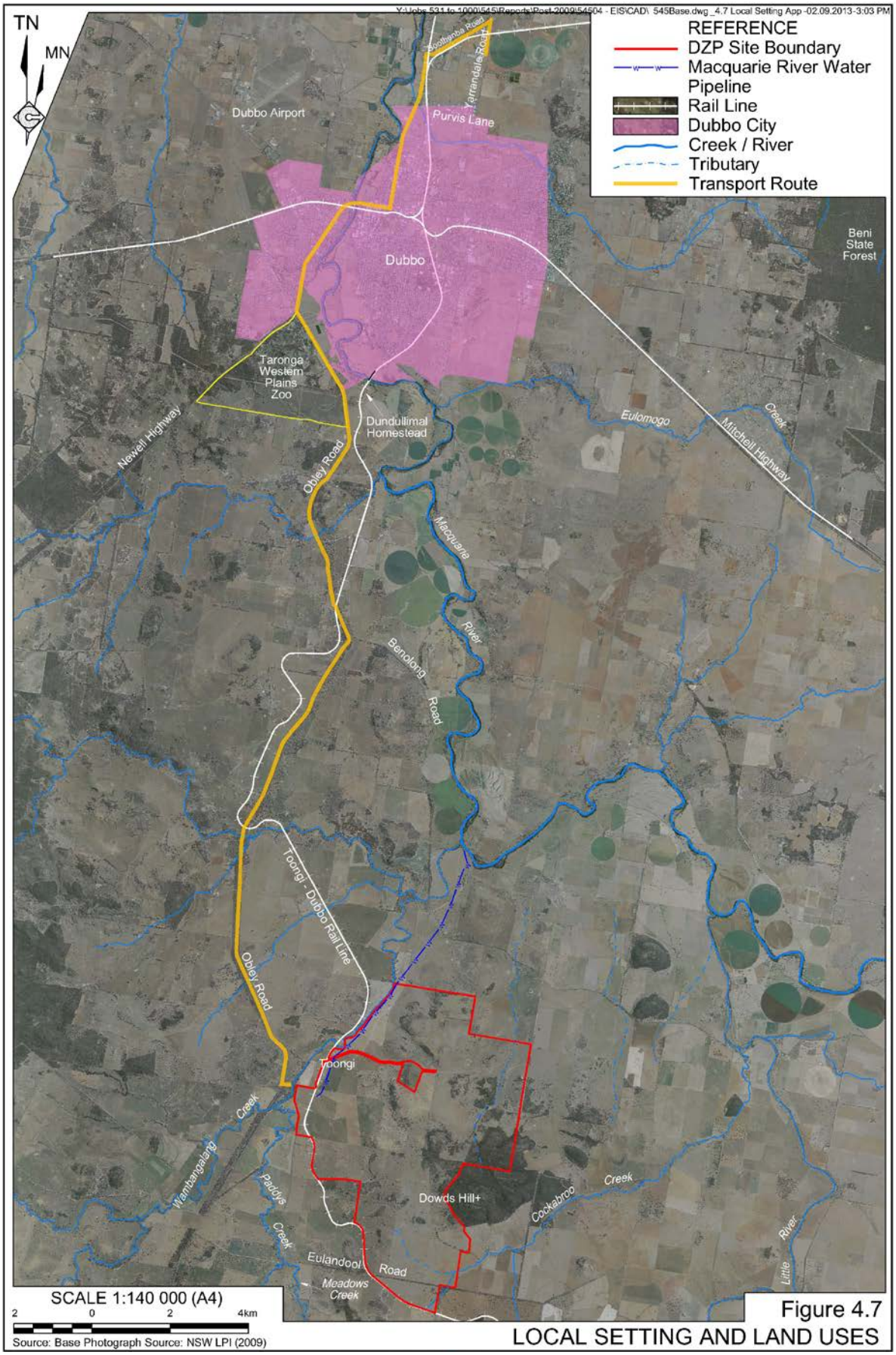

Figure 1 – Site Location Source: EIS, RW Corkery & Co. 2013a p 4-17

The site has a total area of 2,860ha of which the development footprint is 808ha. Different components of the development have areas as outlined below as shown on Figure 2 below:

Open Cut Mine	40 ha
Waste Rock Emplacement	20.4 ha
ROM Pad	4.2 ha
Processing and Admin. Facilities	43.3 ha
Solid Residue Storage Facility	102.8 ha
Liquid Residue Storage Facility	425.4 ha
Salt Encapsulation Cell	34.6 ha
Soil Stockpile	up to 156 ha

The proposal includes biodiversity offsets comprising 1021ha of vegetation including 653.1 ha (64%) of native vegetation and 306.8ha (30%) being derived native grass lands with the remaining 61.1 ha (6%) being currently cleared land (without derived native grasslands) or white cypress pine monoculture.

The proposal seeks approval for a 22 year mine life (2 years construction and 20 years operation). In terms of final landform, following the cessation of mining all site buildings and processing infrastructure from the processing and administration area would be removed, excluding the water and gas pipelines and electricity transmission lines (subject of separate approval). This land would be generally profiled to approximate the pre-establishment landform and vegetation (with the exception of the void area and containment cells). The proposal however envisages that the administration area may be used for future commercial / industrial purposes (subject to separate approval).

In terms of the waste residue structures and waste rock emplacement, these areas are proposed to be shaped and revegetated comprising undulating upper surfaces and outer faces with maximum slopes of approximately 14-16 degrees. The rehabilitated structures would be used for low intensity grazing land. The LRSF land would be returned to its pre-disturbance landform and revegetated for agricultural purposes.

The proposal also includes an offer to enter into a voluntary planning agreement (VPA) with Dubbo City Council in the amount of $600,000 per annum or $12 million over the life of the project.

As outlined in the SEAR, the applicant has nominated the following socio-economic benefits of the proposal:

- Developing a new resource in NSW that is in demand internationally for the manufacture of technologically advanced products
- Capital spending of $1.06 billion
- Annual spending of around $50 million in the local economy
- Providing jobs for up to 250 people during operations and 300 – 400 during the establishment and construction phase
- The payment of around $600,000 per annum to Dubbo Council for community enhancement (the VPA); and
- The payment of around $12 million to the State each year in royalties.

The proposal does not include uranium mining which is prohibited in NSW under the *Mining Act 1992*. Extraction of mineralized material on site will however include small amounts of uranium as a by-product of the extraction process. This uranium will remain on the project site, emplaced in either the liquid or solid waste storage facilities (containment cells).

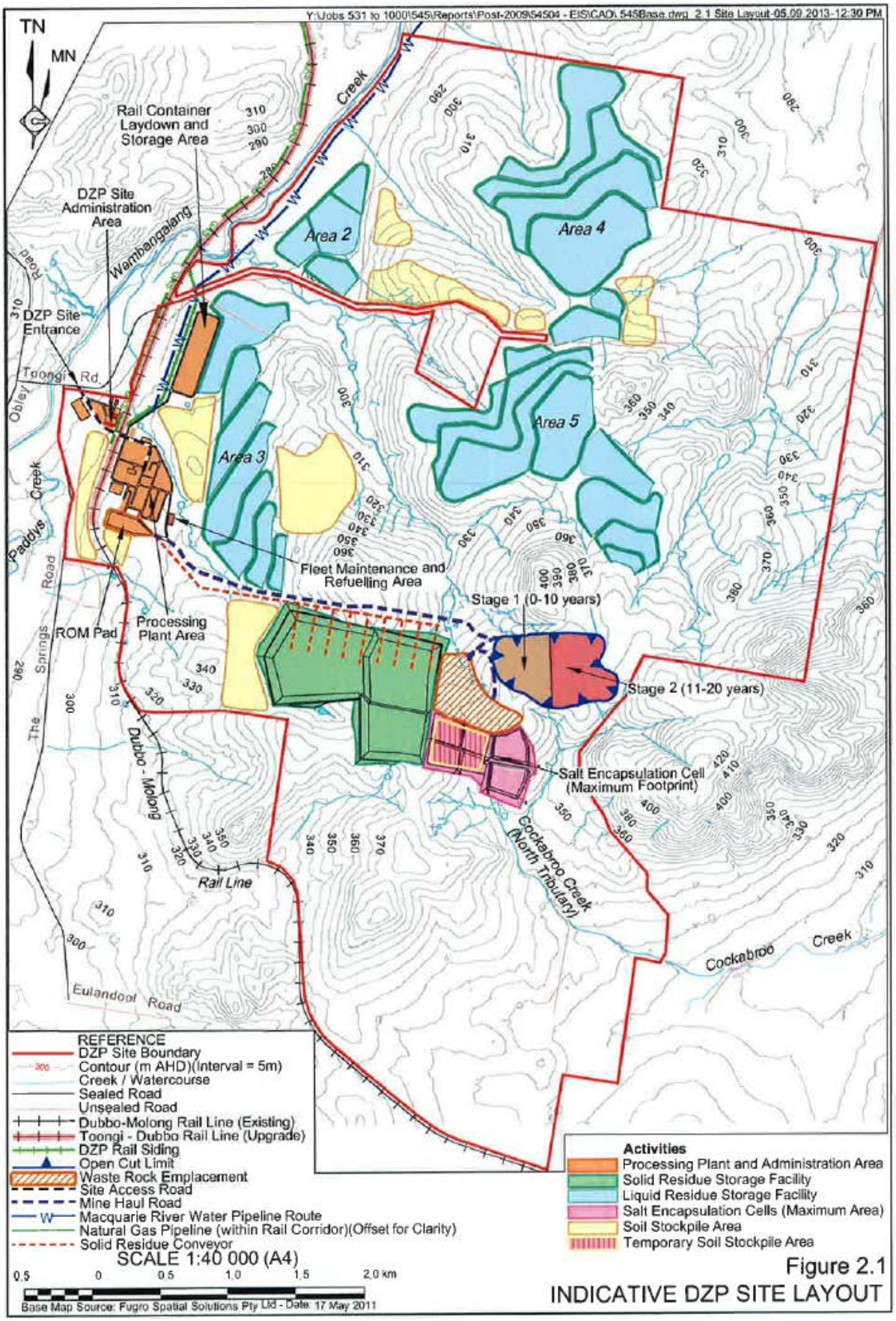

Figure 2: Proposed Site Layout *Source: (*RW Corkery & Co. 2013a)

3. Commission Activities

3.1 Public Hearings and Submissions

In accordance with the Commission's terms of reference, public hearings were held on the 4 November 2014 at the Dubbo RSL, 178 Brisbane St, Dubbo. A total of 20 verbal submissions were made to the Commission at the hearings, comprising the applicant, 6 special interest groups and 13 individuals. 20 other individuals or groups also provided written submissions to the Commission. A list of speakers and summary of the issues raised during the Public Hearing is at Appendix 2 and 3 of this Report.

56 submissions were provided to the Commission for its information, by the Department of Planning and Environment.

3.2 Documents, Meetings & Site Inspections

Through the course of the review the Commission accessed a wide range of documents including:

- The applicant's Environmental Impact Statement and Response to Submissions;
- Submissions from government agencies and the public; and
- The Department's Preliminary Environmental Assessment Report.

During the review, the Commission was briefed by the Department of Planning and Environment on 24 September 2014 and met with Dubbo City Council on 10 October 2014.

The Commission inspected the site, accompanied by the applicant (on 10 October 2014) and visited the applicant's demonstration pilot plant at ANSTO's Lucas Heights campus (on 23 October 2014).

A summary of the Commission's meetings is provided in Appendix 4.

3.3 Agency advice

During the public hearings a variety of speakers raised a number of technical issues in relation to uranium extraction and processing, the management of radiation hazards and ongoing monitoring of radioactive waste, long term management of salt and waste encapsulation cells. The Commission also noted the potential for the project to impact on a scientifically significant fossil site, known as Fossil Hill, within the project site. On 12 November 2014 the Commission wrote to NSW Trade and Investment and NSW Office of Water seeking technical advice on these issues. NSW Trade and Investment provided advice to the Commission on 24 November 2014 which is provided at Appendix 5. The NSW Office of Water provided a response through the Department of Planning and Environment on 28 November 2014, provided at Appendix 5. Regard has been had to this advice in the formulation of this report.

3.4 ANSTO advice

Following inspection of the applicant's demonstration pilot plant at ANSTO's Lucas Heights campus on 23 October 2014, ANSTO Minerals provided written advice relating to the radiological safety of the DZP based on its experience. The ANSTO Minerals (dated 31 October 2014) advised that:

- Its review of the pilot plant operation prior to commencement found that there was not expected to be any significant radiation exposure during the work and that monitoring during the operation confirmed that dose levels were not of radiological significance.
- The major hazards associated with the DZP are chemical hazards rather than radiological hazards and that it is ANSTO Minerals understanding that the ore and waste residues pose a very low radiological risk provided that appropriate controls are in place.
- The radiation assessment undertaken as part of the EIS indicates a total dose to members of the public conservatively of 0.03mSv/y. This is well below the allowed public exposure of 1mSv/y above background set by ARPANSA and well below the average radiation dose in Australia. This is consistent with their experience working with companies in the mining industry affected by NORM.

4. Air Quality

The Commission's terms of reference require it to pay particular attention to the likely air quality impacts of the project, including any exposure to radioactive material.

The proposal would involve the extraction and processing of ore which contains a number of rare earth elements as well as low levels of naturally occurring radioactive material (both uranium, at 120 parts per million (ppm) and thorium, at 300 ppm). In relation to this naturally occurring radioactive material, the disturbance of the ore and the processing and emplacement of the material would all be contained on the project site. The Commission understands that only very low levels of radioactive material are present in the ore, nonetheless, the material would need to be carefully managed to ensure it does not cause health or environmental impacts. There are a number of aspects that need to be considered and managed, including the control of dust containing radiation particles. Radiation, including radiation in dust particles, and the dispersion of radon gas from the ore, is considered in section 8.5.

In addition to the dust emissions that would be generated through the mining activities and associated crushing and grinding on the site (and would be within accepted levels), the processing facility will also produce other air emissions associated with the processing of the ore. In particular, the applicant's Environmental Impact Statement has considered the sulfur dioxide (SO_2), nitrogen dioxide (NO_2), hydrogen chloride (HCl), radon and odour emissions against the *Protection of the Environment Operations (Clean Air) Regulation 2010* (Clean Air Regulation) standards of concentrations for scheduled activities, general activities and plant. The Commission notes that the facility could also be classed as a non-ferrous metals production facility and that the Clean Air Regulation prescribes additional limits for these activities, see Table 1.

Table 1 – Emission limits specified in the *POEO (Clean Air) Regulation 2010*

Air impurity	Activity or plant	Standard of concentration
Standards of Concentration for Scheduled Premises non-ferrous metals		
Solid Particulates (TSP)	Any crushing, grinding, separating or materials handling activity	20 mg/m^3
	Any other activity or plant	50 mg/m^3
NO_2	Any smelting or refining process; Any alloying or casting process; Any sinter plant; Any fuel burning equipment	350 mg/m^3
Type 1 substances (in aggregate)	Any smelting or refining process	—
Type 1 substances and Type 2 substances (in aggregate)	Any smelting or refining process	1 mg/m^3
Cadmium (Cd) or mercury (Hg) individually	Any smelting or refining process	0.2 mg/m^3
Dioxins or furans	Any smelting or refining process	0.1 ng/m^3
Volatile organic compounds (VOCs), as n-propane equivalent	Any smelting or refining process	40 mg/m^3 VOCs or 125 mg/m^3 CO
General Standards of Concentration		
SO_2	Sulfuric acid manufacture using elemental sulfur	1,000 mg/m^3
SO_3	Any activity or plant	100 mg/m^3
HCl	Any activity, other than the manufacture of glazed terracotta roofing tiles	100 mg/m^3

Assessment against air quality criteria

The applicant's EIS (Part 2: Air Quality) indicates there would be 14 point emission sources (vents or stacks) from the processing plant. These would have heights ranging from 20 to 90 m (the Sulfuric Acid Plant Stack was proposed to reach 80 m in the EIS but has been increased to a height of 90 m in response to concerns raised by the EPA regarding air quality). The applicant has indicated the facility would comply with the in-stack concentration limits prescribed under the Clean Air Regulation (EIS Part 2, p44).

Notwithstanding this, and the low background pollution levels in the area, the EIS predicted the sulfur dioxide levels would exceed the impact assessment criteria set out in the NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (*EPA 2005), at the nearest residential receiver (which is owned by the applicant). In response to a submission from the EPA, the applicant increased the height of the Sulfuric Acid Plant Stack as noted above (from 80 to 90 m) and will also include a Caesium catalyst and/or a scrubber system in the plant design (RTS Appendix 5 p 5) to reduce the in-stack concentrations of SO_2, to less than 190ppm (544mg/m^3) to prevent any exceedance of the criteria.

The applicant has predicted that all other emissions would comply with the Impact Assessment Criteria set out in the NSW EPA's *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (*EPA 2005).

Additional Emissions Sources

The applicant's Response to Submissions also notes that three additional air emission sources have been added to the process: Zirconium Calciner and Coolers; Niobium Concentrate Refining – Roaster; and Niobium Concentrate Refining – Calciner. The Response to submissions suggests these sources would not produce sulfur dioxide emissions, but "*may have minor in-stack concentrations of other gases such as SO_3, HCl and NO_2 and will contribute to the overall load of air emissions released during the operation of the DZP processing plant.*" (RTS p 51). The applicant's specialist air quality assessment (Appendix 5 of the Response to Submissions) does not mention these additional emission sources and the Commission has been unable to find any additional information on the in-stack or receiver concentrations from these additional sources.

