NSW GOVERNMENT

Eraring Ash Dam

Major Project Modification Assessment

07_0084 MOD 1

September 2019

Cover photo: Eraring Ash Dam (Source: Department of Planning, Industry & Environment)

Executive Summary

The Eraring Ash Dam is located within the Eraring Power Station complex in Dora Creek, on the western shore of Lake Macquarie approximately 40 kilometres southwest of Newcastle in the Lake Macquarie local government area.

The Eraring Ash Dam is a significant and critical part of the operation of the Eraring Power Station as it provides essential ash storage capacity. Ash is a by-product of electricity generation, produced by the burning of coal. Currently, approximately 29 percent of ash produced at the Eraring Power Station is sold and reused in other processes such as concrete manufacturing or as a gravel substitute for use in landscaping and roads. The remaining 71 percent is stored in the Eraring Ash Dam, located to the north of the power station.

The Eraring Power Station has been operating since 1982 and is Australia's largest power station with an electrical generation capacity of 2,880 megawatts, accounting for up to 25 percent of New South Wales' power requirements. With the recent and planned closures of large generation assets in NSW (Munmorah and Liddell Power Stations), Victoria (Hazelwood) and South Australia (Northern Power Station) there will continue to be an increasing reliance on the power station and associated ash dam to meet market demand for electricity and ensure future power system security.

Origin Energy Eraring Pty Ltd (Origin) owns and operates the Eraring Ash Dam under a Concept Approval (05_0138) which establishes the staging and scoping of works associated with the development and management of the ash dam; and a Project Approval (07_0084) which allows the ash produced during the production of electricity at the power station to be either reclaimed for beneficial reuse or deposited hydraulically via pipelines into the Eraring Ash Dam.

Following higher than planned electricity output rates at the power station to meet market demands, the volume of ash recently deposited at the Eraring Ash Dam has been greater than previously planned and the dam is now likely to reach its storage capacity sometime between November 2020 and January 2022, depending on electricity demand, deposition density and beneficial ash reuse markets. Therefore, Origin has lodged a modification application to augment the ash dam using an alternative ash placement strategy and landform design to increase the storage capacity of the Eraring Ash Dam in the short to medium-term.

It is important to note that this modification application is separate and unrelated to the dam design and stability issues being considered by Origin under the Dam Safety Committee Guidelines[1] which have led to the closure of the Myuna Bay Sports and Recreation Centre. These issues relate to the southern embankment of the dam which is located 575 metres from the proposed augmentation works. It has been confirmed that the proposed modification would have no material impact on the stability of the southern embankment of the dam, or result in any additional stability considerations associated with the Ash Dam.

[1] Australian National Committee on Large Dams (ANCOLD) (October 2012) *Guidelines on the Consequence Categories for Dams*

Modification

The key aspects of the proposed modification include:

- amendment of the ash deposition strategy using a hydraulic ash placement technique to achieve the desired dam stability and landform design;
- construction of a new Western Emplacement Area to enable ash deposition to a relative level of 140m within existing operational areas, requiring:
    - construction of a western saddle embankment;
    - reconfiguration of the access road; and
    - filling of mine voids underlying the ash emplacement area;
- upgrade of the stormwater diversion systems; and
- upgrades and modification of ancillary infrastructure including the ash deposition pipelines and fly ash recycling plant.

The proposed modification would provide an estimated 5 million cubic metres of additional ash storage capacity, extending the operational life of the Eraring Ash Dam to between October 2023 and March 2026, while maintaining broadly similar landform characteristics to the original design.

The primary justification for the proposal is to provide essential additional ash storage capacity for the continued operation of the Eraring Power Station, therefore ensuring future power system security within the broader National Electricity Market. The proposal would also result in improvements to the existing stormwater system in the vicinity of the dam.

Origin is also proposing to surrender the Concept Approval as part of this modification as many of the conditions of this approval are now redundant.

Statutory Context

The application is being considered under the former Section 75W of the now repealed Part 3A of the *Environmental Planning and Assessment Act 1979*. The savings provisions of the Act allow the applications to be assessed and determined under the former Section 75W.

Under the Minister's delegation of 28 September 2011, the Independent Planning Commission will determine the modification application as Origin Energy has declared reportable political donations.

Engagement

The Department publicly exhibited the application and accompanying Environmental Assessment from 13 to 27 September 2018 and received 32 submissions, including 22 objections and 3 comments from the community and 7 submissions from government agencies making comment on the proposal. The majority of the submissions received from the general public were from residents living in the local area.

The key issues raised in community submissions were in relation to potential surface and groundwater impacts on local receiving waters, coastal wetlands and Lake Macquarie. Other issues included risks to the health and safety of residents, and air quality and biodiversity impacts.

Assessment

Unlike the existing area of the Ash Dam, the majority of the proposed western emplacement area would be located over the inactive flooded underground mine workings of the former Awaba Mine. In order to mitigate potential subsidence risks and seepage from the proposed western extension area entering the mine workings and surrounding surface waters, Origin has committed to implement remedial strategies to restrict the flow pathway,

including filling of mine voids underlying the ash emplacement area, excavation to collapse shallow mine workings; and/or installing an impervious barrier using clays or suitable stabilized fill materials. Origin's subsidence expert indicates that these strategies are readily available technologies in Australia and would mitigate both groundwater seepage and subsidence risks associated with the modification. Origin has committed to preparing a Mine Void Remediation Plan prior to remediation activities commencing.

The Department engaged geotechnical and hydrological experts from WSP Australia Pty Ltd (WSP) to provide independent advice on the proposed sealing of underground mine voids. WSP indicates that expanding the Ash Dam over abandoned mine workings is feasible if appropriate subsidence mitigation and groundwater controls are implemented. Filling of the mine workings and pressure grouting overburden fractures with cement fly ash is considered the most feasible remedial method, which is commonly used in the Newcastle Region and other mining regions in Australia. In line with the experts recommendations, the Department has recommend conditions which require a mine subsidence expert to be retained to investigate mine workings and subsurface conditions and consider subsidence impacts and mitigation; a hydrogeologist to be engaged to better conceptualise the groundwater system, refine the potential risks to groundwater, inform detailed design, and design and implement a water monitoring program; mine filling design investigations be undertaken; and regular consultation and reporting be undertaken during the development of the Mine Void Remediation Plan.

In terms of surface water, the proposed stormwater improvements would reduce water inflows into the Ash Dam by diverting flows from local catchments which would otherwise enter the dam. This would ultimately reduce the volume of process water and leachate entering the system and the risk of water discharges to Lake Macquarie. The modification would result in additional clean surface water flows through an existing wetland system during heavy rainfall events, however the flows would be small and infrequent, and would be unlikely to cause loss of biodiversity diversity or ecological function in the wetland.

In terms of the safety of residents and structural integrity of the Ash Dam, it is confirmed that the modification would have no impact on the existing stability of the Ash Dam. The design of the western saddle embankment would be undertaken in consultation with the Dams Safety Committee and in accordance with relevant guidelines and requirements of the *Dams Safety Act 1978*. Ongoing use and operation of the entire Ash Dam, including dam surveillance and reporting, would continue to implement best practice measures to ensure the safety of the community.

In relation to air quality, the existing emissions from the Ash Dam at local receptors are well below the Environment Protection Authority's air emission criteria, which have been developed for the purposes of protecting human health and amenity. The proposed modification would increase the Ash Dam surface area potentially exposed during operation by between 4% and 7%, which represents approximately 10 hectares. Emissions from the minor increases in the surface area of the Ash Dam would be effectively managed using existing monitoring and controls designed to mitigate dust generation. The potential impacts to air quality are predicted to remain substantially the same during operation.

In terms of biodiversity impacts, Ash Dam extension has been designed to limit biodiversity impacts to the existing operational footprint of the Ash Dam as far as possible, and to avoid impacting areas currently reserved for habitat offsets, previously revegetated areas and an existing wetland. The residual 8.95 hectares of disturbance would be suitably offset by the implementation of a nearby land-based offsets and/or through other mechanisms available under the *Biodiversity Conservation Act, 2016*.

A range of other matters were considered in the Department's assessment, including potential impacts relating to construction noise and traffic, historic and Aboriginal heritage, climate change and remediation and closure of the Ash Dam. In summary, the existing conditions of the approvals would effectively manage and minimise any of these residual impacts associated with the proposed modification.

Conclusion

Importantly, the proposed modification would allow additional benefits of the project to be realised. In this regard, the project would provide essential additional ash storage capacity for the continued operation of the Eraring Power Station, therefore ensuring future power system security within the broader National Electricity Market. The ash placement strategy would secure operation for the coming years and facilitate the development of a strategy to enable operations to continue until the presently anticipated Eraring Power Station closure date of 2032.

Other key benefits of the project include improvements to existing stormwater infrastructure associated with the Ash Dam, which would reduce runoff currently entering the dam via overland flows, and therefore reduce the potential for surface water and groundwater impacts.

Given these benefits can be achieved without resulting in any significant additional adverse impacts on the environment or the local community, the Department considers that the proposed modification should be approved, subject to the imposition of the recommended conditions of approval.

Contents

Executive Summary ..... **iii**

Modification iv
Statutory Context iv
Engagement iv
Assessment iv
Conclusion vi

1. Introduction **1**

1.1 Background 1
1.2 Approval History 1

2. Proposed Modification **5**

2.1 Project Approval (07_0084) 5
2.2 Concept Approval (05_0138) 9

3. Strategic Context **10**

3.1 Project Need 10
3.2 Ash Dam Stability 10
3.3 Ash Reuse 11

4. Statutory Context **12**

4.1 Scope of Modification 12
4.2 Approval Authority 13
4.3 Environmental Planning Instruments 13
4.4 Objects of the EP&A Act 13

5. Engagement **15**

5.1 Department's Engagement 15
5.2 Summary of Submissions 15
5.3 Key Issues – Government Agencies 16
5.4 Key Issues –Special Interest Groups and Community 18
5.5 Response to Submissions and additional information 19

6. Assessment **19**

6.1 Groundwater 20
6.1.1 Existing Groundwater Regime 20
6.1.2 Potential Groundwater Impacts 20
6.1.3 Management and Remedial Strategies 24
6.1.4 Groundwater Monitoring 26
6.1.5 Conclusion 28
6.2 Surface Water 28
6.2.1 Consideration of Coastal Management SEPP 30
6.2.2 Surface Water Monitoring 31
6.3 Geotechnical 32
6.4 Biodiversity 34
6.4.1 Consideration of the EPBC Act 34
6.4.2 Biodiversity Offset Strategy 35

6.5 Surrender of Concept Approval 38
6.6 Other Issues 38
7. Evaluation 43
Appendices 44
Appendix A – List of Documents 44
Appendix B – Environmental Assessment 45
Appendix C – Government Agency and Community Submissions 46
Appendix D – Response to Submissions 47
Appendix E – Additional Information 48
Appendix F – WSP Review Report 49
Appendix G - Concept Approval Review 50
Appendix H – Consolidated Project Approval 07_0084 58
Appendix I – Notice of Modification 59

1. Introduction

This report provides an environmental assessment of an application to modify the project approval and to surrender the concept approval for the Eraring Ash Dam under Section 75W of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.1 Background

The Eraring Ash Dam (Ash Dam) is located within the Eraring Power Station (EPS) complex in Dora Creek, on the western shore of Lake Macquarie approximately 40 kilometres southwest of Newcastle in the Lake Macquarie local government area (see **Figure 1**).

The Ash Dam is a significant and critical part of the operation of the EPS as it provides essential ash storage capacity. EPS is the largest coal fired power station in Australia with an electrical generation capacity of 2,880 megawatts, accounting for 25 percent of New South Wales' power requirements.

Origin Energy Eraring Pty Ltd (Origin) owns and operates the EPS and associated Ash Dam, which were purchased from the NSW Government in 2013.

The entire EPS site comprises approximately 1,200 hectares of land owned by Origin, with the power station itself located on approximately 150 hectares and the Ash Dam occupying approximately 250 hectares. The remainder of the land is largely undeveloped consisting of open grassland, canals and bushland.

The surrounding region has historically been used for major underground coal mining and power generation operations. Previous and existing development in the vicinity of the EPS includes the West Wallsend, Awaba, Newstan and Myuna Collieries; Mandalong Coal Mine; and the Vales Point and Colongra Power Stations. The shore length of Lake Macquarie extends for approximately 174 kilometres (km) to the south of the EPS site with the land surrounding the lake containing the residential areas of Morrisett, Dora Creek and Wangi Wangi as well as various parks and reserves. The Myuna Bay Sports and Recreation Centre is located on the shore of Lake Macquarie, approximately 450 meters (m) to the south of the Ash Dam storage.

1.2 Approval History

The regulatory framework of the Ash Dam operates under the *Eraring Power Station Act 1981* (EPS Act), and Concept and Project Approvals issued under the now repealed Part 3A of the *Environmental Planning & Assessment Act 1979* (EP&A Act).

The EPS and Ash Dam were originally built and owned by the Electricity Commission of NSW in 1977. Over time, the Electricity Commission and its successor, Pacific Power were restructured, and ownership of the complex was transferred to Eraring Energy, a State-owned corporation.

Figure 1 | Site Location and Regional Context

The EPS Act was enacted in 1981 to allow the Electricity Commission to transfer the power station and Ash Dam to an association of private companies to assist the Government in funding the operation of the facilities. Most of the provisions of the EPS Act are now obsolete as the Commission and its successors are no longer in existence. However, Section 21 of the Act, which allows the site and any development on the site to be used for approved purposes, notwithstanding any other Act or instrument to the contrary, has ongoing operation.

Eraring Energy obtained a Concept Approval (05_0138) in 2006 and a Project Approval (07_0084) in 2008, which were issued under Part 3A of the EP&A Act for the long-term expansion and operation of the Ash Dam (see **Table 1**).

Table 1 | Existing approvals

Approval	Description	Date
Concept Approval (05_0138) – Coal Combustion Product[2] Management Facility	Long term expansion of the ash dam disposal facility and changes to the ash disposal method and ancillary infrastructure	2006
Project Approval (07_0084) – Capacity Upgrade and Attemperator Reservoir	Expansion of ash dam and changes to the ash disposal method and ancillary infrastructure	2008

The Concept Approval includes conditions that establish the staging and scoping of works associated with the development and management of the Ash Dam. Many of the conditions are now redundant and, as discussed in Section 2.2 of this report, Origin proposes to surrender the Concept Approval as part of this modification.

The Project Approval allows the ash produced during the production of electricity at the EPS to be either reclaimed for beneficial reuse or deposited hydraulically via pipelines into the Ash Dam.

Several reclaim and reuse operations are currently approved to operate at the site by third party contractors, including Flyash Australia and Boral. Flyash Australia manages the reuse of fly ash on site which supplies fine grade fly ash and tailor-made ashes that are utilised in a variety of concrete applications. Boral reclaims bottom ash from the Ash Dam for use as an aggregate in applications such as bitumen in road construction projects. Together these and other initiatives have sustained an ash reuse rate of around 29% (477,292 tonnes) in the 2017-2018 period.

Ash that is not reused is approved to be deposited in the Ash Dam. The existing approved ash placement strategy involves beached and cell deposition of dense phase ash slurry from three dispersal pipelines (nodal points) to a reduced level (RL)[3] of 140m. The total existing capacity of the Ash Dam is approximately 40 million cubic metres. Due to current high deposition rates, the dam is now likely to reach its storage capacity sometime between November 2020 and January 2022.

