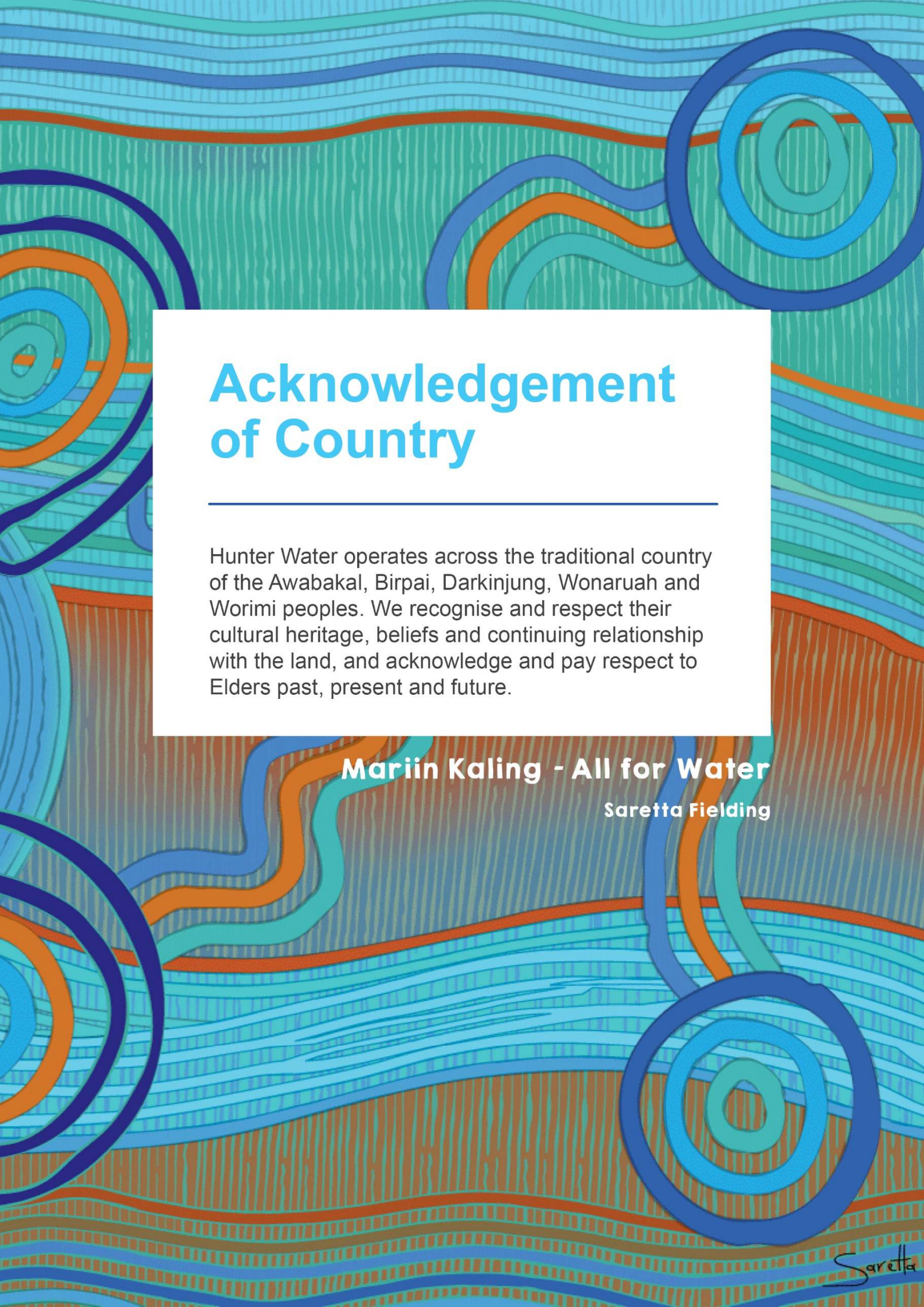
RESPONSE TO SUBMISSIONS

October 2021

Balickera Tunnel Remediation

Acknowledgement of Country

Hunter Water operates across the traditional country of the Awabakal, Birpai, Darkinjung, Wonaruah and Worimi peoples. We recognise and respect their cultural heritage, beliefs and continuing relationship with the land, and acknowledge and pay respect to Elders past, present and future.



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1. INTRODUCTION

1.1 The proposal

Hunter Water Corporation (Hunter Water) are proposing to carry out restoration works to remediate the structural condition of the Balickera Tunnel. The Balickera Canal was built in 1962 and requires structural improvements to ensure its long-term viability to transfer water from the Williams River to Grahamstown Dam.

The Balickera Tunnel (the tunnel) forms part of the Balickera Canal that transfers water from the Williams River to Grahamstown Dam which holds over 65% of the total water storage for the Lower Hunter region. The Balickera Canal provides approximately 50% of water yield for the Grahamstown Dam.

The Balickera Tunnel Remediation REF (Eco Logical Australia, 2021a) proposed the following works:

- Construction of a coffer dam at the downstream end of the tunnel to facilitate dewatering
- Internal remediation works - replacement of existing bolts, spot bolting as required with dental concrete at isolated locations, and the application of fibre-reinforced shotcrete extending from the roof to the base of the tunnel walls
- Establishment of equipment laydowns
- Upgrades to existing roads to provide access for construction and maintenance vehicles.

A Review of Environmental Factors (REF) (Eco Logical Australia, 2021a) and Species Impact Statement (SIS) (Eco Logical Australia, 2021b) has been prepared for the Balickera Tunnel Remediation project. The REF and SIS were publicly exhibited between 13 August 2021 and 10 September 2021. Initially the access tracks and ancillary facilities were assessed as part of the SIS and REF for the Balickera Tunnel Remediation project however due to the access tracks being required for Hunter Water operational uses to access the tunnel they have been assessed separately. A Minor Works REF (MWREF) has been prepared for the access track upgrade and ancillary facilities establishment and determined by Hunter Water.

1.2 Purpose of the report

This Submissions Report is related to the REF and SIS prepared for the Balickera Tunnel Remediation Project and should be read in conjunction with these documents.

The REF and SIS were placed on public display and submissions relating to the proposal were received by Hunter Water. This Submissions Report summarises the issues raised and provides responses to each issue (Chapter 3).

This Submissions Report details further environmental assessment, amendments and clarifications carried out since finalisation of the REF as a result of changes to the proposal (Chapter 4) and describes and assesses the environmental impact of changes of the proposal and identified new or revised environmental management measures (Chapter 5).

2. CONSULTATION

2.1. Review of Environmental Factors and Species Impact Statement display

A SIS was prepared as the proposal is likely to have a significant impact on three threatened microbat species within the tunnel. The REF and SIS were publicly displayed between 13 August

and 10 September 2021. The REF and SIS were made available for download and viewing at Balickera Tunnel Remediation - Hunter Water.

The website link was made available to the community via a community update, advertisements in the local newspaper and direct mail. An invitation to comment was sent directly to key government, utility and industry stakeholders.

The REF and SIS display website link was made available to the community via:

- Community update were sent to eight residents within Balickera that featured project background, key features, concept design and display details distributed to Balickera on 14 August 2021
- Advertisements in the Newcastle Herald on Saturday 14 August 2021 and the Hunter Water's e-news The Stream on Friday 3 September 2021.

In addition to the public display, an invitation to comment was sent directly to the following key stakeholders (refer to Appendix A):

- Port Stephens Council
- Forestry Corporation of NSW
- National Parks and Wildlife
- NSW The Department of Planning, Industry and Environment
- Natural Resources Access Regulator
- NSW The Department of Planning, Industry and Environment (Fisheries)
- NSW The Department of Planning, Industry and Environment (Water)
- Local Land Services
- Transport for NSW (Maritime)
- Boral Australia
- State Member for Port Stephens – Kate Washington
- Federal Member for Lyne – Hon Dr David Gillespie
- Australasian Bat Society
- Wildlife Health Australia
- Williams River Care Association
- William River Farms Protection Association Group.

2.2. Bat expert meeting outcomes and considerations

A meeting was held on 16 September 2021 facilitated by Hunter Water and Hunter Water's ecological consultants Eco Logical Australia to discuss potential offset requirements. Ten expert bat ecologists attended the discussion to inform microbat management for the proposed works. The purpose of the meeting was to agree on offset requirements and/or options for alternative habitat while bats were excluded from the tunnel during construction. The meeting minutes are provided in Appendix B and a summary is provided in this section.

During the meeting the following was agreed amongst the attendees:

- The most appropriate time for excluding the bats from the tunnel is December 2021 (after the first breeding cycle of the Southern Myotis)
- Consensus that one single exclusion event is preferred rather than multiple shorter exclusions over multiple years
- A staged progressive exclusion carried out over a few weeks will provide bats with the best opportunity to self-relocate

- Lighting should be added around the tunnel portals and shine directly into the tunnel to assist exclusion by making the site less inviting for the bats
- Bat boxes will be installed for alternate habitat for Southern Myotis during construction. The bat boxes were requested to be moved as close as possible to the Balickera Tunnel. It was recommended that some bat boxes are placed close to the tunnel as emergency roost habitats and it is best to spread boxes over several sites to increase opportunities for displaced Southern Myotis to locate and use the boxes
- It was recommended to introduce artificial structures as soon as possible rather than once trigger levels were detected. It was noted that there is a lack of suitable studies on artificial structures designed for or used by Little Bent-winged bats. Therefore the Balickera Tunnel characteristics should be replicated as closely as possible. There was some discussion of artificial tunnel recreated using recycled, repurposed culverts situated close to water and existing roost
- The need for alternative habitat (if bats do not return at trigger levels) was agreed and the trigger level of 75% or below was suitable
- Radio-tracking was discussed around uncertainty of results and short-term data. However radio-tracking is still proposed
- Offset/alternative options were discussed. It was agreed that where alternative bat habitat is considered necessary it would be installed as soon as possible or prior to the autumn return of large numbers of Little Bent-winged Bats. The alternative habitat structure should be placed as close to the tunnel as possible and should include two separate internal domed chambers with taller ceilings recommended and around natural water within structure. The alternative habitat structure's design will be agreed by the steering committee/working group. Potential locations and options to be considered where necessary are shown in Figure 2-1 and is being investigated further
- A steering committee / working group will be formed that includes the bat experts involved in the discussion. The steering committee / working group will be consulted with during the development of alternative habitat and alternative habitat designs and options where considered necessary.

