

Newcastle Inner City Bypass Rankin Park to Jesmond

Dark Creek – Microbat Management
Stage 1 low impact work submission

Transport for NSW | October 2021



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1. Introduction

1.1 Purpose

The Newcastle Inner City Bypass Rankin Park to Jesmond (RP2J) Project (the project) is the fifth and final section of the Newcastle Inner City Bypass (NICB), which forms part of the Transport for NSW (formally Roads and Maritime Services) long term strategy to connect the Pacific Highway between Bennetts Green and Sandgate.

The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road, New Lambton Heights and Newcastle Road, Jesmond. The RP2J Project, in its current form, includes interchanges at each end (both south and north) as well as an additional full interchange giving access to the John Hunter Hospital. Approval by the NSW Minister for Planning was granted on 15 February 2019.

The Conditions of Approval (CoA) for the project include an allowance for construction and operation of the project to be carried out in stages. The development of a staging report to describe the proposed staging was accepted by the NSW Planning Secretary in October 2019.

Table 1 of the instrument of approval includes a definition of construction applicable to the project. The definition specifically excludes low impact work (where it is either listed or determined by the Environmental Representative or the Planning Secretary as low impact work) from requiring approval of a CEMP prior to the activity being carried out.

This low impact work submission has been prepared to support an application to the Planning Secretary seeking approval of works involve sealing off opportunistic roosting habitat within Dark Creek culvert as meeting the definition of low impact work.

1.2 Background

During a structural inspection of Dark Creek culvert in May 2019, a colony of microbats were observed roosting in the gaps between the crown units within the culvert. In October 2019 ultrasonic call detectors were deployed at the entrance of the culvert to record the echolocation calls of the microbats. The bat call identification report identified three species with a high level of confidence. These species were:

- Little Bent-winged Bats (*Miniopterus australis*)
- White-striped Free-tailed Bat (*Austronomus australis*)
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*).

An additional 10 species were identified as potentially occurring based on possible call identification. An unidentified issue with the detector at the downstream outlet resulted in no calls being collected from this location.

The structural inspection in May 2019 also identified structural instabilities. Due to these instabilities, it is now proposed to abandon (and likely grout fill) the section of culvert where the bats were observed. A new multi-cell box culvert to the west is proposed to be constructed with an inlet located near the existing inlet in Jesmond Park.

Female and juvenile Bent-winged Bats typically return to their non-maternity roosts in late spring/early summer and return to coastal roots in March/April each year. A remote survey of the entire Dark Creek culvert was completed on 9 December 2020 to determine if the Bent-winged Bats were using Dark Creek culvert as a maternity roost, and to identify if any other microbat species were roosting in the culvert. No microbats were identified during this survey. This indicates the Bent-winged Bats (*Miniopterus australis* and

Miniopterus orianae oceanensis) are not breeding within Dark Creek culvert and instead travel to maternity roosts in limestone caves to give birth. Similarly, no Southern Myotis were recorded during the October 2019 targeted survey or the December 2020 remote camera survey, suggesting Southern Myotis are not using the Dark Creek culvert as a maternity roost site either.

A further evening fly-out and Anabat survey of Dark Creek culvert was conducted on 18 January 2021. No microbats were observed exiting the culvert and none were recorded on the Anabat call recording devices placed either end of the culvert. This confirmed that the colony was away in the maternity caves.

It was considered possible that the microbats could return to Dark Creek culvert around February/ March 2021 to roost over winter. To check if the microbats had arrived back from their maternity caves, two additional evening fly-out surveys were conducted on 9 and 10 September 2021. Insect activity and weather conditions on the 9 and 10 of September were considered optimal for microbat activity, but no microbats were recorded emerging from either end of Dark Creek Culvert. Following the two nocturnal fly-out surveys a diurnal remote camera inspection of Dark Creek culvert was completed in September 2021. This inspection confirmed no microbats were present within the culvert. A summary of all survey results for the Dark Creek culvert is included in Table 1-1.

Table 1-1 Summary of survey results for Dark Creek culvert

Date	Survey type	Results
May 2019	Remote camera survey during structural inspection	Approximately 200 to 300 Little Bentwing Bats roosting in a 50 to 75 millimetre gap between the crown units of the culvert.
Oct 2019	Evening flyout survey and Anabat survey of culvert	Emergence of Little Bent-winged and the Large Bent-winged Bat. The majority of calls recorded on Anabat were attributed to the Little Bent-winged Bat.
Dec 2020	Remote camera survey	No microbats detected
Jan 2021	Evening flyout survey and Anabat survey of culvert	No microbats detected
Sept 2021	Consecutive evening flyout survey and Anabat survey of culvert	No microbats detected
Sept 2021	Remote camera survey	No microbats detected

It is not known exactly where the colony has been roosting over winter as there are numerous structures within the locality that could provide suitable roosting habitat. Some of these locations have been inspected during remote camera surveys carried out in July and September 2021.

Site microbat survey information has been collected since May 2019. From this data it has been observed that no microbats have been recorded roosting in the Dark Creek culvert since October 2019, when pregnant females would have migrated to their maternity caves to give birth. As a result, it is considered that prior to October 2019 the Dark Creek culvert was used opportunistically as an over-wintering roost site for Little Bent-winged Bats and a small number of Large Bent-winged Bats. The absence of microbats from that time presents Transport with an opportunity to minimise impacts to the threatened microbats by removing the habitat while the microbats are occupying other over-wintering roost sites.

