Greena Ecological Consultancy

ECOLOGICAL REPORT

OXFORD FLOOD ALLEVIATION SCHEME

IMSE500177-CH2-XX-00-RP-EN-0733

2020 BAT SURVEYS

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Executive Summary

The proposed scheme comprises the following:

- Construction of a new channel, between the A34 to the west and the railway to the east, to the west of Oxford city centre. The channel will extend south-easterly from the confluence of the Botley and Seacourt Streams lying approximately 0.6km north of Botley Road, to just south of Kennington (approximately 0.3km south of the A423 ring road). The new channel will carry excess flow from the Seacourt Stream, Bulstake Stream and Hinksey Stream channels during a flood event, thereby reducing the water level in the main River Thames and so reducing the frequency of flooding in built-up areas. The channel will comprise two stages:
  - First stage channel – this will be the inner part of the channel which will be permanently wet and carry flowing water all of the time; and
  - Second (or 'two-stage') channel – this will be created by lowering the ground between 1m and 1.5m to one or both sides of the first stage channel. The second stage channel will be dry for most of the time but when river levels are sufficiently high, water will flow along the second stage channel. This may occur regularly during wetter periods, especially during the winter months. During large flood events, the fields in the existing floodplain around the new channel will also continue to be inundated.
    In some local areas, a second stage channel will be constructed without a first stage channel and vice versa;
- Provision of new flood defences (embankments and walls) to protect houses which would otherwise continue to flood even with the reduced river levels;
- Provision of new culverts and bridges to cross highways and footpaths to maintain access routes;
- Installation of flood gates for access (under normal, non-flood, conditions) through the new defences noted above;
- Creation of new and/or improved habitat for flora, fauna and fisheries, where it does not compromise flood defence or other environmental receptors. This habitat creation/restoration forms part of the integrated design of the Scheme to help mitigate habitat losses, to meet WFD measures and support England Biodiversity 2020 habitat creation targets e.g. new wetland habitat within the footprint of the second stage channel, new channel connecting the Bulstake and Hinksey Streams, in-channel habitat improvements including scrapes, ponds and backwaters. The wetland features in the second stage channel will incorporate a variety of profiles and gradients, to include marginal shelves, steep banks and undulating bed profiles to maximise wetland habitat diversity; and
- Removal of Towles Mill weir to allow fish migration via Hinksey Stream.

A detailed ecological study focusing on bats was requested as a part of the preparation works for the Oxford Flood Alleviation Scheme (FAS). Greena Ecological Consultancy was commissioned to re-inspect trees along the route of the proposed scheme, plus to inspect trees in potentially affected new scheme areas and where necessary carry out bat activity surveys of trees.
Surveys had previously been conducted by Greena in 2016, 2017 & 2018 which included static monitoring and transect surveys in 2018.

No Special Areas of Conservation (SACs) designated for bats have been identified within 30 km of the scheme extents and no Sites of Special Scientific Interest (SSSIs), designated for bats, have been noted within 5 km of the site. As such no specific recommendations are made for assessment of the project with respect to a designated features or Annex II bat species.

1. Introduction

1.1 Background

Oxford flood alleviation scheme

The Environment Agency is working in partnership to develop proposals to reduce flood risk in Oxford. Investigations have confirmed that a flood relief channel will bring significant flood relief benefits to Oxford. The Oxford flood alleviation scheme project team have developed a series of options to construct new channels or enlarge existing channels in the western floodplain.

Following the public consultation, the team have analysed the options in detail and now have a route for the scheme.

There are 4,500 properties in Oxford at a 1% or higher annual risk of flooding. This figure could rise to nearly 6,000 by the year 2080 with the predicted effects of climate change. Major roads, railway lines, schools and businesses could also be affected by flooding. The Environment Agency carries out regular maintenance activities and operates its assets to reduce the flood risk as much as possible, reducing this to 1,800 properties at risk.

In 2009, the Oxford flood alleviation scheme project team carried out the Oxford flood risk management strategy, a detailed study of the flood risk from rivers in Oxford. The strategy described how flood risk can be managed in Oxford over the next 100 years. Since the January 2014 floods, the project team has been working with partners including Oxfordshire County Council, Oxford City Council, Vale of White Horse District Council, Thames Water, Oxfordshire Local Enterprise Partnership, Thames Regional Flood and Coastal Committee, University of Oxford and the Oxford Flood Alliance, to develop a scheme in line with this strategy.