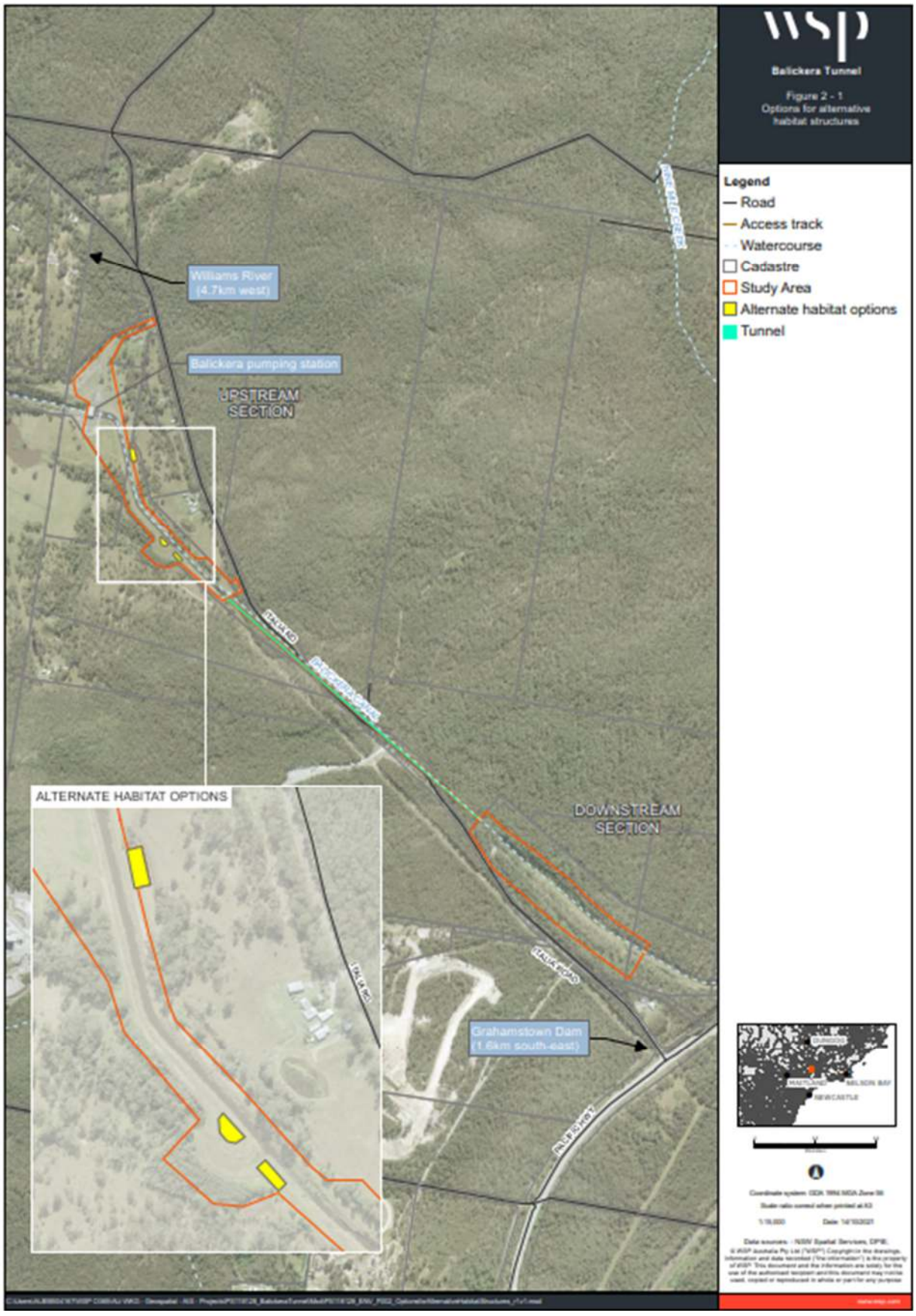


Figure 2-1 Options for alternative habitat structures

3. RESPONSE TO ISSUES

Hunter Water received two submissions during the display period. One submission was from the community and provided support for the proposal and did not provide any further comments. The second submission was from Port Stephens Council (PSC) and support the proposal. Table 3-1 summarises the issues raised in the submission and provides a response for each issue.

Table 3-1: Responses to Port Stephens Council submission

Issue	Response
PSC notes that the proposal will commence in November and the first Southern Myotis breeding event in late October is close. The Microbat Management Plan (MMP) identifies the requirement for pre-exclusion monitoring. PSC recommends that the pre-exclusion monitoring also include methodology and controls to monitor and confirm that Southern Myotis are not actively breeding immediately prior to exclusion.	Ten bat boxes were installed 24 September 2021 in the vicinity of the Balickera Tunnel that is within the Southern Myotis nightly flight range. Four were installed on Nine Mile Creek Bridge and six were installed within vegetation along the Balickera Canal. Three are located upstream of the Balickera Tunnel and three downstream. Pending approval from Transport for NSW (TfNSW) an additional 10 to 15 bat boxes will be installed on the Pacific Highway Bridge over the Balickera Canal. Bat boxes have been installed in spring to allow time for the boxes to be discovered prior to exclusion of the tunnel. Exclusion works are expected to commence in mid-December, allowing about two months for local populations of Southern Myotis to locate and become familiar with the bat boxes. Pre-exclusion monitoring for the status of Southern Myotis pups will be undertaken at two nearby maternity roosts (within 10km of the tunnel) during early December. This will be confirmed by conducting visual and thermal camera emergence surveys at the two maternity roosts and checking for pups left behind in the roost. Exclusion works will only commence once Southern Myotis pups at the two reference sites are capable of independent flight and not being left behind in the roost while mothers leave to forage at night.
PSC recommends that the REF references and commits to the potential offset negotiation required for offsetting artificial structures should post-construction bat-monitoring identify a significant	A meeting was held on 16 September 2021 facilitated by Hunter Water and Hunter Water's ecological consultants Eco Logical Australia to discuss offset requirements and bat management for the proposal. Ten expert bat ecologists attended the discussion to inform the microbat management in relation to the proposed works. A summary of the meeting is provided in Section 2.2 and the minutes are provided in Appendix A.

Issue	Response
microbat population reduction/recolonisation of Balickera Tunnel.	It was agreed that alternative habitat would be introduced as soon as possible rather than when trigger levels were detected or at least prior to the autumn return of large numbers of Little Bent-winged Bats. The three alternative habitat location options have been provided and assessed within this Submissions Report. The locations are illustrated on Figure 2-1 and assessed in Chapter 5.
Figure 7-1 of the SIS should be included in the REF to clearly identify the *Pterostylis chaetophora* locations and applicable exclusion zones, as detailed in Section 7 of the REF.	Figure 7-1 of the SIS has been included in this Submissions Report and in the MWREF prepared by Hunter Water for the access track upgrades (refer to Figure 2 of the MWREF and Figure 3-1 of this Submissions Report). The exclusion zone will be in place during the access track upgrades and the tunnel remediation works and will be incorporated into the construction contractors Construction Environmental Management Plan (CEMP).
PSC recommends the inclusion of the following detail for the cofferdam during construction: • Construction methods that will be used to ensure that sediment runoff into the downstream channel from the imported fill material is minimised e.g. progressive compaction, sediment booms etc. • Mitigation measures (erosion and sediment controls) for dewatering activities • Details for how the site will be managed during high rainfall or flood events.	• Construction will be carried out in accordance with the soil erosion and sedimentation environmental management measures included in Section 5.1 • As part of the CEMP an erosion sediment control plan (ESCP) will be prepared that outlines methods to manage erosion and sediment control. The Sediment and Erosion Control Plan is to be prepared in accordance with The Blue Book – Managing Urban Stormwater: Soils and Construction (Landcom 2004) and implemented prior to works • High rainfall and flood events will be managed in accordance with the ESCP and surveillance of the weather forecast. The access track upgrades result in the existing tracks being upgraded and minimising disturbed land next to the Balickera Canal. The water level in the canal is controlled and does not flood or overtop due to the control of water level from the Balickera Pumping Station.

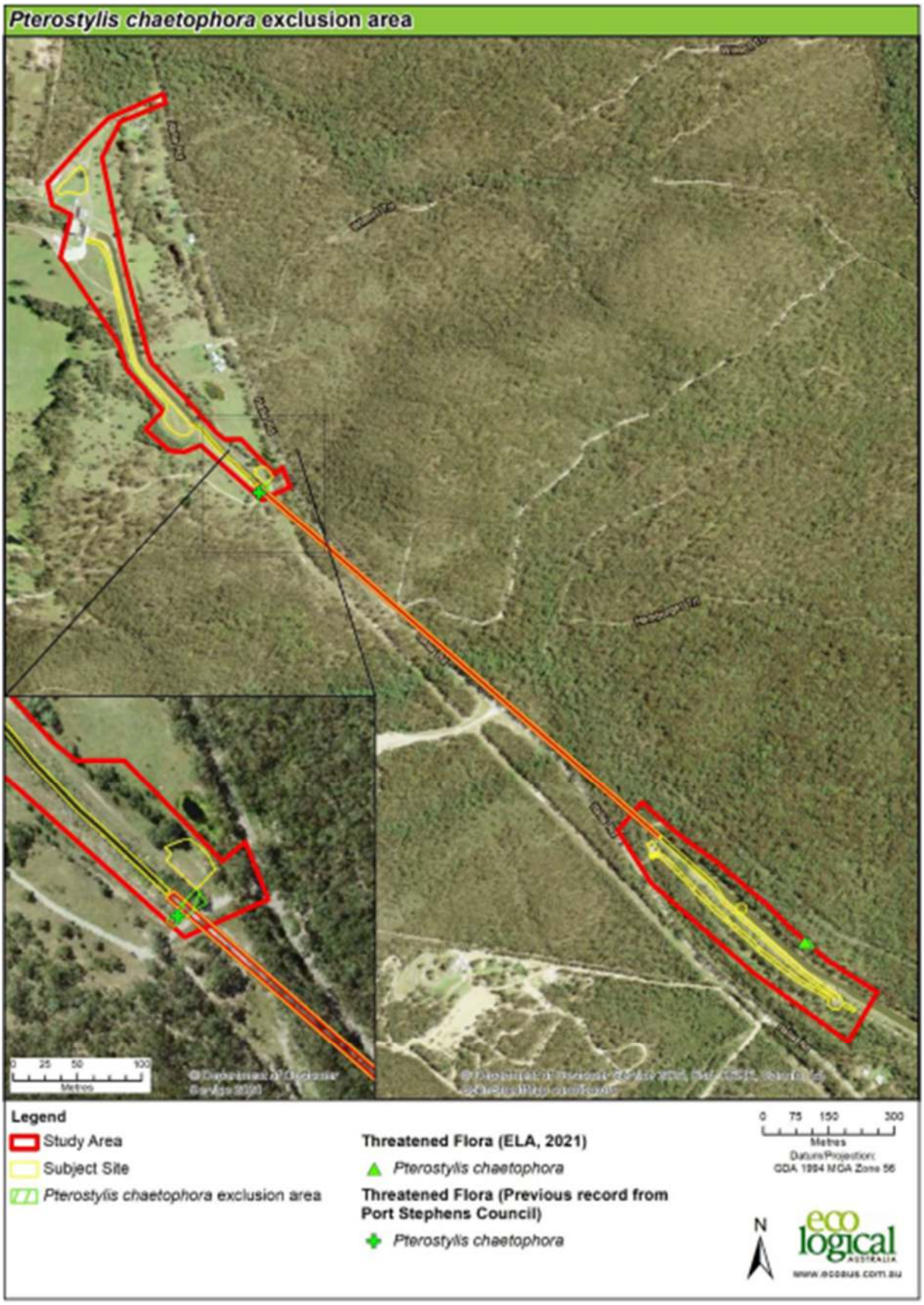


Figure 3-1 Threatened flora species recorded – *Pterostylis chaetophora* exclusion zone

4. CHANGES TO THE PROPOSAL

Since display of the REF and SIS, the access track upgrades and compound establishment components of the scope initially assessed in the Balickera Tunnel Remediation REF (Eco Logical Australia, 2021a) and SIS (Eco Logical Australia, 2021b) have been removed from the proposal description due to the access tracks being required for Hunter Water operational uses to access the tunnel and canal. This work has been assessed separately. The access track works are required to be carried out outside the timeframe of the tunnel remediation project.

The following has been assessed as part of a separate MWREF; Balickera Tunnel access track upgrades (Hunter Water, 2021). The MWREF has been informed by the Balickera Tunnel Remediation REF (Eco Logical Australia, 2021a) and SIS (Eco Logical Australia, 2021b) and includes the following features:

- Establishment of equipment laydowns
- Upgrades to existing roads to provide access for construction and maintenance vehicles.

Since display of the REF and SIS the proposal has been amended to include concrete core sampling of the tunnel to inform the detailed design for the tunnel remediation and to include alternative habitat options (illustrated in Figure 2-1) as an outcome of the bat expert meeting.

4.1 Amended proposal description

The amended scope for the Balickera Tunnel Remediation proposal includes:

- Construction of a coffer dam at the downstream end of the tunnel to facilitate dewatering
- Internal remediation works - replacement of existing bolts, spot bolting as required with dental concrete at isolated locations, and the application of fibre-reinforced shotcrete extending from the roof to the base of the tunnel walls
- Six concrete core samples
- Optional locations of alternative bat habitat.

4.1.1 Construction activities

Timing

Concrete coring works are proposed to commence in late November to early December and take about two days to complete. Each concrete core sample would take about one to two hours to complete. The works are proposed to be carried out during standard construction hours. However, if bats roosting within the tunnel are disturbed the Ecologist will cease work and coring will recommence at 10pm in accordance with the proposed environmental management measures in Section 6.1.

Where alternative bat habitat is considered necessary, it would be constructed within the study area and prior to autumn return of Little Bent-winged bats in March.

Plant and equipment

The plant and equipment is as per Section 3.2.4 of the REF for the tunnel remediation works. Additional plant and equipment required for the concrete coring would involve the use of the following plant and equipment:

- Core drill
- Wet dry vacuum
- Barge with a fuel operated motor

- Fuel operated generator.

Construction of the alternative bat habitat would require plant and equipment listed in Section 3.2.4 of the REF.

5. ENVIRONMENTAL ASSESSMENT

Hunter Water assessed the potential environmental impacts of the proposed refinements described in Section 4.1. Only additional impacts (either positive or negative) resulting from the proposal changes are discussed in the following sections. Impacts considered to be consistent with the REF or regarded as being unaltered have not been discussed. Table 5-1 summarises the environmental factors affected by the changes to the proposal.