The general layout of the approved Ash Dam operations is shown in **Figure 2**.

[2] Ash produced at the Eraring Power Station by the burning of coal was previously known as "Coal Combustion Product".
[3] Origin has used its own surveying heights to derive a reduced level (RL) for ash placement of 140m. The actual RL of ash placement, when derived via the Australian Height Datum (AHD), is RL 40m.

Figure 2 | General Layout of Eraring Power Station and Ash Dam

2. Proposed Modification

2.1 Project Approval (07_0084)

Origin has lodged a modification application for the Ash Dam Project Approval (07_0084) to augment the Ash Dam using an alternative ash placement strategy and dam landform design to increase the storage capacity of the Eraring Ash Dam in the short to mid-term.

There are four main components to the proposed modification, which are described in detail in the Environmental Assessment (EA) (AECOM, August 2018) which accompanied the application (see **Appendix B**):

1. ***Construction of Western Emplacement Area***

Origin is proposing to extend the Ash Dam emplacement area by approximately 10 ha to the west of the existing ash placement area (see **Figure 3**). This extension area is considered the most appropriate as it avoids impacting areas currently reserved for habitat offsets, previously revegetated areas and an existing wetland.

Western saddle embankment

Origin has identified that, in order to enable safe placement of ash to RL 140m in the western operational footprint of the Ash Dam, a western saddle embankment is required. The proposed concept design of the saddle embankment incorporates an earth fill embankment approximately 600m in length to a maximum height of 10m, with faces battered at 1.5:1 upstream and 3:1 downstream (see **Figure 3**). The western saddle embankment would require around 32,000m^3 to 40,000m^3 of fill material to construct, some of which would need to be imported to the site. As the Ash Dam is a prescribed dam under Schedule 1 of the *Dams Safety Act, 1978*, design of the western saddle embankment has been undertaken in consultation with the NSW Dams Safety Committee (DSC) (refer to Section 6.5).

Reconfiguration of Access Road

Origin has identified that the establishment of the western saddle embankment would require re-alignment and re-grading of the existing Access Road for a length of approximately 80 m along the western edge of the Ash Dam perimeter (see **Figure 3**).

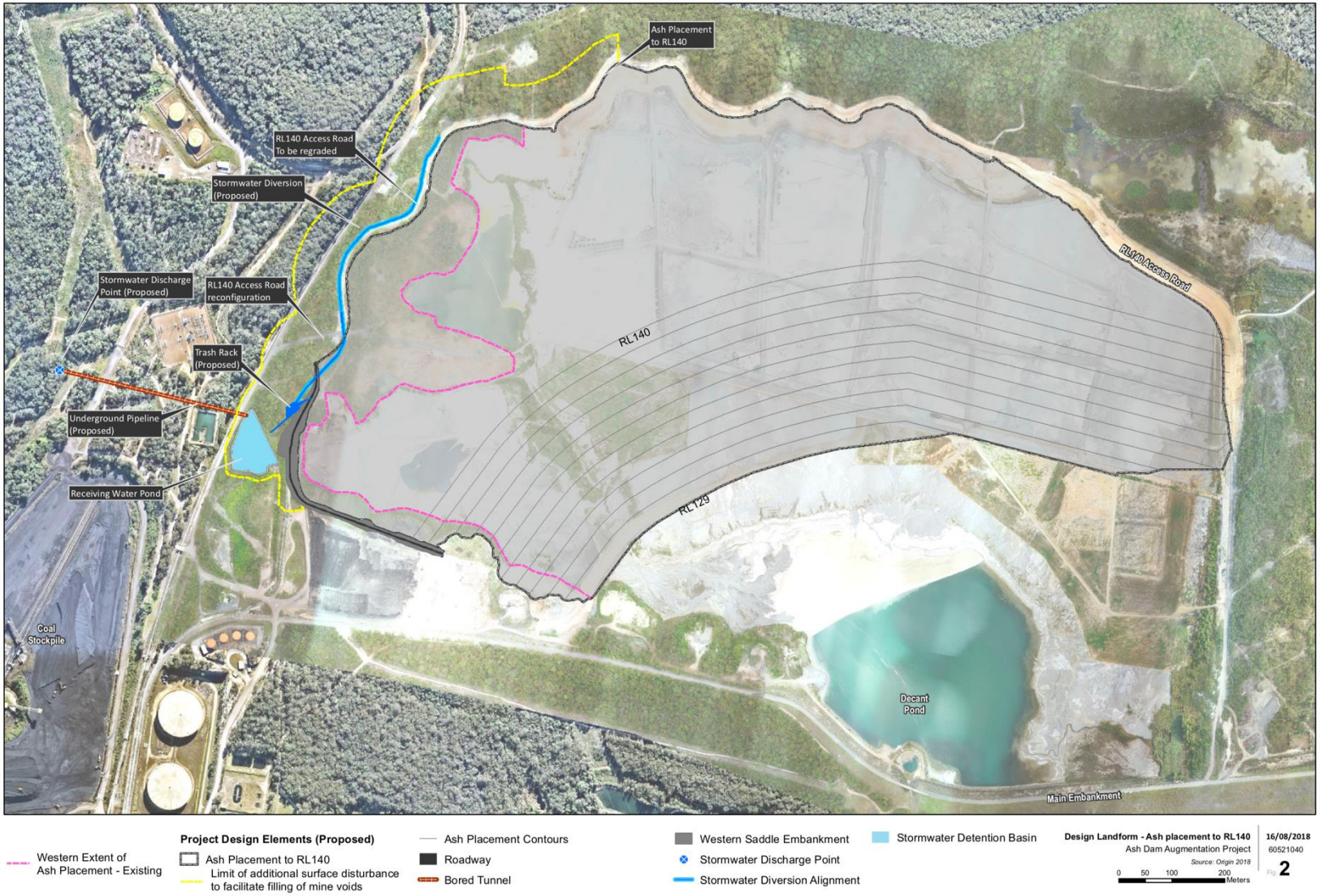

Figure 3 | Design Landform – Ash Placement to RL140

Filling of mine voids

The majority of the proposed western emplacement area is located above inactive flooded mine workings associated with the Awaba Colliery (see **Figure 4**). Origin has identified that the placement of ash above RL 130m in these areas could potentially result in:

- subsidence causing fractures and ground movements potentially impacting the stability of the Ash Dam; and/or
- direct water connectivity between the Ash Dam and mine workings.

To effectively mitigate these impacts, Origin is seeking approval to implement a range of remedial measures, including:

- filling of mine voids with stabilized fill material – involving drilling 100-130 boreholes from the surface to depth ranging from 15-40m and injecting approximately 200,000m^3 of fill material containing fly ash with 2-4% of cement;
- excavating and collapsing shallow mine workings; and/or
- installing an impervious barrier using clays or suitable stabilised fill materials.

Origin has indicated that the preferred strategy may employ all or a combination of the above techniques and that the most effective technique(s) would be confirmed prior to ash placement above RL 130m.

Origin has confirmed that remedial works would extend no further than 100 m from the limit of ash placement (see **Figure 4**).

2. Amendment of ash dam strategy

The existing approved ash placement strategy involves beached and cell deposition of dense phase ash slurry (comprising 70% ash and 30% water) from three dispersal pipelines to RL 140m.

Origin has identified that amendment of the ash deposition techniques is necessary to achieve the desired dam stability and landform design. An *Ash Feasibility Assessment – Stability Assessment* undertaken by AECOM (2018) demonstrates that the factor of safety against post-seismic instability can be achieved for an ash embankment with a batter / terrace slope of 1V:30H (3% gradient). Origin is therefore seeking approval to use an hydraulic ash placement technique involving the hydraulic pumping of ash via pipeline and subaerial (spigot) deposition from agreed locations on the periphery of the Ash Dam onto the surface, resulting in gradually sloping (typically 1-2%) beached tailings formation down to the Decant Pond.

The design landform proposed to be achieved from using this ash deposition technique is shown in **Figure 3**. The design landform is maintaining broadly similar landform characteristics to the original design, including limiting the ash placement to the existing ash dam footprint and to RL 140m.

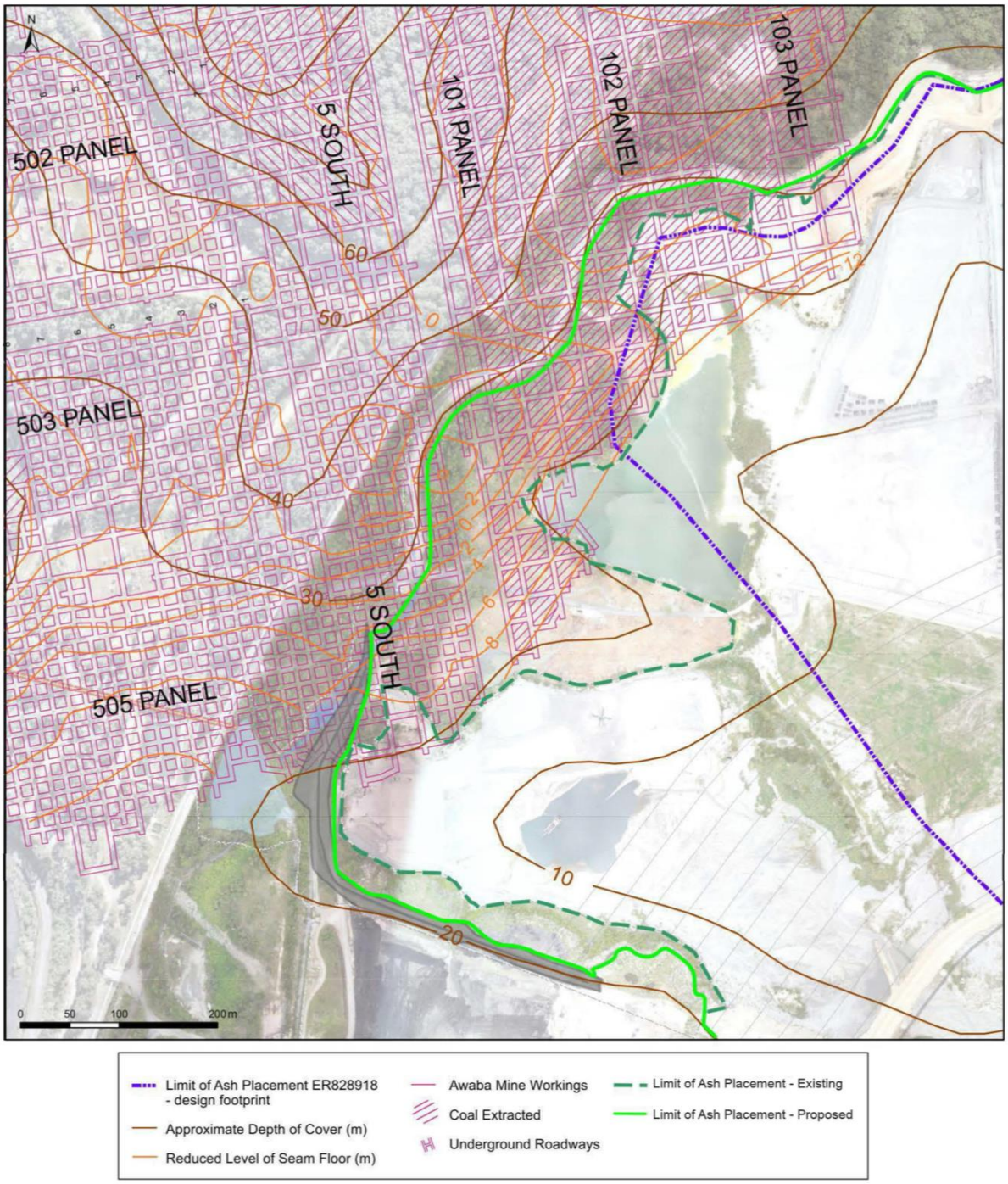

Figure 4 | Location of Inactive Mine Workings Below Ash Placement Area

3. *Upgrade of stormwater system*

Origin has identified several improvements to the existing stormwater management system that would more effectively manage both stormwater and process flows in and around the Ash Dam. Origin is therefore seeking approval to:

- construct new stormwater diversion works along the Access Road for a length of about 1 km to the north-west of the Ash Dam to divert local catchment flows away from the ash dam into an existing clean water receiving pond; and
- upgrade and reconfigure the existing receiving pond, including the inlet structure and discharge point, to accommodate design storage volumes.

The location of these proposed stormwater management features is shown in **Figure 3**.

4. *Upgrades and modification of ancillary infrastructure*

Origin has identified several upgrades and modifications of existing ancillary infrastructure which are considered necessary to support the alternate ash deposition strategy and to ensure the continued safe operation of the Ash Dam. To facilitate these changes, Origin is seeking approval to:

- construct new ash deposition pipelines with multiple discharge points to transport and deposit dense phase ash slurry within the Ash Dam; and
- relocate the fly ash recycling infrastructure currently operated by Boral in the south-western area of the Ash Dam.

2.2 Concept Approval (05_0138)

In 2006, Concept Approval (05_0138) was issued for the long-term expansion of the Ash Dam and changes to the ash disposal method and ancillary infrastructure. The Concept Approval includes conditions that establish the staging and scoping of works associated with the development and management of the Ash Dam, many of which are now redundant. Origin therefore proposes to surrender the Concept Approval as part of this modification.

As discussed in detail in Section 6.5, the Department of Planning, Industry and Environment (Department) recommends that conditions that are still relevant / active in the Concept Approval be transferred into the Project Approval.

3. Strategic Context

3.1 Project Need

The Eraring Ash Dam is a significant and critical part of the operation of the EPS. Without the ability to store ash in the Ash Dam, electricity production at EPS would cease due to the limited alternatives to deposit and store ash without significant risks to safety and the environment.

The EPS is Australia's largest power station with an electrical generation capacity of 2,880 megawatts, accounting for up to 25 percent of New South Wales' power requirements. With the recent and planned closures of large generation assets in NSW (Munmorah and Liddell Power Stations), Victoria (Hazelwood) and South Australia (Northern Power Station) there will continue to be an increasing reliance on the EPS and associated Ash Dam to meet market demand for electricity and ensure future power system security in the short to medium term.

Following higher than planned electricity output rates at the EPS to meet market demands and lower than predicted ash reuse rates, the volume of ash recently deposited at the Ash Dam has been higher than previously planned and the dam is likely to reach its storage capacity of approximately 40 million m^3 sometime between November 2020 and January 2022, depending on electricity demand, deposition density and beneficial ash reuse markets.

In order to provide essential additional ash storage capacity, Origin is proposing to amend the ash deposition strategy and extend the storage capacity of the Ash Dam by approximately 5 million m^3 (12.5% increase). It is predicted that this will provide essential ash storage capacity until sometime between October 2023 and March 2026. Origin has confirmed that preparatory works for the proposed Ash Dam extension would need to commence in 2019 to ensure there is sufficient storage capacity to enable the ongoing operation of the Eraring Power Station.