Level of assessment provided

In its original submission the NSW EPA's recommended:

1. The proponent [applicant] review and benchmark the proposed operations against best practice process design and emission control.
2. The proponent [applicant] identify additional controls that can be implemented to ensure that there are no predicted exceedances at sensitive receptors surrounding the project site.
3. Following the assessment under point 2) the air quality assessment be revised to demonstrate that proposed emissions will not result in exceedances of EPA's impact assessment criteria.
4. The air quality assessment be revised to include a comparison of proposed emission concentrations, for all pollutants and emission points, against the requirements of *the Protection of the Environment Operations (Clean Air) Regulation 2010.*

The Commission agrees with the approach recommended by the NSW EPA and notes that only some of this additional assessment was provided in the applicant's response to submissions. Instead, the applicant proposes to defer some of the revised modelling, until it is in a position to apply for an Environmental Protection Licence (EPL) from the EPA.

The Commission understands that this project and the proposed processing operations are unique and that the methods for processing the ore have been developed specifically for the material found on the project site. The Commission understands most zirconium is sourced from an entirely different type of mineral deposit with different processing methods. Consequently, this process (and potential emissions) are the subject of some ongoing development and refinement, and may also vary depending on the specifications of each buyer. While the Commission acknowledges the unusual circumstances of this unique facility it is important that the potential impacts of the project are properly assessed and managed to prevent health and amenity impacts at neighbouring properties.

Ultimately the EPA has accepted the applicant's proposed approach – to provide a revised Air Quality Impact Assessment following development of the final design and prior to submitting its application for an Environmental Protection Licence. The Commission would not normally condone this approach, however in light of the unusual circumstances the Commission has given careful consideration to this option.

In this instance the information provided to date indicates that the project will comply with all air impact assessment criteria at surrounding residential receivers. The Commission notes that there may be some additional control measures, such as scrubbers that could be installed to further minimise emissions. An integrated reactive and predictive management and monitoring system is also usually able to prevent any potential exceedances of standards by making adjustments to the operations on the site in response to predicted or actual inclement weather or emissions data. With this in mind, the Commission is satisfied that the project would be able to be built and managed to meet accepted air quality standards.

Appropriate consideration of the detailed design and benchmarking against best practice standards will be important to ensure the impacts of the project and minimised and include all reasonable and feasible control measures.

Recommendations

1. The Commission recommends that any development consent for the project should include conditions requiring:
    - the applicant to comply with the relevant emissions criteria at all residential receivers. In this regard it will be important to clarify whether the NO_2 emissions listed in Table 28 of the EIS Part 2 Air Quality volume represent the incremental or cumulative impact levels, as it presently suggests it is both (p56 vol 1 part 2);
    - the applicant to benchmark the design and the emissions controls against best practice standards;
    - emissions validation reports to be provided prior to commissioning (to demonstrate the design will comply with the EPA's Impact Assessment Criteria) and during operations (to demonstrate the commissioned facility is complying with the relevant standards and predictions;
    - detailed and comprehensive management, monitoring and reporting, including an integrated reactive and predictive management and monitoring system.

5. Water Impacts

The Commission has been directed to pay particular attention to the water impacts of the proposal. The potential water impacts were concerns for a number of those who spoke at the public hearing, and also in submissions. The key potential water issues considered by the Commission are:

- the water supply and water balance for the project (which uses considerable water in the processing of the ore into the zirconia and other products);
- the management of contaminated water on site during the life of the project; and
- the containment of waste products on site, particularly the salt encapsulation and residue encapsulation cells, which will need to sealed and contained to prevent moisture and runoff onto surrounding properties and waterways.

Water supply

The Department assessed the water impacts of the proposal, noting the significant water volumes required to process the ore (up to 4.13 GL a year), but found the project's actual water demand is likely to be substantially lower (p19). Nonetheless, the applicant has access to less than half its maximum water demand (1.78 GL of 4.13 GL). The Commission notes that options to improve water efficiency and recycling on site have been suggested, including in submissions and that the applicant has confirmed two reverse osmosis plants are already proposed, and noted that it has significant commercial interest in reducing its water use on site.

The Commission wrote to the NSW Office of Water seeking clarification on a number of matters (correspondence attached in Appendix 5), including the reliability of the applicant's water supply. In correspondence provided via the Department of Planning and Environment, the NSW Office of Water acknowledge the applicant's current water entitlements are inadequate to meet the predicted water demand and that there is uncertainty about its ability to obtain adequate entitlements.

Ultimately the Department's assessment concluded that securing sufficient water for the project is a commercial risk for the applicant and standard conditions would be applied to any consent, requiring the applicant to adjust the intensity of the operations on site to match its available water supply. The Commission has accepted this approach, but notes it will also be important to ensure that any water supply constraints do not compromise the environmental performance of the project, particularly in relation to dust suppression.

The Commission recommends that conditions should be imposed on any consent requiring the applicant to adjust the scale of operations to match the available water supply and also including requirements for forward planning to ensure water supply constraints do not compromise any aspect of the environmental performance of the development.

Management of surface water

During the life of the development, the facility is proposed to be a zero discharge site, with only clean surface water that has been diverted around the facility draining offsite, (although runoff from areas such as haul roads would not be contained in all rainfall events, with average overflow of 3 ML a year). Dirty water from the mine site and from the processing facility would be contained on site, for reuse, for example in dust suppression, or evaporated from tailings ponds. The site would contain a number of chemicals and fuels (largely for use in the processing plant). The ore proposed to be mined also contains relatively low levels of naturally occurring radioactive material/isotopes, and the processing of the ore would produce liquid and slurry waste streams containing these

radionuclides (Radiation is assessed in section 8.5.1, see page 34). Consequently, appropriate bunding and the design and capacity of storage ponds will be critical to ensuring the runoff from mining, processing and waste/residue storage areas is captured and contained even during severe flooding. The applicant proposes different levels of capture and containment for different areas of the site, depending on the level of contamination present.

- The Liquid Residue Storage Facilities would be given the highest level of protection, with capacity to capture the probable maximum flood event and an additional 1 m freeboard to prevent any waves in the pond from overtopping during this event.
- The Solid Residue Storage Facility would have an internal drainage system to collect rainfall, which would be captured and pumped to one of the liquid waste storage facilities.
- The Run of Mine Storage Pad (where the extracted ore would be stored prior to processing) would drain to a dedicated storage basin designed to contain the 1 in 100 year storm volume by a factor of two. Pumps would also be installed to allow water in this storage basin to be directed to the Liquid Residue Storage Facility to prevent overtopping of the basin. The applicant's EIS acknowledges that under exceptional circumstances (if the storm event exceeded the 1 in 100 year rainfall levels) the dam could overtop. In the event of overtopping, the assessment found:
    - the overflow would be diluted with other extreme flows in Wambangalang Creek;
    - the creek would continue to flow at high volumes after any spill from the dam, further diluting the downstream waters;
    - the radionuclides are not readily leachable so would remain in the sediment rather than the water; and
    - the dilution would result in no identifiable increase in isotope concentrations in the stream's sediment.

(EIS Part 4 p 51-53)

The surface water management approach adopted directs all contaminated water to the Liquid Residue Storage facility in the event of a severe storm event. There are a number of risks associated with this approach, which will need to be managed.

In particular, the calculations to determine the capacity of the Liquid Residue Storage Facility were not evident in the documents, so it is not possible for the Commission to verify that the facility will be designed to contain the probable maximum flood event, including the combined catchment runoff from the Liquid, Solid and Run of Mine storage areas, during that event (with a 1 m freeboard), as has been proposed. The Commission notes that the LRSF will be designed to capture the probable maximum flood event and an additional 1 m freeboard to prevent any waves in the pond from overtopping during this event. The water management plan for the site should be required to demonstrate that the design will have sufficient capacity to contain the probable maximum flood event during all years of mining and decommissioning.

Further, the EIS does not explain how water in the liquid storage facility would be managed following a severe event. As noted at the public hearing if the liquid residue storage facility is full of wastewater (or contains significant water volumes) this may affect the facility's capacity to handle the ongoing liquid waste stream that would be produced in the processing facility. Significant water volumes could take considerable time to evaporate from the liquid storage facility and it is not clear whether any contingencies are proposed or available to manage this following a severe weather event. Ultimately this water will need to be managed and contained on site and some further clarification on how this will be managed should be provided prior to any final determination of the application.

Water will be piped from different storage ponds to the Liquid Residue Storage Facility, with risks of leaks or spillage if the pipes are not adequately maintained and bunded. Bunding of pipes is proposed to manage potential leaks and spills in pipes. The Commission notes that a leak detection system and maintenance scheme should be included in the water management plan for the site.

The applicant's assessment (EIS Part 4) does not appear to make any provision for management and containment of any rainfall and runoff entering the Salt Encapsulation Cells. It is possible these have been considered as part of the Solid Waste Residue Storage Facility; however the conceptual design plans only show a stockpile in place of the Salt Residue Storage Facility, so this needs to be amended and addressed. The Commission expects that the Salt Residue Storage Facility will need to have capacity to contain the probable maximum flood, given that the facility is expected to contain the waste salt product and that the uranium will be diluted in this waste stream. The Commission expects it would be possible to engineer another storage basin. Nonetheless, further clarification of how stormwater flows would be managed and contained around the Salt Residue Storage Facility needs to be provided by the applicant prior to any determination of the application.

Bunding of storage tanks associated with the processing facility

The facility would use significant volumes of chemical reagents which would be stored in a tank farm at the processing facility. The storage tanks would be bunded, with capacity to trap 110% of the volume of the largest storage tank on the site as well as containment of up to 200mm of incident rainfall. Water from the mine site would be directed to dams with capacity to contain a 1 in 100 year storm event. If bunded areas are open to the weather, trapped stormwater would be directed to the Liquid Residue Storage Facility, or the processing water pond, as soon as practicable. The Commission acknowledges that covering of the tanks would provide an extra level of safety and considers that it is appropriate that prior to determination of the application, the applicant should be required to assess the probability and consequences of any contaminated discharges from the chemical storage areas and the feasibility (including costs) of covering the bunded tanks. The objective of these additional investigations is to avoid generating additional potentially contaminated water in the bunded area, which would need to be managed during rain events.

Long term containment of waste products

As noted in the applicant's assessment "*A significant volume of brine, and ultimately salt, will be generated in the process of extracting the rare metals. The salt will be precipitated from the brine in the LRSF cells and deposited in the SECs [Salt Encapsulation Cells]. Salt is highly soluble and mobile and has the potential to significantly compromise the beneficial uses of groundwater*." (EIS Vol 1 Part 5, p 5-iv). Extensive containment and leak detection measures are proposed to contain the salt and other waste products, along with groundwater monitoring. While these standard measures and associated conditions should protect ground and surface waters during the life of the project (while the applicant is on site to respond to any leaks detected), the salt and other waste products will need to be contained in perpetuity.

Nonetheless the Commission understands the Liquid Residue Storage Facility is proposed to be lined with a HDPE liner (EIS Part 4, p 51), while the Solid Residue Storage Facility is proposed to be double lined with HDPE or an equivalent impermeable liner. The Commission acknowledges the Liquid Residue Storage Facility does not have the same long term functions as the other storage areas as it would be removed post mining. Nonetheless, the Commission has not been able to identify any information to address the permeability uncertainties noted in the EIS, (Volume 1 Part 5, p 5-56) and this needs to be resolved prior to determination of the application. The permeability of the sediments and geology underlying the proposed liquid storage facilities will need to be confirmed and justified in the detailed design of these facilities, to ensure risks of mobilisation are minimised and so that there is time to identify and appropriately contain the migration of any leaks.

The solid and salt encapsulation cells are proposed to be located on low permeability materials, with a double liner and a leak detection system between the two liners (EIS Volume 1 Part 5). The proposed salt and solid residue storage or encapsulation cells appear to be suitable for the containment of the material, however the mechanisms for ongoing maintenance of these cells in perpetuity are not evident to the Commission. Given some of the containment cells will include highly soluble and mobile materials, the long term monitoring, maintenance and response mechanisms will need to be assured over the long term.

The procedures for closure of the liquid waste storage facilities were not readily apparent to some of the speakers at the public hearing, nor to the Commission. The proposed financial and legal mechanisms to protect the containment cells in the long term also require consideration, as the containment cells will need to be permanently secured. While the cells are proposed to be capped and rehabilitated with grasses there is a foreseeable risk that trees or other biological, physical or chemical processes could invade and erode or crack the capping layers in the long term, for example if the existence of the cells is forgotten, or if records are lost in the future. As also noted in section 8.5.1. it will be important to establish sufficient financial resources and legal mechanisms to ensure ongoing monitoring and maintenance programs are established, maintained and funded; and so that accurate and clear records of the cells will be maintained (for example on the title of the land and/or other appropriate registers).

Details of the suitable mechanisms should be considered prior to the determination of the application and conditions will need to specify the legal and financial arrangements to be established, with provisions for these mechanisms to be regularly reviewed and updated over the life of the project, and upon closure of the mine, to ensure the waste materials are appropriately contained in perpetuity.

Recommendations

2. Prior to determination of the application, the applicant is to assess the probability and consequences of any contaminated discharges from the chemical storage areas and the feasibility (including costs) of covering the bunded tanks. The objective of these additional investigations is to avoid generating additional potentially contaminated water in the bunded area, which would need to be managed during rain events.
3. The water management plan for the site should include a pipe leak detection and maintenance program and should also be required to demonstrate that the design of the Liquid Residue Storage Facility will have sufficient capacity to contain the probable maximum flood event during all years of mining and decommissioning (as is proposed in the application). These calculations will need to demonstrate:
   - how runoff from the Salt Encapsulation Cell is managed and contained;
   - that any stormwater in the bunded tank farm would be contained; and
   - how ongoing liquid waste generated would be managed while the water levels are evaporating.
4. The permeability of the sediments and geology underlying the proposed liquid storage facilities should be confirmed to justified the detailed design of liquid residue storage facilities, prior to determination of the application.
5. Conditions of consent should specify appropriate long term maintenance funding and legal records are put in place prior to the commencement of operations on the site and are regularly reviewed and updated over the life of the project, and upon closure of the mine, to ensure the waste materials are appropriately contained in perpetuity.

6. Transport Impacts

Concerns regarding transport and traffic impacts were some of the main issues raised in both public submissions and at the public hearing. Traffic generated by the proposal will include:

- Construction traffic – employees and the delivery of equipment; and
- Operational traffic – employees and the delivery of goods including up to:
    - 360,000 tonnes of chemical reagents to the site each year
    - 240,000 tonnes of limestone to the site from Geurie; and
    - 75,000 tonnes of ore concentrate from the site.

  (Note: reagents include sulphur, limestone, quick lime, caustic soda, soda ash, anhydrous ammonia, aluminium powder etc.)

The proposal provides for all employee traffic to the site to be via road however three options have been proposed for the transportation of reagents and other materials to, and products from the DZP site. These options involve a combination of road and rail options as outlined below:

> Preferred Option A – Rail (to Toongi) and minor road – upgrading of the disused railway line between Dubbo and the site with the majority of reagents being transported to, and processed product transported from, the site by rail.
>
> Option B – Rail (to Dubbo) / Road (to Toongi) – if Option A is delayed the applicant proposes delivery of bulk reagents to / from the site via the existing 'Fletchers' intermodal terminal in Dubbo by rail with material then being transferred to trucks for delivery to Toongi by road using an approved heavy haulage route. Information submitted post the response to submissions report has confirmed that B-doubles are able to be used in this option therefore local truck volumes would be similar to Option C.
>
> Contingency Option C – Road – This option provides that in the event that the Fletchers' intermodal terminal in Dubbo becomes unavailable or impractical, the majority of processing reagents and other materials (excluding those transported to Dubbo from Sydney by general freight rail) would be transported to the site by road. This option would also be used if access to the rail network is significantly delayed.

Under Option A transportation of approximately two-thirds of the reagents to site, and all of the processed ore product from the site, would be by rail. Option B provides for part rail and part road transportation. However approximately one third of the reagents to be delivered to the site would be via the existing road network under all transport options. Under Option C all transportation would be by road.

The proposal seeks assessment and approval of all three options noting that issues with the rail option (Option A) cannot be fully resolved until certainty over project approval and operations is obtained. AZL has therefore proposed that the initial operation would utilise road transportation only with a commitment that the preferred rail / road transport option, Option A, would be the subject of a feasibility study within 5 years of development approval.

Option B would be the short-term default option, subject to successful negotiations with the Fletchers' Intermodal terminal. Otherwise, option C would prevail.

6.1 Rail infrastructure

AZL has indicated that its preferred option for the transport of reagents and ore concentrate between the site and port for export is via Option A, as described above. However this proposal is in the conceptual stage only with AZL proposing that a final decision would be made on the option following a detailed feasibility study to commence 2 to 3 years after the commencement of operations (once processing operations have been bedded down and reagent supply contracts finalised). They have committed to the study being completed within 5 years of development approval.