In order to minimise impacts on threatened Bent-winged bats, it is considered appropriate to seal off the existing opportunistic roosting habitat and any other suitable habitat (e.g. transport/lift holes and crown unit cracks/gaps over 30mm) within Dark Creek culvert while microbats are absent. This activity will allow

preparation for the replacement of Dark Creek culvert and transition to the long-term compensatory roosting habitat in the new culvert, should the microbats return.

1.3 Purpose

The purpose of this submission is to:

- Provide an overview of the proposed work including location, scope, methodology and program
- Summarise the potential environmental impacts of the activity and outline mitigation strategies that would be implemented during the work
- Assist the Planning Secretary with a determination of the work as low impact work or otherwise as defined in Table 1 of the project approval and to demonstrate compliance with relevant CoAs.

2. Activity description

2.1 Location

Dark Creek flows in a north-westerly direction through the northern extent of the project site under the Jesmond roundabout on Newcastle Road. Dark Creek enters the culvert in Jesmond Park and exits to the north of Newcastle Road between Blue Gum Road and the Newcastle Inner City Bypass (refer Figure 2-1).

The length of the culvert is about 250 metres. Either side of the culvert in an open trapezoidal channel surrounded by grass area with a tree canopy. The area immediately adjacent the upstream and downstream entrances to the culvert have been highly modified by construction of Newcastle Road. In addition, there is urban development to north, east and west which has further modified the landscape. To the south of Dark Creek culvert is remnant bushland of varying quality from modified to intact.

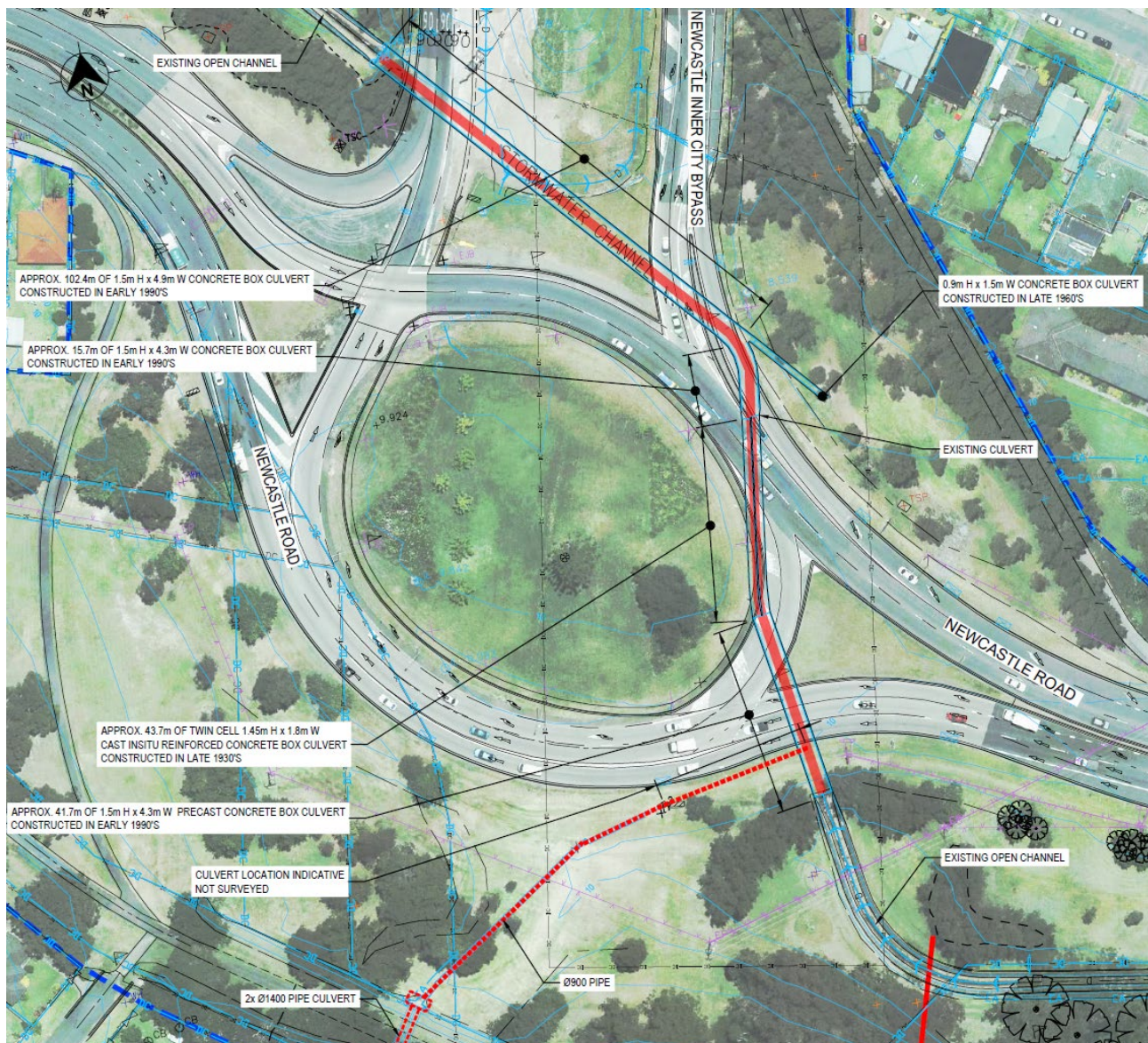


Figure 2-1 Location of Dark Creek culvert

2.2 Scope of activity

The general scope and sequence of work is described below. Further detail on each activity and associated potential impacts is provided in Section 3. The sequence of work will generally include:

- Establishing site access.
- An evening flyout and Anabat survey of the culvert will be undertaken the evening before works are proposed to start.
- Pre-clearing survey involving a diurnal remote camera survey of the culvert to determine if microbats are present. Pre-clearing surveys are to be completed with an ecologist present onsite and on the day the activity takes place.
- Starting closest to where the microbats have been previously recorded roosting, sealing of the gaps with grout, expandable foam or similar.
- If required, the surface of the grout or other material used to fill the gaps may be painted to achieve a smooth finish.
- If works continue over consecutive days, a pre-clearing survey will be completed each morning prior to any sealing works commencing.