Origin acknowledges that the proposed Ash Dam extension would only provide a short to medium-term storage solution for ash storage, given that the EPS is presently not anticipated to reach the end of its operational life until 2032. However, Origin has confirmed that the proposed Ash Dam expansion is just one of the steps that the company is taking to ensure the power station complex continues to have operational flexibility to respond to market demands as the national energy generation mix changes over time, including with the increasing use of solar and other renewables. As discussed in Section 3.3, Origin is also investigating new market opportunities to increase ash reuse rates.

3.2 Ash Dam Stability

The *Dams Safety Act 1978* provides the framework for the regulation of dam safety in NSW. The Dams Safety Committee (DSC) was constituted under the Act to ensure that dams meet a level of safety that is acceptable to the community.

The existing Ash Dam has a "High B" Consequence Category under the DSC Guidelines[4]. This consequence category invokes conservative dam design criteria and a high level and frequency of dam surveillance inspections, monitoring and reporting. In November 2018, as part of the continuous risk and assurance process for the Ash Dam, Origin engaged Stantec Inc. (Stantec) to undertake a detailed *Dam Break Assessment*, which considered the population at risk and severity of damage and loss in the event of a dam break. This assessment concluded that as there was an increase in the assessed population at risk, compared to previous assessments, and as such

[4] Australian National Committee on Large Dams (ANCOLD) (October 2012) *Guidelines on the Consequence Categories for Dams.*

the consequence category under the DSC Guidelines should increase to "High A". The increased population at risk was primarily in relation to an increase in the level of occupancy of the Myuna Bay Sports and Recreation Centre (MBSRC), which is located approximately 450 metres from the southern edge of the Ash Dam. The "High A" consequence category attracts a higher factor of safety than the "High B" category, due to increased seismic requirements.

In March 2019 Origin engaged Stantec to undertake a further *Geotechnical Stability Assessment - Southern Embankment* to determine whether the Ash Dam still met the DSC safety requirements based on the seismic requirements for the "High A" category. This assessment concluded that the Ash Dam no longer met the required factor of safety due to the increased seismic requirements and recommended that stability works be undertaken to the southern embankment to meet the required factor of safety. Origin has confirmed that it is currently designing these works in consultation with Stantec, and that the tender process for undertaking the stability works is underway. Origin has also confirmed that a third party reviewer (Professor David Williams from the University of Queensland) has been engaged to oversee the design and construction of the stability works.

The Department subsequently requested further information from Origin to clarify whether the proposed additional 5 million m^3 of ash within the Ash Dam associated with the modification would:

- have a material impact on the Ash Dam wall stability; and/or
- increase the impact of an Ash Dam wall break.

Origin re-engaged Stantec to provide a position statement and an Ash Dam break re-assessment to address the above request (see **Appendix E**). Stantec concluded that "*the scope of work proposed for the Ash Dam Augmentation Project does not have any bearing on the assessment of stability or likelihood of failure of the southern embankment*" of the Ash Dam. This conclusion was based on two main reasons:

1. The distance between the fly ash deposition footprint and the southern embankment (575 m at its closest point) and the proposed relatively flat deposition landform (1-2% slope), meaning the placed ash would remain stable and within the required DSC post-seismic stability factor of safety; and
2. The intention to continue to operate the existing leachate collection Decant Pond at the current operational water levels (typically RL 125.5m), using existing operational procedures and control, meaning the adjoining southern embankment will continue to comply with relevant design requirements[3] (noting that even where the Decant Pond is maintained at the maximum operational high rainfall level of RL 127.6 m, the southern embankment is assessed to remain stable).

Based on these conclusions, the Department considers that the proposed modification would have no material impact on the stability of the southern embankment of the dam, or result in any additional stability considerations associated with the Ash Dam.

The Ash Dam break re-assessment undertaken by Stantec analysed whether the consequences of a dam break event would increase as a result of the modification. The assessment found that the population at risk would increase by 11 people as a result of the proposed additional 5 million m^3 of ash within the Ash Dam due to a slight increase in the potential inundation footprint, however the PAR would remain within the range applicable to the DSC consequence category of "High A".

Ash Dam stability and safety issues relevant to the modification are discussed in further detail in Section 6 of this report.

3.3 Ash Reuse

Ash is a by-product of electricity generation, produced by the burning of coal. Coal ash produced at coal fired power stations is categorised to determine its suitability for beneficial reuse under the resource recovery orders

and exemptions of the *Protection of the Environment Operations Act 1997* (POEO Act). The categories of ash produced at the EPS include fly ash (85-90%) and bottom ash (10-15%).

The existing Concept Approval for the Ash Dam requires the preparation and implementation of a Long-Term Ash Management Strategy, with the goal of 80% reuse of ash by December 2021. The most recent Strategy was prepared by Origin and submitted to the Department and the EPA on 28 November 2018.

During the 2017-2018 period, the EPS produced around 1.6 million tonnes of ash. Approximately 29 % of the ash produced was sold and reused in other processes. Origin currently has agreements in place with both Flyash Australia and Boral to use the ash produced at the power station in the production of cement and concrete used in the building and construction industries. The remaining 71 % of ash produced at EPS was stored in the Ash Dam.

Ash reuse rates over the last few years have reduced by around 11% due to an extended power station outage (scheduled to occur every ten years) and variance in coal supplied to EPS in early 2017, which saw ash produced during this time deviate from typical product specifications. Together both issues contributed to a number of customers sourcing alternative ash supplies or reverting to blast furnace slag or other recycled products in lieu of ash produced at the EPS. Origin anticipated that reuse rates will return to long term trends as confidence in supply is restored.

Origin has confirmed that it will continue to work with industry to identify new market opportunities and drive the development of new reuse streams through innovation and product development in accordance with the Long-Term Ash Management Strategy. Past work with the Australian Technical Infrastructure Committee to develop technical specifications for ash use and the introduction of the *Coal Ash Exemption* regulation are examples of how Origin's continued engagement with industry and government regulators continues to drive sustainable reuse of ash.

However, ash reuse and recycling options are heavily influenced by market demand and, based on current projections for population growth and infrastructure projects within the region, Origin consider it unlikely that ash reuse in isolation would address the deficiencies in the required storage capacity in the short to medium term.

4. Statutory Context

4.1 Scope of Modification

The Concept and Project Approvals for the Eraring Ash Dam were approved under the former Part 3A of the EP&A Act. Although Part 3A was repealed on 11 October 2011, the project remains a 'transitional Part 3A project'. Under the current savings provisions, the project can be modified under the former Section 75W of the EP&A Act. Following the determination of the modification application, the Department will transition the project approval to the State Significant Development system under Part 4 of the EP&A Act. This means that any future modification applications would be assessed under Section 4.55 of the EP&A Act instead of under Section 75W.

The Department is satisfied that the current proposed modification can be characterised under Section 75W as modification to the current project approval, as:

- there would be a limited increase (between 4-7% increase) to the physical extent of the approved ash dam footprint;
- the proposal would require clearing of a relatively minor area (8.95 ha) of native vegetation;

- the proposal would result in an improved stormwater diversion and storage system;
- following a relatively short construction period (3 months), there would be limited environmental impacts beyond those which have already been assessed and approved (refer to Section 6);
- there is no proposed change to the existing use of the premises, the coal chemical composition or existing practice of depositing ash as a dense phase slurry; and
- the final ash dam design would maintain broadly similar landform characteristics to the original approved design.

Consequently, the Department considers the proposal to be within the scope of Section 75W of the EP&A Act.

4.2 Approval Authority

The Minister for Planning and Public Spaces is the approval authority for the modification application. However, under the Minister's delegation of 28 September 2011, the Independent Planning Commission (IPC) must determine the modification application because Origin has declared reportable political donations.

4.3 Environmental Planning Instruments

Several environmental planning instruments (EPIs) are relevant to the modification, including:

- *State Environmental Planning Policy (SEPP) (Coastal Management) 2018;*
- *SEPP 44 (Koala Habitat Protection);*
- *SEPP 55 (Remediation of Land);*
- *Lake Macquarie Local Environmental Plan, 2014.*

The Department considered the assessment of these EPIs by Origin in the EA and assessed the proposed modification against relevant provisions of these instruments. Based on this assessment, the Department considers that the proposed modification can be carried out in a manner that is consistent with the aims, objectives and provisions of these instruments.

4.4 Objects of the EP&A Act

For Part 3A projects, the approval authority should consider the objects of the EP&A Act when making decisions. The objects of the EP&A Act changed on 1 March 2018. The Department has assessed the proposed modification against the objects of the EP&A Act (see section 1.3 of the Act). **Table 2** summarises how the objects of most relevance to the decision on whether or not to approve the proposed modification have been considered.

Table 2 | Consideration of the proposal against relevant objects of the EP&A Act

Objects of the EP&A Act (section 1.3)		Consideration
(a)	*to promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources;*	The modification meets this object because it would provide essential ash storage capacity necessary to allow continued operation of the EPS and ensure future power system security within the national electricity market. Continued operation of the EPS would also contribute to the security and continued employment of around 400 power station workers, as well as provide employment for additional workers and contractors during construction operations. The modification will be designed to ensure that the existing coal reserves below the dam western extension area and within potential biodiversity offset areas are managed in consultation with both the Division of Resources and Geosciences (DRG) and Subsidence Advisory NSW (SA NSW).

Objects of the EP&A Act (section 1.3)		Consideration
(b)	*to facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment;*	The modification is generally consistent with ESD principles as it is unlikely to have significant environmental impacts, as it would: • provide essential ash storage capacity with a minimal increase in the Ash Dam footprint (4%) and minimal incremental environmental impacts to water resources, biodiversity and heritage; • require the retirement of ecosystem credits (283) and species credits (981) in accordance with the *Biodiversity Conservation Act 2016* (BC Act), that would offset the clearing of 8.95 ha of native vegetation; • not trigger a referral for assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act); • generate no additional greenhouse gas emissions beyond those already approved; and • have no impact on Aboriginal cultural heritage or historic heritage.
(c)	*to promote the orderly and economic use and development of land;*	The modification would result in a minimal increase the physical extent of the approved Ash Dam footprint (4-7%) over currently undeveloped grassland and disturbed bushland. The extended Ash Dam would facilitate use of undeveloped land to ensure security of electrical supply to the State.
(e)	*to protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats;*	The modification meets this objective as it does not involve material changes to environmental matters as: • remedial measures would be implemented to mitigate subsidence and associated hydrogeological risks; • stormwater improvements would reduce the volume of process water and leachate and the risk of water discharges to Lake Macquarie; • there would be negligible environmental consequences to wetlands and aquatic ecosystems; and • residual impacts to biodiversity would be limited to a net increase in clearing of 8.95 ha of native vegetation, which would be appropriately offset in accordance the BC Act.
(f)	*to promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage);* and	The modification would not directly impact Aboriginal cultural heritage or historic heritage.
(i)	*to promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State;*	The Department has assessed the modification in consultation with Lake Macquarie City Council and other relevant NSW government authorities, and given consideration to the issues raised by these agencies in its assessment.
(j)	*to provide increased opportunity for community participation in environmental planning and assessment.*	The Department publicly exhibited the modification and considered all submissions in its assessment.

5. Engagement

5.1 Department's Engagement

After receiving the modification application and accompanying Environmental Assessment (EA), the Department:

- advertised the public exhibition of the EA for the proposal in the Lake Macquarie Lakes Mail and the Newcastle Herald on 13 September 2018;
- publicly exhibited the EA from 13 September 2018 until 27 September 2018:
    - on its major projects website;
    - at Lake Macquarie City Council; and
    - at the Nature Conservation Council;
- notified relevant State government authorities in writing and by phone; and
- inspected the site on 8 October 2018 with representatives from the then Office of Environment and Heritage (OEH), now the Biodiversity Conservation Division within the Department, and again on 14 November 2018 with its independent geotechnical and hydrological consultant.

5.2 Summary of Submissions

During the exhibition period, the Department received 32 submissions, including 7 submissions from government agencies, 7 submissions from special interest groups and 18 submissions from the general public (see **Appendix C** and summary in **Table 3**). Five of the special interest groups and all but 1 of the general public submissions objected to the proposed modification. Of the 18 submissions received from the general public, 9 were form letter type submissions. Of the total received, 5 submissions were from people living in the Lake Macquarie City Council Local Government Area, 12 submissions were made by people living within 50 km of the Eraring Ash Dam, and 1 was from a person living greater than 50 kilometres or more from the site.

The Department received a submission from Centennial Coal Company Limited (Centennial), the owner of the neighbouring Awaba Colliery, following the exhibition period (see **Appendix C**). Centennial Coal Company Limited did not object to the proposed modification, but provided comments, which have been considered as part of this assessment.

Table 3 | Summary of Submitters

Submitters	Number	Position
Agencies	**7**	All comments
• Environment Protection Authority • Department of Industry - Crown Lands and Water Division • Division of Resources and Geosciences • Office of Environment and Heritage • Dams Safety Committee • Office of Sport • Lake Macquarie City Council		
Special Interest groups	**7**	5 objections, 2 comments
• Nature Conservation Council of NSW • Environmental Justice Australia • Northern Lakes Disability Tourism Precinct • Hunter Community Environment Centre • Greenpeace Australia Pacific • Community Environment Network • Centennial Coal Company Limited		• Objection • Objection • Objection • Objection • Objection • Comment • Comment
Community	**18**	17 objections, 1 comment
Approx. distance from Eraring Ash Dam: • <5 km • >5 km and < 50 km • >50 km	 5 12 1	
TOTAL	**32**	**22 Objections, 10 Comments**

5.3 Key Issues – Government Agencies

While none of the agencies objected to the proposed modification, several commented on particular aspects of the proposal and recommended changes to the existing conditions. These comments and recommendations are summarised below and considered in more detail in Section 6 of the report.

Environment Protection Authority (EPA) is satisfied that its areas of responsibility have been adequately addressed in the EA and noted that the Environment Protection Licence (EPL) 1429 which applies to the Eraring Power Station is currently under review.

Department of Industry – Water Division (DoI Water) (now the Water Division within the Department), recommended that the Surface Water and Groundwater Monitoring and Management Plans for the project be revised in consultation with DPIE Water. The Department has recommended a condition requiring the management plans be updated accordingly.

Division of Resources and Geoscience (DRG) indicated that it has no concerns regarding the existing proposed land-based biodiversity offset site location, but requested it be consulted if any changes are made to the current proposed offset areas to ensure there is no consequent reduction in access to respective land for mineral exploration, or potential for sterilisation of mineral resources. Origin has committed to consult with DRG during development of the biodiversity offset strategy.

Office of Environment and Heritage (OEH) sought clarification in relation to the development footprint and the area of direct impact on native vegetation associated with the modification. These clarifications were provided by Origin during the assessment process, and OEH is now satisfied with the biodiversity assessment and offset calculations. OEH recommended a condition of approval requiring Origin to retire all ecosystem and species credits in accordance with the offset rules of the Biodiversity Assessment Method. As discussed in Section 6.4, the Department has recommended a condition accordingly.

In relation to Aboriginal cultural heritage, OEH recommended that consultation be undertaken with registered Aboriginal parties to determine if there are any Aboriginal cultural heritage items or cultural values present within the modification footprint. In its response, Origin indicated that based on previous investigations within the project area and surrounds and in the context of historical disturbances and land use, the archaeological potential within the project area is considered low. However, Origin confirmed that prior to construction the company will invite Registered Aboriginal Parties (RAPs) to attend a site visit of the proposed extension area. Origin will then prepare an updated Aboriginal Heritage Management Plan documenting the outcomes and findings of the site visit and summarising any management requirements in relation to heritage items. As discussed in Section 6.6, the Department considers this to be an acceptable outcome and has recommended a condition accordingly.