AZL has indicated that Option A is its preferred option as it has significant benefits including:

- Lower operating costs which are less subject to fluctuation
- Operational efficiency – greater quantities delivered at once therefore resulting in increased efficiency in loading and unloading
- Environmental benefits – reducing in heavy vehicles and associated noise and air emissions and fauna fatalities; and
- Social investment.

The Commission notes that there is general support in the community and from Dubbo City Council for the upgrading of the disused railway line option (Option A). In particular a number of submissions have noted that pursuing the rail option would allow for a significant reduction in heavy vehicle trips per day on the local road network and a corresponding substantial reduction in amenity impacts for nearby residents.

Submitters have also noted improved safety in the transportation of dangerous goods by rail rather than by road although the Commission notes that the transportation of dangerous goods would be regulated under the *Dangerous Gods (Road and Rail Transport) Act 2008* and would be undertaken in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail*.

Concerns have also been raised that leaving the decision on the rail upgrade option to some years after the commencement of operations, will mean that it is unlikely that this option would be implemented and that this would represent a lost opportunity. Conversely the Commission notes that some concerns have also been raised about the amenity and safety impacts of reopening the rail line which incorporates a number of level crossings and in places is close to residential neighbourhoods.

The Department in its EAR has expressed 'serious doubts' about whether the rail upgrade option (Option A) is viable but recommends that AZL be required to carry out a feasibility study of the option within 3 years of the commencement of operations. Further it is noted that if AZL decide to use the railway line it should be required to develop a detailed schedule, in accordance with the relevant rail authorities, to:

- Reduce the potential amenity impacts of the train trips, by minimising the use of the railway at night; and
- Reduce the potential traffic impacts of the train trips on key level crossings, such as the Cobra Street (Mitchell Highway) intersection, by minimising the use of the railway during the day.

Further the Commission notes that following extensive discussions with the AZL, Transport for NSW has given conditional support to Option A forming part of the merit assessment process subject to additional commitments from AZL. These commitments include that AZL commit to undertaking the feasibility study to progress rail option A within 2 years of the commencement of operations. TfNSW also recommended that the feasibility study should consider the maximum probable mine life which is noted to be up to 70 years (given the available resource) rather than the 20 years for which approval is sought. TfNSW notes that the merit of this option would need to be assessed without a government subsidy.

The Commission has considered all relevant matters and supports the reinstatement of the Dubbo to Toongi Railway Line (Option A) as the preferred option, although it acknowledges that the economics of this option need to be proven and safety concerns at level crossings addressed. It considers that ideally a feasibility study of this option should be undertaken prior to the commencement of operations however it acknowledges that there are some impediments to this occurring and that it should not delay mine construction. The Commission therefore agrees with the Department that the feasibility study should be undertaken within 3 years of the commencement of operations and that it should consider the feasibility over both the proposed 20 years and the long term mine life (approximately 70 years) notwithstanding that the current review is confined to the 20 year proposal. It notes that any extension to the mine life would be subject to a separate approval.

Further the Commission recommends that in addition to the usual matters included in a Feasibility Study, the Study should be required to include consultation with the local community and Taronga Western Plain Zoo and monitoring of truck impacts (including noise impacts, traffic impacts, accident statistics etc.).

Recommendation

6. AZL be required to undertake a feasibility study of Option A within 3 years of the commencement of operations on site and to implement Option A should the study determine that it is feasible
7. The feasibility study be required to consider the feasibility of Option A over both the proposed 20 year mine life and long term mine life (approximately 70 years) and in addition to the usual matters, include consultation with the local community and Taronga Western Plain Zoo and monitoring of truck impacts (including noise impacts, traffic impacts, accident statistics etc.) on nearby residents, the zoo and other impacted parties.
8. If Option A is pursued, AZL is to be required to develop a detailed schedule, in accordance with the relevant rail authorities, to:
   - Reduce the potential amenity impacts of the train trips, by minimising the use of the railway at night; and
   - Reduce the potential traffic impacts of the train trips on key level crossings, such as the Cobra Street (Mitchell Highway) intersection, by minimising the use of the railway during peak traffic periods.

6.2 Road Infrastructure

As noted above, even if Option A is adopted all employees and up to a third of goods to be supplied to the site would be transported by road. The proposal provides for road access to the site via the Newell Highway, Obley Road and Toongi Road (as shown in Figure 3 below). To ensure that the local road system is able to cater to the traffic generated by the proposal AZL proposes to upgrade both

Obley Road and Toongi Road to meet relevant Austroads standards. Specifically upgrade works include:

- upgrade the pavement of both Obley and Toongi Roads to provide a 20 year design life
    - Obley Road – 12m formation between the Newell Highway and Toongi Road (two 3.5m lanes and two 1.5m shoulders of sealed pavement)
    - Toongi Road – 10m formation with 8.5m sealed pavement with 75cm gravel shoulders from Obley Road
- provide Obley Road with a 7.5m clear zone for straight sections and 9m for the outside of all curves, or install wire rope safety barriers where appropriate
- upgrade the intersection of Obley Road with the main Zoo entrance to provide an extended chanellised right hand turn into the Zoo
- provide an asphalt concrete seal to a 2.4km section of Obley Road from the Newell Highway (200m beyond Zoofari Lodge / Dundullimal Homestead intersections)and a 950m section of Obley Road from Toongi Road intersection to reduce noise at the Zoo and other receivers
- upgrade the intersection of Obley and Toongi Roads o the relevant standard to provide appropriate deceleration, acceleration and auxiliary turning lanes
- upgrade Hyandra, Twelve Mile and Wambangalang Creek crossings; and
- provide additional pavement seal as required on approach and exit from existing bus shelters along Obley Road.

These measures are generally supported by the RMS (refer letter dated 14/4/14 from TfNSW) and Dubbo City Council subject to the applicant's Statement of Commitments (with recommended amendments) and recommended conditions of consent. All works would be required to be undertaken to the satisfaction of Council and to meet the relevant Austroads standards.

The Commission notes that the proposed road upgrade works are required to accommodate employee and reagent transport traffic associated with all three transportation options and would be required in the initial 5 years of operation when road transport only (Option 3) is proposed. However it does not include upgrades to Yarrendale Road and Boothenba Road in relation to Option B which have both been identified as fit for purpose. In relation to this option the traffic study recommends a s94 contribution in relation to pavement life and review of access controls for Boothenba Road. Accordingly the Commission recommends that this be required should Option B be pursued.

The Commission notes that the traffic impact assessment indicates that subject to the above road upgrades, the increase in traffic generated by the proposal (both during construction and operation) will be able to be accommodated within the local road system. Further intersections (Newell Highway / Obley Road and Newell Highway / Boothenba Road) in the surrounding area will continue to operate at a satisfactory level of service. The Commission agrees with this conclusion.

However in relation to safety impacts the Commission agrees, as required by the RMS, that the applicant should be required to undertake a traffic safety audit of the intersection of the Newell Highway and Obley Road prior to the commencement of operations (and then every 3 years) and to implement any findings of the audit. The audit should also consider the speed limit on Obley Road along the distance of the Western Plains Zoo. These requirements should be included in any project approval.

The Commission also notes that AZL has made a commitment to schedule shift changes outside of peak periods (8.00am – 9.00am and 3.00pm – 4.00pm) and to ensure they don't coincide with school bus pick up / drop off times. It considers that this should also be included as a requirement of any

approval. The Department's recommendations in relation to traffic management to reduce the traffic impacts of the project are appropriate, that is:

AZL should be required to:

- Minimise the construction traffic impacts of the project
- Stage shift changes outside of peak hours
- Restrict heavy vehicle movements to/from the site to the day period, unless there is an emergency
- Prepare and implement a Drivers Code of Conduct for the project; and
- Monitor the effectiveness of these measures.

Recommendations

9. If Option B is pursued AZL be required to pay section 94 contributions in relation to the pavement life of Boothenba Road. Further AZL should be required to undertake a review of access controls for all accesses and roads intersecting with Boothenba Road and implement any recommendations prior to the commencement of operations.
10. AZL be required to undertake a traffic safety audit of the intersection of the Newell Highway and Obley Road prior to the commencement of operations (and then every 3 years) and to implement the findings of the audit. The audit should review the designated speed limit on Obley Road outside the Western Plains Zoo.
11. AZL be required to prepare a construction and operational traffic management plan for the project which details measures to reduce the traffic impacts of the project, including but not limited to:

    - Minimising the construction traffic impacts of the project
    - Staging shift changes outside of the peak traffic hours 8.00am – 9.00am and 3.00pm – 4.00pm and so as not to coincide for school bus drop off / pick up times
    - Restricting heavy vehicle movements to/from the site to the day period, unless there is an emergency
    - Preparing and implementing a Drivers Code of Conduct for the project; and
    - Monitoring the effectiveness of these measures.

Subject to these recommendations, and other standard conditions of consent and other regulatory requirements, the Commission considers that the transport impacts of the DZP will be acceptable and do not preclude approval of the project.

6.3 Traffic Noise

The proposal will necessarily give rise to an increase in noise in an area which is currently a relatively quiet rural area with low background levels. The Commission notes that a significant source of noise is heavy vehicle haulage and rail transport which has the potential to impact on nearby residences and the Taronga Western Plains Zoo (TWPZ). The acoustic impacts of the project have been addressed in the acoustic assessment (EMGA Mitchell McLennan, December 2013) and note that noise from trains associated with Option A could exceed the required criteria at a number of residences within Dubbo. However the Department's report recommends that compliance could be achieved by scheduling rail operations during the day / or evening and not during the night time period when the criteria is lowest. The Commission supports this approach and considered that a condition should be applied to any approval requiring that rail movements be limited to day / evening hours.

Similarly while the acoustic assessment indicates that road traffic noise will be well below the relevant road traffic noise criteria in the NSW Roads Noise Policy, the Department has recommended that AZL be required to restrict the project's heavy vehicle movements to the day. The Commission agrees that this is appropriate and will minimise noise impacts on nearby residents, as well as TWPZ animals and visitors during the night time period.

Recommendations

12. AZL be required to limit rail traffic movements to the day / evening period (outside of night time period) and heavy vehicle movements to daytime hours.

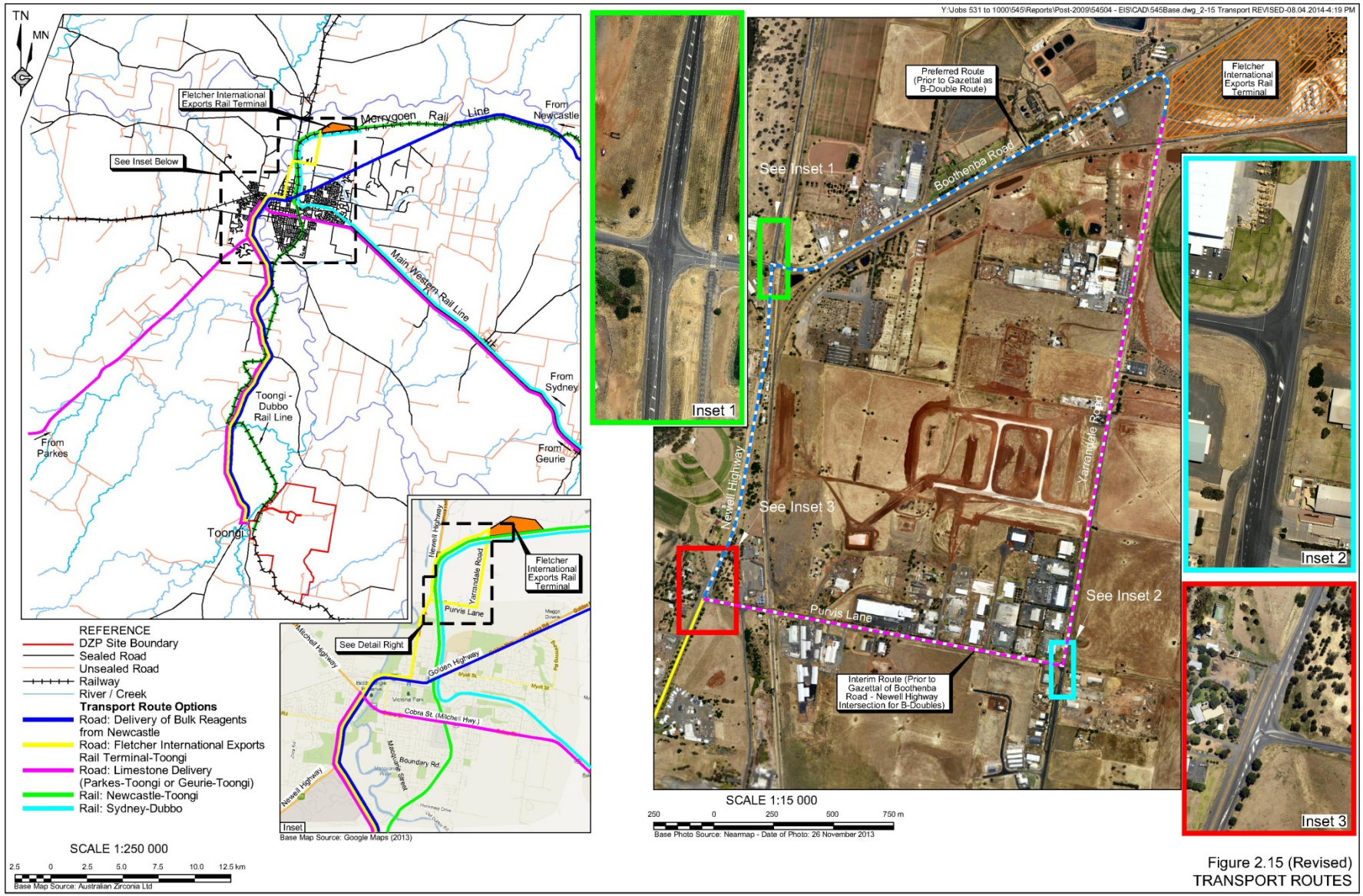

Figure 3: Proposed transport route

7. Long Term Landform and Land Use Impacts

The rehabilitation and long term land use of a mine site is influenced by a number of factors including physical features such as topography, soils, availability of water, the mine plan design and scheduling and the design and implementation of the rehabilitation itself.

It is noted that whilst the proposal seeks consent for a 22 year mine life (including 20 years operational and 2 years of construction) the site includes additional resources that could enable mining to continue for up to 70 years with additional approval. The Commission is restricted to assessing the current proposal and has not assessed, nor implied any endorsement to future mining beyond the current proposal.

In the current application AZL proposes that the final land uses for the site would generally be for agriculture and biodiversity conservation and potentially future industry. The project provides that the final landform (as illustrated in Figure 4 and 5 below) would include:

- Removal of all processing plant, office and ancillary infrastructure with the remaining landform to be profiled to approximate that which existed prior to the establishment of the infrastructure
- A single appropriately bunded, fenced and signed final void
- A shaped and revegetated complex of the WRE, SRSF and Salt Encapsulation Cells comprising undulating upper surfaces, outer faces with maximum slopes of 18^{o} 1:3 (V:H) and appropriately located and designed surface water control structures
- A return to the pre-DZP landform over areas covered by the LRSF with the lined removed and disposed off-site. Material within the embankments respread over the former salt crystallation cells and the areas covered with topsoil and revegetation
- Any vegetated bunds and surface water infrastructure including sediment basins, would be retained
- The Macquarie River Pipeline and Natural Gas Pipeline would either be excavated and removed or retained depending on the preference of future landowners, and
- The rail line infrastructure would be retained.

7.1 Final land use

The proposal indicates that the landform is ultimately dependent on the intended final land use and could be modified during the life of the Proposal. It proposes that the final land use be determined with the community and relevant government agencies prior to decommissioning of the project however the Commission notes that an indicative final land use is included as illustrated in Figure 6 below. The Department's report has indicated that this approach is appropriate.

However, the Commission notes that DRE has raised concerns regarding the intention that the final land use be identified at a later time and the identification of potential land uses which are not consistent with the existing land use strategies in the region (notably identification of future industrial use and possibly rural residential). DRE has recommended a condition of approval requiring the preparation of a final land use plan consistent with existing surrounding land uses and zonings.

The Commission agrees with DRE and considers that any future use of the administration area for industrial or other purposes should be subject to Council's strategic planning process including not

only suitability of the site but existing availability of industrial land. In the interim it agrees that future land uses on site should be limited to agriculture / biodiversity conservation as part of the current project.

DRE has also recommended a condition requiring the preparation of a Rehabilitation Plan to the satisfaction of the Secretary of NSW Trade and Investment, Regional Infrastructure and Services. The Rehabilitation Plan must:

- Be prepared in accordance with DRE guidelines
- Be submitted and approved by the Secretary of NSW Trade and Investment, Regional Infrastructure & Services prior to the commencement of surface disturbing activities within the Mining Lease
- Address all aspects of rehabilitation and mine closure, including post mining land use, rehabilitation objectives, completion criteria and rehabilitation monitoring, and
- Include a final landform design that is consistent with the surrounding topography of the area and considers natural drainage design and relief patterns and principles.

The Commission considers that this requirement is appropriate and should be applied to any approval.