2.3 Activity description

The aspects of the work and how they would be managed have been considered with reference to the Newcastle Inner City Bypass – Rankin Park to Jesmond Environmental Impact Statement (EIS), Submission and Preferred Infrastructure Report (SPIR) and related specialist assessment reports and are outlined in further detail in this section.

The works would be completed using hand tools and a vehicle mounted generator only. It is anticipated that about five personnel would be required to complete the works including an ecologist, remote camera operator and those completing the filling operation.

All site work would be performed during standard working hours which are:

- Monday to Friday, 7am to 6pm
- Saturday 8am to 5pm
- No work on Sundays or Public holidays

However, it is likely that the work would be further limited to standard hours Monday to Friday.

The works are expected to take one day to complete and will be carried out prior to the commencement of construction, ideally late December 2021 or January 2022.

In the event the activity is unable to be completed on a single day, a pre-clearing survey would be carried out each morning prior to work commencing.

2.4 Environmental impacts

The potential environmental impacts from the proposed works are described in Table 2-1 below.

Table 2-1: Environmental impacts from the proposed works

Environmental Aspect	Potential impacts								
Biodiversity	A 5 Part test of significance (Attachment A) has been completed for the following microbats: <table> <tr> <th>Species</th><th>BC Act Status</th></tr> <tr> <td>Little Bent-winged Bat (<i>Miniopterus australis</i>)</td><td>Vulnerable</td></tr> <tr> <td>Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)</td><td>Vulnerable</td></tr> <tr> <td>Southern Myotis (<i>Myotis macropus</i>)</td><td>Vulnerable</td></tr> </table> The assessment found that the project would remove 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat. The project would also temporarily remove occasional roosting habitat within Dark Creek culvert for Little Bent-winged Bat and Large Bent-winged Bat. The temporary removal of opportunistic over-wintering roosting habitat for the Little Bent-winged Bat and small numbers of Large Bent-winged Bats is not likely to have an adverse effect on these species, especially when microbats are absent. Provided the mitigation measures outlined in the low impact work procedure are implemented, the assessment found that there is unlikely to be a significant impact to the Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis. Further, the project has committed to providing long-term compensatory microbat habitat into the new Dark Creek culvert which will increase roosting opportunities for threatened microbat species in the locality.	Species	BC Act Status	Little Bent-winged Bat (<i>Miniopterus australis</i>)	Vulnerable	Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)	Vulnerable	Southern Myotis (<i>Myotis macropus</i>)	Vulnerable
Species	BC Act Status								
Little Bent-winged Bat (<i>Miniopterus australis</i>)	Vulnerable								
Large Bent-winged Bat (<i>Miniopterus orianae oceanensis</i>)	Vulnerable								
Southern Myotis (<i>Myotis macropus</i>)	Vulnerable								
Traffic and transportation	A small number of light vehicles would be required to transport personnel to site and would be parked to avoid traffic impacts. Lane closures or traffic diversion would not be anticipated. Work associated with the proposed change would not increase traffic impacts or affect property access. There would be no operational impacts as a result of the proposed change. The traffic and transport impacts of the proposed change compared to the approved project would be neutral.								
Noise and vibration	The existing noise environment is dominated by traffic on the existing Newcastle Inner City bypass and Newcastle Road. Background noise								

	levels in the area of the works are 55 dB(A) during the day. The works would be carried out in standard working hours and require the use of hand tools only. It is not anticipated that the works would be audible at the closest sensitive receivers.
Soils, contamination and water quality	There is the potential for small quantities of waste to drop into the culvert while the filling operations are being completed. Any excess material or waste would be captured by a drop sheet or similar for off-site disposal. It is not anticipated that the proposed change would not increase soils, contamination and water quality impacts.

3. Environmental management

A number of mitigation measures, safeguards and management strategies have been identified in the project SPIR and conditions of approval in order to avoid or minimise adverse environmental impacts that could potentially arise as a result of the project. Those relevant to the microbat management work are detailed in Table 4-1.

An Environmental Work Method Statement (EWMS) will be prepared to consolidate and detail the safeguards and management measures identified. The EWMS will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The EWMS will be prepared prior to the work and must be reviewed and approved by the Transport for NSW Environmental Officer prior to the commencement of any on-site work.