In relation to hydrology, OEH sought clarification of the assumptions and methodology used to design the proposed receiving pond storage, outlet structures and scour protection works and recommended that the receiving pond be redesigned so that it has capacity to store all appropriate floodwaters. As discussed in Section 6.2, the Department is satisfied that the proposed receiving pond has sufficient capacity to provide detention for events up to and in excess of the 1% AEP event (the "1 in 100 year" flood) and that this is an appropriate design standard for stormwater storages.

Finally, OEH noted that the modification is within the proximity of a coastal wetland and sought further consideration of *State Environmental Planning Policy (Coastal Management) 2018* (Coastal Management SEPP). This information was provided by Origin during the assessment process and, as discussed in detail Section 6.2, the proposal is considered unlikely to impact on the aquatic ecosystems, structural integrity or water flows to and from any wetland. The Department has recommended performance measures to ensure this is the case.

Dams Safety Committee (DSC) did not object to the proposed modification but indicated that, although the proposed new saddle dam is assessed with Low Consequence Category, it will treat the new saddle dam in conjunction with the existing Eraring Ash Dam. The Department notes the recent review recommending that the existing dam structure be categorised as a High A Consequence Category Dam. DSC stated that the new saddle dam should be included in future surveillance inspections, monitoring and reports pertaining to the Eraring Ash Dam. DSC also noted that Origin is required to prepare and submit a Design Report for the new saddle to the DSC for its consideration prior to the construction of the saddle dam.

Office of Sport (OoS) did not object to the proposed modification but raised concerns in relation to potential impact of the modification on the Myuna Bay Sport and Recreation Centre (MBSRC), which is located approximately 450 metres from the eastern edge of the existing ash dam. In relation to the construction phase of the proposal, OoS requested to be consulted in relation to any changes in access arrangements to the facility and requested that the hours of construction be limited to 4pm on weekdays. As discussed in Section 6.6, the Department does not believe that limited construction hours are warranted given that the additional traffic and noise levels would occur over a short construction period (3 months) and can be appropriately mitigated and managed in accordance with the updated Construction Traffic Management Plan.

In relation to the ongoing operation of the dam, OoS recommended stringent conditions to prevent dust emissions and requested that air quality monitoring data be publicly available. OoS also requested that Origin rehabilitate Crooked Creek prior to the commencement of works. Environmental impacts associated with the operation of the Ash Dam are currently managed via the EPA's EPL, which requires air and water quality monitoring

for the Ash Dam to be made publicly available via monthly summary reports and the Annual Return. The Department has also recommended the inclusion of a condition requiring Origin to make a range of project related documentation, including monitoring results, publicly available on its website in accordance with contemporary consents for state significant projects. As discussed in Section 6, the Department is satisfied that the additional air and water quality impacts associated with the proposed modification would be minimal and adequately managed through the existing EPL and conditions of approval.

OoS also raised concern about a proposal to increase the height of the existing dam embankment by 8 metres. As noted by Origin in its response, the design of the western saddle dam does not propose an increase in height of the main embankment of the ash dam.

The Department notes that following the release of the *Dam Break Assessment* in November 2018 (refer to Section 3.2) the OoS made a decision to close the MBSRC. In July 2019, the Department of Family and Community Services engaged SMEC to complete an independent review of the assessment and the likelihood and consequences of a dam failure incident impacting the MBSRC. SMEC confirmed that the *Dam Break Assessment* prepared by Stantec was consistent with current industry practice and that the results were considered conservative. However, SMEC recommended that a detailed risk assessment in accordance with ANCOLD 2003 Guidelines be undertaken to further assist decision makers determine the future of the MBSRC. Origin has confirmed that it is currently preparing the risk assessment in consultation with the DSC and that the formal re-categorisation of the Ash Dam will occur following this process.

Lake Macquarie City Council (Council) did not object to the modification but sought clarification of the flora and fauna mapping and the biodiversity offset approach proposed in relation to a particular vegetation community (*Tetratheca juncea*). Origin provided clarification in relation to these issues during the assessment process. As discussed in Section 6.4, OEH and the Department are satisfied that the biodiversity offset proposed by Origin has been appropriately prepared in accordance with the *Biodiversity Conservation Regulation 2017*.

Council noted that the native vegetation clearing proposed as part of the modification may reduce and fragment a mapped Native Vegetation Corridor and suggested that compensatory revegetation and rehabilitation works be undertaken on site. The *Biodiversity Development Assessment Report* (BDAR) for the project identified that important connectivity and movement habitat is unlikely to be substantially impacted as a result of the proposal. However, Origin has committed to update and implement its Land and Biodiversity Management Plan prior to commencement of the modification to incorporate additional revegetation and rehabilitation works.

Council requested an impact assessment of the proposed modification against the Coastal Management SEPP, which as indicated above, was provided by Origin during the assessment process.

Finally, Council sought further clarification of the air quality assessment and impacts associated with the modification. This information was provided by Origin during the assessment process and, as discussed in detail Section 6.6, the Department is satisfied that the modification would result in a minor increase (between 4-7%) in the surface area of the dam potentially exposed during operation and that the existing air quality controls would be sufficient to maintain air quality at acceptable levels.

5.4 Key Issues –Special Interest Groups and Community

Of the 25 public submissions, 7 were from special interest groups and 18 were from the general public. The key issues raised in these community submissions are summarised in **Figure 5** below. The primary concerns related to:

- water resources, particularly in relation to water quality impacts on Lake Macquarie and coastal wetlands;
- health and safety of residents; and
- air quality impacts from wind borne dust from the Ash Dam.

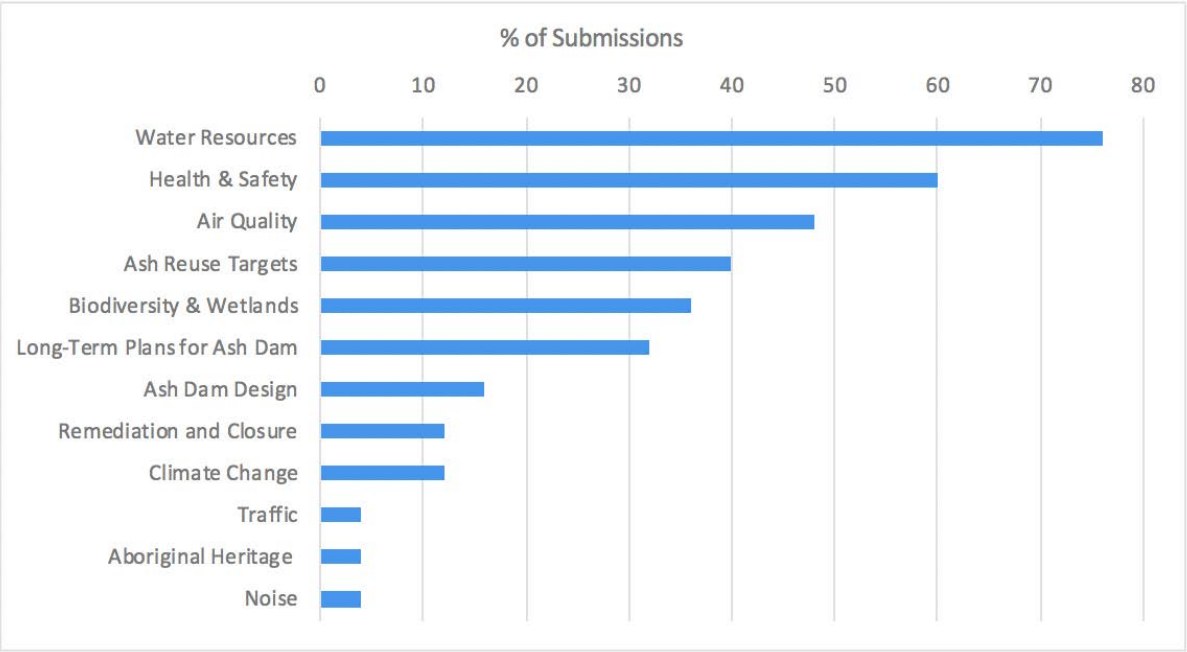

Figure 5 | Issues raised in community and special interest group submissions objecting to the modification

5.5 Response to Submissions and additional information

On 3 December 2018, Origin provided a detailed response to the issues raised in submissions (see **Appendix D**).

Following further consultation with the Department, on 16 January 2019, 30 January 2019, 11 February 2019 and 5 August 2019, Origin provided a range of additional information.

Responses and additional information from Origin are provided in **Appendix E**.

The responses were forwarded to agencies that made submissions to the EA (see **Appendix C**). The agency responses are attached at **Appendix C**. OEH provided a supplementary submission (see **Appendix E**).

The Department has considered these responses in its assessment of the merits of the proposal.

6. Assessment

The Department has assessed the merits of the proposed modification in accordance with the relevant objects and requirements of the EP&A Act. In assessing the proposal's merits, the Department has considered the:

- modification application and accompanying EA;
- current conditions of the Project and Concept Approvals;
- community and agency submissions;
- response to submissions and additional information provided by Origin; and
- relevant environmental planning instruments, policies and guidelines.

In addition, the Department has considered the independent expert advice from its geotechnical and hydrological consultants, WSP Australia Pty Ltd (WSP) (see **Appendix F**).

The Department considers the key issues associated with the proposed modification are groundwater, surface water, subsidence and biodiversity impacts.

6.1 Groundwater

The EA includes an assessment of the potential groundwater impacts associated with the modification. Potential impacts on groundwater quality associated with the proposal are primarily related to the seepage and migration of potentially contaminated groundwater through the Ash Dam extension area, which could impact the local groundwater quality, as well as the water quality of receiving waters of Dora and Crooked Creeks, downstream wetland systems and ultimately Lake Macquarie. Potential groundwater contaminants that may originate from the Ash Dam primarily include heavy metals and trace elements such as selenium, which is a trace element commonly found in coal.

6.1.1 Existing Groundwater Management

Groundwater seepage from the Ash Dam is currently collected via an extensive collection and drainage system which has been installed in the main embankment of the dam. Seepage from these drains flows to a series of toe drains at the base of the embankment, into the main Decant Pond and is then pumped back and returned to the Ash Dam (**Figures 3** and **6**). This system allows for the capture and retention of the vast majority of leachate. However, under emergency conditions, the existing EPL allows leachate from the Ash Dam to be discharged via Crooked Creek.

AECOM notes that the current groundwater seepage from the Ash Dam has been reduced due to the dense phase ash placement technique, which was introduced in 2008 and uses significantly less water to form the ash slurry when compared to the previous lean phase method (ie. 70% ash and 30% water compared to 30% ash and 70% water). Origin contends that the minimal water content and the cementitious nature of the dense slurry provides a low permeability layer across the surface of the Ash Dam which restricts the migration of leachate, compared to the previous lean phase deposition.

6.1.2 Potential Groundwater Impacts

As shown in **Figure 4**, unlike the existing area of the Ash Dam, the majority of the proposed western emplacement area would be located over the mine workings of the former Awaba Mine. AECOM predicts that, due to the existing topography and existing groundwater flow regime, the seepage water from the ash slurry proposed to be deposited in the small areas which are not over the mine workings would drain in a south east direction towards the existing drainage and collection system. The increase in leachate from these areas reaching the Decant Pond is therefore predicted to be minimal and unlikely to result in an increase in water levels in the Decant Pond higher than the current operational level (ie. RL 125.5). Existing operational controls, including the presence of a real-time water level gauge and alarm trigger system, would continue to operate to ensure water level in the Decant Pond is maintained at current levels.

However, AECOM predicts that the presence of the former underground mine workings has the potential to change the groundwater regime in the vicinity of the majority of the proposed western emplacement area, through direct hydraulic connection between the base of the Ash Dam and the underground mine workings.

Origin engaged SCT Operations Pty Ltd (SCT) to undertake a mine subsidence impact assessment to inform the groundwater assessment, and advise on the potential hydrological risks due to the proximity of underground workings to the proposed western extension area (refer to Appendix E of the EA).

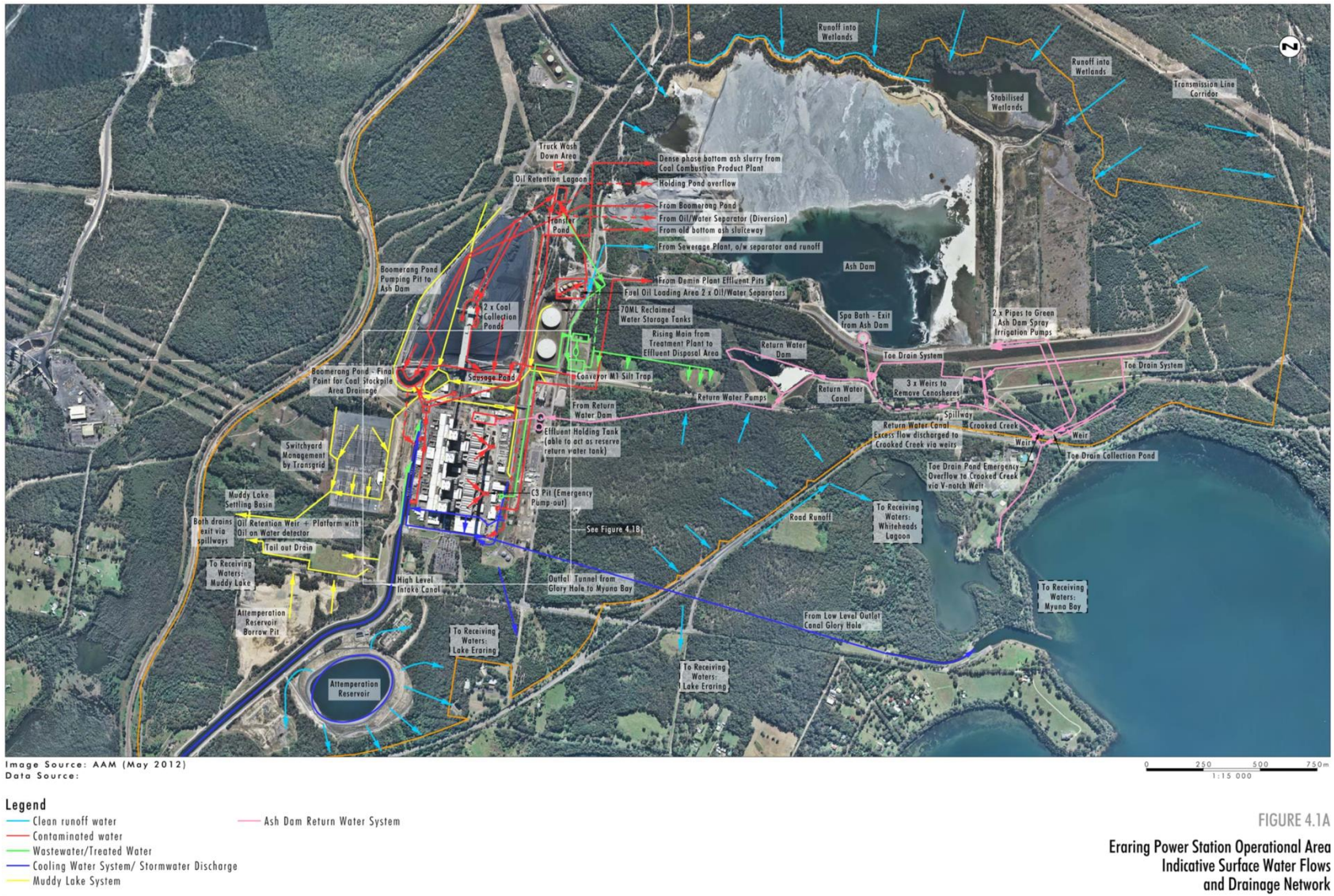

Figure 6 | Existing Ash Dam Existing Clean and Dirty Water System

Figure 4 provides a site plan showing the extent and nature of the Awaba Colliery workings, the current extent of the Ash Dam and the location of the proposed western extension area. The Ash Dam currently extends over some areas of the underground workings, including areas of full extraction and areas of standing pillars. The proposed changes would increase the area of the ash retention, so that the area of Ash Dam directly over the workings of Awaba Colliery would increase approximately fivefold.