Table 5-1 Environmental factors affected by the changes to the proposal

Environmental factor	Environmental impact	Need for further assessment	Where addressed
Biodiversity	Increase noise impacts to the bats in the tunnel.	Yes	Section 5.1 of this Submissions Report
Soils and geology	No additional impacts	No	Section 6.2 of the REF
Contaminated land and acid sulfate soils	No additional impacts	No	Section 6.3 of the REF
Waterways and Aquatic Habitat	Impacts associated with concrete core sampling debris and slurry	Yes	Section 5.2 of this Submissions Report
Aboriginal heritage	No additional impacts	No	Section 6.5 of the REF
Non-Aboriginal heritage	No additional impacts	No	Section 6.6 of the REF
Noise and vibration	Potential increase in noise during construction for the proposal	Yes	Section 5.3 of this Submissions Report
Air Quality	No additional impacts	No	Section 6.8 of the REF
Waste Management	No additional impacts	No	Section 6.9 of the REF
Traffic	No additional impacts	No	Section 6.10 of the REF
Visual amenity and landscape	Impacts associated with visual amenity for the alternative bat habitat structures.	Yes	Section 5.4 of this Submissions Report
Socio-economic	No additional impacts	No	Section 6.12 of the REF

5.1 Biodiversity

The proposed scope change discussed in Chapter 4 was assessed to identify any impact on biodiversity, additional to that already addressed in the REF and SIS. As part of the Submissions Report a memo was prepared by Eco Logical to assess the impacts to biodiversity and is included in Appendix A and a summary is provided below.

5.1.1 Description of existing environment

The existing environment is as per Section 6.1.1 of the REF.

The Balickera Tunnel provides roosting habitat for microbat species and is known to be utilised by three threatened microbat species listed as Vulnerable under the *Biodiversity Conservation Act 2016* (BC Act); Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Southern Myotis (*Myotis macropus*). Bats would only be roosting in areas where there is at least 50 cm of clearance from the obvert to water level, likely to be within the first 800 m of the tunnel as measured from the upstream portal.

5.1.2 Potential impacts

Direct impacts

Concrete coring

Concrete coring will not directly affect any roosting bats or bat roost sites within the tunnel that are located more than 10 m from the upstream portal where works will be undertaken. Concrete coring would not damage or destroy any existing bat roosting habitat within the tunnel because cores would not be drilled in areas used by bats as roosting habitat.

Installation of the alternative habitat within the study area would involve the placement of a precast structure and would not have additional negative biodiversity impacts to that already addressed in the REF. The installation of alternative habitat would have a positive impact on biodiversity due to providing alternative habitat for the three threatened bat species that are predicted to be significantly impacted by the exclusion event to remediate the tunnel.

Alternative habitat

The three options for alternative bat habitat locations shown in Figure 2-1 are located in areas mapped as cleared/exotic vegetation on Figure 5 of the REF.

The alternative habitat would have a positive impact on the environment by providing alternative habitat for the bats excluded from the tunnel.

Indirect impacts

Indirect impacts associated with concrete coring includes disturbance (noise, light and vibration) generated by the presence of people and coring equipment within the first 10 metres of the upstream portal. Indirect impacts are summarised in Table 5-2.

The proposed concrete coring would produce a much greater level of noise and vibration than any previous works or disturbance in the tunnel, even though coring activities are concentrated within 10 m of the upstream portal. The noise and vibration generated by the works would be heard and felt by roosting bats. Each core would take one to two hours to drill and work days of up to 8 hours does not allow roosting bats with much time to rest during the two consecutive days of disturbance.

It is likely that many bats would arouse and fly around inside the tunnel during works. There is a possibility that the disturbance may be enough to cause some bats to seek alternative roosting habitat at the end of the first or second day of works. There is also a possibility that the disturbance may cause some bats to exit the tunnel during daylight. Flying during the day presents significant

risks to bats due to the increased chances of being predated, disoriented and unable to find a safe roost location. There is also a risk of bat collisions with personnel and equipment if bats attempt to fly out of the tunnel during works. This poses a safety risk to contractors and a risk of harm, injury or death to bats.

Table 5-2 Indirect impacts during concrete coring activity

Indirect impact	Nature	Extent	Frequency	Duration	Timing
Disturbance to roosting bats from concrete coring equipment (noise and vibration)	Increased noise and vibrations throughout tunnel from coring equipment causing bats to remain alert and awake rather than resting during the day	Bats roosting in tunnel would be exposed to noise levels in the order of 100 dB, at least three times more than background noise levels commonly experienced in the tunnel. No data is available for vibration levels but it is estimated that vibration levels would be at least twice as much as those commonly experienced in the tunnel.	Coring would occur consistently for periods of between 1 and 2 hours, for up to 8 hours throughout each of the 2 days that works would be undertaken. There would be short periods when no drilling would occur as contractors move between coring locations.	Coring would occur for up to 8 hours over 2 consecutive days, during standard construction hours	Short to medium term impacts
Disturbance to roosting bats from presence of people and equipment in tunnel	Potential disturbance due to movement of people and materials / equipment, within first 10 m of the tunnel	Bats roosting in tunnel are generally not exposed to people and equipment moving inside the tunnel, or even at the portal entrances. In the past year bats have already been exposed to people and equipment (little or no noise / vibration)	Up to 8 hours over 2 consecutive days	Up to 8 hours over 2 consecutive days	Short-term impacts

Indirect impact	Nature	Extent	Frequency	Duration	Timing
		passing through the tunnel on two occasions, with no obvious lasting negative effects.			
Increased lighting in tunnel and reflectance off the water from torches used to illuminate work area	Light spill penetration into tunnel will be limited to about 30 m from the upstream portal	Bats roosting in tunnel are generally not exposed to light spill	Up to 8 hours over 2 consecutive days	Up to 8 hours over 2 consecutive days	Short-term impacts

If a species, population or ecological community listed in Schedules 1, 1A and 2 of the BC Act is impacted, a review of the factors set out to establish if there is likely to be a significant impact on that species, population, ecological community or habitat, must be undertaken. Section 7.3 of the BC Act sets out five factors that must be addressed as part of a Test of Significance (5-part test). This enables a decision to be made as to whether there is likely to be a significant effect on the species.

Tests of Significance were conducted for three threatened bat species listed as Vulnerable under the BC Act known to roost within the Balickera Tunnel (refer to Appendix A):

- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis Macropus*).

Based on these assessments the proposed concrete coring activity is considered unlikely to result in any significant impacts to threatened species listed under the BC Act (Appendix A).

5.1.3 Revised environmental management measures

The following mitigation measures are recommended to minimise the biodiversity impacts of the proposed concrete coring activity, and the assessments of significance are based on implementing that these measures will be implemented:

- Ecologist will be on site to supervise coring works and provide advice on bat behaviour
- Works in the tunnel must cease by 4pm to allow bats time to rest and settle before dusk
- Place generator outside and above tunnel portal to minimise noise disturbance in tunnel
- Use noise shielding around generator to minimise disturbance to surrounding forest habitat
- Ensure boat motor is turned off whilst in tunnel when not moving between locations
- Commence coring at < 5 m and move to 10 m once all cores at < 5 m have been obtained
- When re-starting motor on boat ensure prop faces tunnel portal rather than inwards along tunnel

- Minimise number of personnel on boat and in tunnel, only those necessary for carrying out works, operating the boat and for safety reasons to be present
- Keep chatter when in tunnel to absolute minimum
- When coring is not occurring aim to minimise noise, light spill and vibration as much as possible inside the tunnel and outside the tunnel along the canal as noise is channelled into the tunnel along the canal
- Minimise artificial lighting used during works. Do not shine light down the tunnel. Keep lighting focused on work areas. Use head torches /lights with red filter (red cellophane with rubber bands to affix it to the light is adequate), if this will not compromise ability of contractors to complete coring activities
- Do not patch core holes until after bats have been excluded from the tunnel. This will minimise the time that contractors are required to be in the tunnel and reduce the chance of bats interacting with potentially toxic substances used to patch cores whilst they set
- The supervising ecologist will direct works to stop works if disturbed bats are observed flying out of tunnel as this poses a serious risk of death or injury to bats
- If daytime works have been stopped as a result of significant disturbance to bats, the remaining works should be undertaken at night when bats are active but after bats have left to forage for the night. In this case, coring works inside the tunnel can be conducted between the hours of 10pm and 4am.

5.2 Waterways and aquatic habitat

The proposed scope change discussed in Chapter 4 was assessed to identify any impact on waterways and aquatic habitat, additional to that already addressed in the REF and SIS.

5.2.1 Description of existing environment

The existing environment is as per Section 6.4.1 of the REF.

5.2.2 Potential impacts

The proposed scope change includes concrete core sampling in the Balickera Tunnel prior to dewatering and has the potential for debris and drill slurry to be released into the canal during coring. Environmental management measures outlined in Section 5.2.3 will be implemented to minimise impacts to water quality and the aquatic environment. Potential impacts to water quality and the aquatic environment are considered to be negligible with the implementation of mitigation measures.

Installation of the alternative habitat within the study area would involve the placement of a precast structure and involve some earthworks, however would not have additional waterway or aquatic habitat impacts to that already addressed in the REF.

5.2.3 Revised environmental management measures

The following environmental management will be implemented to minimise the impacts to water quality and aquatic habitat:

- A core drill slurry ring with a vacuum to capture any slurry and debris during coring will be used
- Geofabric will also be installed on the scaffolding to capture any slurry and/or debris during coring and prevent slurry and/or debris that is not captured by the vacuum.

5.3 Noise and vibration

The proposed changes as discussed in Chapter 4 were assessed to have potential noise impacts during construction and is assessed as part of this Submissions Report. The proposed changes have been assessed to identify any impact on noise and vibration, additional to that already addressed in the REF and SIS. The Balickera Tunnel Restoration REF (Eco Logical Australia, 2021a) and Noise and Vibration Impact Assessment (EMM, 2021) was used to inform this section.

5.3.1 Description of existing environment

The existing environment is as per Section 6.7.1 and Appendix B of the REF.

Six sensitive receivers are located in the vicinity of the proposal that have potential to be impacted by the proposal. Table 5-3 lists the sensitive receivers assessed in the REF and Noise and Vibration Impact Assessment. Figure 32 of the REF illustrates the location of each sensitive receiver.

Table 5-3Sensitive receivers

ID	Address	Type/description	Easting	Northing
R1	16 Italia Road, Balickera NSW	Residential	388836	6383503
R2	209 Italia Road, Balickera NSW	Residential	386842	6384603
R3	241 Italia Road, Balickera NSW	Residential	387333	6385154
R4	267 Italia Road, Balickera NSW	Residential	387263	6385431
R5	299 Italia Road, Balickera NSW	Residential	387147	6385699
R6	303 Italia Road, Balickera NSW	Residential	386570	6385180

5.3.2 Potential impacts

Construction noise

Concrete coring

The potential noise impacts for the proposed concrete coring are comparable to the Tunnel restoration works assessed as part of the REF and Noise and Vibration Impact Assessment. The noise impacts associated with the tunnel remediation scenario include additional plant and equipment that would not be required for the concrete coring works. However due to the limited number of impacted sensitive receivers in the vicinity of the proposal, this scenario is considered suitable to inform the noise impacts of the proposal description changes.

The noise and vibration assessment identified that there would be an exceedance of up to 8 dBA to occur at the nearest residential receiver (R3) during standard construction hours. Construction noise emissions works are predicted to comply with the relevant NMLs for standard construction hours at all other sensitive receiver locations.

There is potential for the proposed concrete coring works to be carried out during out of hours due to potential displacement of bats during standard construction hours. Exceedances are predicted at five sensitive receiver locations of up to 18 dBA R1, R2, R3, R4 and R5. Given that the out of hours predictions assume all equipment operating simultaneously and includes more equipment than would be required for the proposed concrete coring works, the actual construction noise levels would be less than those predicted for the majority of the time, and as such these noise level predictions can be considered conservative.

Alternative bat habitat

Installation of the alternative habitat within the study area would involve the placement of a precast structure and would involve some earthworks to install the proposed structure.

The potential noise impacts for installing the alternative bat habitat is comparable to the north track maintenance works scenario assessed as part of the Noise and Vibration Impact Assessment report (EMM, 2021). The noise impacts associated with the north track maintenance works includes additional plant and equipment that would not be required for installing the alternative habitat. However due to the limited number of impacted sensitive receivers in the vicinity of the proposal, this scenario is considered suitable to inform the noise impacts of the proposal description changes.