The EWMS will include the following management measures:

- An evening flyout and anabat survey of the culvert would also be conducted the evening before the works are proposed to start.
- A pre-clearing survey of the Dark Creek culvert would be undertaken prior to any works commencing. Due to the culvert being a confined space, this may be conducted using a remote-controlled camera.
- An ecologist specialised in microbat mitigation will be required on site during the remote camera pre-clearing survey to determine if microbats are present.
- If the ecologist determines it appropriate, they will sign the pre-clearing checklist stating that no microbats are present and sealing works of the gaps can commence.
- If works can commence, the gaps will be sealed using a smooth grout product to reduce the likelihood of microbats gripping onto infilled surfaces. If expandable foam is used to infill the gaps, it will need to be covered with thin plywood or similar, to remove roughened surfaces.
- Once infilled, the surface would be smoothed to contain no edges/divots that the microbats may be able to grip onto. Painting over the surface with a glossy paint may achieve this.
- The contractor would commence filling in gaps closest to where the microbats have been recorded roosting previously, approximately 45 metres downstream of the inlet (Jesmond Park side).
- If works continue over consecutive days, a pre-clearing survey will be required each morning prior to any sealing works commencing.
- A drop sheet or similar would be used to capture any material that may fall during the filling operation.

In addition to these measures, compensatory threatened microbat habitat will be provided in the new Dark Creek culvert. This new habitat will include three features. The first feature will be constructed by leaving the transport/lift holes in the new culvert unsealed and roughened internally to a one to two millimeter thickness. The second feature will be in the form of horizontal or longitudinal recesses and the third will be shaped from coarse cement render/silicon applied to the roof of the culvert. The compensatory roosting habitat will then be monitored for use by threatened microbats in accordance with the Microbat Management Strategy, currently in development.

3.1 Summary of relevant SPIR safeguards and project approval conditions

Environmental safeguards and management measures outlined in project EIS, SPIR and conditions of approval will be incorporated into an activity specific EWMS. These safeguards and management measures will minimise any potential adverse impacts arising from the work on the surrounding environment and community. The safeguards and management measures are summarised in Table 3-1.

Table 3-1 Summary of mitigation measures, safeguards and management strategies

Potential impact	Environmental controls	Approval document reference	Responsibility
Non-compliance with approval	A contractor's Environmental Work Method Statement (EWMS) for the work will be prepared in consultation with an ecologist and submitted for review and endorsement by the Transport for NSW RP2J environmental officer - Newcastle. As a minimum, the EWMS will contain and/or address the following: • Detail of environmental policies, guidelines, principles and approvals to be complied with and followed during the work • Detailed constraints mapping in the form of sensitive area maps or site plans with constraints identified eg flora and fauna, sensitive receivers • Detail of training and induction for employees including contractors and sub-contractors • An outline of the sequence of tasks for the work and a description of the roles and environmental responsibilities for relevant employees for those tasks and their relationship with the Principal and ER • Detail of communication requirements • An inspection program detailing the activities to be inspected and frequency of inspections • Details of managing and reporting any incidents or non-compliances • A process for rectifying non-conformances • Procedures for emergency and incident management including "stop work" processes and reporting to Transport for NSW • A process for periodic review and update of the EWMS in response to changes to site conditions or work methodology • Details of how the demolition work will implement the identified safeguards.	SPIR BD04	Contractor
Complaints	All enquires and complaints will be managed in accordance with the project Complaints Management System (CMS) outlined in the Community Communication Strategy. Key project details established in response to SSI CoA B9 include: • Phone number – 1800 818 433 • Email address – rp2j.community@aurecongroup.com • Postal address – RP2J Project, Roads and Maritime Services, Locked Bag 2030 Newcastle NSW 2300 The project phone number will be attended at all times while demolition work is in progress so as to receive and response to complaints eg noise.	MCoA B6 – B9	TfNSW / Contractor

Potential impact	Environmental controls	Approval document reference	Responsibility
Pollution of the environmental / non-compliance with approval	If an incident (eg spill) occurs, the Roads and Maritime Services Environmental Incident Classification and Reporting Procedure is to be followed and the Transport for NSW Project Manager (or delegate) notified immediately. In circumstances where an incident causes or threatens to cause material harm and which may or may not be or cause a non-compliance, the Planning Secretary must be notified.	MCoA A37	Contractor / TfNSW
Biodiversity	Pre-clearance surveys will be carried out in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (Guide 1: Pre-clearing process)</i> (RTA 2011a)	MCoA E10 / SPIR BD05, BD06, BD07	Contractor
Unexpected threatened species finds	Any unexpected threatened species finds will be dealt with in accordance with the Roads and Maritime <i>Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects</i> (RTA 2011a)	SPIR BD06	Contractor
Noise and vibration	Mitigation measures must be implemented with the aim of achieving the following construction noise management levels and vibration criteria: (a) construction 'Noise affected' noise management levels established using the Interim Construction Noise Guideline (DECC, 2009); (b) vibration criteria established using the Assessing vibration: a technical guideline (DEC, 2006) (for human exposure); (c) Australian Standard AS 2187.2 - 2006 "Explosives - Storage and Use - Use of Explosives"; (d) BS 7385 Part 2-1993 "Evaluation and measurement for vibration in buildings Part 2" as they are "applicable to Australian conditions"; and (e) The vibration limits set out in the German Standard DIN 4150-3: Structural Vibration- effects of vibration on structures (for structural damage).	MCoA E34	Contractor
Noise complaint	In the event of a valid noise complaint, monitoring will be carried out and reported as soon as possible. If exceedances are detected, the situation will be reviewed to attempt to identify reduce the impact to acceptable levels, where practicable.	SPIR NV15	Contractor

4. Conclusion and approval

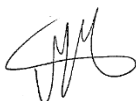
4.1 Conclusion

The low impact work submission has considered the various stages of activity, potential impacts on the environment and community for the respective stages, and outlined mitigation measures and safeguards to avoid or minimise those potential impacts.