The Awaba Colliery workings include areas of full extraction and areas of standing pillars, with overburden depths ranging from 20 m near the edge of the dam to over 50 m at a distance of 300m from the dam. Awaba Colliery is flooded and fully connected across the footprint of the mine. The water level within the mine is artificially maintained at about 16.5 m AHD, through pumping and by natural overflow at low points within the surface topography. One of the reasons for this pumping is to control the potential for artesian outflows at the EPS during periods of extended rainfall. This pumping and discharge is managed by Centennial Coal Company under its EPL.

In relation to hydrological risk, SCT identified that mine induced fractures may provide connectivity and the potential for surface water and seepage from the proposed western extension area to flow from the Ash Dam into the mine workings (**Figure 7**). This flow path would be expected to extend from the underground workings to locations where the surface level above the workings is less than the water level within the flooded workings. SCT indicate that under these conditions a flow pathway may establish between water in the Ash Dam and the nearby tributaries of Dora Creek. **Figure 8** shows where artesian flows could emerge and flow into the tributaries of Dora Creek when the water level in the mine or greater than about RL 16.5 m AHD.

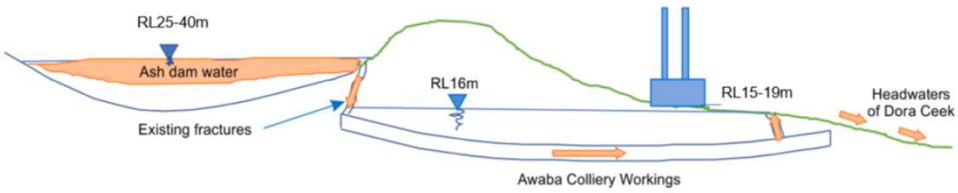

Figure 7 | Potential flow path for water from Ash Dam to Dora Creek via Awaba Colliery underground workings

SCT predicts that, without intervention, the cessation of pumping at Awaba Colliery and the EPS would potentially lead to the creation of an ongoing flow pathway whereby leachate from the Ash Dam flows into the Awaba workings and potentially into the tributaries of Dora Creek.

Although it is acknowledged that any leachate that would potentially be discharged into the tributaries of Dora Creek would be diluted by water within the underground workings, it is considered that this water may contain elevated levels of heavy metals and trace elements such as selenium.

Figure 8 | Potential outflow points from Awaba Colliery underground workings

6.1.3 Management and Remedial Strategies

Given that ongoing pumping down of the water level at Awaba Colliery is unlikely to be sustainable in the long term, SCT identified a range of alternative remedial strategies to restrict the flow pathway from the Ash Dam to the mine workings. As described in Section 2 of this report, these include:

- filling of mine voids with stabilized fill material – involving drilling 100-130 boreholes from the surface to depth ranging from 15-40m and injecting approximately 200,000m^3 of fill material containing fly ash with 2-4% cement;
- excavating to collapse shallow mine workings; and/or
- installing an impervious barrier using clays or suitable stabilized fill materials.

SCT indicate these strategies can be effectively implemented using readily available technologies in Australia, and conclude that:

> *"Filling up all the mine voids and mining induced fractures directly under and to an approximate distance beyond the edge of the ash dam is expected to be effective as a control on the potential for additional connectivity between the ash dam and underground working at Awaba Colliery and as a control on the current flows".*

SCT proposes that the area required to be filled to control the water flow risk would extend from the edge of the mine workings to a distance of up to 100 m from the limit of the proposed Ash Dam. Origin has confirmed that the preferred remedial strategy may employ all or a combination of the above techniques and that the most effective technique(s) would be confirmed prior to ash placement within the western extension area.

Origin committed to preparing a Mine Void Remediation Plan prior to mine void remediation activities commencing. It is proposed that the plan would identify the proposed void treatment methods, excavations, a material placement strategy and design criteria, as well as environmental safeguards to minimise risks to the environment. It is proposed that preparation of the Mine Void Remediation Plan would be prepared in consultation with Subsidence Advisory NSW (SA NSW) and Centennial (the owner of Awaba Colliery) and would be informed by:

- geotechnical mine void investigations, including drilling and geotechnical core logging and/or borehole camera inspection;
- geotechnical and hydrologic models to assist in identifying potential groundwater flow paths, discharge locations, and water quality parameters;
- an assessment of potential hydraulic connectivity to determine the potential impact of subsidence and resulting hydraulic connectivity for preferred design scenarios;
- hydraulic conductivity of the fill material, the height to which the voids are filled, and the expected effectiveness of the filling strategy used;
- construction quality control measures to be implemented describing monitoring and verification of works and quality control of filling materials;
- design drawings, specifications and performance measures; and
- long-term performance monitoring requirements.

In addition, Origin committed to preparing a Mine Void Remediation Verification Report to determine the effectiveness of the applied rehabilitation action works. It is proposed that the verification report would be informed by and contain:

- a summary of geotechnical and/or groundwater investigations undertaken to verify performance measures identified in the Mine Void Remediation Plan are met; and
- if necessary, any further monitoring or geotechnical work required to manage residual risk associated with subsidence and surface water connectivity risks prior to ash deposition above RL 130 within the western emplacement area.

The Department engaged geotechnical and hydrological experts from WSP to provide independent advice on the proposed sealing techniques for the underground mine voids, and recommendations for mitigation and management of the process (see **Appendix F**).

WSP concluded that expanding the Ash Dam over abandoned mine workings is feasible if appropriate subsidence mitigation and groundwater controls are implemented. WSP state that grouting or filling[5] of the mine workings and pressure grouting overburden fractures with cement fly ash is considered the most feasible remedial method, and that this is commonly done in the Newcastle Region and other mined areas in Australia. WSP note that further consideration of the lateral extent of filling is needed, as the scientific bases for the distance of 'up to 100m' proposed by SCT is not provided.

WSP does not consider the other remedial techniques proposed by Origin to be effective methods to mitigate potential hydrogeological risks, particularly excavation and collapsing of mine workings. This technique would create a zone of broken rock pieces which would be difficult to fill, may become flooded and the collapsing could cause vibration which may impact the existing Ash Dam.

WSP identified that the EA contains limited groundwater information and recommended that a qualified and experienced hydrogeologist be engaged to:

- better conceptualise the groundwater system, particularly in the vicinity of the proposed mine filling zone, including recharge and discharge processes and locations, artesian verses non-artesian conditions, groundwater levels and local flow paths, groundwater quality (including in the mine voids) and hydraulic properties;
- assess and refine the potential risks to groundwater, including the potential change to the groundwater quality due to mixing/interaction/leaching of the cement stabilised fly ash with groundwater, increasing groundwater levels and outflow from the presence of fill material, the release of potentially contaminated groundwater from the mine workings, changes in the quantity and quality of flows to the wetland systems; and
- work closely with Origin and its engineering consultant to inform and refine the detailed design, including the mine fill/barrier design and program, leaching potential of cement stabilised fly ash, rate of introduction of the fill and consideration of flowability of the fill.

The Department considers that the filling method has been used extensively in the past and is a feasible remedial technique to control potential connectivity between the Ash Dam and the mine workings. As discussed further in Section 6.3 below, filling is also considered the most effective method to control subsidence risks. The Department accepts Origin's broad approach to developing a Mine Void Remediation Plan which includes further hydrological investigations to better conceptualise the existing geotechnical and hydrogeological conditions in

[5] Note that the *Geotechnical and Hydrogeological Review – Eraring Ash Dam Expansion* prepared by WSP (December 2018) uses the term "grouting" to refer to the injection of a cement fly ash to "fill" mine workings and overlying caved areas. This process is termed "filling" in this Assessment Report.

the vicinity of the dam and to inform detailed designs. The Department agrees with WSP that this process needs to be completed by a highly experienced and qualified hydrogeologist and has recommended a comprehensive condition requiring investigations to better conceptualise the groundwater system, potential risks to groundwater and mine filling design. The condition also requires regular consultation with the Department during detailed design and implementation stages to allow opportunities to review and advise during the process and allow the establishment of performance criteria to ensure compliance with a performance measure to "minimise seepage into the underground workings".

6.1.4 Groundwater Monitoring

WSP also undertook a review of the existing groundwater monitoring system associated with the Ash Dam. Groundwater monitoring in the vicinity of the Ash Dam is currently undertaken in accordance with the requirements of the EPL, which requires monitoring from four wells (EPA ID numbers 21 – 24) (refer to **Figure 9**). Standing water levels, anions (sulphate, chloride, fluoride), cations (calcium, magnesium, sodium, potassium, iron) boron, manganese, pH and total dissolved solids are required to be monitored every 6 months. WSP indicate that elevated species concentrations have been recorded at the downgradient monitoring wells.

WSP recommended that a more comprehensive ground water monitoring program, beyond that specified in the EPL, should be implemented to monitor the potential for changes in groundwater levels, flow and quality as a result of the modification. WSP recommended that this program be implemented to assess groundwater conditions during construction and operational regimes.

In line with WSP's advice, the Department has recommended a comprehensive ground water monitoring regime be implemented prior to the commencement of construction and during operations.

Figure 9 | Ground water and surface water monitoring locations

6.1.5 Conclusion

Overall, the Department is satisfied that the hydrogeological risks associated with the modification can be effectively controlled using filling techniques, and that the development of a Mine Void Remediation Plan by an experienced and qualified hydrogeologist will ensure the existing groundwater conditions are understood and the most effective filling technique is implemented. A comprehensive ground water monitoring program would ensure any groundwater impacts associated with the modification are identified and further remedial activities implemented, if necessary.

6.2 Surface Water

The EA includes an assessment of the potential surface water impacts associated with the modification, which draws on information contained in the following reports:

- *Eraring Power Station – Water Balance Model of Contaminated Water System*, prepared by AECOM in 2015; and
- *Clean Water Design, Stormwater Drainage Design Report*, prepared by Aurecon in 2018.

The proposed expansion of the Ash Dam and ancillary infrastructure has the potential to impact on surface waters during both construction and operational phases. Potential construction impacts include erosion of soils and sedimentation from clearing of vegetation, drilling of boreholes and earthworks associated with the establishment of the western emplacement area. Potential impacts to surface water quality and receiving waters during the operation of the Ash Dam include increased pollutant concentrations and sediments in surface runoff from the extended Ash Dam discharging into the receiving waters of Dora Creek, existing wetlands and ultimately Lake Macquarie.

The Department is satisfied that the potential surface water impacts during construction can be adequately managed through standard construction management measures and erosion and sediment controls. The existing Construction Environmental Management Plan (CEMP), including an Erosion and Sediment Control Plan for the site would be required to be reviewed and updated to incorporate the proposed construction work controls associated with the modification.

In order to reduce potential impacts to surface water quality during operation of the Ash Dam, Origin is proposing to upgrade the existing stormwater management system in and around the dam. As discussed in Section 2 and shown on **Figure 3** of this report, Origin is proposing to:

- construction new stormwater diversion works along the Access Road for a length of about 1 km to the north-west of the Ash Dam to divert local catchment flows away from the ash dam into an existing clean water receiving pond; and
- upgrade and reconfigure the existing receiving pond, including the inlet structure and discharge point, to accommodate design storage volumes.

Survey and site investigations undertaken by Aurecon indicate that an additional catchment area of around 8.6 ha or an increase of just over 70% of the existing catchment area would drain away from the Ash Dam and into the upgraded receiving pond. Aurecon indicates that this would result in an improvement to surface water management by diverting "clean" stormwater that would have otherwise reached the Ash Dam into the receiving pond.

Aurecon indicates that the receiving pond has been designed to be double the existing capacity (proposed capacity of 10,000 m^3) with additional buffer (21,000 m^3) and overtopping storage (18,000 m^3) based on the surrounding terrain (**Figure 10**). Once the capacity of the receiving pond is exceeded, water would be discharged via an underground pipe to a new discharge point approximately 360 m to the west of the receiving water pond.

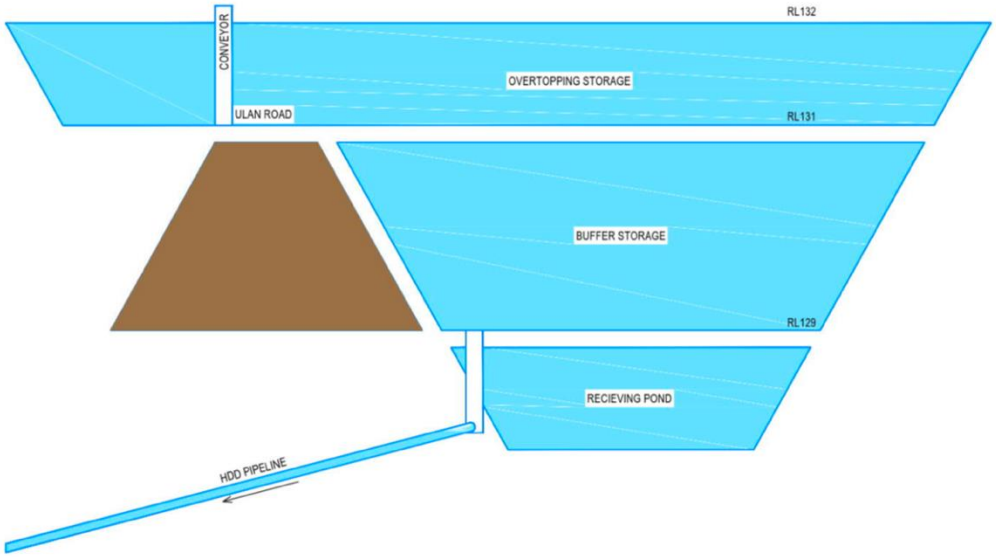

Figure 10 | Conceptual Arrangement of Clean Water Storages

The discharge point would consist of a headwall and rock lining to control localised scour and erosion. From this discharge point, water would be directed south-west through existing drainage pathways to enter existing wetlands prior to flowing into Lake Eraring and ultimately Lake Macquarie (**Figure 11**).

