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Newcastle Inner City Bypass: Rankin Park to Jesmond

Microbat Management Strategy

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Newcastle Inner City Bypass: Rankin Park to Jesmond
Microbat Management Strategy

Transport for NSW

WSP
Level 3, 51-55 Bolton St
Newcastle NSW 2300
PO Box 1162
Newcastle NSW 2300

Tel: +61 2 4929 8300
Fax: +61 2 4929 8382
wsp.com

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	NAME	DATE	SIGNATURE
Prepared by:	Josie Stokes	1 November 2021	
Reviewed by:	Toby Lambert	1 November 2021	
Approved by:	Alex Cockerill	1 November 2021	

WSP acknowledges that every project we work on takes place on First Peoples lands.
We recognise Aboriginal and Torres Strait Islander Peoples as the first scientists and engineers and pay our respects to Elders past and present.

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1 Project Background

1.1 Purpose of this Microbat Management Strategy

The purpose of this Microbat Management Strategy (MMS) is to provide safeguards to minimise potential impacts during each construction phase for threatened microbats that have been recorded, or that have a high likelihood of occurring within the project area.

Six threatened microbat species have been recorded or are predicted to occur within the project area including:

- Eastern Free-tail bat (*Mormopterus norfolkensis*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Little Bent-winged Bat (*Miniopterus australis)*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

In May 2019 during a daytime structural inspection of the Dark Creek culvert, a colony of microbats was observed roosting in a 50–75-millimetre gap between the crown units of the existing culvert. The microbats were unable to be identified to species level from the video footage.

To confirm the microbat species roosting within the Dark Creek culvert, a targeted survey of the culvert was undertaken in October 2019. The survey confirmed that the Little Bent-winged Bat and the Large Bent-winged Bat were roosting 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 safeguards and mitigation measures proposed as part of this strategy would be incorporated into the project's Construction Environmental Management Plan (CEMP) and project design.

This is required by the project's Conditions of Approval (E10) where '*before the removal or clearing of any vegetation, or the demolition of structure identified as potential roosting sites for microbats, commences, pre-clearing/demolition inspections for the threatened species must be undertaken. The inspections, and any subsequent relocation of fauna and associated management/offset measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist. Survey and relocation methodologies and management/offset measures must be included in the Construction Flora and Fauna Management Sub-plan required under Condition C4*' (DPIE, 2019).

Pre-clearing surveys and other industry standard mitigation measures for hollow-tree dependent microbats (Eastern Free-tail bat, Yellow-bellied Sheathtail-bat and the Greater Broad-nosed Bat) would be included in the CEMP Construction Flora and Fauna Management Sub-plan.

The main focus of this Microbat Management Strategy is to minimise potential impacts on cave-dwelling microbats (Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis) during construction, especially within the Dark Creek Culvert and its vicinity.

1.2 Description of works

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.

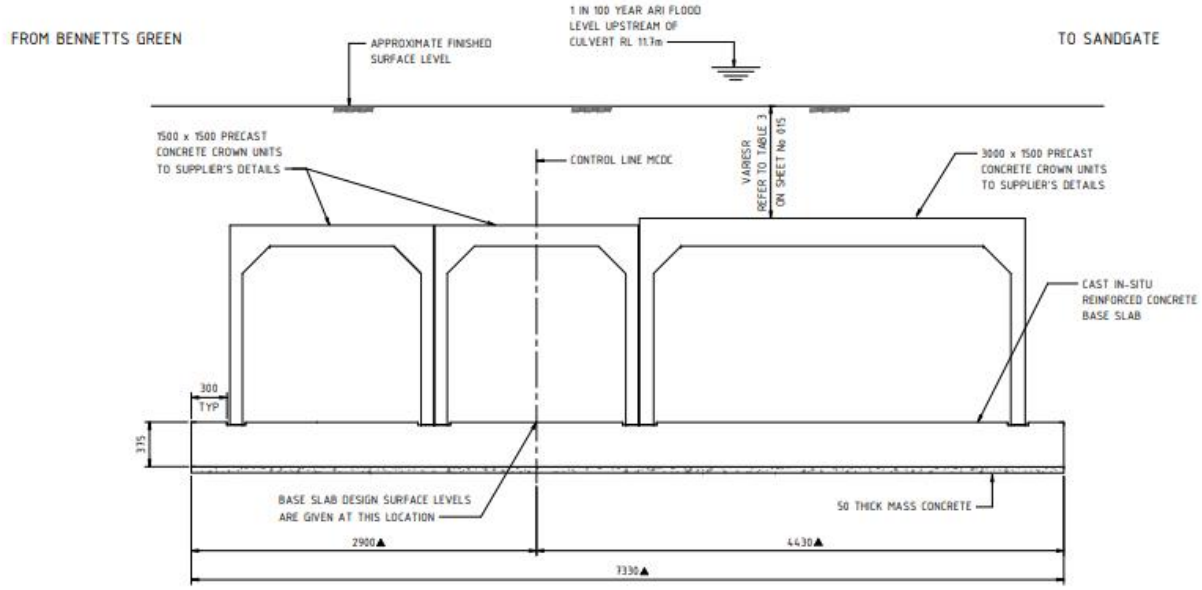
Stage 2 of the project requires the demolition of the existing sub-surface drainage structure and construction of a new channel and culvert as part of the diversion of Dark Creek. The Detailed Design report for the Dark Creek culvert (Aurecon, 2020) outlines that the existing culvert is proposed to be abandoned and a new alignment is proposed to the west with the inlet near the existing culvert inlet. The new proposed culvert structure will consist of three cells of two different sizes – two 1500 mm x 1500 mm cells and one 3000 mm x 1500 mm cell (internal dimensions of the precast crown units) (see Figure 1.1 below)