Through the application of appropriate mitigation measures as outlined in Section 3, it is considered that the work would be consistent with the definition of low impact work as per Table 1 of the project Infrastructure Approval (SSI 6888).

4.2 Certification

This document provides a true and fair consideration of the scope and potential impacts of the work as outlined in the EIS / SPIR and aligns with the stages defined in the Staging Plan.

Signed		Signed	
Name	Melissa Mayfield-Smith	Name	Steve Dalley
Position	RP2J Environment Officer	Position	RP2J Project Manager
Date	26 October 2021	Date	27 October 2021



MEMO REPORT

TO: Melissa Mayfield-Smith
FROM: Josie Stokes
SUBJECT: BC Act 5 Part tests of Significance for threatened microbats
OUR REF: PS122282 – NICB: Rankin Park to Jesmond
DATE: 28 October 2021

1. BACKGROUND

The Rankin Park to Jesmond Project (RP2J) is the fifth section of the Newcastle Inner City Bypass (NICB), which will be approximately 3.4 kilometres between Lookout Road at New Lambton Heights and Newcastle Road at Jesmond, to the west of the John Hunter Hospital. The project is funded by the NSW State Government. A concept design has been completed for the Project and Environmental approvals were received in early 2019.

During a structural inspection in May 2019 of one of the culverts proposed for decommissioning (Dark Creek culvert), a small colony of microbats were observed roosting in a 50-75 millimetre gap between the crown units of the culvert.

SMEC undertook a targeted survey of the culvert in October 2019 to determine the species of microbat roosting in the culvert. Echolocation calls confirmed the presence of the Little Bent-winged Bat (*Miniopterus australis*) and the Large Bent-winged Bat (*Miniopterus orianae oceanensis*) inside the Dark Creek culvert (SMEC, 2019). Both species are listed as Vulnerable under the NSW *Biodiversity Conservation Act 2016*. Based on the number of calls recorded, it is most likely that the colony was dominated at the time by the Little Bent-winged Bat, but both species have similar roosting habitat requirements.

The importance of the Dark Creek culvert as an over-wintering roost site for either *Miniopterus* species is not currently known, there are numerous structures within the locality that could provide suitable roosting habitat, some of which have been inspected with remote camera surveys.

A remote survey of the entire Dark Creek culvert was undertaken for Transport for New South Wales (TfNSW) in December 2020 to determine if any of the Bent-winged Bats were using the culvert as a maternity roost, and to identify if any other microbat species were roosting in the culvert. No microbats were present during this inspection. This means Bent-winged Bats are not using the Dark Creek culvert as a maternity roost and would have returned to maternity roosts in limestone caves to give birth. Similarly, no Southern Myotis were recorded during the 2019 targeted survey or the December 2020 remote camera survey, suggesting Southern Myotis are not likely to be using the Dark Creek culvert as a maternity roost site.

WSP ecologists undertook an evening fly-out survey of Dark Creek culvert on 18 January 2021. No microbats were observed exiting the culvert and none were recorded on the Anabat call recording devices, placed at either end of the culvert. This meant that the majority of the colony was away in the maternity caves attending to young but could return towards end February-beginning of March 2021. However, they did not return in February-March 2021. This is consistent with the literature on *Miniopterus* population dynamics (see Dwyer 1963, White, 2011 and Gonslaves and Law, 2018) who found the females and juveniles arrive back to their non-maternity roots between February and March each year.

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To gather further information on the microbat population roosting in the Dark Creek culvert and to check if the bats had arrived back from their maternity caves, WSP ecologists undertook additional evening fly-out surveys on two consecutive nights (9 and 10 September 2021) of the Dark Creek culvert. Weather conditions on the 9 and 10 of September were considered optimal for microbat activity with evening temperatures ranging from 23°C - 26 °C. Conditions were calm with no wind and very high insect activity. Common microbat species such as Gould's Wattled Bat (*Chalinolobus gouldii*) were recorded foraging in the open forested areas of Jesmond Park, but not emerging from the culvert (as they mainly roost in tree hollows). No microbats were recorded emerging from either end of the Dark Creek Culvert. After the two nocturnal flyout surveys, TfNSW commissioned a diurnal remote camera inspection of Dark Creek culvert on 17 September 2021 and this survey also confirmed no microbats were currently present in the culvert.

Information collected during all of the flyout surveys and the remote camera inspections was used to inform the BC Act Assessments of Significance for the three threatened species of microbat likely to occur in the project area (this report).

2. PURPOSE OF THIS REPORT

The purpose of this technical report is to provide updated information about the importance of the Dark Creek culvert as a potential over-wintering roost site for the Little Bent-winged Bat and to support a low impact works submission for the infilling of gaps in the Dark Creek culvert while microbats are absent.

This report also assesses the potential impacts of the project as a whole on the three threatened microbats. Potential impacts include removal of approximately 50.9 hectares of native vegetation, a proportion of which would be suitable foraging habitat and temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat).

3. CURRENT STATUS OF MICROBAT POPULATION AT DARK CREEK

There have been no threatened microbats (Little Bent-winged Bats or Large Bent-winged Bats) recorded roosting in the Dark Creek culvert since December 2020 when pregnant females would have migrated to maternity caves to give birth (see Table 3.1). The current absence of microbats presents TfNSW and its contractors with a unique opportunity to minimise impacts to threatened microbats by undertaking low impact works such as infilling of the gaps between the culvert crown units and any culvert lift holes while microbats are absent.