In terms of site rehabilitation, the proposal notes that it would adopt a progressive approach to ensure that where practicable areas where mining, waste rock placement or solid residue storage are completed, are quickly shaped and vegetated to provide a stable landform. However it notes that the nature of the proposal dictates that the largest areas of disturbance, the LSRF, remains active for the life of the proposal and therefore progressive rehabilitation of this area would be minimal. To compensate for this the applicant proposes biodiversity enhancement management activities on undisturbed areas as part of its Biodiversity Offset Strategy. The Commission recognises this is appropriate however considers that a condition should be applied to any approval requiring that the Rehabilitation Plan provide for progressive rehabilitation of the site as far as practicable.

Recommendations

13. Conditions of consent should limit the final land uses of the site to agriculture and biodiversity conservation and an amended land use plan reflecting this requirement should be required prior to commencement of construction on the site.
14. The applicant be required to prepare a Rehabilitation Plan in accordance with DRE guidelines for the approval of the Secretary of NSW Trade and Investment, Regional Infrastructure & Services prior to the commencement of surface disturbing activities within the Mining Lease. The plan is to address all aspects of rehabilitation and mine closure, including post mining land use, rehabilitation objectives, completion criteria and rehabilitation monitoring, and Include a final landform design that is consistent with the surrounding topography of the area and considers natural drainage design and relief patterns and principles
15. Conditions of consent should ensure that:

- progressive rehabilitation be undertaken on site as far as practicable within the constraints of the project; and
- the rehabilitation and final landform are reviewed and updated at year 15 of the mine life (or at any other stage, at the request of the Secretary) to ensure the proposal is consistent with current standards and best practice.

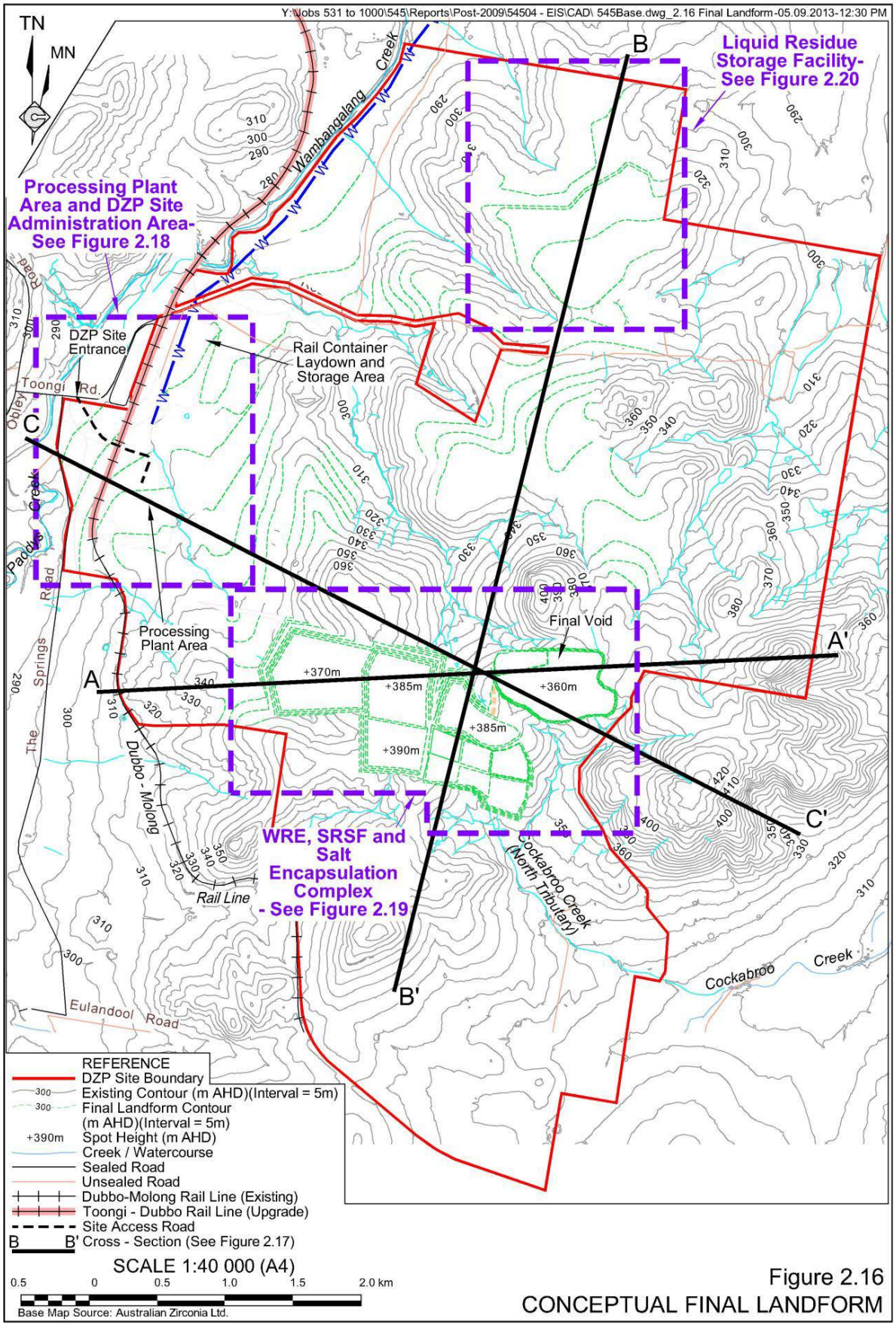

Figure 4: Conceptual Final Landform (Source: RW Corkery & Co. 2013a)

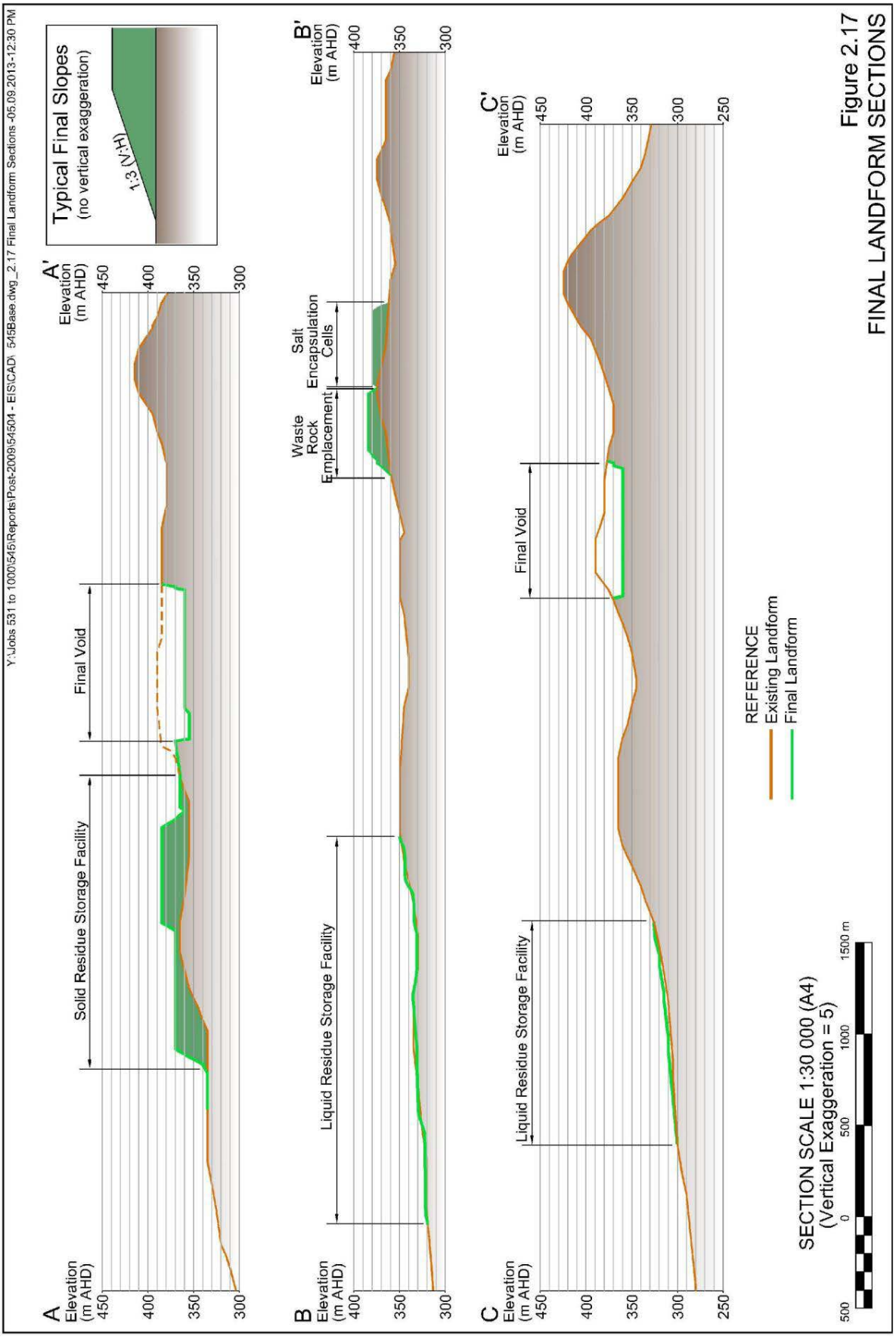

Figure 5: Final Landform Sections (Source: RW Corkery & Co. 2013a)

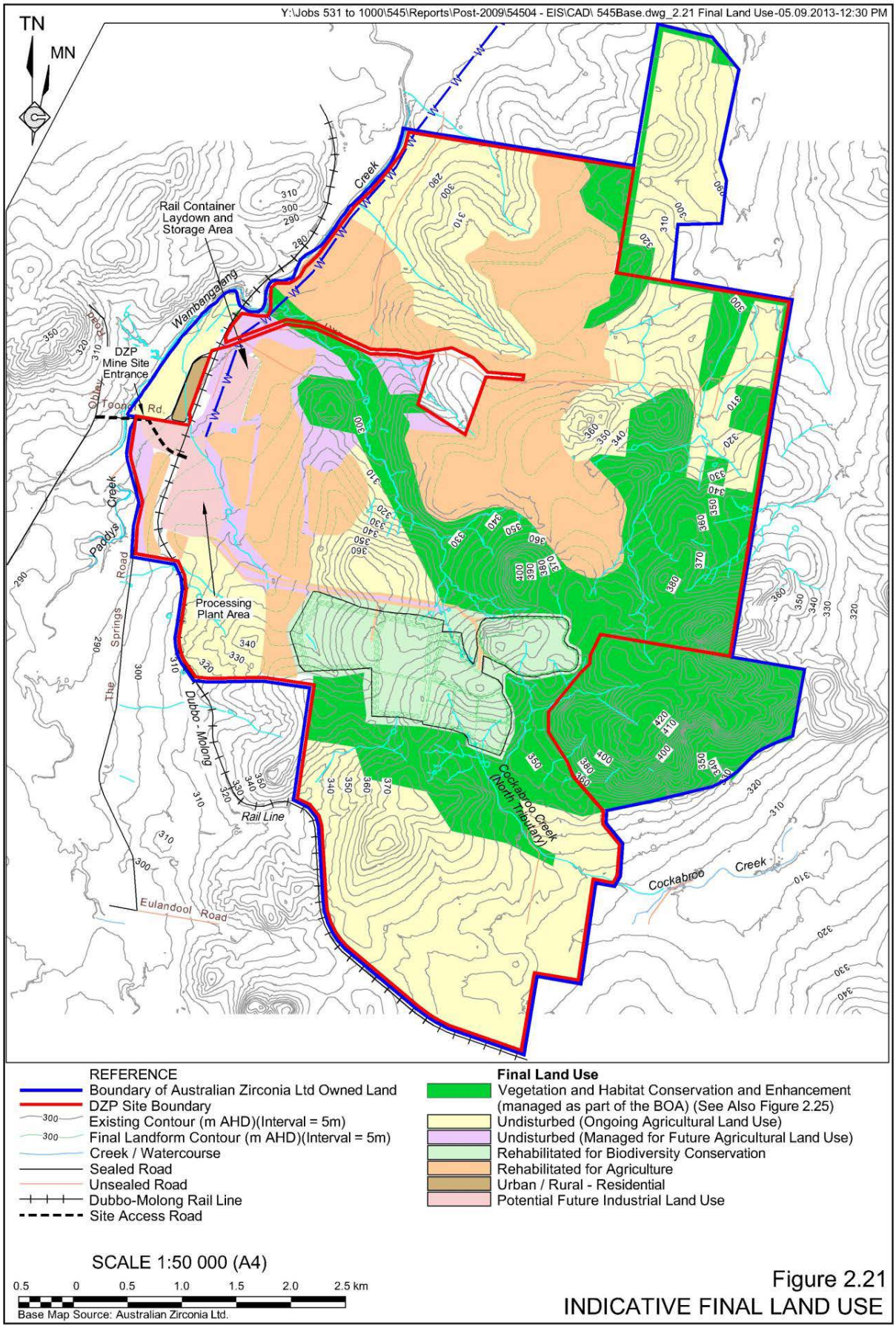

Figure 6: Indicative Final Land Use (Source: RW Corkery & Co. 2013a)

7.2 Final Landform

Figure 4 above (p24) illustrates the proposed final landform post mining operations on site.

The void

The Commission notes that the proposal provides for the void to remain open with bunding and fencing proposed. Concerns have been raised that the void could potentially fill with water and could result in a concentration of salts.

The proposal indicates that the final depth of the open cut would remain above the groundwater table and that given the elevated position, i.e. without any surface water catchment, accumulation of water in the void is unlikely. However it appears that the void could have a depth of approximately 25m below the adjacent ground level in the worst case situation.

The Commission notes that DRE requires that the site be rehabilitated such that the final landform design is consistent with the surrounding topography of the area and considers natural drainage design and relief patterns and principles.

The Commission notes that the preference should be to avoid the legacy of a final void if practical. Factors that need to be considered include the practicality of avoiding a final void, the likely cost and the final land use options. The Department's Assessment Report does not discuss the pros and cons of leaving a void other than noting 'the final void would remain open, however it would be appropriately bunded and fenced' (p.46). These issues appear not to be addressed in the EA or appendices other than noting that a void would be left bunded and fenced. The Commission was advised verbally by the applicant and Department that it would be advantageous to leave the void open as there are known reserves of rare earths and rare metals directly below the void and it is the applicant's current intention to apply for an extension of mining for a further 50 years. As stated above the Commission is not assessing any future potential for mining, however, it is legitimate to consider potential future land uses post mining. The Commission inspected the site and noted the mineral outcrop is currently rocky and has low agricultural productivity and that there are substantial additional reserves of rare earths and rare metals under the proposed mining area. The Commission is also advised that progressive backfilling of the mine pit is not particularly practical as the mineral extraction will progress downwards rather than horizontally. In order to avoid leaving a void, the applicant would have to backfill the void at the end of the current proposed 20 year period. This is not cost effective, as it would require double handling and redisturbance of material that had been emplaced during the mining period. The Commission considers that leaving a final void is acceptable in this case given, the cost of backfilling and redisturbance of emplaced material for backfilling , the low potential for agricultural productivity and the substantial value of the mineral resource below the pit.

Solid Residue Storage Facility, Waste Rock Emplacement and Salt Encapsulation Cells

The final landform shown for the SRSF, WRE and SECs does not appear natural with these areas projecting approximately 20-40m above the adjacent topography. The applicant has indicated the landforms will be undulating with maximum slopes of 14 to 16 degrees and revegetated for low intensity grazing. Given the importance of maintaining the integrity of the emplacement/encapsulation cells, the Commission accepts the landform design options are likely to be constrained in this instance. Nonetheless, the prosed undulating landform should be included in conditions of any consent.

Recommendations

16. AZL be required to comply with detailed performance measures for the Solid Residue Storage Facility, Waste Rock Emplacement and Salt Encapsulation Cells to achieve an undulating landform consistent with the surrounding environment and revegetated suitable for pre mining grazing agricultural land, while ensuring the integrity of the cells is maintained.

7.3 Revegetation Strategy

The proposal notes that revegetation of the site would be undertaken as either revegetation of the final landform or biodiversity enhancement planting and seeding of native species as a component of the Biodiversity Offset Strategy. There would be a distinction between rehabilitation and revegetation for those areas to be returned to agricultural production (infrastructure areas, surface water management structures and LRSF) and areas to be managed for the re-establishment of native vegetation (Waste Rock Emplacement, SRSF and final void area).

Areas to be returned to agricultural production would be profiled, covered with topsoil and sown with a mix of pasture species. Over the remaining areas of disturbance a mixture of native and introduced species of grasses and legumes would be used for rapid stabilisation of batters. Following stabilisation revegetation would be undertaken using both tube stock and direct seeding techniques to create native woodland vegetation communities across the site.

The Commission considers that this approach is appropriate.

7.4 Monitoring and Maintenance

The proposal indicates the applicant's commitment to effective rehabilitation of the site would involve an ongoing monitoring and maintenance program. No time limit has been placed on post mining rehabilitation monitoring and maintenance rather the applicant proposes that maintenance would continue until such time as the rehabilitation objectives (section 2.17.2 of the EIS) are achieved to the satisfaction of the relevant government agencies.

The Commission is of the view that monitoring and maintenance of site rehabilitation post cessation of mining should be conditioned in any approval.

Recommendations

17. AZL is to undertake ongoing monitoring and maintenance of the site post mining in accordance with the approved monitoring and maintenance program until such time as the Department of Planning and Environment and the Department of Resources and Energy direct.