The noise and vibration assessment identified that there would be an exceedance of up to 9 dBA to occur at the nearest residential receiver (R3) and 2 dBA at R4 during standard construction hours. Construction noise emissions works are predicted to comply with the relevant NMLs for standard construction hours at all other sensitive receiver locations. Given that the predictions assume all equipment operating simultaneously and includes more equipment than would be required for the alternative habitat installation, the actual construction noise levels would be less than those predicted for the majority of the time, and as such these noise level predictions can be considered conservative and would not have additional noise impacts to that already addressed in the REF.

Vibration

During concrete coring, vibration is expected to impact the roosting bats in the tunnel. Due to the height of the water in the canal and the known roost sites it is estimated that the bats would be roosting about 800 metres from the concrete coring locations. The impacts to roosting bats in regard to vibration during concrete coring have been considered in Section 5.1.

The proposed concrete coring works and installation of the alternative bat habitat would not have additional vibration impacts to that already addressed in the REF to human comfort and cosmetic damage.

5.3.3 Revised environmental management measures

No additional or revised environmental management measures are proposed for the revised scope change.

5.4 Visual amenity

The proposed scope change discussed in Chapter 4 was assessed to identify any impact on visual amenity, additional to that addressed in the REF.

5.4.1 Description of existing environment

The existing environment is as per Section 6.11.1 of the REF.

5.4.2 Potential impacts

During construction, there would be impact on visual amenity from construction activities such as earthworks associated with the installation of the alternative habitat structure where required. These impacts would occur throughout the construction period and would not have an additional visual amenity impact to that already addressed in the REF.

During operation, there would be potential visual amenity impacts due to the permanent alternative habitat structure. The permanent habitat structure would be located in one of the three location options illustrated in Figure 2-1. Due to the surrounding vegetation and limited visual receivers nearby the visual amenity of a potential permanent concrete structure at one of the three location

options is considered to be minor. The concrete structure may be partially visible for nearby receivers however it would be considered consistent with the scale and bulk of the existing water supply infrastructure associated with the Balickera Pumping Station.

6. ENVIRONMENTAL MANAGEMENT

A number of safeguards and management measures have been identified in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposal.

Should the proposal proceed, these management measures would be incorporated into the detailed design and applied during the construction and operation of the proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the proposal and must be reviewed and approved by environment staff prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

6.1 Summary of safeguards and management measures

The REF for the Balickera Tunnel identified a range of environmental outcomes and management measures that would be required to avoid or reduce the environmental impacts.

After consideration of the issues raised in the Port Stephens Council submission, the environmental management measures for the proposal (refer to Chapter 7 of the REF) have been updated. Updated or new safeguards have been **bolded** and deleted have been ~~struck out~~. Should the proposal proceed, the environmental management measures in Table 6-1 will guide the subsequent phases of the project.

Table 6-1 Summary of environmental management measures

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
General	• Prepare a Construction Environmental Management Plan (CEMP) prior to any construction works to address measures to be adopted to minimise impacts on the environment as a result of the proposal.	Prior to construction	Project Manager
Biodiversity	• Pre-works briefing ~~to~~ **will** be undertaken by Hunter Water environmental representative, advising of sensitive areas and relevant safeguards for these areas • Implement Microbat Management Plan (Appendix J of the SIS) • Install alternative microbat roosting habitat (bat boxes) prior to works, in accordance with the Microbat Management Plan • Extent of works for access track upgrades ~~to~~ **will** be clearly demarcated prior to works to avoid damage to vegetation not proposed for removal • No-go zone ~~to~~ **will** be fenced in potential *Pterostylis chaetophora* habitat near upstream portal **(refer to Figure 3-1 of this Submissions Report)** • The CEMP must include requirement for a qualified ecologist ~~to~~ **will** be present for preclearance surveys of native vegetation for access track upgrades • The CEMP must include instructions for dealing with orphaned or injured native animals and include the contact details for the NSW Wildlife Information, Rescue and Education Service Inc (WIRES) • ~~Wash down all equipment and vehicles prior to entry and before leaving site, to manage the introduction and spread of weed propagules~~ • Procedures to minimise impacts to microbats roosting in the tunnel during operational tunnel condition assessments ~~to~~ **will** be developed prior to any inspections • **Options for alternative bat habitat within the study area will be investigated to be installed where considered necessary. The alternative habitat structure will be placed as close to the tunnel as possible and should have two separate internal domed**	Prior to and during construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	chambers with taller ceilings recommended and around natural water within the structure. The alternative habitat structure's design will be agreed by the steering committee/working group.		
Biodiversity – Concrete coring	**The following will be implemented during concrete coring works:** • **Ecologist will be on site to supervise coring works and provide advice on bat behaviour** • **Works in the tunnel must cease by 4pm to allow bats time to rest and settle before dusk** • **Place generator outside and above tunnel portal to minimise noise disturbance in tunnel** • **Use noise shielding around generator to minimise disturbance to surrounding forest habitat** • **Ensure boat motor is turned off whilst in tunnel when not moving between locations** • **Commence coring at < 5 m and move to 10 m once all cores at < 5 m have been obtained** • **When re-starting motor on boat ensure prop faces tunnel portal rather than inwards along tunnel** • **Minimise number of personnel on boat and in tunnel, only those necessary for carrying out works, operating the boat and for safety reasons to be present** • **Keep chatter when in tunnel to absolute minimum** • **When coring is not occurring aim to minimise noise, light spill and vibration as much as possible inside the tunnel and outside the tunnel along the canal as noise is channelled into the tunnel along the canal** • **Minimise artificial lighting used during works. Do not shine light down the tunnel. Keep lighting focused on work areas. Use head torches /lights with red filter (red cellophane**	Construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	with rubber bands to affix it to the light is adequate), if this will not compromise ability of contractors to complete coring activities • **Do not patch core holes until after bats have been excluded from the tunnel. This will minimise the time that contractors are required to be in the tunnel and reduce the chance of bats interacting with potentially toxic substances used to patch cores whilst they set** • **Supervising ecologist will direct works to stop works if disturbed bats are observed flying out of tunnel as this poses a serious risk of death or injury to bats** • **If daytime works have been stopped as a result of significant disturbance to bats, the remaining works will be undertaken at night when bats are active but after bats have left to forage for the night. In this case, coring works inside the tunnel can be conducted between the hours of 10pm and 4am.**		

Soil Erosion and Sedimentation	• The **Erosion and Sediment** ~~Sediment and Erosion~~ Control Plan **will**~~s to~~ be prepared in accordance with *The Blue Book – Managing Urban Stormwater: Soils and Construction* (Landcom 2004) and implemented prior to works, with the aim of achieving an outcome of 'no visible turbid plumes migrating through the waterway'. The Plan ~~must~~**will** include, but not be limited to:
	  ○ Locations and type of instream sediment controls to be erected downstream of the tunnel. These can be constructed from hay bales or sandbags and lined with geofabric; however, they must be secured in the channel to ensure they do not mobilise
	  ○ Prior to forecast heavy rain, work ~~is to~~ **will** cease, accumulated material ~~is to~~ **will** be removed from within the instream sediment controls and then these are to be removed from the waterway to prevent them from being mobilised and causing a flood hazard or other environmental damage downstream
		Prior to and during construction	Project Manager
			All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	○ Works area within the tunnel and canal ~~should~~**will** be dewatered prior to works commencing to reduce likelihood of sediment entering the waterway. ~~As part of dewatering the works area, any fish caught in the dewatering process must be immediately released downstream of the site by an experienced aquatic ecologist.~~ **A dewatering management plan will be developed by an experienced aquatic ecologist to outline procedures for fish capture and release** • Inspect erosion controls regularly (daily during workdays) and after rainfall. Fix damaged controls immediately. Remove accumulated sediment or waste material from within the sediment controls regularly and dispose of at a licensed waste facility • Leave erosion and sediment controls in place until after the works are completed • Where works are required outside of the tunnel, schedule the works outside of predicted heavy rain periods • Minimise work outside of the tunnel during heavy rainfall to reduce risk of mobilising sediment • Where vegetation on the banks of the Canal is removed, the area should be stabilised with jute matting and revegetated as soon as possible, with ongoing maintenance of the areas to ensure survival of planted vegetation.		
Soil Contamination	• If contaminated soils are uncovered during the works, all works within the vicinity of the find must cease immediately and the Hunter Water Project Manager and must be notified immediately • For any excess spoil material which requires offsite disposal, formal waste classification will be required before being taken to an appropriately licensed landfill in accordance with the EPA (2014) Waste Classification Guidelines • Store all chemicals (e.g. fuel, oil) in appropriate bunding/storage systems within the approved storage facility • Ensure appropriate spill kits are carried with the equipment	During construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	• Dedicated refuelling areas are to be established outside of the canal and riparian zones. These areas are to bunded to ensure any spills do not enter the canal.		
Water Quality and Hydrology	• Weather forecasts will be checked daily to ensure that work is not carried out before or during high rainfall • Prior to use at the site and/or entry into the waterway, machinery is to be appropriately cleaned, degreased and serviced • Store all chemicals (e.g. fuel, oil) offsite and if required to be stored onsite, chemicals ~~should~~**will** be stored in appropriate bunding/storage systems and only for short periods • Ensure appropriate spill kits, are present onsite • Ensure all equipment is in good working order • Carry associated Safety Data Sheets (SDS) for all chemicals • Do not use any chemicals that are labelled as 'harmful to marine life' or 'Class 9 Environmentally hazardous' as part of the proposed activities • Any collected surface water ~~should~~**will** be discharged into a suitable Council approved drainage system and not adversely impact downslope surface and subsurface conditions (Martens 2019) • Wash all equipment, including, erosion and sediment control measures and trailers to prevent spread of exotic species. A visual check for vegetation and seeds on all equipment machinery to be used in the activities must be carried out before work commences • **A core drill slurry ring will be used with the vacuum to capture any slurry and debris generated during coring** • **Geofabric will also be installed on the scaffolding to capture any slurry and/or debris during coring and prevent slurry and/or debris that is not captured by the vacuum.**	During construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
Aboriginal Heritage	• All contractors undertaking works on site ~~should~~**will** be briefed on the protection of Aboriginal heritage objects under the NPW Act, and the penalties for damage to these items • Contractors will be made aware through toolbox talks, inductions and training that it is an offence under Section 86 of the NPW Act to harm or desecrate an Aboriginal object unless that harm or desecration is the subject of an AHIP (which is not applicable to this site) • Should an unexpected Aboriginal object be identified during construction, work in the immediate vicinity of the find ~~is to~~ **will** stop and the area must be fenced off with suitable markers (star pickets, flagging or barrier mesh). The Hunter Water Project Manager ~~is to~~ **will** be notified. Engage an archaeologist to determine the significance of the find, and if required, determine the notification, consultation, and approval requirements. Works must not recommence until Hunter Water has provided written approval to do so • If human remains are discovered, works should immediately cease, and the NSW Police should be contacted. ~~If the remains are suspected to be Aboriginal, the DPIE may also be contacted at this time to assist in determining appropriate management.~~	Prior to and during construction	Project Manager All Staff/Contractors
Historic Heritage	• The vibrating roller ~~must~~**will** not be operated within 25m of the heritage item known as 'Grahamstown - Balickera Pumping Station' • In accordance with Section 146 of the *Heritage Act 1977*, if an archaeological relic (such as a deposit or artefact) is uncovered during works, work must cease in the affected area and a qualified archaeologist contacted to assess the find. Further advice and clarification may be sought from the Heritage Council of NSW, or the Heritage Division under delegation regarding assessment and approvals.	During construction	Project Manager All Staff/Contractors
Noise and Vibration	Implement the following work practices: • Regular reinforcement (such as at toolbox talks) of the need to minimise noise and vibration • Regular identification of noisy activities and adoption of improvement techniques	During construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	• Avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents • Developing routes for the delivery of materials and parking of vehicles to minimise noise • Minimising the movement of materials and plant and unnecessary maximum noise events • Minimising vehicle movements • Choosing quieter plant and equipment based on the optimal power and size to most efficiently perform the required tasks • Using temporary noise barriers to shield intensive construction noise activities from residences • Operating plant and equipment in the quietest and most efficient manner • Regularly inspecting and maintaining plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively • Scheduling activities to minimise impacts by undertaking all possible work during hours that will least adversely affect sensitive receivers and by avoiding conflicts with other scheduled events • Optimising the number of deliveries to the site by amalgamating loads where possible and scheduling arrivals within designated hours • Include contract conditions that include penalties for non-compliance with reasonable instructions by the principal to minimise noise or arrange suitable scheduling. Hunter Water can use the following method to mitigate impacts to noise sensitive receivers during work outside of standard hours. Hunter Water and **the** construction contractor ~~can~~ **will** determine **the** most appropriate course of action **of the following:** • Respite periods: Construction works during evening and night-time periods would be restricted so that assessment locations R1 – R5 are impacted for no more than three		