1.2.1 Provision of microbat roost habitat within the new Dark Creek culvert

The Project has also committed to providing long-term compensatory threatened microbat habitat into the new Dark Creek culvert. While the design is subject to change, any new design would incorporate the following:

- 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.

Figure 1.1 Detailed design drawing of the proposed Dark Creek culverts (Aurecon, 2020)



2 Microbat population status

2.1 Microbat species likely to occur in project area

2.1.1 Hollow-bearing tree dependent microbats

The following three (3) threatened hollow-bearing tree dependent microbats have potential roosting and foraging habitat within the vegetated sections of the project area, especially where hollow-bearing trees area present:

- Eastern Free-tail bat (*Mormopterus norfolkensis*), listed as Vulnerable on the BC Act
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*), listed as Vulnerable on the BC Act
- Greater Broad-nosed Bat (*Scoteanax rueppellii*), listed as vulnerable on the BC Act.

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

2.1.1.1 Eastern Free-tail bat (*Mormopterus norfolkensis*)

The Eastern Freetail-bat is found along the east coast from south Queensland to southern NSW. Occur in dry sclerophyll forest and woodland east of the Great Dividing Range. Roost mainly in tree hollows but will also roost under bark or in man-made structures (Churchill, 2008). Potential habitat was recorded in the study area. This species has previously been recorded within the project area by Umwelt (2006).

2.1.1.2 Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)

The Yellow-bellied Sheathtail Bat is widespread through tropical Australia and migrates to southern Australia in summer. Occurs in eucalypt forest where it feeds above the canopy and in mallee or open country where it feeds closer to the ground. Generally, a solitary species but sometimes found in colonies of up to ten. It roosts and breeds in tree hollows but has also been recorded roosting under exfoliating bark, in burrows of terrestrial mammals, in soil cracks and under slabs of rock and in the nests of bird and sugar gliders (Churchill, 2008). Potential habitat was recorded in the Project area. This species has previously been recorded within the project area by Umwelt (2006).

2.1.1.3 Greater Broad-nosed Bat (*Scoteanax rueppellii*)

The preferred hunting areas of this species include tree-lined creeks and the ecotone of woodlands and cleared paddocks but it may also forage in rainforest. Typically it forages at a height of 3–6 metres but may fly as low as one metre above the surface of a creek. It feeds on beetles, other large, slow-flying insects and small vertebrates. It generally roosts in tree hollows but has also been found in the roof spaces of old buildings (Churchill, 2008). Potential habitat was recorded in the study area. This species has previously been recorded within the project area by Umwelt (2006).

2.1.2 Cave-dwelling microbats

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

- 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.

2.1.2.1 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; Hoye and Spence 2004).

2.1.2.2 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 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. 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 roots in March/April (Dwyer 1963; Hoye and Spence, 2004; White, 2011).

2.1.2.3 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).

2.2 Potential Impacts

2.2.1 Hollow-bearing tree dependent microbats

Potential impacts to hollow-bearing tree dependent microbats from construction of the project include:

- removal of approximately 50.9 hectares of vegetation comprising about 39.2 hectares of native vegetation and associated habitat for roosting and foraging habitat
- removal of about 320 hollow-bearing trees within the construction area
- injury and mortality during construction when vegetation and habitat is being removed, machinery and plant during construction, and from operational traffic.

Unavoidable impacts to hollow-bearing tree dependent microbats were assessed and quantified in accordance with the NSW FBA (OEH, 2014) in the Environment Impact Statement for the project (GHD, 2016).

In accordance with the project Conditions of Approval (E10), pre-clearing inspections for threatened species must be undertaken and included in the CEMP (DPIE, 2019).