7.5 Rehabilitation for Agricultural use

The Department of Primary Industries, Office of Agricultural Sustainability & Food Security (DPI) has raised concerns that the DZP will impact 613.1ha of Class 3 agricultural land and 74ha of Class 2 lands. In terms of rehabilitation DPI is concerned that AZL has not adequately committed to rehabilitate the land back to its former productivity nor to maintain the agricultural productivity of the surrounding land throughout the life of the project. DPI has recommended a condition of consent in this regard. The applicant has made a commitment to return that affected land (LRSF land) back to agriculturally productive land however with a final Land and Soil Capability Class of 4

being a reduction from Class 3/2 as currently nominated. The applicant argues that the current use of the land is more akin to Class 4 or 5 therefore Class 4 is appropriate.

The Commission considers that the commitment to return the land to Class 4 agricultural land is appropriate given the existing and future proposed uses of the land. It does however agree with DPI that a condition should be imposed requiring maintenance of the agricultural productivity of land surrounding the project (not being for biodiversity conservation) throughout the life of the project and requiring the control of invasive species within the total site.

Recommendations

18. AZL be required to maintain the agricultural productivity of lands within its control surrounding the project throughout the life of the project and control invasive species (weeds and pest animals) within the total site.

8. Other issues

8.1 Socio Economic impacts

The Commission notes that significant support has been indicated for the proposal in a number of submissions including notably the submission from Dubbo City Council. The Commission agrees that the proposal is unique in nature and would result in a range of social and economic benefits for both the state of NSW and the Dubbo region. In particular the benefits nominated by the applicant (and outlined in the SEAR, p 3 and 11) include:

- Developing a new resource in NSW that is in demand internationally for the manufacture of technologically advanced products
- Capital spending of $1.06 billion
- Annual spending of around $50 million in the local economy
- Providing jobs for up to 250 people during operations and 300 – 400 during the establishment and construction phase
- The payment of around $600,000 per annum to Dubbo Council for community enhancement (under the VPA); and
- The payment of around $12 million to the State each year in royalties.

The Commission also notes that the proposal includes value added benefits to the local region and State as a result of the processing of the ore on site. Accordingly it considers that the social and economic benefits of the proposal are significant.

8.2 Impacts on Taronga Western Plains Zoo

The Commission notes that the entrance to Taronga Western Plains Zoo (TWPZ) is off Obley Road which also forms the main access to the project site. In its submission to the Commission hearing, the Zoo noted its general support for the project however has raised residual concerns regarding traffic safety and traffic noise particularly from the use of Obley Road to access the proposal. Whilst it noted that a number of its issues had been resolved by the applicant through the response to submission report (RTS) outstanding issues include:

1. Request for 3m vertical sound barrier approx. 1km in length along Obley Road to reduce the acoustic impacts on its conservation programs for the Southern Black Rhinoceros and the African Wild Dog and other holding areas (Note: barrier will reduce max. levels from predicted 65dB to <50-55dB as noted in applicant's supplementary acoustic report)
2. Upgrade to provide a safe road crossing for pedestrian and bike users between Tracker Riley Cycle Way and TWPZ with TWPZ, Council and potentially the RMS to agree design and implementation
3. Request for reduction in speed limit on Obley Road between TWPZ and Dundullimal Homestead from 100 to 80 kmph to protect cyclist and pedestrian safety and to mitigate risk of vehicle incident or chemical spill
4. Installation of a left hand turning lane into Zoo from southern approach allowing separation of turning tourist traffic and heavy vehicle traffic associated with the project.
5. Installation of lighting at the main zoo entrance

6. Request for copy of Transport Management Plan for the Project and appropriate emergency response detail.

The Commission notes the significance of the Taronga Western Plains Zoo (and nearby heritage attractions) and is concerned to ensure that the project does not result in negative impacts on the zoo operations, breeding programs, safety of visitors, etc. It notes that AZL has committed to a range of measures to reduce the noise impacts of heavy vehicle traffic on Obley Road on TWPZ animals and visitors (acoustic pavement and truck management arrangements). It further notes that AZL has indicated a willingness to investigate the construction of a vertical noise barrier adjacent to the TWPZ breeding pens should the currently proposed measures fail to mitigate the impacts of increased traffic on TWPZ animals and overnight guests.

Although it is noted that the Department has recommended heavy vehicle movements be limited to day time hours only, the Commission considers that it is appropriate to require AZL to commission a study of the impacts of the increased traffic on Obley Road on TWPZ animals and visitors during the first 6 months of operations. It recommends that the Study be undertaken in conjunction with TWPZ and be submitted to the Secretary within 8 months of the commencement of operations. If the Study identifies adverse impacts AZL shall be required to implement a vertical sound barrier as agreed with the TWPZ.

The Commission considers that other requests made by TWPZ in relation to pedestrian / cycle crossing, left hand turn lane from southern approach and lighting at the Zoo entrance are not reasonable in the light of upgrades and commitments already made by AZL. However it does agree that a copy of the project Transport Management Plan and appropriate emergency response detail should be provided to TWPZ for information following approval.

The Commission agrees that as requested by TWPZ (and supported by AZL) it would be appropriate for a reduction in speed limit on Obley Road be implemented between TWPZ and Dundullimal Homestead from 100 to 80 kmph. This would assist in ensuring pedestrian / cyclist safety. It does however note that this is a matter for Dubbo City Council and cannot be given effect through a development approval. As noted above, the matter of the speed limit on Obley Road should be considered as part of the safety audit to be undertaken by the applicant.

Recommendations

19. AZL be required to commission a study of the impacts of the increased traffic on Obley Road on TWPZ animals and visitors during the first 6 months of operations. The Study is to be undertaken in conjunction with TWPZ and be submitted to the Secretary within 8 months of the commencement of operations. If the Study identifies adverse impacts AZL shall be required to implement a vertical sound barrier as agreed with the TWPZ to reduce noise impacts to acceptable levels.
20. AZL be required to provide a copy of its approved Transport Management Plan and emergency response detail to TWPZ for information following approval.

8.3 Pink-tailed Worm Lizard

Concerns have been raised by submitters regarding the impact of the proposal on the Pink-tailed Worm Lizard which is listed as a vulnerable species under the *Threatened Species Conservation Act 1994* and the *Environment Protection Biodiversity Conservation Act 1999* (Clth).

The Commission notes that the project would remove 25.5ha of high and 9.8ha of medium quality habitat for the lizard however the proposed biodiversity offsets would provide for the permanent protection and management for conservation of 82.3ha of high, 114.7ha of medium and 42ha of low quality habitat. A plan of management is also currently being prepared for the species and significant measures incorporated into the project to minimise the potential impact on the species.

The Commission notes that the NSW Office of Environment & Heritage has provided advice that it is satisfied with the proposed biodiversity offsets taking into account the impact on the Pink-tailed Worm Lizard.

Having regard to the measures outlined by the applicant to minimise potential impacts and the proposed biodiversity offset area and ongoing species management, the Commission is satisfied that the impact of the proposal on the Pink-tailed Worm Lizard has been minimises and does not preclude approval of the project.

8.4 Fossil site

The Commission notes advice from NSW Trade and Investment's Resources and Energy Division which indicates that the plant fossil site "Fossil Hill' at Grandale within the project site is scientifically significant and includes representatives of several species which are found nowhere else. It also notes that the Sherwin report, prepared on behalf of NSW Trade and Investment, indicates that the site is disturbed but also suggests that there may be further scope for paleontological discoveries to be made. It also concludes that surveys should be undertaken during bench cutting on Fossil Hill and the best exposures retained.

The Commission sought further clarification in relation to the fossil site from NSW Trade and investment and in particular sought advice in relation to:

a. Whether options to avoid disturbance and covering of the Fossil Hill site were considered, and is so, the reasons this was not pursued
b. What management actions would be necessary to minimise the disturbance / destruction of fossils during construction? In particular what construction techniques would allow the best chances of protecting and identifying any fossils? What surveying and collection methods would be required? And how any extracted fossils could be preserved and made publicly accessible.

In response to the Commission's request NSW Trade and Investment advised:

> *The current plan of development for the project requires the construction of terraced tailings dams, one of which is proposed to overlap with a scientifically significant fossil site known as Fossil Hill.*
>
> *A field investigation of the site was undertaken by Dr Lawrence Sherwin (contact palaeontologist) and a geologist from the Geological Survey of NSW on 6 November 2013. Dr*

Sherwin considered that the proposed mine development will not adversely impact upon what is already a disturbed site.

Regardless it is necessary for the proponent to propose how the fossil site should best be managed in order to minimise adverse impact on both the mine development and an important scientific resource.

The Geological Survey of NSW has advised the proponent that any excavation work carried out at the site should be inspected by a qualified person for any further geological and paleontological information and, if possible retain at least one exposure for future reference.

The Commission considers that the issue of whether the proposed terraced tailings dam can be relocated to ensure that it does not affect the scientifically significant Fossil Hill site has not adequately been addressed in the current application. Accordingly it considers that it is appropriate that prior to determination of the subject application, AZL should provide additional information which addresses options to relocate the proposed terraced tailing dam to ensure it does not impact on the fossil site. Where no such options are considered viable, a requirement should be imposed on any consent requiring that any excavation work carried out at the site should be inspected by a qualified person for any further geological and paleontological information and, if possible at least one exposure of the local stratigraphy retained for future reference.

Recommendations

21. Prior to determination of the subject application AZL should be required to provide additional information which addresses options to relocate the proposed terraced tailing dam to ensure it does not impact on the fossil site. Where no such options are considered viable, a requirement should be imposed on any consent requiring that any excavation work carried out at the site should be inspected by a qualified person for any further geological and paleontological information and, if possible at least one exposure of the local stratigraphy retained for future reference.

8.5 Hazards and Risks

As noted in the earlier sections of this report, the deposit proposed to be mined contains low levels of naturally occurring radioactive material (both Uranium, at concentrations of 80 to 160 parts per million (ppm) and Thorium, at 250 to 500 ppm) (EIS specialist report Part 3). The disturbance of the ore and the transport, processing and emplacement of the material would all be contained on the project site. Nonetheless, the EIS indicates that the uranium and thorium contain radionuclides from the uranium -238, uranium-235 and thorium-232 decay chains, which have significant half lives. The Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) describe these as long lived radionuclides (both uranium-238 and thorium-232 have a half-life of over 1 billion years) (ARPANSA 2008). Consequently, the radioactive components will need to be carefully managed during all stages of the project.

As noted in the Department's assessment report, the processing of the ore will also require dangerous goods to be transported to and used on the site (Department 2014). The Department's assessment found that the project would comply with accepted risk criteria and that the transport and handling and storage of Dangerous Goods would be strictly regulated under the NSW Dangerous Goods (Road and Rail Transport) Regulation (2009) [the Commission is aware that this has been updated in 2014] and *NSW Work Health and Safety (Mines) Act2013*. The Department's assessment suggests it would recommend standard conditions for potentially hazardous industries, which would include requirements for a Final Hazard Analysis and regular hazard audits.

8.5.1 Radiation

The Commission notes that the predicted levels of radioactive material on the site are very low, and largely below the criteria that would meet the definition of a radioactive substance under NSW's *Radiation Control Regulation2013* (Hondros, 2014). Nonetheless, they are above the world average (which is 3 ppm for uranium and 6 ppm for thorium) and at levels that require the consideration of radiological impacts to workers, the public and the environment (EIS Part 3 p 10).

Some submissions raised concerns about the extraction of material containing uranium. The Commission understands the radioactive material is naturally occurring; present in relatively low concentrations within the ore; and is not the target of this application.

In 2005, the Radiation Health and Safety Advisory Council prepared a discussion paper for the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) about Naturally-Occurring Radioactive Material in Australia (ARPANSA 2005). The paper notes that Naturally-Occurring Radioactive Material (NORM) is distributed throughout the earth's crust. Most of the NORM contains radionuclides from decay of uranium -238, uranium-235 and thorium-232 (those present on the project site). It notes that "*in the majority of situations the naturally occurring radionuclide concentrations are not high enough to pose problems for the environment or human*" (ARPANSA 2005. p5)

It goes on to caution however that:

- *"Although the concentration of NORM in most natural substances is low, almost any operation in which any material is extracted from the earth and processed can concentrate NORM in the product, by-product, residue or waste streams*." ARPANSA 2008 p 4
- *"Activities such as mineral processing, coal burning (e.g. for electricity generation) and water treatment can modify the NORM concentrations in the products, by-products and wastes (residues) generated by these activities. In some situations, specific radionuclides can become separated from the original radionuclide mixture, e.g. volatilisation of polonium and lead isotopes when coal is burnt to generate electricity and the separation of radium and uranium during the processing of phosphate ore to produce fertiliser and phosphogypsum."* (ARPANSA 2005. p5)

Consequently the Commission has considered the radiation issue. Each of the three radioactive isotopes in the ore (uranium -238; uranium – 235 and thorium 232) goes through a decay chain, transforming into other elements as it decays, before finally becoming a stable lead - 206, 207 or 208 isotope. The applicant's assessment (EIS Specialist Consultant Studies, Part 3) indicates that the main active solid elements in the ore are:

Those associated with the decay of uranium – 238:

- Uranium – 238;
- Thorium – 230;
- Radium – 226;
- Lead – 210; and
- Polonium – 210.

Those associated with the decay of uranium – 235:

- Protactinium – 231;
- Actinium – 227;

Those associated with the decay of thorium – 232:

- Thorium – 232; and
- Radium – 228.

Most of the other isotopes that occur through the decay chain are short lived, with half lives of days or even seconds. Nonetheless, some isotopes in the material, particularly the Radium, decays to various radon isotopes (inert gases). The radon gases (some of which are also referred to as thoron) have the capacity to disperse, posing additional hazard considerations, especially for workers onsite and also in relation to potential dispersion and subsequent deposition off site (when it decays to solid polonium and then lead radioisotopes). This is a particular issue for radon – 222 as it has a half life of 3.8 days, sufficient time to disperse off site.

The Commission notes that these are all natural decay processes occurring on the site at present. The processing would not alter the existing decay chain reactions, but the extraction, milling chemical processing and subsequent management of waste streams could all increase dispersion and subsequent exposure risks associated with the material.

The ARPANSA Safety Guide for the Management of naturally occurring radioactive material, Radiation Protection Series No 15 identifies key stages in the overall management of materials containing NORM. Those relevant to this application are:

- Mineral extraction;
- Mineral processing;
- Management of residues containing NORM; and
- Management of wastes containing NORM (p21).

The guide notes there are both internal and external exposure pathways, with internal exposure, including:

- Inhalation of radon and thoron from materials containing NORM;
- Inhalation of dust and fume;
- Ingestion of material contaminated with NORM;

External exposures include:

- Direct exposure to radionuclides in residue or equipment or plant surfaces;
- Direct exposure to radionuclides on the ground surface;
- Direct exposure from radionuclides in waste rock piles from mining operations;
- Direct exposure from material deposited on the skin;
- Direct exposure from radionuclides in landfill. (ARPANSA, 2008)

The EIS considers the exposure pathways and radiation doses for both mine and processing plant workers, as well as the offsite, or public dose. The EIS found that doses for workers on the site would be within the 20mSv a year occupational exposure limit set by the International Commission on Radiological Protection.

The International Commission on Radiological Protection also prescribes that the general public shall not be exposed to more than 1 mSv per annum (over and above natural background) (ARPANSA 2013). The EIS indicates that the only potential public or offsite exposure pathways associated with the project are airborne, inhalation of radioactive dust and inhalation of radon (RN^{222} and RN^{220}) (EIS part 3 p 25). The EIS predicts the maximum public exposure dose to be 0.028 mSv a year, mainly from the inhalation of dust.

The Commission notes that some of the assumptions used in calculating the worker and public exposure doses appear to leave some of the potential pathways nominated in the ARPANSA Safety Guide unaccounted for. For example, the applicant's assessment doesn't appear to consider potential ingestion of material, for example if deposited dust and decayed radon gas (solid polonium and then lead radioisotopes) are washed into water supplies including rainwater tanks. Also in

calculating the occupational radiation dose for miners, the EIS indicates the mine walls have been assumed to be inert (non-radioactive). The Commission understands that during some stages of mining, some of the walls will be the mineralised ore deposit rather than the surrounding inert material. It is therefore recommended that the applicant be required to demonstrate that all pathways have been considered and that the modelling reflects the nature of all relevant potential exposures. Nonetheless the Commission acknowledges that other assumptions have added conservatism to the calculations, and that the calculated average annual dose rate for miners is well below prescribed limits, and for members of the public the expected does is <0.1mSv/y, an order of magnitude lower than the 1mSv/y standard.

The ARPANSA Safety Guide to the Management of Naturally Occurring Radioactive Material (NORM), suggests that where there is potential for significant exposures to occur, a NORM Management Plan may be required, including provision for monitoring of radionuclide concentrations and dose assessments. In this case significant exposure is not likely, due to the relatively low levels of uranium and thorium within the material. The Commission nonetheless considers that such a plan would be an important mechanism for ensuring radiation and radioactive material is appropriately, handled, stored and disposed of.