Table 3.1 Summary of survey results for the Dark Creek culvert from 2019-2021

DATE	SURVEY TYPE	RESULTS
May 2019	Remote camera survey during structural inspection	Approximately 200-300 Little Bentwing Bats roosting in a 50-75 millimetre gap between the crown units of the culvert.
October 2019	Evening flyout survey and Anabat survey of culvert (SMEC)	Emergence of Little Bent-winged and the Large Bent-winged Bat. The majority of calls recorded on Anabat were attributed to the Little Bent-winged Bat.
December 2020	Remote camera survey	No microbats were present during this inspection.
January 2021	Evening flyout survey and Anabat survey of culvert (WSP)	No microbats were observed exiting the culvert and none were recorded on the Anabat call recording devices, placed at either ends of the culvert.
September 2021	Consecutive evening flyout survey and Anabat survey of culvert (WSP)	No microbats were observed exiting the culvert and none were recorded on the Anabat call recording devices, placed at either ends of the culvert.
September 2021	Remote camera survey	No microbats were present during this inspection.

Individuals of Little Bent-winged Bats use a network of non-maternity roosts throughout the year. They congregate in the thousands with Large Bent-winged Bats in a small number of caves in NSW to give birth over summer. Non-breeding males often roost alone or in small numbers separate from females. Over winter, both species will use caves, culverts, abandoned mines, bridges, tunnels, buildings and sometimes tree hollows as hibernation / winter roosts (Churchill 2008).

Prior to December 2020, the Dark Creek culvert was used opportunistically as an over-wintering roost site for Little Bent-winged Bats and a small number of Large Bent-winged Bats. The carrying capacity of the 50-75 millimetre gap between the crown units of the Dark Creek culvert is relatively small and as such does not meet the requirements of a high conservation over-winter roost site (unlike other sites such as Balickera and Brookfield Tunnels that have carrying capacities in the thousands).

Gonslaves and Law (2018) demonstrated that fidelity to roost sites varies by individual and is closely linked to the availability of foraging habitat (such as large, open spaces with artificial lighting). White (2011) also recorded *Miniopterus orianae oceanensis* shuffling between artificial roosts (disused military tunnels and underground bunkers) in association with changes in weather conditions.

Infilling of gaps between the culvert crown units in Dark Creek culvert while microbats are absent from the culvert is considerably less of an impact compared with implementing potentially disruptive exclusion measures when an entire colony of threatened microbats may be present within the culvert.

The low impact work procedure for infilling gaps in Dark Creek culvert would only be implemented in accordance with the mitigation measures outlined in Section 5 below.

4. BC ACT ASSESSMENTS OF SIGNIFICANCE

Cave-dwelling Microchiropteran bats

The following three (3) threatened cave-dwelling microchiropteran bats have potential foraging habitat within the study area, and potential artificial roosting habitat within the study area especially within the Dark Creek Culvert:

- Little Bent-winged Bat (*Miniopterus australis*), listed as Vulnerable on the BC Act
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*), listed as Vulnerable on the BC Act
- Southern Myotis – (*Myotis macropus*), listed as vulnerable on the BC Act.

None of the above mentioned microbats are listed under the EPBC Act.

Little Bent-winged Bat (*Miniopterus australis*)

The Little Bent-winged Bat is listed as Vulnerable under the BC Act. The Little Bent-winged Bat is distributed between northern Queensland to southern New South Wales, along the Great Dividing Range. The Little Bent-winged Bat utilises moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and *Banksia* scrub for foraging. The species is generally found in well-timbered areas.

Little Bent-winged Bats roost over winter in caves, tunnels, tree hollows, abandoned mines, stormwater drains, culverts, bridges and sometimes buildings or tree hollows during the day, and at night forage in densely vegetated habitats.

In late spring, pregnant females disperse from the east coast and migrate to maternity roosts in caves (Dwyer 1968) where the species congregates in the thousands with Large Bent-winged Bats in a single known maternity cave in NSW to breed over summer, showing high maternity roost fidelity (Churchill 2008). They give birth in the maternity caves and raise young over summer before returning east in autumn (Dwyer 1963; Hoyer and Spence 2004).

Large Bent-winged Bat (*Miniopterus orianae oceanensis*)

The Large Bent-winged Bat is listed as Vulnerable under the BC Act. The Large Bent-winged Bat is distributed from southern Queensland to northern Victoria, along the Great Dividing Range (with a small number of scattered recordings outside this range). Large Bent-winged Bats utilise moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, *Melaleuca* swamps, dense coastal forests and Banksia scrub for foraging. The species is generally found in well-timbered areas. Over winter, Large Bent-winged Bats will use caves, culverts, bridges, abandoned mines and tunnels as hibernation / winter roosts (Churchill 2008). At night they forage in densely vegetated habitats.

Individuals use a network of roosts throughout the year. In late spring, pregnant females disperse from the east coast and migrate to one of three known maternity roosts in caves in New South Wales (NSW), where they give birth and raise young over summer before returning east in autumn (Dwyer 1963; Hoye and Spence, 2004).

They congregate in the thousands in a small number of caves in NSW, often shared with Little Bent-winged Bats, to breed over summer. The species use the same maternity roost year after year. Females disperse to maternity roosts in limestone caves in late spring/early summer and return to coastal roosts in March/April (Dwyer 1963; Hoye and Spence, 2004; White, 2011).