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	consecutive evenings and no more than two consecutive nights in any one week. A minimum respite period of four evenings/five nights would be implemented between periods of consecutive evening and/or night works • Duration reduction: Where respite periods are not reasonable or feasible, the number of consecutive evenings and/or nights would be increased and the duration of the activity each night reduced. Impacted receivers would be consulted and evidence of support for the duration reduction provided as justification • Alternative accommodation: Where respite periods and reductions in duration are not agreed to, alternative accommodation options would be considered for evening and night-time periods where construction works are likely to incur highly intrusive impacts. Alternative accommodation would provide a replacement for permanent residents, including provisions for pets, where reasonable and feasible • Resident agreement: Where respite periods and reductions in duration are not agreed to, Hunter Water may develop an agreement with residents where noise could not be mitigated to meet the night-time noise level. The form and content of such an agreement would be determined through consultation between the parties.		
Air Quality	• Works ~~must~~**will** be minimised during high wind periods • Dust suppression ~~should~~**will** be applied as required to limit excessive dust generation • Plant and equipment ~~must~~**will** be regularly inspected to ascertain that fitted emission controls are operating efficiently • Plant and equipment ~~must~~**will** be maintained in accordance with manufacturer's specifications to ensure that it is in a proper and efficient condition • Do not have machinery running while not in use • Minimise use of machinery for required activity only • Vehicles to maintain recommended speed	During construction	Project Manager All Staff/Contractors

Impact	Safeguards/Mitigation Measures	Timing	Responsibility
	• Look for excessive dust generation and slow down if needed.		

Waste Management	• Resource management options for the project must be considered against a hierarchy of the following order embodied in the *Waste Avoidance and Resource Recovery Act 2001*:
	  ○ Avoid unnecessary resource consumption
	  ○ Recover resources (including reuse, reprocessing, recycling and energy recovery)
	  ○ Dispose (as a last resort).
	• All wastes and excess spoil must be classified in accordance to the Waste Classification Guidelines (EPA, 2014) prior to disposal and transported to a licensed waste disposal facility
	• All waste ~~must~~**will** be removed from the site on completion of the works
	• Upon completion of waste disposal, all original weighbridge / disposal receipts issued by the receiving waste facility ~~must~~**will** be retained in a waste register as evidence of proper disposal
	• An adequate number of bins must be placed at the site for workers and all litter will be placed in these bins. Work areas ~~must~~**will** be kept clean and free of litter, including cigarette butts, at all times.
		During construction	All Staff/Contractors

Traffic	• Vehicles, materials and equipment ~~must~~**will** be positioned to minimise impacts to public access and parking • Heavy vehicles, if required, will be restricted to specified routes.	During construction	Project Manager All Staff/Contractors
Visual Amenity and Landscape	• Ensure vegetation clearance is undertaken within delineated footprint only • Works areas are to be cleared of plant and construction equipment and rehabilitated to pre-works condition following completion of the project.	During and post construction	Project Manager All Staff/Contractors

7. REFERENCES

Eco Logical Australia, 2021a. Balickera Tunnel Remediation Review of Environmental Factors

Eco Logical Australia, 2021b. Species Impact Statement

EMM, 2021. Balickera Tunnel Remediation Noise and Vibration Impact Assessment

Hunter Water, 2021. Balickera Tunnel access track upgrade, Minor Works Review of Environmental Factors

APPENDIX A CONSULTATION MATERIAL

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
enquiries@hunterwater.com.au
hunterwater.com.au

13 August 2021

Our Ref: HW2014-392/17/7.002

NAME
Hunter Water projects in Balickera
ADDRESS
ADDRESS

Dear Resident

Hunter Water projects in Balickera – Have your say

Hunter Water is inviting your feedback on two projects we're planning to deliver in your area.

Balickera Tunnel rehabilitation

Hunter Water is proposing to carry out rehabilitation of the Balickera Tunnel to ensure the ongoing reliable transfer of water from the Williams River to Grahamstown Dam via the Balickera Pump Station.

The 1.2km tunnel was constructed in 1962 and is a key piece of the region's water supply infrastructure.

The work will involve removing loose rocks and reinforcing the tunnel walls to provide long term structural stability.

The tunnel is a known roost site for a number of threatened micro bat species and the proposal is likely to have a biodiversity impact on these colonies through temporary exclusion from the tunnel during work.

A Review of Environmental Factors and a Species Impact Statement have been prepared which details the research and investigations undertaken on the bats. The impacts of the works and proposed mitigation measures are also outlined.

Public exhibition details

We are seeking community feedback on the Review of Environmental Factors and Species Impact Statement between **Friday 13 August 2021** and **Friday 10 September 2021** (28 days).

You are invited to:

- Read the Review of Environmental Factors and Species Impact Statement available at **hunterwater.com.au/balickeratunnel**
- Make a submission via:
  - **Email:** balickeratunnel@hunterwater.com.au
  - **Post:** PO Box 5171 HRMC NSW 2310

The feedback received during this exhibition period will be considered in a “Response to Submissions” report, which will form part of our submission to the NSW DPIE for their concurrence.

Balickera solar project

We’re investigating the installation of a large solar photovoltaic (PV) system at the Balickera Pumping Station site. The system will generate electricity to power our facilities, reduce electricity costs and lower our carbon footprint. The project involves the installation of between 4,500-5,000 ground mounted solar panels on Hunter Water owned land adjacent to the pumping station on Italia Road. The facility will be capable of generating 2 and 2.5MW of renewable energy.

To enable this work, we’re proposing to permanently close Balickera Park and remove a number of mature trees from the park where the solar panels would be installed. Our intention is to retain as many trees as possible and revegetate where required to provide screening for neighbouring properties.

We’re keen to hear from you to gain a better understanding of how the park is used by the local community and identify any concerns. If you would like to provide feedback, please email **yourvoice@hunterwater.com.au** or call **1300 657 657** (Monday – Friday, 9am – 5pm).

We’re also preparing a Review of Environmental Factors for this project to assess the impacts of the work and expect to make a final decision on the project later this year. If proceeding, construction would likely start in early to mid-2022 and we’ll keep you updated as planning progresses.

This work is part of our onsite renewable energy program, which aims to reduce our impact on the environment and bring us closer to achieving our aspirational goal of becoming carbon neutral by 2030. Program information can be found on our website at **hunterwater.com.au/renewables.**

Kind Regards

Justin Watts
Group Manager Asset Solutions

Hunter Water Corporation
ABN 46 228 513 446

PO Box 5171
HRMC NSW 2310
36 Honeysuckle Drive
NEWCASTLE NSW 2300
1300 657 657
enquiries@hunterwater.com.au
hunterwater.com.au

14 August 2021

Our Ref: HW2014-392/17/7.001

<Addressee>

To whom it may concern

RE: BALICKERA TUNNEL REHABILITATION PROJECT

Hunter Water is proposing to carry out rehabilitation of the Balickera Tunnel in the Hunter Region to ensure the ongoing reliable transfer of water from the Williams River to Grahamstown Dam via the Balickera Pump Station.

The 1.2km tunnel was constructed in 1962 and is a key piece of the region's water supply infrastructure.

The work will involve removing loose rocks and reinforcing the tunnel walls to provide long term structural stability.

The tunnel is a known roost site for a number of threatened micro bat species and the proposal is likely to have a biodiversity impact on these colonies through temporary exclusion from the tunnel during work. The affected species are listed as 'Vulnerable' under the *NSW Biodiversity Conservation Act 2016* (BC Act) and include:

- Little Bent-winged Bat (*Miniopterus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

A Review of Environmental Factors (REF) and a Species Impact Statement (SIS) have been prepared which detail the research and investigations undertaken on the bats. The impacts of the works and proposed mitigation measures are also outlined. Feedback is sought from the community and stakeholders prior to a submission to the NSW Department of Planning, Industry and Environment (DPIE) for their concurrence.

Public exhibition details

We are seeking feedback on the REF and SIS between **Friday 13 August 2021** and **Friday 10 September 2021** (28 days).

You are invited to read the REF and SIS available at hunterwater.com.au/balickeratunnel and make a submission via:

- **Email:** balickeratunnel@hunterwater.com.au
- **Post:** Balickera Tunnel Rehabilitation, PO Box 5171 HRMC NSW 2310

The feedback received during this exhibition period will be considered in a “Response to Submissions” report, which will form part of our submission to the NSW DPIE for their concurrence.

Hunter Water strives to continually improve water and waste water-related infrastructure across the Region to deliver quality outcomes for both the community and the environment in which we live.

Kind Regards

Justin Watts
Group Manager, Asset Solutions

REVIEW OF ENVIRONMENTAL FACTORS AND SPECIES IMPACT ASSESSMENT PUBLIC EXHIBITION BALICKERA TUNNEL NSW

Hunter Water is proposing to carry out essential structural rehabilitation work of the Balickera tunnel to ensure the ongoing reliable transfer of water from the Williams River to Grahamstown Dam. The tunnel is a known roost site for three threatened microbat species and the proposal is likely to have a biodiversity impact on these species.

A Review of Environmental Factors and Species Impact Statement have been prepared which outline the research, analysis and mitigation measures for the proposed project and its impacts, ahead of submission to the NSW Department of Planning, Industry and Environment (DPIE) for review and concurrence. These are available for review at **hunterwater.com.au**

Exhibition: Feedback on the Review of Environmental Factors and Species Impact Assessment should be provided between **Friday 13 August** and **Friday 10 September 2021**, to: Balickera Tunnel project team, Hunter Water.
Phone: 1300 657 657
Email: balickeratunnel@hunterwater.com.au
Mail: PO Box 5171 HRMC NSW 2310

hunterwater.com.au

[redacted]

From: Hunter Water <communications@hunterwater.com.au>
Sent: Thursday, 16 September 2021 12:52 PM
To: [redacted]
Subject: (TEST) The Stream (Your Voice edition)
Attachments: ATT00001.txt; ATT00002.htm

Welcome to The Stream!

Dear Jane

As a subscriber to our community engagement newsletter *Your Voice*, we are pleased to let you know that we have merged that publication with our monthly community newsletter, *The Stream*.
The Stream, will provide you with the same project updates as before as well as some exciting insights into other areas of our organisation. We hope you will continue to enjoy our content, however if you wish to unsubscribe you may do so below.

Thanks and happy reading!
Hunter Water

As the weather warms up, let's all keep lovin' water

Figures show residential water use has crept up in the recent, cooler months. Usage has increased by up to 13 litres per person per day in comparison to our region's impressive efforts during the drought where average consumption fell to among the leading community in the nation. With spring just around the corner, let's continue to Love Water by making smart

water choices to help achieve a sustainable water future.
Some of the ways each of us can save water include:

- Take 4 minute showers
- Only use washing machines and dishwashers for full loads
- Wash vehicles on the lawn, preferably with a bucket and trigger nozzle
- Water gardens before 10am and after 4pm
- Use mulch to retain soil moisture.

Learn more

Our Lower Hunter Water Security Plan is now on public exhibition

This draft plan is a whole-of-government approach to ensuring the region has a resilient and sustainable water future that contributes to regional health and prosperity and is supported by the community. It aims to ensure water security for the Lower Hunter for the next 40 years. For the last three years we have talked to our community and customers about their values and preferences for our water future. These conversations have helped to shape our plan and now we invite you to read it and tell us what you think.

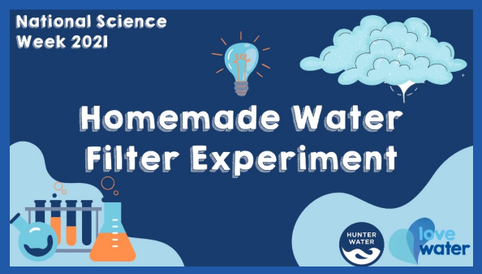
Share your thoughts

Support for our community

We recognise that this is a very challenging time for households and businesses. For those experiencing financial difficulty, we can extend your account to give you more time to pay, there's interest free payment relief available, and flexible payment options. We're here to support you Please click below for more information.