OEH sought clarification of the assumptions and methodology used by Aurecon to design the proposed upgrades to the stormwater system. In response, Origin confirmed that the designs for the stormwater containment and diversion works have been based on the:

- *Generalised Short-Duration Method* (Bureau of Meteorology, 2003) for the Probable Maximum Precipitation (PMP) and Annual Exceedance Probability (AEP) calculations;
- *Australian Rainfall and Runoff Guideline* (Geoscience Australia 2016) for the hydrologic and hydraulic calculations; and
- *Managing Urban Stormwater: Soils and Conservation* (Landcom, 2004) for the scour protection works.

Figure 11 | Proposed stormwater flow path and discharge point

The Department accepts that the designs for the stormwater containment and diversion works have been based on accepted industry best practice, and notes that the upgraded stormwater system has been designed to cater for heavy rainfall events. Aurecon's calculations demonstrate that the:

- buffer storage would fill to 16% during a critical 1% AEP storm, and would drain to the dry weather level after 0.6 hours; and
- overtopping storage would fill to 56% during a critical PMP storm duration, and would drain to the dry weather level after 5.4 hours.

Only during a sustained extreme PMP storm event would the overtopping storage be used and would there be temporary inundation of Ulan Road (a private access road) and the coal conveyor. In its submission, OEH recommended that the receiving pond be redesigned so that it has capacity to store all appropriate floodwaters. However, the Department considers that the proposed receiving pond has sufficient capacity to provide detention for events up to and in excess of the 1% AEP event (the "1 in 100 year" flood) and that this is an appropriate design standard for clean stormwater storages. Further, the access road is not a public road and inundation would only be for a short period following a PMP storm event.

Overall, the Department considers that the stormwater improvements would reduce water inflows into the Ash Dam by diverting flows from local catchments which would otherwise enter the dam. This would ultimately reduce the volume of process water and leachate entering the system and the risk of water discharges to Lake Macquarie.

6.2.1 Consideration of Coastal Management SEPP

In submissions, both OEH and Council noted that the modification is within the proximity of a coastal wetland and sought further consideration of Coastal Management SEPP. In relation to wetlands, the SEPP states that development consent must not be granted for development on land within the coastal environment area unless the consent authority has considered whether the proposed development is likely to cause an adverse impact on:

(a) *The integrity and resilience of the biophysical, hydrological (surface and groundwater) and ecological environment; and*

(b) *Coastal environmental values and natural coastal processes.*

The wetland areas located to the south-west of the Ash Dam, as well as Lake Eraring and Lake Macquarie are mapped as coastal wetlands under the Coastal Management SEPP (**Figure 11**). Potential impacts on these systems were considered by Umwelt (Australia) Pty Ltd (Umwelt) in the *Biodiversity Development Assessment Report* (BDAR) for the proposed modification (refer to Appendix C of the EA) and further considered in Origin's response.

Umwelt notes that the proposed modification would not involve physical development within the coastal environment. Potential impacts associated with the modification are primarily related to the diversion of additional surface water into the existing wetland, prior to flowing into Lake Eraring and ultimately Lake Macquarie, during times of sustained rainfall events when the receiving pond's storage capacity may be exceeded. Umwelt indicate that these impacts are unlikely to impact on the integrity or resilience of the coastal wetland environments, given:

- the diverted surface water flows would not come into contact with ash or process water, so would be "clean" water and of comparable quality to existing surface water runoff that drains into the wetland from the surrounding environment;
- the proposed increased stormwater catchment area (21 ha) is relatively small compared to the existing catchment area reporting to the wetland system (131 ha) as well as the existing wetland it would flow into (100 ha), so the volume of water diverted would comprise a small proportion of the receiving water volume;
- the diverted flows would be limited to a maximum rate of 240m^3 per hour and temporary in nature (less than 40 minutes during a 1% AEP storm event and 5.4 hours during a PMP event), which is considered inconsequential in comparison to the flows reaching the wetland under existing conditions.

The Department accepts that the additional flows into the wetland system would be small and infrequent, and that the quality of the water would be similar to the existing surface water runoff. As discussed further in Section 6.4 of this report, the Department considers that the diverted flows would be unlikely to cause loss of biodiversity diversity or ecological function in the aquatic ecosystems.

To ensure this is the case, the Department has recommended performance measures requiring negligible environmental consequences to wetlands and aquatic ecosystems as a result of the modification. In addition, the recommended Mine Void Remediation Plan requires investigations to better conceptualise the groundwater dependent and wetland systems in the vicinity of the dam expansion zone, changes in the quantity and quality of flows through these systems and a comprehensive monitoring program to assess conditions during baseline, construction and operation.

6.2.2 Surface Water Monitoring

Surface water monitoring in the vicinity of the Ash Dam is currently undertaken in accordance with the requirements of the EPL, which requires monitoring from five locations (EPA ID numbers 1, 8, 10, 17, 20) (refer to **Figure 9**), on a monthly or quarterly basis. Key parameters of the surface water monitoring program include metals, selenium, temperature, pH, nutrients and total suspended solids.

Similar to recommendations made in relation to ground water, WSP recommended that the surface water monitoring network be expanded to include surface water conditions at the outflow points during baseline, construction and operational regimes. The Department has recommended a condition accordingly. The EPA has confirmed that the existing EPL is currently under review and that the review will include consideration of additional monitoring associated with this modification.

6.3 Geotechnical

As described in Section 2 of this report, a saddle embankment is required in order to enable safe placement of ash to an RL 140m in the western operational footprint of the Ash Dam. The proposed concept design of the saddle embankment incorporates an earth fill embankment approximately 600m in length to a maximum height of 10 m, with faces battered at 1.5:1 upstream and 3:1 downstream (see **Figure 3**).

Numerous submissions on the modification noted the risks of dam failure and raised concerns regarding the structural integrity of the Ash Dam and the proposed saddle embankment. Questions in relation to the stability of the Ash Dam were also raised in the media following the release of the Dam Break Assessment (Stantec, 2018), which recommended an increase in the consequence category of the Ash Dam from "High B" to "High A" due to an increased PAR and the associated seismic requirements. As discussed in Section 3.2, Origin is currently undertaking stability works on the southern embankment to address these issues, and Stantec has confirmed that the proposed modification would not impact the stability works or affect the overall stability of the Ash Dam.

The DSC has confirmed that the proposed Ash Dam western extension saddle embankment is assessed with Low Consequence Category. However, DSC intend to treat the embankment in conjunction with the existing Ash Dam, which currently has a "High B" Consequence Category. This consequence category invokes highly conservative dam design criteria and a high level and frequency of dam surveillance inspections, monitoring and reporting to ensure the ongoing use and operation of the dam is in accordance with best practice measures.

Under the provisions of the *Dams Safety Act 1978,* Origin is required to prepare and submit a Design Report for the new embankment to the DSC for its consideration prior to the construction of the saddle dam. The Department considers that this process will ensure the saddle dam extension is designed, constructed and operated to a high safety standard which would pose a minimal risk to the community and environment.

SCT's mine subsidence impact assessment identified potential geotechnical risks due to the proximity of underground workings to the proposed western extension area and saddle embankment (refer to Appendix D of the EA). SCT noted the potential for mine subsidence in the form of either pillar collapse or roof failures leading to sinkhole formation, impacting these structures. If differential movements occur below the proposed western saddle embankment, there is the potential for loss of integrity of the embankment followed by piping failure and loss of material from the emplacement.

SCT indicates that the subsidence related risks would be effectively controlled by employing the remedial measures identified in Section 6.1 of this report to restrict flow pathways from the Ash Dam to the mine workings. These include filling of mine voids with stabilized fill material; excavating to collapse shallow mine workings; and/or installing an impervious barrier using clays or suitable stabilized fill materials. SCT state that:

> *"The extent of void filling required to control the water connectivity risk is expected to be larger than the extent of void filling for subsidence control, so that if the water connectivity risk is controlled, the subsidence risk would likely be controlled by default" (pg. 13).*

As discussed in detail in Section 6.1 above, Origin has committed to undertaking a range of geotechnical investigations to better understand the nature of the mine voids and the potential impact of subsidence. This includes geotechnical mine void investigations, including drilling and geotechnical core logging and/or borehole camera inspection; geotechnical modelling; and further consideration of subsidence for preferred design scenarios.

WSP's geotechnical expert confirmed that stabilisation of the mine workings beneath the site by filling voids is considered feasible as it provides support and has been previously used for this purpose. Other proposed remedial methods, including collapsing the workings and/or over-excavation, are not considered to be effective to mitigate potential subsidence impacts, primarily due to the flooded nature of the workings.

WSP's geotechnical expert recommended that a mine subsidence expert be retained to conduct the investigations of mine workings and subsurface conditions and to further consider subsidence impacts to the site and mitigation. Further, WSP recommend a trial to consider the effectiveness of the mine filling to be used, involving:

- developing a filling program considering items such as project objectives; mine level and environmental considerations, including open/caved and flooded mine workings; and fill requirements;
- trial mix design to demonstrate the fill has the desired flowability and strength;
- modify the program as needed to fit the conditions encountered, such as adjusting the fill hole pattern and fill flow characteristics;
- monitoring during filling consisting of strength and flowability testing and assessing filling effectiveness, such as tracking fill flow in boreholes; and
- verification after filling involves drilling boreholes into the filled area to obtain samples of the fill and assess the effectiveness of the fill.

The Department agrees that filling considerations are a key component to ensure both structural stability and minimise flow paths from the dam. The Department has therefore recommended that a subsidence expert be retained and that a fill trial and program be included as part of the Mine Void Remediation Plan. The Department has also recommended subsidence performance measures requiring the dam expansion area, including the western saddle dam, be safe, stable and non-polluting with negligible subsidence impacts.

In its submission on the modification, Centennial indicated that it currently holds Consolidated Coal Lease 746 over the proposed Ash Dam extension area, and that potential future expansion of its underground mining operations would be within the West Borehole Seam, located approximately 200-300 m beneath the proposed extension area. Centennial raised concerns about any subsidence related interactions of future mining in this seam jeopardising the effectiveness of any remedial strategies to reduce the potential for water connectivity between the Ash Dam and the Awaba Mine workings, and potentially sterilising coal reserves in this area. Centennial requested that remedial measures and ash containment embankment walls be designed in consultation with the mine and the Subsidence Advisory NSW (SA NSW) to prevent sterilising coal reserves.

The Department confirms that the Ash Dam, including the proposed western extension area, are located within the West Lake Mine Subsidence District. SA NSW regulates development within mine subsidence districts to protect infrastructure (typically homes and buildings) from potential subsidence damage. Under Section 22 of the *Coal Mine Subsidence Compensation Act 2017*, Origin is required to obtain approval from SA NSW for the extension of the Ash Dam. The Department has consulted with SA NSW in relation to the proposed modification and has sent a copy of the recommended conditions in relation to mine void remediation works. In addition, the Department has recommended that the Mine Void Remediation Plan would be prepared in consultation with SA NSW.

Several submissions indicated that the Ash Dam design should include a liner to act as a barrier between the ash emplacement and the dam floor. In its response, Origin indicated that placement of a liner under the existing facility is not feasible, given that the existing dam occupies an area of approximately 250 ha. Placing a liner on top of the existing landform is not considered viable from an operational perspective as ash placement activities are required to occur on a continual basis.

The Department accepts that installing a liner under the existing Ash Dam is not feasible and notes that the existing dense phase ash placement method is likely to have formed a low permeability layer across the surface of the Ash Dam which restricts migration of leachate. As discussed above, installing an impervious barrier over the proposed

ash extension area using clays or suitable stabilised fill materials may form part of the preferred mine void remediation strategy, subject to final detailed design and preparation of the Mine Void Remediation Plan.

Overall, the Department considers that the final design, construction and operation of the proposed saddle embankment and western extension area would be done in consultation with the Department, DSC and following approval from SA NSW, therefore ensuring a high level of safety to the community and environment, and ensuring existing coal reserves beneath the extension area are not sterilised.

6.4 Biodiversity

Origin engaged Umwelt to prepare a BDAR for the proposed modification (refer to Appendix C of the EA). The assessment involved a literature and database review, field surveys over a period of 8 days completed between September 2017 and July 2018, aerial photography interpretation and biodiversity mapping.

OEH has confirmed that it is satisfied that the BDAR has appropriately been completed in accordance with the Biodiversity Assessment Method Order 2017 (BAM) of the *Biodiversity Conservation Act 2016*.

The proposed modification would require clearing of approximately 8.95 ha of land, which comprises native fauna habitats and two Plant Community Types (PCTs) assessed as being in good condition, being:

- 0.95 ha of PCT1627 Smooth-barked Apple-Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast; and
- 8.0 ha of PCT1636 Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast.

The land disturbance would mostly be associated with the areas required to improve the existing stormwater management system and to facilitate filling of mine voids.

The proposed modification has been designed to limit biodiversity impacts to the existing operational footprint of the Ash Dam as far as possible, and to avoid impacting areas currently reserved for habitat offsets, previously revegetated areas and an existing wetland. Origin has also committed to implement additional mitigation measures to minimise indirect impacts on biodiversity, including demarcation of approved clearance boundaries, pre-clearance surveys, weed management, pest animal control and bushfire management.

OEH and the Department agree that potential biodiversity impacts associated with the proposed modification have been appropriately avoided and minimised, and that residual impacts are not considered significant, as:

- the area of net clearance (8.95ha) is relatively minor and necessary for the establishment of an improved storm water system and dam stabilisation works;
- the disturbance areas would be progressively rehabilitated; and
- Origin's Biodiversity Offset Strategy would compensate any residual impacts (see below).

6.4.1 Consideration of the EPBC Act

Several public and special interest group submissions raised concerns about the loss of biodiversity as a result of the modification, with two special interest groups indicating that the modification should trigger a referral for assessment under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In response, Origin re-engaged Umwelt to prepare an *EPBC Assessment of Significance Report* to assess the likelihood of occurrence and an assessment of significance for biodiversity related Matters of National Environmental Significance (MNES) listed under the EPBC Act (refer to Appendix A of the RTS). The assessment identified 102 threatened and/or migratory entities have been recorded and/or are predicted to occur in the locality. Of these, 11 were categorised as having a medium or greater likelihood of utilising the terrestrial habitats

in the modification development footprint. Assessments of the 'significance of impact' of these entities was undertaken which found that the modification:

> *"…is unlikely to result in a significant impact on an important population of the migratory black-faced monarch or vulnerable grey-headed flying-fox, large-eared pied bat,* Acacia bynoeana, Grevillea parviflora *subsp.* parviflora, Rutidosis heterogama, *or* Tetratheca juncea, *and unlikely to result in a significant impact on a population of the endangered spotted-tailed quoll or critically endangered regent honeyeater, swift parrot or* Genoplesium insigne *" (pg. 11).*

Based on these findings, Umwelt concluded that the proposed modification is unlikely to have a significant impact on biodiversity related MNES and, as such, a referral to the Commonwealth Environment Minister should not be required. The Department accepts this conclusion, noting that whether to refer the activity under the EPBC Act is a matter for Origin to decide.

6.4.2 Biodiversity Offset Strategy

Origin is proposing to supplement the existing Biodiversity Offset Strategy for the EPS with an additional offset to compensate for residual biodiversity impacts.

The BAM calculator determined that a total of 283 ecosystem credits and 981 species credits are required to offset the impacts of the modification. A summary of the offset credit requirements is provided in **Table 4**.