Southern Myotis (*Myotis macropus*)

The Southern Myotis is listed as Vulnerable under the BC Act. The Southern Myotis is patchily distributed in a broad coastal band in northern and eastern Australia and is closely associated with waterways (Churchill 2008, Gorecki, 2020). The project occurs in the core of their distribution but the closest Southern Myotis maternity roost to the Dark Creek culvert is the bridge over Ironbark Creek near Hexham approximately seven kilometres away.

The Southern Myotis utilises habitat near water, generally roosting in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Roosting habitat is often used across years and occupied year-round, but each colony will have a network of roosts within foraging range (Churchill 2008). Southern Myotis show high maternity roost fidelity however, situated usually over or within 100 m from water (Campbell 2009).

Southern Myotis forage over streams and pools catching insects and small fish by raking their feet across the water surface. The species' close association with waterways reflects this highly specialised foraging behaviour (Thompson and Fenton 1982).

Specific impacts to threatened microbats

Potential impacts include removal of approximately 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat, and temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat). As all three threatened microbats are cave-dwelling species and occupy similar ecological niches, they have been assessed collectively below.

4.1 SECTION 7.3 TESTS OF SIGNIFICANCE

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.

From May 2019 to December 2020, a colony of Little Bent-winged Bats and small numbers of Large Bent-winged Bats were observed utilising a 50-75 millimetre gap between the crown units of the Dark Creek culvert as an over-wintering non-maternity roost site. The Southern Myotis was not recorded roosting in the culvert or foraging in the vicinity of the culvert. Surveys undertaken since December 2020 have not recorded the presence of any microbats roosting within Dark Creek culvert.

There are foraging opportunities for these species associated with remnant vegetation, throughout the proposal area and in the wider locality. Approximately 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat, and temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat) would be affected by the Project. Bent-winged Bats often prefer to forage along the ecotonal edges between open and habitats and these types of foraging opportunities will continue to exist throughout the proposal area and further abroad. An abundance of available occurs within the locality (National Parks and reserves), the impact of 50.9 ha would represent a loss of <5% of potential foraging habitat in the region for these species. Therefore, the projects impact on potential foraging habitat is considered unlikely to cause significantly adverse effects upon cave-dwelling microbat species, due to the relatively small proportion of available foraging habitat removed.

The project will result in the temporary removal of opportunistic roosting habitat for threatened bats, particularly the Little Bent-winged Bat. However these temporary impacts will be further mitigated through the implementation of the following:

- 1) A pre-clearing survey of the Dark Creek culvert would be undertaken by a suitably qualified ecologist prior to any works commencing. An evening flyout and Anabat survey of the culvert should be done the evening before works are proposed to start.
- 2) A diurnal a remote camera survey should be undertaken on the morning works are proposed to start.
- 3) An ecologist specialised in microbat mitigation must be on site to determine if microbats are present during the remote camera pre-clearing survey.
- 4) *(Hold point)* Ecologist to sign pre-clearing checklist that no microbats are present and sealing works of the gaps can commence.
- 5) The gaps would be sealed with a smooth grout product. If expandable foam is used to infill the gaps, it would need to be covered with thin plywood or similar to remove roughened surface, microbats may grip onto.
- 6) The preferred product is a smooth concrete grout or similar as it reduces the likelihood of microbats gripping onto infilled surfaces.
- 7) Once infilled, the surface must be smoothed and contain no edges/divots that the microbats may be able to grip onto. Painting over the surface with a glossy paint may achieve this.
- 8) The contractor should commence filling in gaps closest to where the microbats have been recorded roosting previously, approximately 45 metres downstream of the inlet (Jesmond Park side).
- 9) If works continue over consecutive days, a pre-clearing survey is required each morning prior to any sealing works commencing.

Further, the Project has committed to providing long-term compensatory threatened microbat habitat into the new Dark Creek culvert would be provided including:

- Leaving the transport/lift holes in the new culvert unsealed and roughened internally to a 1-2mm thickness.
- Where possible, habitat in the form of horizontal or longitudinal recesses
- Applying coarse cement render (aggregate) and/or silicon on the roof of the culvert.
- Monitoring of the new roosting habitat for use by threatened microbats.

Provided the mitigation measures outlined in the low impact work procedure are implemented, it is unlikely 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.

In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

· 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

· 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.

In relation to the habitat of a threatened species, population or ecological community: the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Approximately 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat, and temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat) would be affected by the Project. The temporary removal of opportunistic over-wintering roosting habitat for the Little Bent-winged Bat and small numbers of Large Bent-winged Bats is not likely to have an adverse effect on these species, especially when microbats are absent. Further, the project has committed to providing long-term compensatory microbat habitat into the new Dark Creek culvert which will increase roosting opportunities for threatened microbat species in the locality.

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, and

Approximately 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat, is proposed to be removed by the project. Bent-winged Bats often prefer to forage along the ecotonal edges between open and habitats and these types of foraging opportunities will continue to exist throughout the proposal area and further abroad. An abundance of available occurs within the locality (National Parks and reserves), the impact of 50.9 ha would represent a loss of <5% of potential foraging habitat in the region for these species, some of which is already fragmented and isolated from other areas of habitat.

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 proposal area provides a relatively small amount of potential foraging habitat for these species. The removal of 50.9 ha of potential foraging habitat will present <5% of available habitat in the region for these species. Foraging opportunities occurring within the proposal area, such as ecotonal zones, will continue to exist and an abundance of similar and potential higher quality foraging opportunities will remain available the wider locality. The temporary and intermittent use of Dark Creek culvert has a relatively small carrying and as such does not meet the requirements of a high conservation over-winter roost site (unlike other sites such as Balickera and Brookfield Tunnels that have carrying capacities in the thousands).