Learn more

Try out one of our National Science Week experiments



We recently celebrated National Science Week by sharing six water themed experiments conducted by our staff. The experiments covered a broad range of topics; from a replica of our water filtration process, an example of what pollutants can do to our waterways and a miniature weather cycle. Each video comes with an experiment card so you can try them out with the kids at home.

Learn more

Why I work in water: Kate Olrich

Providing sustainable services to the community: it's a goal environmental planner Kate Olrich and her colleagues are always striving to achieve. Kate works in our environment team, which covers a diverse range of activities such as carrying out audits, inspections and training, reviewing assessments, heritage issues, land contamination and rehabilitation management. She is currently helping to rehabilitate Crawchie Creek, located at the back of the Shortland Wastewater Treatment Works. The project is removing invasive species and replanting with natives to improve water quality at the creek, which flows into Ironbark Creek and the Hunter Wetlands National Park.

Read more

Catchment management in our backyard

Grahamstown Dam is our largest drinking water source, so it's important we maintain the land in the dam's catchment to help protect our drinking water. We've embarked on a range of projects to the south-west of the dam to promote high quality land management and improve bushfire preparedness. We've already removed a number of invasive pine trees and will be increasing the frequency of vegetation control behind private properties to reduce bushfire hazards. We'll also be fencing our boundary with neighbours to minimise unauthorised access and prevent land deterioration.

"It's our job to protect and improve our land so we can ensure great quality water in our storages. Better maintenance will improve bushfire management and will hopefully encourage a return of native flora and fauna to the area." Hunter Water Ranger, Greg Mason

To infinity and beyond!

Satellite data is now providing valuable insights at both Grahamstown Dam and Chichester Dam in a state-of-the-art safety upgrade. We are excited to be working with Australian company Detection Services in partnership with United Kingdom-based analytics experts Rezatec to deploy cutting edge technology to monitor our two biggest assets.The satellites will enable us to receive high-quality data showing any changes on a very fine scale, which gives us increased confidence in our dams' integrity and allows us to proactively manage and plan for the future.

Read more

Help us give wastewater a makeover

Did you know that some of the Hunter's wastewater is processed into recycled water, and biosolids, which is used in farming and mine site rehabilitation? We even use wastewater to generate renewable energy. Yes it's mostly water, and it's now too valuable to waste. A new name will give wastewater the kudos it deserves. But what should we call it? Used Water? Resource Water? Recyclable Water? Perhaps just good old-fashioned Sewage? Do you have another suggestion?

Let us know your thoughts! (Just one quick question)

Take our survey!

Take a look at one of our latest improvements for the Dungog community

We've finished work on a new $28 million wastewater treatment plant, which is part of our commitment to deliver improved services to support the town's growing population.
We've also kicked off construction on a new wastewater pump station and rising main pipeline. The new treatment plant is part of a region-wide focus on our wastewater facilities, with Dungog the first of several major upgrades.

Read more

Share your thoughts on Balickera Tunnel's rehabilitation

We're proposing to carry out rehabilitation of the Balickera Tunnel to ensure ongoing reliable transfer of water from the Williams River to Grahamstown Dam via the Balickera Pump Station. The 1.2km tunnel was constructed in 1962 and is a key piece of the region's water supply infrastructure. The work will involve removing loose rocks and reinforcing the tunnel walls to provide long term structural stability. The tunnel is a known roost site for a number of threatened microbat species and the proposal is likely to have a biodiversity impact on these colonies due to temporary exclusion from the tunnel. We are seeking feedback on the Review of Environmental Factors and Species Impact Statement between Friday 13 August and Friday 10 September 2021. Click below for details on how to make a submission.

Learn more

The latest from our socials

Issue 8

1300 657 657
enquiries@hunterwater.com.au

Smart Water Choices
Water before 10am or after 4pm | Use a trigger nozzle | Sweep hard surfaces

Please consider the environment before printing this email.
Hunter Water acknowledges the Traditional Owners and Custodians of the land and we pay our respects to their Elders, past, present and future. We are an inclusive workplace that embraces diversity in all its forms.

APPENDIX B BAT EXPERT MEETING NOTES

MEMORANDUM			
TO	Hunter Water		
FROM	Alicia Scanlon – Microbat Ecologist (Eco Logical Australia)		
DATE	28 September 2021	PURPOSE	Meeting Minutes/Summary
SUBJECT	Bat Expert Round Table Meeting Summary Balickera Tunnel Remediation Works SIS and REF Meeting held: 16 September 2021; 14:00-17:00pm (via MS Teams)		

SUMMARY

A total of 10 expert bat ecologists met with Hunter Water and the Balickera Tunnel Remediation Project Team on 16th September 2021 for round table discussions to inform microbat management in relation to proposed works. There was strong participation from the bat experts in a wide ranging discussion.

There was broad consensus of:

- Most appropriate time for Tunnel exclusion – majority of group members agreed December 2021 (after 1st breeding cycle of Myotis)
- Alternate habitat proposed for Myotis (during construction) – all accepted need, group requested bat boxes be moved as close as possible to existing structure
- Compensatory habitat (if bats do not return at trigger levels) – All agreed need and agreed trigger level of 75% or below was suitable. Group recommended introducing artificial structures as soon as possible rather than once trigger levels detected. Group noted the lack of suitable studies on artificial structures designed for or used by Little Bent Wing bats, therefore Balickera Tunnel itself are the characteristics to be replicated as closely as possible. There was some discussion of artificial tunnel form recreated using recycled, repurposed culverts situated close to water and existing roost.

There were divergent views on the methods for monitoring microbat population movements. The need for monitoring pre, during and post construction was agreed.

ATTENDANCE RECORD

Name	Role	Organisation
Alicia Scanlon	Project Microbat Expert	ELA
Dr Frank Lemckert	Principal Scientific Ecologist	ELA
Dr Brad Law	External Microbat Expert	NSW DPI
Glenn Hoye	External Microbat Expert	Fly by Night
Anna Lloyd	External Microbat Expert	NSW DPIE
Josie Stokes	External Microbat Expert	WSP

Name	Role	Organisation
Narawan Williams	External Microbat Expert	Fauna Field Ecology
Amy Williams	External Microbat Expert	Corymbia Ecology
Alison Martin	External Microbat Expert	Green Loaning Biostudies
Vanessa Gorecki	External Microbat Expert	ARTC Inland Rail
Justin Watts	Manager – Asset Solutions	Hunter Water (HW)
Joe Kenny	Delivery Manager – Asset Solutions	HW
Yasir Sahito	Senior Project Manager	HW
Angus Seberry	Manager Environment and Sustainability	HW
Annette Finnegan	Ecologist	HW
Emma Dean	Environmental Advisor	HW
Sarah Saunders	Environmental Advisor	HW
Emma Berry	Executive Manager – Strategy and Engagement	HW
Kate King	Change Manager (Meeting Facilitator)	HW
Sophie Powrie	Principal Consultant, Project Director	Eco Logical Australia (ELA)
Tom Schmidt	Senior Ecologist, Project Manager	ELA
Apologies		
Dr Caragh Threlfall (could not attend)	External Microbat Expert	University of Sydney
Greg Ford (could not attend)	External Microbat Expert	Balance! Environmental

1. Introduction

Hunter Water provided a description of the project background and objectives. Key points raised:

- Tunnel is critical to water supply of Lower Hunter Region
- Tunnel supplies 50% of water into Grahamstown Dam
- Supplies safe and secure water supply to 600,000 people
- Tunnel 1200m long and 4.5 m wide. Constructed in 1962. No remediation work since
- Current condition of tunnel unknown – evidence of failed rocks bolts and some rock falls
- Potential for catastrophic failure with risks to water supply and remediation costs
- Description of proposed tunnel remediation works was provided based on SIS description. Of note;
    - the proposed works are based on 100 year design life
    - detail design is only possible with internal tunnel investigations post dewatering
- End 2021 presents a unique timing opportunity to complete remediation with lower risk to water supply due to record high water supply levels in Grahamstown Dam. The current proposed timing also provides the lowest impact to resident bats based on expert advice.

Eco Logical Australia provided a description of the bat impacts assessed and proposed management measures. Key points raised:

- Species Impact Statement (SIS) for proposed Balickera Tunnel Remediation Works includes a Microbat Management Plan (MMP) – prepared by ELA, exhibited by HW, pending submission to DPIE with outcomes of this meeting.
- Bat Activity on site
    - Tunnel roost discovered in 1995. Studies since in 2000, 2016/17, 2018, 2020/21.
    - More bat activity detected over winter. Data from snapshot estimates only.
    - Four bat species present (three threatened species under NSW *Biodiversity Conservation Act 2016*)

Species	Tunnel Population
Southern Myotis (Vulnerable)	80-200 bats; present all year; breeds in tunnel in Summer.
Little Bent-winged Bat (Vulnerable)	2000 bats in Summer, 6000 bats in Winter. Present all year, females absent in Summer, does not breed in Tunnel.
Large Bent-winged Bat (Vulnerable)	300-500 bats, present all year, non-breeding, unknown sex ratios.
Eastern Horseshoe Bat (Not listed)	10-50 bats; present all year; possible breeding site.

- Alternative roost sites known within region/nightly flight range (shown on maps)

Species	Alternative Roosts
Southern Myotis	3 other maternity roosts within 10-12km, 10 x bat boxes within 3km
Little Bent-winged Bat	8 roosts within 33km, 4 more roosts within 50km, 3 can accommodate 500 – 1000 bats
Large Bent-winged Bat	20 known roosts within 60km, 4 can accommodate 200-500 bats

- Description of mitigation measures proposed

Method	Description
Monitoring	Pre, during and post construction at tunnel and other known sites in region
Microbat exclusion	Full tunnel exclusion in mid-December (lowest number of bats, after Southern Myotis first breeding event) - total exclusion for up to 5 months
Bat box installation	Install bat boxes as alternative habitat for Southern Myotis
Radio-tracking	Radio-tracking of up to 40 bats at exclusion
Re-instate tunnel roosting habitat	Retain existing natural rock surface in tunnel surface wherever possible Remediation works to reshape contours

- The MMP identifies that a suitable offset/compensation should be identified and implemented as part of adaptive management to address the worst case scenario that bats do not return to the tunnel after works

- Impacts to man-made structures are considered 'prescribed impacts' under legislation
- Where actions described in adaptive management plans for mitigating prescribed impacts are considered high risk, measures to secure offsets in the event of failure can be proposed. These measures may include the retirement of credits and/or other conservation measures that benefit the threatened entity.

2. Bat Expert Discussion

Topic Impact Assessment

There were no dissenting views on the impact assessment and general agreement on the mitigation measures in the SIS and MMP.

Topic Population data

There was group discussion on the monitoring data available. It was noted that data is limited to snapshot estimates from years cited. Discussion noted this is a limited base to understand local population dynamics and to inform threshold levels.

Topic Timing of works / microbat exclusion

Discussion

- Trade-off between small number of breeding Southern Myotis vs large numbers of non-breeding Little Bent-winged Bats
- SIS proposed December exclusion to be undertaken between first and second Myotis breeding events, once pups from the first breeding event are independent
- Little Bent-winged Bats travel further, particularly with seasonal migrations between roosts
- Rationale for proposed timing is to impact the least bats, to avoid breeding events initially and disrupt the least number of breeding events possible subsequently in a single disturbance event.

Conclusions

- Expert group general consensus that proposed exclusion timing is best (December – after Myotis pups can fly)
- Expert consensus that one single exclusion event is preferred to multiple shorter exclusions over multiple years in terms of limiting overall impacts to bats
- Expert consensus that staged progressive exclusion undertaken over a couple of weeks will provide bats with best opportunity to self-relocate
- Experts recommend addition of lighting around tunnel portals, and shining directly into tunnel to assist exclusion – making the site less inviting for bats.

Topic Bat box locations (Southern Myotis)

Discussion

- Current proposed location Nine Mile Creek Bridge on Nine Mile Creek Road

- Debated receiving structure – existing bridge/s, trees adjacent to canal, new structure over canal
- Discussed thermal properties in tunnel
- Discussed potential for designing and installing a new alternative structure over Balickera canal
- Discussed potential for designing and installing stand-alone culverts placed near canal as roosting habitat for Southern Myotis and other species.