Table 4: Summary of offset credit requirements

PCT/Species Credit	Disturbance Area	Credits Required
Ecosystem Credits		
PCT1627 Smooth-barked Apple-Turpentine – Sydney Peppermint heathy woodland on sandstone ranges of the Central Coast	0.95	22
PCT1636 Scribbly Gum – Red Bloodwood – *Angophora inopina* heathy woodland on lowlands of the Central Coast	8.0	261
Species Credits		
Black-eyed Susan – *Tetratheca juncea*	8.95	327
Squirrel glider – *Petaurus norfolcensis*	8.95	327
Stephen's banded snake – *Hoplpcephalus stephensii*	8.95	327

In order to satisfy these requirements, Origin has proposed a strategy which includes securing additional land-based offsets and/or using alternative mechanisms available under the *Biodiversity Conservation Act 2016*, including:

- in-perpetuity conservation through the establishment of Stewardship sites and the retirements of credits;
- securing the required credits through the open credit market; and/or
- payments into the Biodiversity Conservation Fund.

Origin has identified three potential land-based offset sites within 10 km of the Ash Dam which are considered suitable sites within the locality (refer to **Figure 12**). Umwelt confirmed that these three sites comprise over 500

ha in total and, based on a high-level habitat suitability assessment, would likely generate the required credits to offset impacts of the modification if they were to be established as Biodiversity Stewardship sites.

OEH has reviewed and accepted the calculations as presented in the BDAR and has indicated that it is satisfied that the above offsetting approach is consistent with the BAM.

In its submission on the modification, Centennial indicated that a large portion of the potential offsite land-based offset sites on Crown Land to the north of the Ash Dam are within its proposed future mine extension area, where it holds surface title via mining leases. Centennial raised concerns that dedication of these areas for offset sites may result in sterilisation of coal these coal reserves. In its submission on the modification DRG indicated that it has no concerns regarding the location of the currently proposed offset.

In its response, Origin noted that extensive areas for potential offset sites have been identified both within and outside of its existing landholdings, and that extensive consultation with DRG, other relevant government agencies and Centennial would be undertaken prior to finalising any offsite land-based offset sites to ensure any land-based offset does not sterilise coal reserves.

The Department accepts that the proposed modification would result in some clearing of native vegetation. However, the stormwater improvements are necessary to avoid surface water pollution and some of the clearing is necessary to fill mine voids and ensure the stability of the Ash Dam extension. The Department considers that the net overall disturbance area associated with the modification has been reduced as far as possible to avoid impacting areas currently reserved for habitat offsets, previously revegetated areas and an existing wetland. The Department also considers that the implementation of the additional offset strategy will suitably offset any residual impacts associated with this clearing.

In accordance with OEH's recommendation, the Department has recommended a condition requiring Origin to retire all ecosystem and species credits, in accordance with Biodiversity Offset Scheme (BOS) as required under the BC Act, within 12 months of commencing construction of the modification activities. Origin has all committed to reviewing and updating the existing Biodiversity and Land Management Plan (AECOM, 2017) for the site to incorporate the proposed modification.

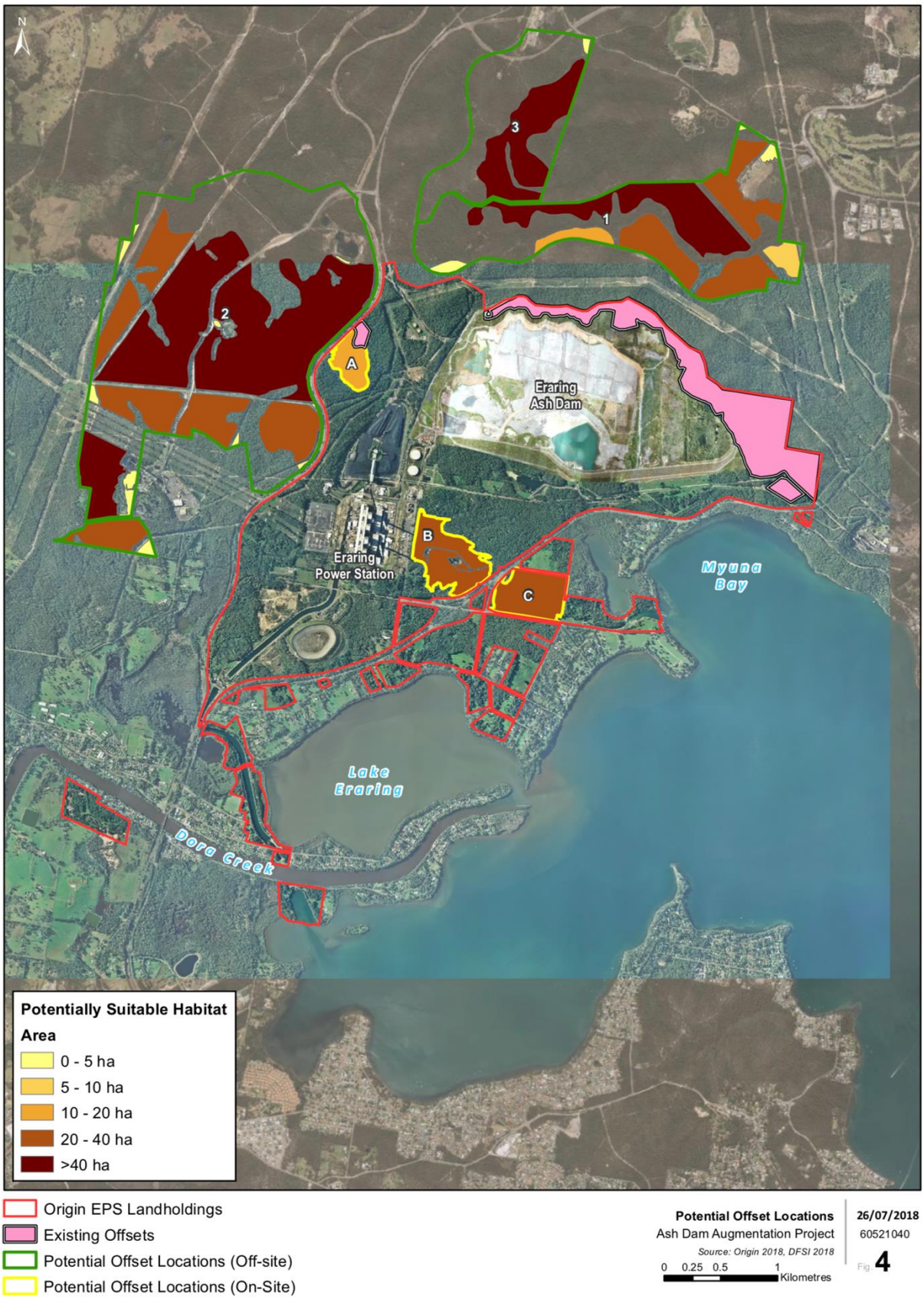

Figure 12 | Potential offset locations

6.5 Surrender of Concept Approval

The existing Concept Approval (05_0138) was issued in 2006 for the long-term expansion of the Ash Dam and changes to the ash disposal method and ancillary infrastructure. The Concept Approval includes conditions that establish the staging and scoping of works associated with the development and management of the Ash Dam. The majority of the Concept Approval conditions are now redundant, and Origin proposes to surrender the approval as part of this modification.

The Department has completed a comprehensive review of the existing Concept Approval (refer to **Appendix G**). The Department agrees that most of the conditions are now redundant, particularly in relation to limits of approval, staging and scoping of works and the specific requirements for a project application. However, several conditions remain relevant and are not reflected in the existing Project Approval. These include conditions in relation to compliance monitoring and tracking, community information, consultation and involvement. The Department has recommended that the contemporary version of these conditions be included in the modified Project Approval.

The key condition that remains relevant to the existing and proposed modified operations of the Ash Dam is Condition 3, which requires the development of a Long-Term Ash Management Strategy. In summary, the Strategy is required to be prepared in consultation with the EPA and Council and requires Origin to report against a stipulated goal of 80% reuse or recycling of ash from the EPS by 31 December 2021. The Strategy is required to include a program for identifying and investigating alternative ash management measures over time, with a focus on minimising of ash disposal on site and beneficial reuse of ash. The most recent version of the Long-Term Ash Management Strategy was submitted by Origin in November 2018.

The Department has recommended that a modified version of this condition (which removes redundant parts in relation to compensatory habitat areas) is included in the modified Project Approval.

6.6 Other Issues

The Department has summarised its assessment of a range of other matters in **Table 5**. These matters are considered to be minor and not determinative, and would be regulated under the existing EPL and/or conditions of approval.

Table 5: Other Issues

Issue	Findings
Air Quality	• The Ash Dam and proposed extension area are surrounded predominantly by bushland which serves as a buffer zone between the dam and surrounding residential areas. The nearest sensitive receivers to the extension area include the Myuna Bay Sport and Recreation Centre and residents in the suburb of Eraring, located approximately 500 m and 1 km to the south, respectively. • Potential impacts to air quality during construction of the modification would primary relate to the generation of dust during vegetation clearing, earthworks and the transport of materials to the site. • The Department considers that dust emissions during construction can be appropriately managed under the existing Construction Environmental Management Plan (CEMP), which would be updated to incorporate the proposed modification. • Concerns were raised in public submissions about increased dust pollution from the operation of the Ash Dam and the extension area, with several residents citing recent dust emission incidents from the site.

Issue	Findings
	• The proposed modification would increase the Ash Dam surface area potentially exposed during operation by between 4% and 7%, which represents approximately 10 ha. • A comprehensive *Dust Emission Dispersion Study* was undertaken by AECOM in 2016 to better understand the dispersion and impact of dust emissions from the Ash Dam. The study indicated that the influence of Ash Dam emissions on local receptors was well below the EPA criteria, with a maximum criterion contribution of 27% (24 hour PM_{10} concentration of 13.6 $\mu g/m^3$ compared to the EPA PM_{10} 24 hour contribution of 50 $\mu g/m^3$). The study also included a screening analysis for heavy metals using ash composition and dust modelling, which predicted that all heavy metals met relevant EPA criteria by a large margin. • The results and recommendations of the study were used to inform an *Ash Dam Management Strategy* which was prepared by Origin in 2017. The strategy details the dust management and monitoring that is currently implemented, including strategic placement of ash and water management practices during dry, high wind conditions. • Dust emissions from the Ash Dam are regulated under the existing EPL. In accordance with the EPL, Origin currently maintains real-time meteorological and dust monitoring around the Ash Dam and surrounding suburbs to proactively **monitor and respond to dust generation events. The existing system** includes dust deposit gauges, Total Suspended Particulate (TSP) and Particulate Matter (PM_{10} and $PM_{2.5}$) monitors, as well as a real-time meteorological station. • **Origin has committed to continue to implement the existing dust management and monitoring strategy for the modification, as well as to progressively cap and rehabilitate surface areas of the Ash Dam**, where appropriate, to further minimise dust emissions from the Ash Dam. • AECOM concludes that the existing monitoring and controls designed to mitigate dust generation would effectively manage the increase in exposed surface area and that potential impacts to air quality would remain substantially the same as existing operations. • The Department considers that the proposed modification would result in very minor increases in the surface area of the Ash Dam, and that any potential additional air quality impacts during operation of the dam would therefore be minimal. • The Department and the EPA also consider that the current EPL regulatory regime, as well as an updated *Ash Dam Management Strategy*, would continue to effectively manage any air quality impacts.
Health & Safety	• Concerns were raised in submissions regarding the potential for the Ash Dam to impact on human health and safety due to ash dust and water contaminants. • In its response, Origin noted that the proposed modification does not change the coal chemical composition or the existing practice of depositing ash as a dense phase slurry, and would result in a minor increase (10ha) in the current area of exposed ash material. As a result, it is concluded that the modification would not substantially change the risk profile for human health and safety. • In relation to air quality, the Department notes that the air dispersion modelling results contained in *Dust Emission Dispersion Study* (AECOM, 2016) indicate that the existing emissions from the Ash Dam at local receptors are well below the EPA's updated air emission criteria[6], which have been developed for the purposes of protecting human health and amenity. Potential impacts to air quality associated with the modification would remain substantially the same as existing operations.

[6] *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (EPA, 2016)

Issue	Findings
	• As discussed in Section 6.1 and 6.2 above, the implementation of mine void filling and/or other remedial techniques would minimise potential impacts to groundwater. The proposed stormwater system upgrades would provide an improvement to the existing surface water management and quality. • As discussed in Section 6.3, the design of the western saddle embankment is required to be undertaken in consultation with the DSC and in accordance with relevant DSC and ANCOLD guidelines and the requirements of the *Dams Safety Act 1978*. Ongoing use and operation of the entire Ash Dam, including dam surveillance and reporting, will continue to be implemented best practice measures and DSC requirements. • Overall, the Department considers that existing Ash Dam monitoring and management practices would continue and that the proposed modification would not adversely impact human health or safety.
Historic Heritage	• The EPS, including the Ash Dam, is listed as a heritage item under the *Lake Macquarie Local Environmental Plan* (LEP) 2014. The objective of the LEP is to conserve the heritage significance of listed heritage items. • AECOM considers that the heritage significance of the EPS is primarily related to electricity generation infrastructure and technology associated with the power station building. • The modification would primarily be located within the existing operational footprint of the Ash Dam and would not impact key electricity generation infrastructure at the EPS. AECOM therefore considers that impact to the heritage item would be negligible. • The Department accepts this conclusion.
Aboriginal Cultural Heritage	• An *Aboriginal Heritage Due Diligence Assessment* was undertaken by AECOM for the modification which included consideration of landscape context, database searches, review of previous Aboriginal archaeological investigations and a visual inspection of the modification area. • No existing Aboriginal archaeological sites were identified within the modification area on databases or during the visual inspection of the site. Given this, and based on previous investigations and the extent of historical disturbances and land use, the archaeological potential within the modification area was assessed as low. • OEH recommended that consultation be undertaken with relevant Aboriginal parties to determine if there are any Aboriginal cultural heritage items or cultural values present within the modification footprint. • In its response, Origin confirmed that consultation with the local Aboriginal community was undertaken in January 2006 and September 2007 as part of the previous Ash Dam expansion assessment and in response to a condition in the Concept Approval in relation to Native Title Claims. The Aboriginal community did not raise any concerns in relation to the previous expansion and no Native Title claims were made over the area. • Prior to the commencement of construction, Origin has committed to: - Consult in writing with the six Registered Aboriginal Parties (RAPs) informing them of the modification and inviting them to attend a one day site visit to confirm the existing disturbed landscape and provide the opportunity to identify extant sites or areas or archaeological sensitivity; and

Issue	Findings
	- Prepare an updated Aboriginal Heritage Management Plan documenting the outcomes and findings of the site visit and summarising any management requirements in relation to heritage items. • The Department considers this to be an acceptable outcome and has recommended a condition accordingly.
Noise	• Noise impacts associated with the proposed modification would primarily be associated with the operation of vehicles and plant involved in the construction of the western emplacement area. These works would be located on the north and western boundaries of the Ash Dam, away from the nearest sensitive receivers. • The existing noise environment between the proposed construction works and the sensitive receivers is dominated by road traffic noise from Wangi Road. • Construction noise impacts would be limited to day time hours already specified in the Project Approval (Condition 2.3), for a period of approximately 3 months. • The Department considers that construction noise levels associated with the modification would be minimal and adequately managed through implementation of the Construction Noise Management Plan, which would be updated to incorporate the proposed modification. • Operational noise levels associated with the Ash Dam would remain similar to those already approved.
Construction Traffic	• The modification would require the transport of fill material (40,000m^3) and cement (8,000m^3) to the site , which would require up to 600 truck movements over a construction period of approximately 3 months. This would equate to an additional 50 truck movements per week, or 10 truck movements per day on the existing road network. • A small number of additional light vehicle movements would also be required for construction workers. • Several submissions raised concerns about potential traffic impacts of the modification, and the OoS requested to be consulted if any changes in access arrangements to the Myuna Bay Sport and Recreation Centre (located along Wangi Road) are proposed. • Origin has confirmed that the modification would not impact existing access arrangements to the EPS site or internal access to the Ash Dam, and that all additional light and heavy vehicle parking would be accommodated within the EPS site. • Heavy vehicles would be required to travel to the site via Construction Road, Rocky Point Road, Wangi Road, Macquarie Street, Dora Street and then Mandalong Road to the Pacific Highway (M1). • Additional heavy vehicle movements as a result of the modification would represent a less than 5% increase on the existing overall vehicle movements at the Dora Street / Short Street and Rocky Point Road / Construction Road intersections during the morning and evening peak periods. • Council did not raise any concerns in relation to the traffic increases associated with the proposed modification. • The Department considers that the predicted increases in heavy vehicle movements during the short construction period would not significantly impact the capacity of the existing traffic network, and that construction traffic can be appropriately managed under the Traffic Management Plan (TMP), which would be updated to incorporate the proposed modification.