Minimising the removal of native vegetation and mature trees, undertaking pre-clearing surveys and implementing other industry standard construction mitigation measures for hollow-tree dependent microbats (Eastern Free-tail bat, Yellow-bellied Sheathtail-bat and the Greater Broad-nosed Bat) are not a focus of this Microbat Management Strategy, but would be included in the CEMP Construction Flora and Fauna Management Sub-plan.

To minimise potential impacts to hollow-bearing tree dependent microbats, it is recommended the Construction Flora and Fauna Management Sub-plan of the CEMP includes industry-standard measures such as those outlined in the *Biodiversity Guidelines: Protecting and managing biodiversity on TfNSW projects* (Transport for NSW, 2011).

2.2.2 Cave-dwelling dependent microbats

Potential impacts to cave-dwelling microbats from construction of the project include:

- removal of approximately 50.9 hectares of vegetation, of which, only a small proportion would be suitable foraging habitat
- temporary removal of occasional roosting habitat at the Dark Creek culvert (for Little Bent-winged Bat and Large Bent-winged Bat).

In accordance with S7.3 of the BC Act, significance assessments were undertaken for the three cave-dwelling microbats (WSP, 2021). The assessments concluded that the project is unlikely to have a significant impact, provided the mitigation measures outlined in the low impact work procedure in Section 3 of this Microbat Management Strategy are implemented.

Works on Dark Creek culvert can only be undertaken when no microbats are present.

If microbats return to Dark Creek culvert during construction, works must be rescheduled for when the bats are absent (usually absent in December to February when they are at maternity caves).

2.3 Importance of microbat habitat at Dark Creek culvert

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 2.1 below).

Table 2.1 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.

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.

Prior to December 2020, the Dark Creek culvert was used opportunistically as an over-wintering non-maternity 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).

The Southern Myotis was not recorded roosting/breeding in Dark Creek culvert or foraging in the vicinity of the culvert.

3 Infilling/sealing of microbat habitat

The infilling/sealing of gaps (low impact works) which may be known or potential microbat roosting habitat in Dark Creek can only be undertaken when threatened microbats are not present. If microbats return to Dark Creek culvert during construction, works must be rescheduled for when the bats are absent (usually absent December to February when they are at maternity caves).

The infilling/sealing of gaps whilst threatened microbats are not present in the culvert has been committed to by TfNSW as a mitigation measure to minimise any potentially significant impacts to threatened microbats, in particular the Little Bent-winged Bat (WSP, 2021) and must be implemented.

The infilling/sealing 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.

3.1 Prior to works

A suitably qualified project ecologist would be appointed prior to works to ensure the Microbat Management Strategy, in particular, the infilling/sealing of gaps procedure in Section 3.2 is implemented successfully.

A suitably qualified ecologist is considered to be an individual with:

- a minimum of five years of experience in microbat ecology and management.
- experience undertaking microbat surveys, especially roost site searches for Little and Large Bent-winged Bats and the Southern Myotis
- experience in emergence surveys, ultrasonic recording and thermal camera recording.

The project ecologist must also hold a current NPWS S132 Scientific Licence and a relevant Animal Research Authority issued by an approved Animal Care and Ethics Committee.

3.2 Infilling/sealing procedure

It is recommended the following infilling/sealing procedure is implemented by the contractor/contractor's representative.

1. A pre-clearing evening flyout/emergence survey of the Dark Creek culvert would be undertaken by a suitably qualified ecologist prior to any works commencing. An evening flyout/emergence and Anabat survey of the culvert should be done the evening before works are proposed to start.
2. A diurnal remote camera survey should be undertaken on the morning works are proposed to start to ensure microbats are not present.
3. A suitably qualified ecologist 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 microbats are not 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 (from 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.

This procedure is summarised in Table 3.1.

Table 3.1 Infilling/sealing of gaps at Dark Creek culvert procedure

Management measure	Timing	Details	Responsibility
Engage suitably qualified project ecologist	Pre-construction	Engage a suitably qualified project ecologist as outlined in Section 3.1.	Contractor
Emergence survey of Dark Creek culvert	Construction	Undertake a pre-clearing survey/ evening flyout (emergence survey) and Anabat survey of the Dark Creek culvert the evening before works are proposed to start.	Project Ecologist
Remote camera survey	Construction	Undertake a pre-clearing survey/ remote camera survey the morning works are proposed to start to ensure microbats are not present. *(Hold point)* Ecologist to sign pre-clearing checklist that microbats are not present and sealing works of the gaps can commence.	Contractor's or TfNSW tunnel inspection specialist Project Ecologist
Seal gaps/microbat habitat in culvert	Construction	Infill/ seal gaps and holes/cracks with a smooth grout product. Use a smooth concrete grout or similar to reduce the likelihood of microbats gripping onto infilled surfaces. If expandable foam is used, cover it with thin plywood or similar. Smooth the surface and ensure it contain no edges/divots that the microbats may be able to grip onto.	Contractor
	Construction	Seal gaps starting closest to where the microbats have been recorded previously, approximately 45 metres downstream of the inlet (Jesmond Park side).	Contractor
	Construction	If infilling/sealing gaps occurs over consecutive days, undertake a pre-clearing survey remote camera survey each morning of works to ensure no microbats have moved in overnight. *(Hold point)* Ecologist to sign pre-clearing checklist that microbats are not present and sealing works of the gaps can commence.	Contractor's or TfNSW tunnel inspection specialist Project Ecologist