Conclusions

- Consensus from experts considered Nine Mile Creek to be too far away for recently independent Southern Myotis pups and that a number of closer alternatives should also be provided
- Recommended that some boxes be placed very close to tunnel as emergency roost habitat
- Consensus was that it will be best to spread boxes over several sites to increase opportunities for displaced Southern Myotis to locate and use the boxes.

Topic Radio-tracking

Discussion

- High-cost of radio tracking discussed relative to uncertain results and short-term data only. Example given of unsuccessful radio tracking in urban environment using fixed receiver sites at known alternate roosts. Balickera application designed with two dynamic receiving methods (drone and field survey team) and two static receiving methods (3 existing MOTUS towers and known roost locations) to improve detection success rate
- Counter view discussed that radio tracking may provide flight path data and timely data inputs to adaptive management in weeks immediately after exclusion (trade off with longer term methods)
- Banding suggested as an alternative
- DNA sampling discussed as additional population study.

Topic Offset/Compensation options

Discussion

- BAM limitations discussed. Changes to BAM are out of scope
- Not designing for precedence. Seeking for practical solutions to protect local microbat populations during remediation works
- Provision of new alternative tunnel OR other conservation action
- Need for lawful, structured plan for compensatory habitat agreed before works commence
- Discussion of offset mechanisms. Chief Executive Requirements (7.1.2). Stewardship considered untenable, credits not an option and reservation unlikely. No known occurrence of manmade structure on private land recognised as 'offset' under BC Act. Precedence discussed for Conservation Agreement (Division 12) or Planning Agreement.
- General perception from experts that bats will likely return to using the Balickera Tunnel after works

- HW has accessible land available near tunnel site for artificial structures. Potential to use cleared land near site (subject to HW approval). Public park not preferred location for safety, vandalism and disturbance.

Conclusions

- **Consensus support for provision of alternate tunnel/cave habitat (Little Bent-wing Bat plus other species)**
- Rationale: alternative tunnel best option to potentially assist the local populations and would provide useful research to assist species in general – understanding potential for use in future situations and future maintenance of Balickera Tunnel
- Timing: Best if installed prior to works, or at least prior to autumn return of large numbers of Little Bent-winged Bats. Should be left in place long-term
- Location: Best if close to existing tunnel than at another site.
- Design: Two separate internal domed chambers with taller ceilings recommended. Discussion of natural water or solar powered pumped water within structure.

Topic HW suggested a Steering Committee / Working Group of Bat Experts

- All bat experts expressed willingness to be part of a steering committee / working group available to advise on key decisions if required.

CONCLUDING STATEMENTS

Timing of microbat exclusion/remediation works

- No change. Exclusion of the tunnel is proposed to commence in December as per the MMP. Remediation works will commence on completion of exclusion following the MMP protocols.

Microbat exclusion

- Lighting to be used during exclusion to further encourage departure/discourage return of bats.

Bat Boxes

- Four (4), four-chambered bat boxes will be installed under the Nine Mile Creek Bridge
- Six (6), four-chambered bat boxes will be installed in trees in close proximity to the tunnel, or close to the canal outside of the works area. Three (3) upstream and three (3) downstream
- Hunter Water will also continue to attempt to gain approval for installation of bat boxes under the Pacific Highway Bridges from Transport for NSW (TfNSW). If TfNSW grants permission, additional nest boxes will be installed for Southern Myotis at this location.

Radio-tracking

- Radio-tracking is still proposed
- Banding or PIT tagging were not selected for the following reasons:
  - Uncertainty on gaining ethics approval (original banding study at Balickera was abandoned due to bat band injuries)

- Large trapping effort required
- Inability to automate PIT tagging logging receiver at tunnel and other known roosts
- Proposed radio-tracking program relies on multiple detection methods to increase potential for collecting information from tagged bats
  - Data-logging receivers placed in other known Bent-winged Bat roosts within nightly flight range of the tunnel
  - Daily manual tracking using hand-held receivers (diurnal and nocturnal)
  - Daily drone radio tracking to provide greater spatial coverage and access to sites that are difficult to access by land / sea (diurnal and nocturnal)
  - Use of existing MOTUS logging receiver network (towers at Swan Bay and Kooragang Island) increases spatial coverage of area within nighty flight range of bats and on flight path to known alternative roost sites

- Considering addition of basic genetic sampling to provide long term data on population genetics (lower cost and disturbance to bats than large scale banding or PIT tagging study).

Alternative Tunnel

- Hunter Water investigating constructing alternative tunnel in close proximity to tunnel
- Tunnel to be constructed using pre-fabricated concrete culvert sections with two larger internal chambers
- Tunnel design to be agreed upon by steering committee / working group
- Potential locations and design options under investigation.

Steering Committee / Working Group of Bat Experts

- Expert Group to be provided opportunity for input on key decisions including design of alternative habitat.

APPENDIX C MICROBAT IMPACT ASSESSMENT

Suite 203, 24 Gordon Street
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t: (02) 6651 5484

8 October 2021

Our ref: 13555

Hunter Water Corporation
Level 1, 426 King St
Newcastle West
NSW 2300

Attention: Yasir Sahito

Dear Yasir,

Balickera Tunnel Concrete Coring – Microbat Impact Assessment

As part of the proposed remediation works on the Balickera Tunnel, Hunter Water have advised a minor amendment to the scope of activities. Hunter Water have requested this assessment to ensure the potential impacts of these works are formally considered and appropriate mitigation measures can be documented and implemented.

Please find attached report that provides an assessment of the potential impacts of the proposed, additional concrete coring works and details mitigation measures to be implemented to minimise the impacts. The concrete coring work outlined in this report was not assessed in the Balickera Tunnel Remediation Works REF and SIS. This report is to be appended to the Species Impact Assessment prepared and exhibited.

Concrete coring inside the tunnel (within 10 m of the upstream portal) is required prior to microbat exclusion due to the timeframes required to test and analyse the concrete condition. Completing the concrete coring prior to the microbat exclusion may reduce the length of time microbats are required to be excluded from the tunnel.

The assessment is based on the results of database searches and recent targeted fauna surveys of the tunnel and surrounds to determine the likely biodiversity impacts of the proposed works. The potential impacts are associated with disturbance (noise, vibration and lighting) to roosting microbats over a period of up to two days.

Tests of significance were completed to determine whether the proposed concrete coring was likely to have a significant impact on the threatened microbat species or materially change the conclusions of the SIS. It was concluded that the proposed concrete coring is unlikely to significantly impact the microbats using the Balickera Tunnel or materially change the conclusions of the SIS if the mitigation measures recommended within this report are implemented.

Yours sincerely,

Alicia Scanlon
Microbat Ecologist

1. Introduction

1.1. Background

Hunter Water Corporation engaged Eco Logical Australia (ELA) to assess the potential impacts on microbats of proposed concrete coring to be undertaken at the Balickera Tunnel, Balickera, NSW. The concrete coring investigations are required to inform the detailed design of future remediation works for the Balickera Tunnel. The Balickera Tunnel Remediation works are subject to a separate assessment, a Species Impact Statement (SIS) and Review of Environmental Factors (REF) that are required to obtain concurrence from DPIE before commencement of works.

The Balickera Canal and Tunnel are used to transfer water from the Williams River to the Grahamstown Dam, the main drinking water supply for the Lower Hunter region. The Balickera Tunnel requires remediation in the near future to ensure drinking water supply is maintained.

The concrete coring works involve up to two days of drilling into the tunnel's concrete lining within 10 m of the upstream portal. The purpose of this assessment is to describe the works and evaluate the potential impacts to bats roosting within the tunnel and to provide suitable mitigation measures to reduce those impacts. This assessment will be included in the submissions report that is presented to DPIE along with the SIS and REF prepared for the proposed tunnel remediation works.

1.2. Proposed works

The proposed concrete coring works aim to obtain a minimum of 6 concrete cores and will include:

- Site establishment 1-2 hours
- Outboard motorboat providing transport for coring contractors from the access ramp at the spillway into the upstream portal
- Unleaded petrol generator to power coring machine to be placed outside tunnel
- Determination of reinforcement configuration at portal using Ground Penetrating Radar (GPR)
- Coring at chainage of <5 metres (to capture reinforcement), and approximately at 10 metres (to capture tunnel lining)
- Coring at each chainage (<5 metres and 10 metres) at 3 locations – wall, shoulder, obvert (for a total of 6 cores)
- Core locations to be staggered and checks undertaken for void at obvert
- Coring of crown to minimum of 300 mm, targeting > 600 mm (80 mm diameter)
- Core to intersect circumferential (lateral) bar. Breakout to expose bar
- Concrete coring is wet coring with wet/dry vacuum collecting used core water
- (Provisional) Non -destructive testing (NDT) to determine thickness (Impact Echo, GPR) or drill and probe
- Rebound hammer for concrete correlation
- Estimated time per core location is 1-2 hours (dependent upon site conditions)
- Estimated time to complete coring is 2 days
- Works are planned to occur as soon as DPIE concurrence is granted on the SIS and REF and are likely to take place in November 2021.

2. Existing environment

2.1. Threatened species

The Balickera Tunnel provides roosting habitat for microbat species and is known to be utilised by three threatened microbat species listed as Vulnerable under the BC Act; Little Bent-winged Bat (*Miniopterus australis*), Large Bent-winged Bat (*Miniopterus orianae oceanensis*) and Southern Myotis (*Myotis macropus*). The main bat roosts are located towards the upstream end of the tunnel at approximately 170 m and 290 m from the upstream portal. During June 2020 isolated bats were recorded roosting within 40m of the upstream portal based in Infra Red (IR) imagery captures during internal tunnel inspection using a tunnel inspection platform. The current water level is high and is estimated to be causing at least 300 m of the downstream end of tunnel to be submerged. Bats will only be roosting in areas that are not submerged and have at least 50 cm of clearance from the obvert to water level, likely to be within the first 800m of the tunnel as measured from the upstream portal.

Table 1: Threatened fauna species potentially impacted by the proposed works

Scientific name	Common name	Status BC Act	Status EPBC Act
Miniopterus australis	Little Bent-winged Bat	Vulnerable	Not listed
Miniopterus orianae oceanensis	Large Bent-winged Bat	Vulnerable	Not listed
Myotis macropus	Southern Myotis	Vulnerable	Not listed

Several other threatened species are known or considered likely to occur in the vicinity of the Balickera Tunnel, however the proposed works are unlikely to impact these species and as such no further assessment for these species has been undertaken.

3. Impact Assessment

3.1. Direct impacts

Direct impacts are those impacts that directly affect threatened species habitat and individuals (OEH, 2018).

Concrete coring will not directly affect any roosting bats as all known bat roost sites within the tunnel are located > 10 m from the upstream portal where works will be undertaken. Concrete coring will not damage or destroy any existing bat roosting habitat within the tunnel because cores will be drilled in areas not used by bats as roosting habitat.

3.2. Indirect impacts

Indirect impacts occur when project-related activities affect species or ecological communities in a manner other than direct loss within the subject site (OEH 2018). Indirect impacts can include both short and long-term impacts.

Indirect impacts associated with the proposed activity include disturbance (noise, light and vibration) generated by the presence of people and coring equipment within the first 10 metres of the upstream portal. Indirect impacts are summarised in **Table 2**.

Disturbance to bats roosting in the Balickera Tunnel has been considered in this assessment.

The main bat roosts are located towards the upstream end of the tunnel at approximately 170 m and 290 m from the upstream portal. During June 2020 isolated bats were recorded roosting within 40 m of the upstream portal based on Infra Red (IR) imagery captured during internal tunnel inspection using a tunnel inspection platform. The current water level is high and is estimated to be causing at least 300 m of the downstream end of tunnel to be submerged. Bats will only be roosting in areas that are not submerged and have at least 50 cm of clearance from the obvert to water level, likely to be within the first 800m of the tunnel as measured from the upstream portal.

Several previous tunnel inspections have been undertaken using either a floating tunnel inspection platform controlled by ropes on each end or a remotely operated tunnel inspection platform/ROV. Minimal disturbance to microbats (bats visible in flight in internal tunnel imagery) has been observed during previous tunnel inspections (Abyss Solutions 2018, 2020). No bats were observed exiting the tunnel during previous internal tunnel inspections with the remotely operated or hand pulled tunnel inspection platforms.

However, it is noted that concrete coring works will produce a much greater level of noise and vibration than any previous works or disturbance in the tunnel, even though coring activities are concentrated within 10 m of the upstream portal. The noise and vibration generated by the works will be heard and felt by roosting bats, many times above levels commonly experienced. The sustained nature of the disturbance with each core taking 1-2 hours to drill and work days of up to 8 hours does not leave roosting bats with much time to rest during the two consecutive days of disturbance.