The project would not impact habitat considered critical to the long-term survival of populations in the locality.

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)

The study area does not represent a declared area of outstanding biodiversity value and is not in the immediate vicinity of such areas.

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 following key threatening processes (KTP) are listed in NSW under the BC Act for the three threatened microbats and may result from the project:

- Clearing of native vegetation
- Predation by the *Felis catus* (feral cat)
- Predation by the *Vulpes vulpes* (European red fox)
- Loss of hollow-bearing trees
- Alteration to the natural flow regimes of rivers and streams and their floodplains and wetlands
- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition

The KTP ‘clearing of native vegetation’ is relevant to the project. While the three threatened microbats subject to this test of significance prefer subterranean roost sites, there is a possibility that the Southern Myotis could be roosting temporarily in tree hollows (within 100 metres of large waterways) so the KTP ‘loss of hollow-bearing trees’ is also relevant to the project.

The removal of 50.9 ha of potential foraging habitat will present <5% of available habitat with the region for these species. Foraging opportunities occurring within the proposal area, such as ecotonal zones, will continue to exist and an abundance of similar and potential higher quality foraging opportunities will remain available the wider locality. Although the proposed action will represent a small loss of potential foraging habitat, such habitat only represents a very small component of locally occurring resources accessible to these species.

Conclusion of Significance Assessment

From May 2019 to December 2020, a colony of Little Bent-winged Bats and small numbers of Large Bent-winged Bats were observed utilising a 50-75 millimetre gap between the crown units of the Dark Creek culvert as an over-wintering non-maternity roost site. The Southern Myotis was not recorded roosting in the culvert or foraging in the vicinity of the culvert. Surveys undertaken since December 2020 have not recorded the presence of any microbats roosting within Dark Creek culvert.

Approximately 50.9 hectares of native vegetation, of which, only a small proportion would be suitable foraging habitat, and temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat) would be affected by the Project. The temporary removal of opportunistic over-wintering roosting habitat for the Little Bent-winged Bat and small numbers of Large Bent-winged Bats is not likely to have an adverse effect on these species, especially when microbats are absent.

Provided the mitigation measures outlined in the low impact work procedure are implemented, there is unlikely to be a significant impact to the Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis.

Further, the project has committed to providing long-term compensatory microbat habitat into the new Dark Creek culvert which will increase roosting opportunities for threatened microbat species in the locality.

5. CONSTRUCTION MITIGATION REQUIREMENTS

In accordance with Condition of Approval E10 (DPIE, 2019), pre-clearing surveys before the removal or clearing of any vegetation, or the demolition of structures identified as potential roosting sites for microbats (eg Dark Creek culvert), pre-clearing/demolition inspections for the threatened species must be undertaken.

Should microbats be detected roosting in the Dark Creek culvert prior to the low impact works commencing, the works would not be undertaken at that time and the Microbat Management Strategy would be implemented (in accordance with the Construction Environment Management Plan).

Construction activities of the project relevant to microbats includes providing long-term compensatory roosting habitat for threatened microbats in the new culvert/s including:

- Leaving the transport/lift holes in the new culvert unsealed and roughened internally to a 1-2mm thickness.
- Where possible, habitat in the form of horizontal or longitudinal recesses
- Applying coarse cement render (aggregate) and/or silicon on the roof of the culvert.
- Monitoring of the new roosting habitat for use by threatened microbats.

5.1 LOW IMPACT WORK PROCEDURE

It is recommended the following low impact work procedure is implemented by the contractor/contractor's representative. This low impact work procedure forms the basis of mitigation measures to minimise any potentially significant impacts to threatened microbats, in particular the Little Bent-winged Bat.

- 1) A pre-clearing survey of the Dark Creek culvert would be undertaken prior to any works commencing. An evening flyout and Anabat survey of the culvert should be done the evening before works are proposed to start.
- 2) A diurnal a remote camera survey should be undertaken on the morning works are proposed to start.
- 3) An ecologist specialised in microbat mitigation must be on site to determine if microbats are present during the remote camera pre-clearing survey.
- 4) (*Hold point*) Ecologist to sign pre-clearing checklist that no microbats are present and sealing works of the gaps can commence.
- 5) The gaps would be sealed with a smooth grout product. If expandable foam is used to infill the gaps, it would need to be covered with thin plywood or similar to remove roughened surface, microbats may grip onto.
- 6) The preferred product is a smooth concrete grout or similar as it reduces the likelihood of microbats gripping onto infilled surfaces.
- 7) Once infilled, the surface must be smoothed and contain no edges/divots that the microbats may be able to grip onto. Painting over the surface with a glossy paint may achieve this.
- 8) The contractor should commence filling in gaps closest to where the microbats have been recorded roosting previously, approximately 45 metres downstream of the inlet (Jesmond Park side).
- 9) If works continue over consecutive days, a pre-clearing survey is required each morning prior to any sealing works commencing.
- 10) Following sealing works and construction of the new culvert/s, provision of long-term compensatory microbat habitat into the new Dark Creek culvert would be provided including:
 - Leaving the transport/lift holes in the new culvert unsealed and roughened internally to a 1-2mm thickness.
 - Where possible, habitat in the form of horizontal or longitudinal recesses
 - Applying coarse cement render (aggregate) and/or silicon on the roof of the culvert.
 - Monitoring of the new roosting habitat for use by threatened microbats.

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Placeholder for response of any other consultation records