Management measure	Timing	Details	Responsibility
Recreation of roosting habitat in new culvert/s	Construction	Recreate long-term compensatory microbat habitat into the new Dark Creek culvert/s by: leaving the transport/lift holes in the new culvert unsealed and roughened internally to a 1-2mm thickness. Where possible, providing habitat in the form of horizontal or longitudinal recesses Applying coarse cement render (aggregate) and/or silicon on the roof of the culvert Installing microbat habitat approximately 45-60 metres downstream of the inlets on the Jesmond Park side)	Contractor
Monitoring of Dark Creek culvert and long-term compensatory microbat habitat	Construction/ Post-construction	Engage a suitably qualified ecologist as outlined in Section 3.1 to monitor the new roosting habitat for use by threatened microbats.	TfNSW
	Post-construction	1. After construction is complete, undertake monthly daytime remote camera surveys (between March and November) of the new Dark Creek culverts and new roosting habitat. 2. Ecologist to review monthly remote camera video footage for threatened microbats: - If microbats are detected on remote camera video footage, ecologist to undertake survey to obtain information on the microbat population in the culvert/s and potential use of the new roosting habitat. Surveys may include emergence surveys, ultrasonic recordings and thermal camera recording. - If no microbats are found, monthly daytime remote camera surveys should be undertaken between March and November for 24 months after construction is complete, or until threatened microbats are recorded. If no threatened microbats are detected after 24 months of monthly daytime remote camera surveys between March and November, then monitoring of the new Dark Creek culverts and new roosting habitat can be discontinued.	TfNSW tunnel inspection specialist Ecologist
	Post-construction	Submit a report to TfNSW documenting the findings of the remote camera and/or microbat population surveys.	Ecologist

4 Conclusion

The purpose of this Microbat Management Strategy is to provide safeguards to minimise potential impacts during each construction phase for threatened microbats that have been recorded, or that have a high likelihood of occurring within the project area.

Six threatened microbat species have been recorded or are predicted to occur within the project area including:

- Eastern Free-tail bat (*Mormopterus norfolkensis*)
- Yellow-bellied Sheathtail-bat (*Saccolaimus flaviventris*)
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Little Bent-winged Bat (*Miniopterus australis)*
- Large Bent-winged Bat (*Miniopterus orianae oceanensis*)
- Southern Myotis (*Myotis macropus*).

The main focus of this Microbat Management Strategy is to minimise potential impacts on cave-dwelling microbats (Little Bent-winged Bat, Large Bent-winged Bat and Southern Myotis) during construction, especially within the Dark Creek Culvert and its vicinity.

Section 3 provides a procedure for the infilling/sealing of gaps in Dark Creek that can be implemented when threatened microbats are not present.

The Contractor would recreate long-term compensatory microbat habitat into the new Dark Creek culvert/s including:

- leaving the transport/lift holes in the new culvert unsealed and roughened internally to a 1-2mm thickness.
- where possible, providing habitat in the form of horizontal or longitudinal recesses
- applying coarse cement render (aggregate) and/or silicon on the roof of the culvert
- installing microbat habitat approximately 45-60 metres downstream of the inlets on the Jesmond Park side)

After construction is complete, undertake monthly daytime remote camera surveys (between March and November) of the new Dark Creek culverts and new roosting habitat. Monthly daytime remote camera surveys should be undertaken between March and November for 24 months after construction is complete.

The Ecologist would review monthly remote camera video footage for threatened microbats.

If microbats are detected on remote camera video footage, ecologist to undertake survey to obtain information on the microbat population in the culvert/s and potential use of the new roosting habitat. Surveys may include emergence surveys, ultrasonic recordings and thermal camera recording.

If no microbats are found, monthly daytime remote camera surveys should be undertaken between March and November for 24 months after construction is complete, or until threatened microbats are recorded.

If no threatened microbats are detected after 24 months of monthly daytime remote camera surveys between March and November, then monitoring of the new Dark Creek culverts and new roosting habitat can be discontinued.

A report would be submitted to TfNSW by the microbat ecologist documenting the findings of the remote camera and/or microbat population surveys.

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