"*In the case of NORM, the Authority and operator would negotiate a project specific NORM Management Plan (NMP), that consists of a Radiation Management Plan (RMP) and Radioactive Waste Management Plan(RWMP), and other project specific management arrangements as agreed with the Authority, using the guidance from the Mining Safety Guide as a basis. The NORM management plan should include:*

- *a description of operation/process including a description of where in the process doses may arise;*
- *a demonstration of compliance with relevant radiation protection standards (see Mining Code and Safety Guide);*
- *the relevant elements of a radiation management plan (see Mining Code and Safety Guide);*
- *the relevant elements of a radioactive waste management plan, where applicable (see Mining Code and Safety Guide);*
- *an assessment of the current or projected use of a material that is regarded as a residue containing NORM and that currently is, or has the potential to be, recycled;*
- *an assessment of the potential impact of manufactured items containing NORM;*
- *appropriate monitoring programs;*
- *the relevant occupational health and safety issues;*
- *the relevant environmental protection issues;*
- *the definition of responsibilities for the operator/employer and employees;*
- *a process of review of the status of the operation in relation to continuing controls.*" P 43-44

Much of this has already been prepared by the applicant. Critical elements will include the monitoring program and the process for review of the operation against the controls.

In the long term, management of residue and waste will pose the most significant issue as the material has such a long half life.

ARPANSA (2008) indicates that, "*Current and historical methods for disposing of NORM wastes and residues on-site include landfill, down-hole disposal, near-surface disposal, land contouring, and disposal into mine tailings dams. Off-site approaches to re-use or disposal include dilution in industrial waste disposal facilities, land farming by ploughing in over a gazetted disposal area, incorporation into concrete for building construction or road base, and incorporation into other building materials such as bricks or plasterboard.*" P5

The EIS indicates that there are three main waste streams that would be treated and disposed of in a residue storage facility, these are a solid residue stream, a chloride waste liquor stream and a sulfate waste liquor stream. The majority of the radionuclides end up in the solid residue stream. The uranium is more soluble and would be found in the liquid fraction, but this liquor stream would be directed to the evaporation ponds where the uranium precipitates to salts during evaporation (EIS Part 3 p 35). Consequently the Salt Encapsulation Cell would contain most of the uranium radionuclides and associated decay chain isotopes.

The applicant's assessment indicates the solid waste would be classified as a restricted solid waste, as would the ferro-niobium slag; which would be slurried and mixed with the solid residue for disposal in the solid residue storage facility. The applicant has indicated that the residue storage facility would be designed to be permanent and zero discharge, with a geo-membrane lining and leak detection system.

The Radiation Assessment Report notes that one of the waste products for the processing stream for ferro-niobium (FeNb) meets the classification as a "radioactive substance" if it were to be disposed of by itself. All three solid waste streams containing radionuclides (i.e. FeNb, combined residues and combined salt) have been assessed against the NSW *Radiation Control Act 1990* and associated regulations and have been found to be classified as restricted solid wastes but not hazardous solid wastes. Liquid wastes (i.e. the combined waste liquor) are not classified as restricted solid waste as they are predicted to be below the assessment level criteria.

The radioactive material from the processing streams would be mixed and diluted before final waste emplacement. The final emplaced material would then be well below the maximum acceptable level. The applicant has indicated that the residue storage facility would be designed to be permanent and zero discharge, with a geo-membrane lining and leak detection system.

The Commission understands that dilution of the radioactive waste to achieve a lower and acceptable overall radiation level is common practice and consistent with national guidelines. One potential concern however is the large dilution ratio (eg 4,000t of FeNb waste diluted with 1,300,000t each year). This mixing regime would need to be managed carefully throughout the life of the project to maintain homogeneity of the final mixed waste and avoid any hot spots in the final waste emplacement cell. The applicant has advised that the radioactive waste will be slurried and mixed with other non-radioactive slurries where it will be homogenised before dewatering prior to final emplacement. The Commission accepts that this process should be satisfactory but recommends that a comprehensive monitoring regime be developed prior to final determination of the proposal, to monitor the level of radiation in the materials both before and after mixing to ensure the final waste is well mixed and does not contain hot spots. This information should also be publicly available.

<u>Long term management issues</u>

As noted in other sections of this report, the waste streams would be disposed of in emplacement areas (containment cells) on the site. Material that has potentially become contaminated with process streams containing these radionuclides would also be directed to the containment cells for disposal, this would include decommissioned plant, along with disposable materials used within the processing facility. The Commission notes that once mining is completed it will be important to ensure the processing facility and associated infrastructure are appropriately decommissioned and that all potentially contaminated components are appropriately dismantled and disposed of. Conditions and bonds or securities to insure against any potential liability to the state of NSW should be required in any consent for the application.

Plans and procedures for the closure of the containment cells and mechanisms for protecting them in the long term require some further clarification and consideration, as noted previously in section 5.

The Commission recommends that conditions of consent should specify appropriate maintenance funding and legal records are put in place prior to the commencement of operations on the site and are regularly reviewed and updated over the life of the project, and upon closure of the mine.

Radon Gas

As noted earlier in this section, radon gas is produced as part of the natural decay of certain isotopes in the ore on site. Radon decays to solid polonium and then lead radioisotopes but has a half-life of 3.8 days, sufficient time to disperse off site. Both the applicant and the Department have assessed the potential for radon to disperse from the site. The EIS predicts radon levels would be highest in the vicinity of the waste storage facilities, the mine pit, stockpile and processing areas and would disperse to low levels, predicted to reach an annual average of approximately 2 Bq/m^3 at the project boundary. Surrounding residences are predicted to receive annual average concentrations of up to 0.22 Bq/m^3.

The applicant notes that the NSW EPA does not specify a criterion for radon (EIS Vol 1 Part 2 Air Quality, p2-58). Consequently the Commission has referred to the Australian Radiation Protection and Nuclear Safety Agency which notes that radon may be found in higher concentrations in buildings, "*as buildings have the effect of trapping radon for a while*". "*…the average concentration of radon in Australian homes is about 11 Bq* m^{-3}*. This is less than in many other countries and is not much larger than radon levels in outside air.*" (ARPANSA 2011, p 2) and is not generally an issue of concern. Nonetheless radon levels in homes vary and homes with very high concentrations of radon may take action to reduce radon levels and the associated risks of contracting lung cancer (ARPANSA 2011). ARPANSA indicates that "*The National Health and Medical Research Council (NHMRC) has reviewed the evidence available and the results of the ARPANSA survey, and has recommended that if the annual average radon concentration in a home exceeds 200 Bq* m^{-3}*, the householder should contact the appropriate state or territory radiation health authority for advice.*" (ARPANSA 2011, p 2)

The maximum annual average radon increase associated with the project is 0.22 Bq m^{-3} outside the nearest residence (EIS). This is three orders of magnitude lower than the 200 Bq m^{-3} internal action level recommended by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA 2002). Consequently the Commission is satisfied the increased radon levels would have minimal impacts and are acceptable.

Non-human biota

The applicant has also assessed the radiation exposure risks to flora and fauna in the area. The assessment indicates that outside the $10g/m^2$ per month deposition contour there is negligible risk of harm to 'reference organisms' (EIS Part 3 3-27). This level would not be exceeded outside of the project boundary, however the assessment predicts that an area up to 5 km long and 1 km wide could be affect by levels requiring further consideration (EIS Part 3, p3-67).

Dose rates for various reference organisms were then considered and were found to be within levels where no measurable population effects would occur. The assessment also noted that in the long term, levels would gradually reduce over time, with associated reductions in dose rates (EIS Part 3, p3-67).

The Commission is satisfied the naturally occurring radioactive material on site can be safely handled and managed on the project site. Nonetheless, it will be important to ensure that dust is minimised, waste and contaminated stormwater is appropriately contained and handled; that waste products (including decommissioning of the processing plant) are carefully diluted, mixed and emplaced with ongoing monitoring, maintenance and contingency measures in place during all stages of the project

Recommendations

22. Condition of consent should include requirements for a NORM Management Plan, including a Radiation Management Plan and Radioactive Waste Management Plan
23. Calculations for worker and public exposure to be updated to take account of all potential pathways nominated in ARPANSA Safety Guide prior to determination of the application.
24. The Commission recommends that a comprehensive waste stream monitoring regime be developed prior to final determination of the proposal, to monitor the level of radiation in the materials both before and after mixing to ensure the final waste is well mixed and does not contain hot spots. This information should also be publicly available.

Conditions of consent should require decommissioning to be undertaken upon completion of mining, with provision of appropriate bonds or securities to ensure this can be completed in the event of financing issues.

8.6 Loss of Agricultural Land for biodiversity offsets

Concerns have been raised that the allocation of land for biodiversity offsets will reduce land available for agricultural including some land which is identified as Biophysical Strategic Agricultural Land (BSAL) under *State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007*.

The Commission notes that the SEPP does not strictly apply to the subject project as the affected land was not included in the SEPP prior to the EIS going on exhibition. Nonetheless the Commission is of the view that given the proposed economic value of the project to the local area, State and potentially internationally and the proposed final land uses (return to agricultural productivity and biodiversity conservation), the impact of the proposal on the availability of agricultural land is acceptable.

8.7 Statement of commitments

The Commission notes that the applicant has included a Statement of Commitment in its EIS. A Statement of Commitments no longer has legal status under the *Environmental Planning and Assessment Act 1979*, therefore it is considered that in any approval the Department should ensure that the commitments made are legally binding (potentially through inclusion as conditions of consent).

Recommendation

25. The Department should ensure that the commitments made by the applicant in its application are legally binding.

9. Conclusions

The Commission has carefully considered the application for the Dubbo Zirconia Project. The Commission has also considered that submissions made to the Commission and to the Department of Planning and Environment, the issues raised that the public hearing and in meetings with and advice from government agencies, and other documents referred to throughout this report.

The Commission notes that concerns have been raised by a number of parties in relation to the potential for the mine to result in uranium mining. In this regard it notes that the proposal does not include uranium mining which is prohibited in NSW under the *Mining Act 1992*. The mineralized material on site does however include small amounts of naturally occurring radioactive material, including uranium, which will remain in a relatively dilute form within the waste streams of the extraction process. These waste (including that containing the uranium radionuclides) will remain on the project site, emplaced in containment cells.

The proposal is unique in nature and would result in a range of socio-economic benefits for both the state of NSW and the Dubbo region. In particular these benefits (as outlined in the SEAR) include:

- Developing a new resource in NSW that is in demand internationally for the manufacture of technologically advanced products
- Capital spending of $1.06 billion
- Annual spending of around $50 million in the local economy
- Providing jobs for up to 250 people during operations and 300 – 400 during the establishment and construction phase
- The payment of around $600,000 per annum to Dubbo Council for community enhancement (under the VPA); and
- The payment of around $12 million to the State each year in royalties.

The Commission has given careful consideration to the key issues raised in relation to the application including impacts on: air quality, water; transport, long term landform and land use, Taronga Western Plains Zoo, the pink-tailed worm lizard, Fossil Hill, agricultural lands as a result of biodiversity offsets and hazards and risks (including radiation impacts).

In conclusion, the Commission is generally satisfied that the project is approvable subject to further detail on a number of matters and stringent environmental requirements. The Commission recognises that the project is unique in nature and accordingly some flexibility should be allowed to enable further design development prior to construction and commencement of operations on site, so long as it complies with the health, amenity and environmental standards. The Commission also recognises the significant economic benefits of the project for both the state of NSW and the region. It considered that the proposal is unlikely to result in significant environmental impacts and that on balance the benefits of the project outweigh its impacts.

Recommendations

Air Quality

1. The Commission recommends that any development consent for the project should include conditions requiring:

    - the applicant to comply with the relevant emissions criteria at all residential receivers. In this regard it will be important to clarify whether the NO_2 emissions listed in Table 28

of the EIS (Part 2 Air Quality volume) represent the incremental or cumulative impact levels, as it presently suggests it is both (p56 vol 1 part 2);
- the applicant to benchmark the design and the emissions controls against best practice standards;
- emissions validation reports to be provided prior to commissioning (to demonstrate the design will comply with the EPA's Impact Assessment Criteria) and during operations (to demonstrate the commissioned facility is complying with the relevant standards and predictions;
- detailed and comprehensive management, monitoring and reporting, including an integrated reactive and predictive management and monitoring system.

Water

2. Prior to determination of the application, the applicant is to assess the probability and consequences of any contaminated discharges from the chemical storage areas and the feasibility (including costs) of covering the bunded tanks. The objective of these additional investigations is to avoid generating additional potentially contaminated water in the bunded area, which would need to be managed during rain events.
3. The water management plan for the site should include a pipe leak detection and maintenance program and should also be required to demonstrate that the design of the Liquid Residue Storage Facility will have sufficient capacity to contain the probable maximum flood event during all years of mining and decommissioning (as is proposed in the application). These calculations will need to demonstrate:
    - how runoff from the Salt Encapsulation Cell is managed and contained;
    - that any stormwater in the bunded tank farm would be contained; and
    - how ongoing liquid waste generated would be managed while the water levels are evaporating.
4. The permeability of the sediments and geology underlying the proposed liquid storage facilities should be confirmed to justified the detailed design of liquid residue storage facilities, prior to determination of the application.
5. Conditions of consent should specify appropriate long term maintenance funding and legal records are put in place prior to the commencement of operations on the site and are regularly reviewed and updated over the life of the project, and upon closure of the mine, to ensure the waste materials are appropriately contained in perpetuity.

Transport

6. AZL be required to undertake a feasibility study of Option A within 2 years of the commencement of operations on site and to implement Option A should the study determine that it is feasible
7. The feasibility study be required to consider the feasibility of Option A over both the proposed 20 year mine life and long term mine life (approximately 70 years and in addition to the usual matters, include consultation with the local community and Taronga Western Plain Zoo and monitoring of truck impacts (including noise impacts, traffic impacts, accident statistics etc.) on nearby residents, the zoo and other impacted parties.
8. If Option A is pursued AZL is to be required to develop a detailed schedule, in accordance with the relevant rail authorities, to:

- Reduce the potential amenity impacts of the train trips, by minimising the use of the railway at night; and
- Reduce the potential traffic impacts of the train trips on key level crossings, such as the Cobra Street (Mitchell Highway) intersection, by minimising the use of the railway during peak traffic periods.

9. If Option B is pursued AZL be required to pay section 94 contributions in relation to the pavement life of Boothenba Road. Further AZL should be required to undertake a review of access controls for all accesses and roads intersecting with Boothenba Road and implement any recommendations prior to the commencement of operations.

10. AZL be required to undertake a traffic safety audit of the intersection of the Newell Highway and Obley Road prior to the commencement of operations (and then every 3 years) and to implement the findings of the audit. The audit should review the designated speed limit on Obley Road outside the Western Plains Zoo.

11. AZL be required to prepare a construction and operational traffic management plan for the project which details measures to reduce the traffic impacts of the project, including but not limited to:

    - Minimising the construction traffic impacts of the project
    - Staging shift changes outside of the peak traffic hours 8.00am – 9.00am and 3.00pm – 4.00pm and so as not to coincide for school bus drop off / pick up times
    - Restricting heavy vehicle movements to/from the site to the day period, unless there is an emergency
    - Preparing and implementing a Drivers Code of Conduct for the project; and
    - Monitoring the effectiveness of these measures.

12. AZL be required to limit rail traffic movements to the day / evening period (outside of night time period) and heavy vehicle movements to daytime hours.

Long Term Landform and Final Land Use

13. Conditions of consent should limit the final land uses of the site to agriculture and biodiversity conservation and an amended land use plan reflecting this requirement should be required prior to commencement of construction on the site.

14. The applicant be required to prepare a Rehabilitation Plan in accordance with DRE guidelines for the approval of the Secretary of NSW Trade and Investment, Regional Infrastructure & Services prior to the commencement of surface disturbing activities within the Mining Lease. The plan is to address all aspects of rehabilitation and mine closure, including post mining land use, rehabilitation objectives, completion criteria and rehabilitation monitoring, and Include a final landform design that is consistent with the surrounding topography of the area and considers natural drainage design and relief patterns and principles.

15. Conditions of consent should ensure that:

    - progressive rehabilitation be undertaken on site as far as practicable within the constraints of the project; and
    - the rehabilitation and final landform are reviewed and updated at year 15 of the mine life (or at any other stage, at the request of the Secretary) to ensure the proposal is consistent with current standards and best practice.

16. AZL be required to comply with detailed performance measures for the Solid Residue Storage Facility, Waste Rock Emplacement and Salt Encapsulation Cells to achieve an undulating landform consistent with the surrounding environment and revegetated suitable for pre mining grazing agricultural land, while ensuring the integrity of the cells is maintained.

17. AZL is to undertake ongoing monitoring and maintenance of the site post mining in accordance with the approved monitoring and maintenance program until such time as the Department of Planning and Environment and Department of Resources and Energy direct.

18. AZL be required to maintain the agricultural productivity of lands within its control surrounding the project throughout the life of the project and control invasive species (weeds and pest animals) within the total site.

Impacts on Taronga Western Plains Zoo

19. AZL be required to commission a study of the impacts of the increased traffic on Obley Road on TWPZ animals and visitors during the first 6 months of operations. The Study is to be undertaken in conjunction with TWPZ and be submitted to the Secretary within 8 months of the commencement of operations. If the Study identifies adverse impacts AZL shall be required to implement a vertical sound barrier as agreed with the TWPZ to reduce noise impacts to acceptable levels.