Issue	Findings
Climate Change	• As the proposed modification is linked with the operation of a power station, the impacts of climate change due to greenhouse gas emissions was an issue raised in several community and special interest group submissions. • The proposed Ash Dam modification would not involve any increase in the production of electricity at the EPS, or the generation of additional greenhouse gas emissions beyond those already approved. • The Department considers that the concerns over climate change impacts largely by association with the EPS are incidental and not directly relevant to the assessment of the proposed modification.
Remediation and Closure	• Concerns were raised in submissions that there is no long term remediation/rehabilitation strategy or closure plan for the Ash Dam. • In its response, Origin confirmed that an area covering 60 ha on the eastern side of the Ash Dam has progressively been rehabilitated and revegetated with native plant species. • Origin committed to further ongoing and progressive rehabilitation of the Ash Dam in accordance with the existing Biodiversity and Land Management Plan (AECOM, 2017). • Origin noted that long term rehabilitation of the Ash Dam is dependent on further engineering design, however the company committed to preparing a detailed rehabilitation and closure plan once the final landform for the Ash Dam has been developed. • The Department accepts this approach and notes that the existing conditions of approval require the preparation of a Rehabilitation Program, which will be updated to incorporate the proposed modification area.

7. Evaluation

The Department has assessed the modification application in accordance with the relevant provisions of the EP&A Act, including the principles of ecologically sustainable development.

The proposed modification would provide essential additional ash storage capacity for the EPS, therefore ensuring future power system security within the broader National Electricity Market. The proposal would also result in improvements to the existing stormwater system in the vicinity of the dam.

The Department considers its revised recommended conditions of approval provide a comprehensive, strict and precautionary approach to ensuring the Ash Dam operations would continue to comply with performance measures and standards, and that the predicted residual impacts would be effectively avoided, minimised, mitigated and/or compensated.

Based on its assessment, the Department of Planning, Industry and Environment considers that the proposed modification is in the public interest and is approvable, subject to the stringent conditions outlined in **Appendix I**.

This assessment report is hereby presented to the Independent Planning Commission to determine the application.

11/10/19

Paul Freeman

A/ Director

Resource Assessments

Michael

1/10/19.

Mike Young

A/ Executive Director

Energy and Resources

Appendices

Appendix A – List of Documents

- *Ash Dam Augmentation Project Environmental Assessment* dated 15 August 2018 (see **Appendix B**)
- *Origin Eraring Power Station – Ash Dam Expansion MOD1 – Response to Submissions* dated 3 December 2018 (see **Appendix D**)
- Concept Approval 05_0138 and Project Approval 07_0084

Appendix B – Environmental Assessment

Ash Dam Augmentation Project Environmental Assessment dated 15 August 2018 is available at the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix C – Government Agency and Community Submissions

C1 Government agency and community submissions are available at the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

C2 Centennial Coal late submission dated 7th February 2019 available at the Department's website at:

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix D – Response to Submissions

Origin Eraring Power Station – Ash Dam Expansion MOD1 – Response to Submissions by AECOM dated 3 December 2018

Response to Submissions available at the Department's major projects website at

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix E – Additional Information

E1 Origin responses to information requests from the Department dated 16 January 2019

E2 Origin responses to information requests from the Department dated 30 January 2019

E3 Origin responses to information requests from the Department dated 11 February 2019

E4 Origin responses to information requests from the Department dated 5 August 2019

E5 OEH Supplementary Response dated 21 February 2019

See the Department's major projects website at

http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix F – WSP Review Report

- *Geotechnical and Hydrogeological Review – Eraring Ash Dam*, dated 21 December 2018, and prepared by WSP Australia Pty Ltd

See the Department's major projects website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix G - Concept Approval Review

Concept Approval Condition	Recommendation
1. ADMINISTRATIVE CONDITIONS Terms of Concept Approval 1.1 The Proponent shall carry out the proposal generally in accordance with: a) Major Projects Application 05_0138; b) *Proposed Upgrade Eraring Power Station Environmental Assessment*, prepared by HLA-Envirosciences Pty Ltd and dated May 2006; c) the *Submissions Report* prepared by Eraring Energy and dated 8 August 2006; d) the supplement to the *Submissions Report* titled *Proposed Upgrade to Eraring Power Station – Response to Submissions* prepared by Eraring Energy and dated 30 August 2006; e) the conditions of this approval.	Redundant condition - delete
1.2 If there is any inconsistency between the above, the most recent document shall prevail to the extent of the inconsistency.	Redundant condition - delete
1.3 The Proponent shall comply with any reasonable requirement(s) of the Director-General arising from the Department's assessment of: a) any reports, plans or correspondence that are submitted in accordance with this approval; and b) the implementation of any actions or measures contained in these reports, plans or correspondence.	Redundant condition - delete
Limits of Approval	Redundant condition - delete
1.4 This concept approval shall operate from the date the approval is endorsed by the Minister.	
1.5 This concept approval shall lapse 10 years after the date the approval is endorsed by the Minister, unless works the subject of a related project approval are physically commenced on or before that date.	Redundant condition - delete
1.6 Nothing in this approval permits the commencement of works unless and until a project approval is obtained for those works.	Redundant condition - delete
2. STAGING AND SCOPING OF WORKS 2.1 The proposal is modified to limit the extent of vegetation clearing for ash disposal to the area generally delineated as "approximate extent of land clearance end of year 10" in the document referred to under condition 1.1d). This condition does not include areas required to be cleared for pipeline or roadway access, which shall be undertaken in a manner that minimises any additional vegetation clearing.	Redundant condition - delete
2.2 Notwithstanding condition 2.1 of this approval, vegetation clearing shall be staged such that: a) the proposal is undertaken in no fewer than three stages; and b) no more than seven hectares of vegetation is removed in any single stage of the proposal.	Redundant condition - delete
2.3 The Proponent shall provide no fewer than two hectares of compensatory habitat for each hectare of vegetation removed as part of the proposal. Specifications for the compensatory habitat, including location, composition and quality, shall be subject to the approval of the Director-General and may be the subject of further detailed conditions as part of a project approval. All compensatory habitat measures shall be developed in consultation with the DEC.	Fully addressed by condition 2.1 of Project Approval 07_0084
2.4 Commencement of each stage of the proposal shall be contingent on the implementation of the compensatory habitat works for the previous stage of the proposal to a level approved by the Director-General, or as otherwise specified as part of a project approval.	Fully addressed by condition 2.1 of Project Approval 07_0084

Concept Approval Condition	Recommendation
3. LONG-TERM ASH MANAGEMENT STRATEGY 3.1 Prior to 31 December 2011, or the lodgement of a project application, whichever is the sooner, the Proponent shall prepare and submit for the approval of the Director-General, a Long-Term Ash Management Strategy for the site. The Strategy shall be developed in consultation with the DEC and Council, and shall include, but not necessarily be limited to: a) a stipulated goal of 80% reuse or recycling of ash from the Eraring Power Station by 31 December 2015. This goal may only be altered with the prior written agreement of the Director-General, based on a demonstration by the Proponent that market conditions reasonably preclude this goal being achieved; b) a program for the investigation of alternative ash management measures over time, with a particular focus on the minimisation of ash disposal on site and beneficial reuse of ash; c) a framework for the identification and assessment of alternative ash management measures from time to time, having regard to the operational needs of the Eraring Power Station, and social, economic and environmental implications of those measures; d) a staging strategy for the implementation of works the subject of this approval, having regard to the status and outcomes of the investigations referred to under a) and the requirements of conditions 2.1 to 2.4; e) a staging strategy for the implementation of compensatory habitat areas required under this approval, having regard to the status and outcomes of the investigations referred to under a) and the requirements of conditions 2.1 to 2.4; f) a strategic management framework for the optimisation of ash disposal capacity on the site, and periodic review of ash management practices to achieve this outcome; g) an environmental management framework for the on-going management of ash disposal and ash management measures on site, consistent with contemporary best environmental practice; and h) a strategy for the reconciliation of the generating life of the Eraring Power Station and the availability and management of ash produced by the Power Station. In respect to a), if reuse options are slow to emerge, or they are not feasible on economic, environmental, or industrial reliability criteria, the timeframe goal be may extended with the agreement of the Director-General , in consultation with the DEC, and subject to the Proponent providing to the satisfaction of the Director-General information of available reuse options, justification of why these cannot be – or have not been - adopted, and a description of what measures will be implemented to facilitate the reuse of all ash generated on the premises for a beneficial purpose. After reviewing this information, the Director-General in consultation with the DEC, may approve a modified timeframe goal(s), and may require the Proponent to carry out further investigations or works into reuse of all ash generated on the premises for a beneficial purpose.	Majority of condition remains applicable. Parts d) and e) fully addressed by condition 2.1 of Project Approval 07_0084 – therefore delete. Remaining condition be reflected in Project Approval 07_0084 MOD1. Include an annual reporting requirement in accordance with the Department's letter to the Proponent dated 3 August 2016.
4. SPECIFIC REQUIREMENTS FOR PROJECT APPLICATION 4.1 The Proponent may lodge a project application(s) for one or more of the stages of the proposal (refer to condition 2.2) from time to time.	Redundant condition - delete
4.2 Pursuant to section 75P(1)(a) of the *Environmental Planning and Assessment Act 1979* the following environmental assessment requirements apply with respect to the project(s): a) full details of the project, including any staging consistent with the requirements of this approval, construction and operation methods, infrastructure and equipment requirements, duration of works for any stages and clear identification of the status of ash management and disposal needs of the Eraring Power Station; b) demonstration that the project is consistent with the aims, objectives and outcomes stipulated in an approved Long-Term Ash Management Strategy (refer to condition 3.1); c) a detailed project-specific Statement of Commitments, consistent with the Statement of Commitments included in the documents referred to under condition 1.1, with a clear indication of any new or amended commitments relating to the project; d) full details of the compensatory habitat package for the project (refer to condition 2.3), developed having regard to contemporaneous surveys of the area to be affected the project (if a project application is lodged later than one year after the date of this concept approval) and the 'Lake Macquarie *Tetratheca juncea* Management Plan' (as amended 2001); e) details of how construction, operation and maintenance of the project will be undertaken to minimise impacts on terrestrial and aquatic ecology;	Redundant condition - delete

Concept Approval Condition	Recommendation
f) an updated review of potential impacts on indigenous heritage, having regard to the status of any Native Title claims apply to the land to be affected by or surrounding the project, and consultation with relevant aboriginal groups, elders and broader aboriginal community; g) a risk analysis and geotechnical assessment for any ash dam extension, prepared in consultation with the Department of Primary Industries (Mineral Resources) and Mine Subsidence Board, having regard to the proximity of old mine workings (to verify that they are collapsed and there is no risk of future subsidence) and potential for impacts on the future extraction of coal reserves in the area; h) details of mitigation, monitoring and management measures to be applied to the project with respect to dust generation and impacts, consistent with best environmental practice; i) details of mitigation, monitoring and management measures to be applied to the project with respect to surface and groundwater impacts, consistent with best environmental practice. The assessment shall include consideration of potential impacts on water quality, a plan to manage any identified impacts on waters (including Lake Macquarie) and a monitoring program for surface and groundwater. The assessment shall consider all chemicals of potential concern including, but not limited to, trace metals such as selenium. The assessment shall be prepared in consultation with the DEC, the DNR and the Hunter-Central Rivers Catchment Management Authority; j) results of consultation with the local community, relevant state agencies and Council; and k) demonstration that the project is consistent with this concept approval.	
5. COMPLIANCE MONITORING AND TRACKING Compliance Tracking Program 5.1 The Proponent shall develop and implement a Compliance Tracking Program to track compliance with the requirements of this concept approval and all related project approvals. The Program shall include, but not necessarily limited to: a) provisions for periodic review of the compliance status of the proposal and each of its components; b) provisions for periodic reporting of compliance status to the relevant approval authority; c) a program for independent environmental auditing of the proposal, in accordance with *ISO 19011:2002 - Guidelines for Quality and/ or Environmental Management Systems Auditing*; and d) mechanisms for rectifying any non-compliance identified during environmental auditing or review of compliance.	Condition remains applicable. Include contemporary version of condition in modified Project Approval 07_0084 MOD1.
6. COMMUNITY INFORMATION, CONSULTATION AND INVOLVEMENT 6.1 Subject to confidentiality, the Proponent shall make all documents required under this concept approval and any relevant project approval available for public inspection on request.	Condition remains applicable. Include contemporary version of condition in modified Project Approval 07_0084 MOD1.
Provision of Electronic Information 6.2 Prior to the commence of the proposal, the Proponent shall establish and maintain a new website, or dedicated pages within its existing website for the provision of electronic information associated with the proposal. The Proponent shall publish and maintain up-to-date information on this website or dedicated pages including, but not necessarily limited to: a) information on the proposal, each of its components and the current implementation status of each component and stages; b) a copy of this concept approval and related project approval; c) a copy of each relevant environmental approval, licence or permit required and obtained in relation to the proposal; d) a copy of each monitoring program and each environmental management plan required under this concept approval or under the relevant project approval; e) details of the outcomes of reviews and audits of the proposal and each of its components undertaken in accordance with the Compliance Tracking Program referred to under condition 5.1; and f) details of a contact point(s) to which community complaints or inquiries may be directed, including a telephone number, a postal address and an email address.	Condition remains applicable. Include contemporary version of condition in modified Project Approval 07_0084 MOD1.

Appendix H – Consolidated Project Approval 07_0084

See the Department's major projects website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554

Appendix I – Notice of Modification

See the Department's major projects website at
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=9554