It is likely that many bats will arouse and fly around inside the tunnel during works. There is a possibility that the disturbance may be enough to cause some bats to seek alternative roosting habitat at the end

of the first or second day of works. There is also a possibility that the disturbance may cause some bats to exit the tunnel during daylight. Flying during the day presents significant risks to bats due to the increased chances of being predated, disoriented and unable to find a safe roost location. There is also a risk from bat collisions with personnel and equipment if bats attempt to fly out of the tunnel during works. This poses a safety risk to contractors and a risk of harm, injury or death to bats. For these reasons, works will be stopped immediately if bats fly out of the tunnel during works.

Table 2: Indirect impacts during concrete coring activity

Indirect impact	Nature	Extent	Frequency	Duration	Timing
Disturbance to roosting bats from concrete coring equipment (noise, vibration)	Increased noise and vibrations throughout tunnel from coring equipment causing bats to remain alert and awake rather than resting during the day	Bats roosting in tunnel will be exposed to noise levels in the order of 100 dB, at least three times more than background noise levels commonly experienced in the tunnel. No data is available for vibration levels but it is estimated that vibration levels will be at least twice as much as those commonly experienced in the tunnel.	Coring will occur consistently for periods of between 1 and 2 hours, for up to 8 hours throughout each of the 2 days that works will be undertaken. There will be short periods when no drilling will occur as contractors move between coring locations.	Coring will occur for up to 8 hours over 2 consecutive days, during daylight hours	Short-to medium term impacts
Disturbance to roosting bats from presence of people and equipment in tunnel	Potential disturbance due to movement of people and materials / equipment, within first 10 m of the tunnel	Bats roosting in tunnel are generally not exposed to people and equipment moving inside the tunnel, or even at the portal entrances. In the past year bats have already been exposed to people and equipment (little or no noise / vibration) passing through the tunnel on two occasions, with no obvious lasting negative effects.	Up to 8 hours over 2 consecutive days	Up to 8 hours over 2 consecutive days	Short-term impacts
Increased lighting in tunnel and reflectance off the water from torches used to illuminate work area	Light spill penetration into tunnel will be limited to approx. 30 m from the upstream portal.	Bats roosting in tunnel are generally not exposed to light spill	Up to 8 hours over 2 consecutive days	Up to 8 hours over 2 consecutive days	Short-term impacts

3.3. Test of Significance (BC Act)

If a species, population or ecological community listed in Schedules 1, 1A and 2 of the BC Act is impacted, a review of the factors set out to establish if there is likely to be a significant impact on that species, population, ecological community or habitat, must be undertaken. Section 7.3 of the BC Act sets out five factors that must be addressed as part of a Test of Significance (5-part test). This enables a decision to be made as to whether there is likely to be a significant effect on the species.

Tests of Significance were conducted for three threatened bat species listed under the BC Act known to roost within the Balickera Tunnel (Appendix A):

- Little Bent-winged Bat (*Miniopterus australis*) – Vulnerable BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*) – Vulnerable BC Act
- Southern Myotis (*Myotis Macropus*) – Vulnerable BC Act

Based on these assessments the proposed concrete coring activity is considered unlikely to result in any significant impacts to threatened species listed under the BC Act (Appendix A).

3.4. Matters of National Environmental Significance

The proposed works are unlikely to impact on any Matters of National Environmental Significance (MNES) listed under the EPBC Act.

4. Recommendations

The following mitigation measures are recommended to minimise the biodiversity impacts of the proposed concrete coring activity, and the assessments of significance are based on the assumption that these measures will be implemented:

- Ecologist to be on site to supervise coring works and provide advice on bat behaviour
- Works in the tunnel must cease by 4pm to allow bats time to rest and settle before dusk
- Place generator outside and above tunnel portal to minimise noise disturbance in tunnel
- Use noise shielding around generator to minimise disturbance to surrounding forest habitat
- Ensure boat motor is turned off whilst in tunnel when not moving between locations
- Commence coring at < 5 m and move to 10 m once all cores at < 5 m have been obtained
- When re-starting motor on boat ensure prop faces tunnel portal rather than inwards along tunnel
- Minimise number of personnel on boat and in tunnel, only those necessary for carrying out works, operating the boat and for safety reasons to be present
- Keep chatter when in tunnel to absolute minimum
- When coring is not occurring aim to minimise noise, light spill and vibration as much as possible inside the tunnel and outside the tunnel along the canal as noise is channelled into the tunnel along the canal
- Minimise artificial lighting used during works. Do not shine light down the tunnel. Keep lighting focused on work areas. Use head torches /lights with red filter (red cellophane with rubber bands to affix it to the light is adequate), if this will not compromise ability of contractors to complete coring activities
- Do not patch core holes until after bats have been excluded from the tunnel. This will minimise the time that contractors are required to be in the tunnel and reduce the chance of bats interacting with potentially toxic substances used to patch cores whilst they set
- Supervising ecologist will direct works to stop works if disturbed bats are observed flying out of tunnel as this poses a serious risk of death or injury to bats
- If daytime works have been stopped as a result of significant disturbance to bats, the remaining works should be undertaken at night when bats are active but after bats have left to forage for the night. In this case, coring works inside the tunnel can be conducted between the hours of 10pm and 4am.

5. Conclusion

Hunter Water propose to undertake concrete coring inside the tunnel (within 10 m of the upstream portal prior to microbat exclusion due to the timeframes required to test and analyse the concrete condition (6 – 8 weeks for production of results). Completing the concrete coring prior to the exclusion may reduce the length of time microbats are required to be excluded from the tunnel. The proposed concrete coring works involve boat access for contractors and coring equipment to a distance of approximately 10 m within the upstream portal over a period of two consecutive days. Up to six concrete cores will be obtained via a process that will generate noise and vibration levels inside the tunnel many times above those generally experienced by bats roosting in the tunnel. ELA has completed an assessment of the likely impacts of the proposed activity on threatened microbats species known to inhabit the tunnel.

The assessment utilised results of recent targeted microbat surveys at the tunnel and surrounds in order to evaluate the likely biodiversity impacts of the proposed works. The potential impacts are indirect and related to disturbance to roosting bats caused by noise, vibration and light spill generated during the coring works. The coring works will be undertaken over two consecutive days and represent a short to medium term disturbance that may cause some bats to roost elsewhere for a short time.

Significance assessments were completed to determine whether the proposed activity was likely to have a significant impact on threatened entities listed under the BC Act and EPBC Act known or likely to occur in the study area and with the potential to be impacted by the works. It was concluded that the proposed activity is unlikely to have a significant impact on these threatened species.

References

NSW Department of Planning, Industry and Environment (DPIE), 2021a. *BioNet Atlas*. *Database of flora and fauna records* (formerly known as the NSW Wildlife Atlas and Threatened Species Profile Database). www.BioNet.nsw.gov.au. New South Wales Department of Planning, Industry and Environment, Sydney.

NSW Department of Planning, Industry and Environment (DPIE), 2021b. *NSW Threatened Species Profiles*. http://www.environment.nsw.gov.au/threatenedspeciesapp/ New South Wales Department of Planning, Industry and Environment, Sydney.

Office of Environment and Heritage (OEH), 2018. *Threatened species test of significance guidelines*. New South Wales Office of Environment and Heritage, Sydney.

Appendix A – *Biodiversity Conservation Act 2016* Test of Significance

VULNERABLE CAVE-ROOSTING MICROBATS – LITTLE BENT-WINGED BAT, LARGE BENT-WINGED BAT AND SOUTHERN MYOTIS.

BC Act	Question	Response
7.3.1 a)	In the case of a threatened species: whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction	Although the works are of short duration, they will cause disturbance (primarily through noise and vibration, but also light spill from artificial lights required to illuminate the works area) to any bats roosting within the tunnel over a period of two days. The works will be restricted to the area between the upstream tunnel portal and 10 m inside the tunnel. Existing bat roosts will not be changed in any way, and the nearest bat roost site is located 30 m away from the works area. Bats will be aroused from resting states and may take flight within the tunnel for extended periods during works. There are risks that bats may wish to exit the tunnel during daylight. There are risks that bats may seek to roost elsewhere for a short period of time while the works are occurring. Works are proposed to occur in late spring / summer when pregnant female Little and Large Bent-winged Bats will have left or be preparing to leave for maternity roosts. Short term disturbance over two days is not likely to cause significant adverse effects to pregnant females or to non breeding individual Little and Large Bent-winged Bats that remain in the roost over summer such that the local population would be placed at risk of extinction. Pregnant Southern Myotis will be present and may have given birth to pups that will not be able to fly. The risks are largely going to be to Southern Myotis mothers and pups. Lactating female Southern Myotis have peak energy demands at this time of year and any disruption to rest periods may reduce their ability to provide milk and feed their pups. If the disturbance causes mothers to abandon the roost, even for a short period of time, pups may not survive. Works will be stopped immediately if bats take flight outside the tunnel during works. There are six bat boxes suitable for use by Myotis installed along Balickera Canal. One is located immediately above the upstream portal and two more upstream of the pump station within 900 m of the upstream portal. Works will be re-scheduled to occur at night between the hours of 10pm and 4am, after bats have emerged to forage and when they are naturally awake, alert and capable of flying in relative safety under cover of darkness. The proposed activity will cause short to medium term disturbance to roosting bats from noise, vibration and light spill during concrete coring. Effects will not be significant for Little and Large Bent-winged Bats. Southern Myotis mothers and pups will be placed under stress as a result of these works for a short period. Provided bats do not fly out of the tunnel, and works are stopped if a bat is observed flying outside of the tunnel, the works should not have a significant long term effect on the ability of the local population to survive and remain viable.
7.3.1 b) i	In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:	Not applicable.

BC Act	Question	Response
	Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or	
7.3.1 b) ii	In the case of an endangered ecological community or critically endangered ecological community: Whether the proposed development or activity is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.	Not applicable.
7.3.1 c) i	In relation to the habitat of a threatened species or ecological community: The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity	No habitat will be removed or modified as a result of the proposed works. Concrete coring will not affect any of the bat roosting sites within the tunnel. Bats will not be prevented from accessing the tunnel or other alternative roosts in the region.
7.3.1 c) ii	In relation to the habitat of a threatened species or ecological community: Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity	No isolation of habitat for these highly mobile microbat species will occur as a result of the proposed works. Concrete coring will not affect any of the bat roosting sites within the tunnel. Bats will not be prevented from accessing the tunnel or other alternative roosts in the region.
7.3.1 c) iii	In relation to the habitat of a threatened species or ecological community: The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality.	The tunnel is a highly significant habitat resource for local populations of Little and Large Bent-winged Bats and Southern Myotis. It is used as a permanent roost site for thousands of Little Bent-winged Bats, hundreds of Large Bent-winged Bats and a large breeding colony of Southern Myotis (80-200 bats). Whilst there will be no change to bat roosting habitat in the tunnel from the proposed works, there will be high levels of disturbance experienced by any bats roosting within the tunnel over a period of two days. The effects will be short term and the tunnel will remain available to bats as a roost throughout. The main risk from the proposed works is that the disturbance may cause bats to fly out of the tunnel during daylight. If this occurs works will be stopped immediately and a works program that allows for works at night between the hours of 10pm and 4am will be enacted. In this way bats will already be active and if the disturbance is too great bats can relocate at night, a time when they are naturally in flight. The other key risk for Southern Myotis is that bats may seek to roost elsewhere for the duration of the works. Southern Myotis mothers will have pups that are unable to fly and if they are left unattended for more than a night they may not survive. Works will be stopped immediately if bats are observed flying from

BC Act	Question	Response
		the tunnel. This will significantly reduce the risk of pups being left unattended. The tunnel roosting habitat is considered to be important to the annual survival of these species in the locality, however minor short-term disturbance to the tunnel will not impact the suitability of this habitat in the long-term.
7.3.1 d)	Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).	No areas of outstanding biodiversity value are located on or in proximity to the subject land.
7.3.1 e)	Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.	The proposal is not part of a key threatening process.
Conclusion	**Is there likely to be a significant impact?**	No significant impact to the Little Bent-winged Bat, Large Bent-winged Bat or Southern Myotis are expected as a result of the proposed activity following the implementation of the recommended mitigation measures. Only short to medium term disturbance to the roosting bats is expected to result from concrete coring.