20. AZL be required to provide a copy of its approved Transport Management Plan and emergency response detail to TWPZ for information following approval.

Fossil Hill site

21. Prior to determination of the subject application AZL should be required to provide additional information which addresses options to relocate the proposed terraced tailing dam to ensure it does not impact on the fossil site. Where no such options are considered viable, a requirement should be imposed on any consent requiring that any excavation work carried out at the site should be inspected by a qualified person for any further geological and paleontological information and, if possible at least one exposure of the local stratigraphy retained for future reference.

Hazards and Risks

22. Condition of consent should include requirements for a NORM Management Plan, including a Radiation Management Plan and Radioactive Waste Management Plan

23. Calculations for worker and public exposure to be updated to take account of all potential pathways nominated in ARPANSA Safety Guide prior to determination of the application.

24. The Commission recommends that a comprehensive waste stream monitoring regime be developed prior to final determination of the proposal, to monitor the level of radiation in the materials both before and after mixing to ensure the final waste is well mixed and does not contain hot spots. This information should also be publicly available.

25. Conditions of consent should require decommissioning to be undertaken upon completion of mining, with provision of appropriate bonds or securities to ensure this can be completed in the event of financing issues.

Statement of Commitments

26. The Department should ensure that the commitments made by the applicant in its application are legally binding.

References

EIS/Environmental Impact Statement = R.W. Corkery & Co. 2013a.

RTS/Response to Submissions = R.W. Corkery & Co. 2013b.

SEAR/Secretary's Environmental Assessment Report = Department of Planning and Environment. 2014

ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). 2002. *Recommendations for limiting exposure to ionizing radiation (1995) (Guidance note [NOHSC:3022(1995)]) and National standard for limiting occupational exposure to ionizing radiation [NOHSC:1013(1995)] Radiation Protection Series Publication No. 1 Republished March 2002*. ISBN 0-642-79403-0. Accessed 5 February 2015 http://www.arpansa.gov.au/pubs/rps/rps1.pdf

ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). 2005. *Naturally-Occurring Radioactive Material (NORM) in Australia: Issues for Discussion* (prepared by the Radiation Health and Safety Advisory Council for the CEO of ARPANSA). Accessed 6 February 2015 http://www.arpansa.gov.au/pubs/norm/rhsac_disc.pdf

ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). 2008. *Safety Guide: Management of Naturally Occurring Radioactive Material (NORM), Radiation Protection Series No 15.* Accessed 6 February 2015 http://www.arpansa.gov.au/pubs/rps/rps15.pdf

ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). 2011. *Fact Sheet 5: Radon in Homes*. Accessed 6 February 2015 http://www.arpansa.gov.au/pubs/factsheets/005is_radon.pdf

ARPANSA (Australian Radiation Protection and Nuclear Safety Agency). 2013. *Fact Sheet 17: Ionising Radiation and Health.* Accessed 6 February 2015 http://www.arpansa.gov.au/radiationprotection/factsheets/is_rad.cfm

Department of Planning and Environment. 2014. *State Significant Development: Dubbo Zirconia Project (SSD 5251) Secretary's Environmental Assessment Report, September 2014*.

EPA. 2005. *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*. Accessed 6 February 2014 http://www.epa.nsw.gov.au/resources/air/ammodelling05361.pdf

Hondros, 2014. *Technical Note: Comments on Radioactivity of the DPZ Ore, Processing Streams and Waste* JRHC Enterprises Pty Ltd

R.W. Corkery & Co. 2013a. *Dubbo Zirconia Project Environmental Impact Statement, Development Application SSD 5251.* Prepared for Australian Zirconia Limited.

R.W. Corkery & Co. 2013b. *Dubbo Zirconia Project Response to Submission, State Significant Development Application SSD 5251.* Prepared for Australian Zirconia Limited.

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Appendix 1 – Minister's Terms of Reference for the Review

Request to the Planning Assessment Commission
Dubbo Zirconia Project

Section 23D of the *Environmental Planning and Assessment Act 1979*
Clauses 268R and 268V of the *Environmental Planning & Assessment Regulation 2000*

I, the Minister for Planning, request the Planning Assessment Commission to:

1. Carry out a review of the Dubbo Zirconia Project, and:
   a) consider the EIS for the project, the issues raised in submissions, the formal response to submissions, the Department of Planning and Environment's preliminary assessment report for the project, and any other relevant information provided on the project during the course of the review;
   b) assess the merits of the project as a whole, paying particular attention to the likely
      - air quality impacts, including any exposure to radioactive material;
      - water impacts;
      - transport impacts; and
      - long term land use impacts of the project, including the suitability and feasibility of the proposed rehabilitation strategy; and
   c) recommend any measures to further avoid, minimise, and/or manage the potential impacts of the project (if required).

2. Conduct public hearings after the Department of Planning and Environment provides a copy of its preliminary assessment report for the project to the Planning Assessment Commission.

3. Submit its final report on the review to the Department of Planning and Environment within 2 months of the public hearings, unless the Secretary of the Department of Planning and Environment agrees otherwise.

The Hon Pru Goward MP
Minister for Planning

Sydney -7 JUL 2014

Appendix 2 - List of speakers at the Public Hearing

1. Australian Zirconia Ltd
   Nic Earner, Chief Operations Officer
2. Taronga Western Plains Zoo
   Matthew Fuller, General Manager
3. Regional Development Australia Orana NSW
   Felicity Taylor-Edwards, CEO
4. Rob Hudson
5. Michael Brennan
6. Paul McCallum
7. Elsie Howe
8. Dubbo Chamber of Commerce and Industry
   Megan Dixon, Vice President
9. Matt Parmeter
10. Zoe Bourchier
11. Ian Maxwell Donald
12. Steve Fieldus
13. Inland Rivers Network
    Bev Smiles
14. Warwick Harper
15. Glenn Shepherd
16. Central West Environment Council
    Cilla Kinross
17. Mudgee and District Environment Group
    Diane O'Mara
18. Roland Samuels
19. Phil Cameron
20. Phil Thompson

Appendix 3 - Summary of Issues raised at the Public Hearing

Issues of concern or objection

Impacts to Taronga Western Plains Zoo and the associate tourist and recreation precinct;

- noting the zoo's significance as an asset to NSW, to the regional economy and it's significant contribution to global science and conservation outcomes;
- Traffic safety and noise impacts around the zoo, for:
    - visitors, noting visitors attend the zoo at all hours, for early morning tours as well as conferences and events; and
    - noting the roads proximity (and associated noise and hazard risks) to the black rhino breeding area –which is currently highly successful having bred more black rhinos than any other breeding program outside of Africa.
- Mitigation measures requested included 3 m vertical sound barriers along the road to reduce noise impacts to the black rhino; upgrades to pedestrian and cycleway facilities; a reduction in the speed limit in the tourist precinct; measures to improve safety at the entrance to the zoo, including a separate turning lane and lighting; and transport management and emergency response measures.

Health impacts, including:

- exposure to dust and radiation;
- concerns about contamination of rainwater and storage facilities;
- to crops, livestock and biodiversity;
- questioning the contingency and corrective options available and options for residents to leave.

Water resources, including:

- contamination risks:
    - to both ground and surface waters, including to Dubbo's town water supply, noting the site's proximity to waterways and locations of surrounding aquifers;
    - lack of information on the follow up/remediation processes in the event a leak is detected;
    - inconsistencies in the proposed leak management response actions post closure of the evaporation ponds;
    - lifespan of the liners;
    - noting emergency discharges have been allowed on other mines
- the huge water resource requirements and comparisons to the Dubbo town water usage;
- lack of secure water supply for the project; and
- that impacts of extracting water from the likely sources has not been assessed;

Waste, including

- Waste products, particularly saline waste and waste containing radiation;
- Ability to store and contain waste on the site, including:
    - in the long term;
    - the liquid waste storage capacity and operating implications should evaporation rates prove to be lower than has been modelled;
    - need for detailed design to be finalised prior to determination of the application.

Hazards and Risks, especially in the event of a bush fire, concerns about the timing for preparation of the final hazard analysis; the transport of large volumes of dangerous goods and the potential for unforseen impacts arising from limited knowledge of the materials to be extracted and processed.

Transport and traffic impacts:

- some noted a preference for rail transport;
- inconsistencies and uncertainties about when or if the rail option would be pursued and associated impacts and number of train movements;
- truck noise, noting truck movements should be limited to day time hours only, a driver code of conduct was requested along with a traffic management plant;
- uncertainties about road maintenance monitoring and funding, noting potential burden to Council and taxpayers;
- cumulative heavy vehicle traffic impacts; and
- assessment said to be inadequate.

Biodiversity impacts, including calls for the offset mechanism to be identified and in place prior to determination and need to specify clear implementation timeframes.

Amenity concerns, especially for visitors to the area and potential for detrimental impacts on the region's tourism and cultural industries, including from visual, blasting and traffic impacts.

Other concerns about:

- the potential to develop and extract uranium from the site and the legality of the proposal given uranium mining is banned in NSW;
- loss of agricultural land;
- final landform, particularly the proposed final void;
- social impacts;
- the ability to adequately monitor and regulate the facility and respond to incidents, noting monitoring and auditing would be undertaken by the applicant rather than Government;
- integrity of the applicant;
- the potential for the operation to be extended beyond the life of this application and calls for the extraction of the whole resource to be assessed;
- the Department of Planning and Environment's track record of supporting large mining applications; and
- whether royalties will be returned to the region.

Comments in support of the application

The economic benefits of the proposal, suggesting that the mining industry provides the largest value add for the economy; also said to be a catalyst project, as well as benefits to local shareholders.

Employment benefits of the proposal including both direct and indirect employment benefits, opportunities for young people; the creation of skilled and professional jobs and noting the applicant has advised employees would live locally, rather than a fly in fly out situation.

Road and transport:

- upgrades to be provided (to cater for B-double trucks) would assist farming operations too; and
- impacts can be minimised with larger capacity trucks and with rail freight.

Biodiversity offsets would provide secure habitat for the Pink Tailed Worm Lizard, its habitat is not currently well preserved.

Other:

- Progress and change for the better, Dubbo needs to diversify, no longer an agricultural town.
- Current good track record and practices of the applicant on other projects and in the community, was said to represents best practice, operate transparently and provide assistance to neighbours.
- Property values were said to be good, unaffected by the project.
- Unique project and rare products.

Appendix 4 – Summary of Meetings Held by the Commission

Briefing from NSW Department of Planning and Environment		
Meeting note taken by Megan Webb	**Date:** Wednesday, 24 September 2014	**Time:** 1:30pm
Project: Dubbo Zirconia Project		
Meeting place: NSW Planning Assessment Commission Offices, Level 13 301 George St, Sydney		
Attendees: **PAC Members** Mr Paul Forward, Mr Joe Woodward PSM and Mr Gordon Kirkby **PAC Secretariat** Megan Webb **Department of Planning and Environment**: Mike Young and Carl Dumpleton		
The purpose of the meeting is to brief the Commission on the project		
Meeting details and actions The Department advised that the site is mainly used for grazing, but also contains some stands of remnant vegetation and some areas of high quality agricultural land. The Department noted that there are also some lifestyle properties in the area. The Department advised that there are 4 properties in Toongi and that the applicant has either purchased, or has an option to purchase, each of the 4 properties. The Department advised there is a privately owned property that would be surrounded by the project site. The landowner of that property has not made a submission on the project and the Department understands the property owner does not intend to sell the property. Any draft conditions would provide an acquisition right for this property owner should they wish to move. The Department noted that the response to submissions provided updated information on issues such as noise. It was noted that the proposal is unique in NSW. While there are other mineral mines, there are not any other rare earth/zirconia mines in NSW. The proposed rail and truck transport options were noted. The Department confirmed that the applicant wanted to pursue both options in its application. The Department noted that the rehabilitation proposed would include the encapsulation cells; removal of liners from the ponds; and return of the land to agricultural purposes. In relation to the proposed final void, it was noted that the void would be relatively small and would be above the groundwater level. The Department explained that the resource extended deeper below the currently proposed mine plan depth and that the applicant has suggested it intends to seek to continue mining beyond the life of this 20 year application. The Department has assessed the application before it, for 20 years of mining. After 20 years of mining the void would be approximately 30 m deep and would require some micro relief to create an appropriate final landform. The Department advised that there are substantial mineral reserves under the mine pit and backfilling the void would inhibit access to these reserves. The Department advised that the EPA had considered the radiation issues associated with the proposal and that the radiation levels would be below the criteria. It was noted that radiation levels in one of the waste stream may trigger the Commonwealth requirements for a controlled facility and that if it does trigger this requirement, there are mechanisms to ensure the appropriate process will be followed.		

Briefing from NSW Department of Planning and Environment
The Division of Resources and Energy's Minerals Resources team regulate the mining and extraction of radioactive material and that Department will look at the regulations and safety of workers In relation to the water requirements, the Department indicated the applicant has about half of the licences it would need to meet its maximum requirement of 4 GL a year. The Department understood there are sufficient licences available in the market, so the licencing issue is a commercial risk for the company. It was noted the applicant has considered options to extract groundwater but that it is not seeking approval for this in this application. It was noted that the encapsulated materials would be designed to be long term stable, but that nonetheless this represents a potential legacy issue. It was noted that Dubbo Council has used a contributions tool to calculate the developer contributions. The Commission noted that Wellington Council had made a submission on the proposal. The Department advised that the applicant's assessment predicted most of the workers at the facility would live in Dubbo. The Department advised it had spoken to Wellington Council and noted that a quarry associated with the project might be built in Wellington LGA, but that it is not part of this application and would require its own planning approval in order to proceed. In relation to traffic, it was noted that the applicant would be undertaking substantial road upgrade works. In relation to intersections, a study would consider whether an upgrade is needed and if so, the applicant would be required to contribute to the cost of the upgrade. It was noted that some clearing of native vegetation is proposed and that the site contains the Pink-tailed Worm-Lizard. A draft management plan for the lizard and offset sites, have been proposed. The Department advised there is some BSAL and class 3 agricultural land on the site. The applicant was not required to get a gateway certificate as transitional arrangements apply. The proposal is to restore some parts of the site to class 3 agricultural land and return the site to its current landuse.
Documents tabled at meeting/to be provided: The Department agreed to provide some additional clarification on radiation dose limits.
Meeting closed at 2:30pm

Meeting with Dubbo Council		
Meeting note taken by Megan Webb	**Date:** Monday, 13 October 2014	**Time:** 2:00pm
Project: Dubbo Zirconia Project		
Meeting place: Dubbo Council		
Attendees: **PAC Members** Mr Paul Forward, Mr Joe Woodward PSM and Mr Gordon Kirkby **PAC Secretariat** Megan Webb **Dubbo Council representatives**: Melissa Watkins, Director Environmental Services; Stewart McLeod, Director Technical Services; and Mark Stacey, Manager Technical Support		
The purpose of the meeting is to discuss the project and the Council's submission, with the Council		
Meeting details and actions: Council advised that a Voluntary Planning Agreement with the applicant has been exhibited; that no submissions had been received; and that it expected it would be finalised very soon. Council indicated it preferred the rail transport option. Nonetheless, Council confirmed it was satisfied with the proposed road upgrades. It was noted that these upgrades will have significant cost so it seems unlikely that the rail option would proceed as well. The traffic/transport impacts were considered to be acceptable, noting that Dubbo is a significant transport hub. Council noted the applicant has other mining operations in the region, Peak Hill (now closed) and Tomingley. Council indicated the proposal is consistent with plans to establish Dubbo as a mining services centre. The economic benefits of the proposal and predicted housing growth needs were noted. Council confirmed it had planning in place to supply the additional housing. The skilled nature of the work was noted and a training program would be developed at the TAFE. It was noted that a road diversion (to avoid travelling next to the zoo) was considered, but that this was found to be cost prohibitive and the associated intersection design would have produced a poor outcome. Council confirmed the proposal would not use the Dubbo town water supply		
Documents tabled at meeting: draft VPA documents		
Meeting closed at 2:45pm		

Record of Site Inspection		
Note taken by Megan Webb	**Date:** Monday, 13 October 2014	**Time: 9:30am**
Project: Dubbo Zirconia Project		
Meeting place: Dubbo		
Attendees: **PAC Members** Mr Paul Forward, Mr Joe Woodward PSM and Mr Gordon Kirkby **PAC Secretariat** Megan Webb **Applicant's representatives**: Mike Sutherland (Alkane General Manager NSW) and Alex Irwin (RW Corkery and Co)		
• Travel to DZP via Obley Road, noting proximity to Western Plains Zoo. The applicant noted it intended to upgrade the road. Rail crossings were noted. • Ecological communities, transport task, traffic, social impacts were mentioned. • Inspected the DZP Processing Plant site, noting the approximate location of the stack; and locations of tailings and storage facilities. The Commission noted the location of Fossil Hill and private properties adjoining the site. • The Commission inspected the ore deposit walking over part of the deposit noting the change in elevation. • The approximate location of the proposed pump site on Macquarie River was noted. The applicant noted potential groundwater exploration on Sweet Waters and general water supply strategy. The Commission noted that both the groundwater exploration and the 132kV powerlines do not form part of the application. • The Commission also drove past the Fletcher International siding in North Dubbo		
Documents tabled at meeting: Nil		
Meeting closed at 1 pm		

Record of ANSTO Pilot Plant Inspection		
Note taken by Megan Webb	**Date:** 23 October 2014	**Time: 10 am**
Project: Dubbo Zirconia Project		
Meeting place: Dubbo		

Attendees:

PAC Members Mr Paul Forward, Mr Joe Woodward PSM

PAC Secretariat Megan Webb

ANSTO Minerals: Dr Robert Gee (General Manager); and Dr Adrian Manis (Pilot Plant Operations Manager)

Applicant's representatives: Mike Sutherland (Alkane General Manager NSW); Natalie Chapman (Corporate Communications Manager); Jim Hondros (JRHC Enterprises) and Alex Irwin (RW Corkery and Co)

Apologies: Mr Gordon Kirkby

- The applicant and ANSTO provided some background to the development of the Pilot plant noting it was partially funded by an initial government grant.
- The Commission sought clarification on whether the plant needed to be at the ANSTO site, and the applicant advised that it had chosen to work with ANSTO at the Lucas Heights site because of the skills of the ANSTO Mineral's division and the relatively close proximity to the site (i.e. in NSW rather than elsewhere in Australia). The Commission was advised the pilot plant did not need to be on the Lucas Heights site.
- The applicant's radiation expert provided an overview of the radiation assessment undertaken, noting this application is straight forward. The assessment involved monitoring of background levels around the site, consideration of exposure pathways, including radon gas and determining doses for the public, workers on the site and flora and fauna.
- The applicant has committed to implementing a Radiation Management Plan, including a monitoring system, with contingencies to adjust the level of operations should dust levels be higher than predicted.
- The applicant also emphasised the security of the evaporation ponds noting they have been designed to contain the 1 in 10,000 year rainfall event.
- The Commission was escorted around the pilot plant facilities, the facilities were not operating at the time, however key processing components including the roasting, leaching and separating steps were pointed out and explained.
- The Commission was advised some local residents had attended and assisted with the operation of the plant.
- ANSTO Minerals advised that its monitoring of radiation levels around the pilot plan did not find any significant dose impacts. ANSTO Minerals also confirmed it had successfully mapped the radionuclides through the various processes.
- The applicant showed the Commission some of the sample products that had been produced at the plant explaining some of the potential uses, values and potential buyers.

Documents to be provided: The applicant agreed to provide a summary of how the radiation issue had been considered and addressed (subsequently provided to the Commission on 31 October 2014)

Meeting closed at 12 noon

Appendix 5 – Correspondence with Government Agencies

Mr Michael Bullen
Acting Deputy Director General Water
NSW Office of Water
GPO Box 3889
SYDNEY NSW 2001

12 November 2014

Dear Mr Bullen

Subject: Review of the Dubbo Zirconia Project

I refer to your Office of Water's submission on the above application, and the Commission Secretariat's letter of 18 September 2014 notifying that the project had been referred to the Planning Assessment Commission for Review and Public Hearings. As outlined in that letter, I am chairing the Commission to review the application and Mr Joe Woodward PSM and Mr Gordon Kirkby are the other members to constitute the Commission for the project.

Public Hearings were held on Tuesday 4 November 2014. Speakers raised a number of issues at the public hearing and I am writing to seek clarification from you on some of these matters.

1. Water availability for the project.
   Speakers noted that the applicant does not have sufficient water licences for the predicted water needs of the project. Is it feasible that sufficient water will be available for the Zirconia proposal and how will a prolonged dry period impact on the proposal? It was also suggested that recent amendments to the *Water Management Act 2000* reduce the reliability of high security water licences. Would this impact on the proposal? Your Office's submission of 25 November 2013 also requested the Applicant consider impacts of reduced water availability for riparian rights downstream of the project site, however it is not clear how the Applicant has addressed this issue. The Commission would appreciate the NSW Office of Water's latest views on these issues.

2. Management of liquid waste.
   The Commission understands the proposal is intended to be a nil discharge site, with evaporation ponds to manage wastewater from the site. Speakers raised a number of questions about the management of wastewater and the evaporation ponds.

   a. Speakers advised that the modelling assumed an evaporation rate of 72% and raised concerns that this may not take account of potential extended wet periods when evaporation rates would be low.

   b. Speakers also questioned whether the ponds had been designed to handle potential extreme weather events associated with climate change.

   The Commission notes that the wastewater that would need to be managed would be highly saline and considers it is important that the facility complies with the commitment for nil discharge from the site. Is the NSW Office of Water satisfied that the modelling of

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wastewater management is conservative enough to ensure there is no risk of discharge from the site?

3. Long term stability of the encapsulation cells
   Speakers at the public hearing also raised concerns about the mechanism for managing the salt and other waste encapsulation cells in the long term. The Commission understands there was a particular concern that should the containment cells leak or fail in any way, salts or other waste products might then migrate into the surrounding soils, and surface or groundwater, contaminating these systems. The Commission would appreciate your advice on:

   a. the suitability of the design of the proposed waste encapsulation infrastructure for containing the material in the very long term; as well as

   b. the monitoring regime that would be necessary to ensure any failure of the encapsulation cells is identified and remedied in a timely manner.

Your prompt response on these matters would assist the Commission in finalising its review of the application in a timely manner. Consequently, if possible, the Commission would appreciate your response on these issues, by COB Tuesday 25 November 2014.

The Commission would also be available to meet with you or your officers, should you consider this useful. To arrange a meeting, or if your officers have any questions on the above I have arranged for Megan Webb of the Commission Secretariat to assist you. Megan can be contacted on 9383 2113 or megan.webb@planning.nsw.gov.au.

Yours sincerely

Mr Paul Forward
Member
Planning Assessment Commission

NSW GOVERNMENT | Trade & Investment

INW14/49404

Mr David Kitto
Director Mining Projects
Department of Planning & Environment

By email: David.Kitto@planning.nsw.gov.au

Dear Mr Kitto

Planning Assessment Commission Review of the Dubbo Zirconia Project

I refer to a request received by the NSW Office of Water from the Planning Assessment Commission dated 12 November 2014 requesting clarification on a number of matters related to the Dubbo Zirconia Project.

In accordance with an earlier direction from the previous Minister for Planning & Infrastructure, I provide the Office of Water's responses to the Department of Planning & Environment. I would appreciate if you could provide our advice to the Commission.

I refer to your letter dated 12th November 2014 requesting clarification on matters related to the Dubbo Zirconia Project. It is understood this follows the outcomes of a public hearing held in Dubbo on Tuesday 4th November 2014. The Office of Water has considered the matters raised and provides the following key comments and detailed information in Attachment A to aid in assessment of the project.

- The proponent currently holds inadequate water entitlements to meet the predicted 4.05GL of makeup water demand. The proponent intends to investigate further options to improve water security though the purchase of additional water entitlements on the regulated Macquarie River and accessing groundwater via bores. Uncertainty however exists in the ability to obtain adequate high security entitlement on the regulated Macquarie River and an adequate groundwater supply has not been identified.

- The recent amendments to the *Water Management Act 2000* reaffirm the previous water sharing rule which was developed prior to the millennium drought and therefore maintains the status quo for water security. No impacts to the Dubbo Zirconia project are therefore envisaged.

- The Office of Water is supportive of the proposed Residue Storage Facility Management Plan to address detailed design and operational management of

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the associated wastewater during a design rainfall and runoff event. The Environment Protection Authority as the primary regulator of pollution provided detailed comments on this aspect in responses on the project and the Office of Water is supportive of these recommendations.

- The Office of Water is supportive of the proposed design and management of the salt encapsulation cells. A detailed monitoring and contingency plan is to be submitted as part of the Residue Storage Facility Management Plan which would include monitoring bores and a seepage management system as proposed by the proponent. This plan should include consideration of extraction of water for town water supply downstream of the site.

Should you have any further queries in relation to this submission please contact Mr Mitchell Isaacs, Manager Strategic Stakeholder Liaison on (02) 8838 7529.

Yours sincerely

Michael Bullen
A/Deputy Director General Water

Encl.

Mr Mark Patterson AO
Secretary
NSW Trade and Investment
GPO Box 5477
SYDNEY NSW 2001

12 November 2014

Dear Mr Patterson AO

Subject: Review of the Dubbo Zirconia Project

I refer to your Resources and Energy Division's submission on the above application, and the Commission Secretariat's letter of 18 September notifying that the project had been referred to the Planning Assessment Commission for Review and Public Hearings. As outlined in that letter, I am chairing the Commission to review the application and Mr Joe Woodward PSM and Mr Gordon Kirkby are the other members to constitute the Commission for the project.

Public Hearings were held on Tuesday 4 November 2014. Speakers raised a number of issues at the public hearing and I am writing to seek clarification from you on some of these matters.

1. The Commission understands that the proposal is to mine and process Zirconia and other rare earths, but that the ore proposed to be extracted also contains some Uranium. Some speakers raised concerns about the legality of any proposed extraction of Uranium. The Commission understands the Uranium within the ore would not leave the site, and would form part of the waste stream emplaced on the site. Nonetheless, the Commission would appreciate your advice on whether there is any legal impediment to the proposal as a result of the presence of Uranium within the ore to be extracted and processed on the site.

2. Radiation hazards would also need to be managed on the site and the Commission is seeking clarification on who would regulate the management of these radiation hazards. For example the Commission notes there would need to be careful monitoring and management protocols in place to ensure that a consistent dilution of the waste is achieved, to prevent radiation hotspots from occurring within the waste encapsulation cells. Monitoring of radiation levels around the site would also be important. The Commission is also interested in understanding whether there are other examples of mining or processing facilities around NSW where these issues are currently being monitored and managed?

3. Speakers at the public hearing also raised concerns about the mechanism for managing the salt and other waste encapsulation cells in the long term. The Commission understands there was a particular concern that should water penetrate into the waste cells it could then migrate into the surrounding soils, and surface or groundwater contaminating these systems. Speakers noted there is some discrepancy between the proposed rehabilitation of the site and the contingency measures that would be installed should contaminated water require management on the site. The Commission would appreciate your advice on how the long term risks posed by the waste encapsulation cells would be managed post completion

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of the mine, including the responsibilities for maintaining and responding to monitoring results and the funding mechanisms available to support this, and any remedy required.

4. The Commission also notes your Resources and Energy Division's letter of 20 November 2013, to the Applicant's consultant, regarding plant fossils at Grandale within the project site. The letter notes that the site is scientifically significant and includes representatives of several species which are found nowhere else. The disturbed state of the Fossil Hill site is highlighted in Dr Sherwin's report, however the report also suggests there may be further scope for palaeontological discoveries to be made. The report concludes that surveys should be undertaken during bench cutting on Fossil Hill and the best exposures should be retained. The Commission considers this issue requires some clarification. The Commission would also like to know whether options to avoid further disturbance and covering of the Fossil Hill site was considered or explored, noting that the site is the proposed location of one of the evaporation ponds, rather than any mining. Can you please confirm:

    a. Whether options to avoid disturbance and covering of the fossil hill site where considered, and if so, the reasons this was not pursued?

    b. What management actions would be necessary to minimise the disturbance/destruction of fossils during construction? In particular what construction techniques would allow the best chances of protecting and identifying any fossils? What surveying and collection methods would be required? And how any extracted fossils could be preserved and made publicly accessible?

Your prompt response on these matters would assist the Commission in finalising its review of the application in a timely manner. Consequently, if possible, the Commission would appreciate your response on these issues, by COB Tuesday 25 November 2014.

The Commission would also be available to meet with you or your officers, should you consider this useful. To arrange a meeting, or if your officers have any questions on the above I have arranged for Megan Webb of the Commission Secretariat to assist you. Megan can be contacted on 9383 2113 or megan.webb@planning.nsw.gov.au.

Yours sincerely

Mr Paul Forward
Member
Planning Assessment Commission

NSW GOVERNMENT | Trade & Investment

Office of the Secretary

SECI14/840

Mr Paul Forward
Member, Planning Assessment Commission
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Dear Mr Forward

Review of the Dubbo Zirconia Project

Thank you for your letter dated 12 November 2014 seeking clarification of issues raised by speakers at the Public Hearings held for the Dubbo Zirconia Project.

I have received information addressing each question and provide answers hereunder.

Question 1 - is there any legal impediment to the proposal as a result of the presence of uranium within the ore to be extracted and processed on the site?

No, there is no legal impediment to the proposal. Under the *Mining Act 1992*:

> "a person must not prospect for or mine any mineral except in accordance with an authorisation that is in force in respect of that mineral and the land where the prospecting or mining is carried out on" section 5; and
>
> "an authorisation (other than an exploration licence or an environmental assessment permit relating to an exploration licence) may not be granted in respect of uranium." section 10A. Any mining lease (ML) granted in relation to this project would not include uranium in accordance with the *Mining Act 1992 No.29*, Section 10 (A).

Based on the Environmental Impact Statement (EIS) for the Project, it is understood the Project fundamentally consists of "a small scale open cut mine supplying ore containing rare metals (zirconium, niobium, hafnium and tantalum) and rare earth elements (REEs) to a processing plant" (EIS page ES-1). Mineralised material contains 80-160 parts per million of uranium which is "not excessive" (EIS page ES-2). The "small amounts of trace materials, including uranium, would be removed from the precipitated zirconium oxide for disposal as a solid residue" (EIS page 2-53). Further, "the concentration of uranium would be very low and diluted significantly as part of the liquid residue stream" (EIS page 2-53) and "the average uranium and thorium concentration in the residue storage facility would be less than that in the ore" (EIS page 2-54).

As part of the Project "solid or liquid residues (waste by-products no longer containing economically extractable metals or REEs) would be generated and require disposal." (EIS page 2-63). As stated above, uranium will be disposed of as solid residue (EIS page 2-53). Solid residue would contain 11.5 parts per million, or less than 0.1 mg/L (Table 2.9, EIS page 2-65) and is classified as "general solid waste" (EIS page 2-65). Solid residue would be placed in cells as part of a solid residue storage facility (EIS page ES-11).

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Given the above, it is clear that the Project does not seek the extraction of ore for the purposes of recovering uranium. Rather, it proposes the mining of ore to recover rare metals and REEs, with any by-product containing uranium (and other trace elements) being returned to the extraction site through cell emplacement.

Since, based on the EIS, the proponent would not be mining uranium, the proponent would not be mining uranium illegally without a mining lease, nor seeking a mining lease for uranium which the Minister for Resources and Energy would be unable to grant under section 10A. Based on the EIS, the mining lease would presumably be for Columbium, Tantalum, Zirconia and Rare Earth Minerals which are classes of minerals in respect of which the Minister for Resources and Energy is not prohibited from granting a mining lease, subject to any other legal constraint on grant which may apply.

It should also be noted that almost all rocks contain some uranium compounds at a low level. In order to make allowance for this, the *Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986 No. 194*, Section 7(3)(a) prescribes a limit for ores below which the prohibition does not apply. Waste material containing radioactive minerals may exceed this level and is managed as any other hazardous material.

Question 2 - clarification as to which agency regulates the management of radiation hazards and if there are any other mines in NSW that currently have radioactive waste and if so, how is it monitored.

The Secretary NSW Trade & Investment is the Regulator of Radioactive ores under Section 5A (2) of the *Radiation Control Act 1990 No.13.*

There are no other examples of similar mining or process facilities in NSW.

Cristal Mining operates several heavy mineral sands mines in NSW. The ore mined has the mineral monazite present, which is radioactive. Consequently, once the heavy minerals are concentrated and separated, the level of radiation can reach the definition of a "radioactive ore" for that particular product stream, but the radiation levels are dissipated by blending it with inert sands before it is removed from the processing plant.

This process is managed in accordance with the operation's Mine Safety Management Plan (MSMP) in the same way as any other health and safety hazard is. In particular, the mine must have a Radiation Management Plan.

Question 3 - clarification of the mechanisms for managing the long term salt and other waste encapsulation cells over the long term. In addition, what is the risk of water penetrating and escaping to the surrounding local area and the contingency measures proposed.

In regard to the long term management of the waste encapsulation cells, this is a matter that would be regulated and conditioned by the Environmental Protection Authority under its Environmental Protection Licence.

Question 4 - confirmation as to what management options would be necessary to avoid disturbance or burial of the fossil site, protect and identify any fossils, along with surveying and methods to collect, preserve and make publicly accessible.

The current plan of development for the project requires the construction of terraced tailings dams, one of which is proposed to overlap with a scientifically significant fossil site known as Fossil Hill.

A field inspection of the site was undertaken by Dr Lawrence Sherwin (contract palaeontologist) and a geologist from the Geological Survey of NSW on 6 November 2013. Dr Sherwin considers that the proposed mine development will not adversely impact upon what is already a disturbed site.

Regardless, it is necessary for the proponent to propose how the fossil site should best be managed in order to minimise adverse impact on both the mine development and an important scientific resource.

The Geological Survey of NSW has advised the proponent that any excavation work carried out at the site should be inspected by a qualified person for any further geological and palaeontological information and, if possible retain at least one exposure for future reference.

If you or the Planning Assessment Commission have any further questions on NSW Trade and Investment's responses or any other regulatory matters you would like to have addressed, please contact William Hughes, Director Mineral Operations on (02) 8281 7323 or william.hughes@trade.nsw.gov.au.

Yours sincerely

Mark I Paterson AO
Secretary
24.11.14