The project team has carried out investigations into the flood risk and possible options to alleviate this risk. Their investigations show that capacity can be increased in Oxford's western flood plain by building a new flood relief channel.

During heavy rainfall and high flows on the river, the new channel would provide additional capacity and help manage the movement of water through Oxford. It would reduce the risk of flood water entering homes, businesses and disrupting transport links. Although a channel would reduce flood risk, it cannot remove it entirely. The flood plain would still play an important role in managing flood risk in Oxford.

Bat surveys

The scheme holds the potential to result in impacts to features used by bats. Adverse impacts upon protected wildlife species, including bats, need to be avoided, minimised and / or mitigated. This report identifies the location of key features, commuting routes and foraging areas utilised by bats and provides guidance for further surveys and mitigation which should be incorporated into detailed project design, construction and operational phases to minimise impacts to bats to resurvey trees the year works are due to start.

The first phase of the preliminary tree inspections was undertaken by CH2M in September and October 2016 (CH2M Preliminary Bat Inspections, 2016, ref

IMSE500177-HGL-00-ZZ-RE-I-000179). This phase identified 55 trees with bat roosting potential.
Further inspection carried out by Greena Ecological Consultancy in 2016 concluded that 14 of these trees held negligible bat roosting potential and 30 trees low bat roosting potential. Eight features were assigned moderate bat roosting potential and two features high bat roosting potential. Six trees (or tree features) could not be directly inspected due to safety reasons.

Greena Ecological Consultancy subjected 11 trees (previously identified as moderate or high bat roosting potential or not possible to inspect) to dusk bat emergence surveys and/or pre-dawn re-entry surveys in 2016. A single tree (81) was confirmed to serve as a regular roost of two Long-eared bats. Further two trees (84 and 90) were suspected to serve as Common Pipistrelle male lekking site / roost; however, roosting was not confirmed.

The second phase of the preliminary tree inspections took place in April 2017. Follow up surveys were undertaken in July and August 2017, as well as in February 2018.
A total of 94 trees containing 190 potential bat features were inspected to assess the bat roosting potential. The scheme was later amended resulting in reduction in the no's of trees to survey. As a result, 68 trees with 150 potential bat roosting features remained in the updated area of the scheme.
While four features were identified as negligible bat roosting potential during a detailed inspection, 49 features were of low potential, 64 features of moderate potential and 30 features of high bat roosting potential.
Three potential bat roosting features could not be fully inspected for safety reasons or due to the presence of two eusocial bee colonies.

Further bat activity surveys of trees holding high or moderate bat potential as well as trees that could not be fully inspected are recommended to determine bat presence or suggest their absence. Emergence / re-entry surveys will be carried out in the bat active season (May to September) in suitable weather.
Re-inspections of features that do not require bat activity surveys will take place in the season prior to the removal of the trees.

Transect surveys were carried out once in May and then twice-monthly between June and September 2018. Nine bat species were confirmed to utilise the area of the scheme as a result of the transect surveys. These included Common pipistrelle, Soprano pipistrelle, Noctule, Myotis species such as Natterer's, Daubenton's and Geoffroy's or Alcathoe.
In addition to these, several Lesser horseshoe bat passes and a single Barbastelle pass have also been recorded. The north-west of the surveyed area was utilised more often than the central and southern sections. Monitoring for other scheme at Wolvercote (<4km away) has recorded individuals of all these species over the last 10 years.

Nine static bat detectors were placed in set locations once a month between May and September 2018 inclusive. EcoObs Batcorders were used for this purpose. Batcorders recorded continuously throughout the night for seven nights each month. The static surveys resulted in the confirmation of presence of at least eight bat species, including Common pipistrelle, Soprano pipistrelle, Nathusius' bat, Daubenton's bat, Natterer's bat, Whiskered or Brandt's bat, Noctule, and Alcathoe bat. The north-western section of the scheme was confirmed to be utilised by bats more often than the south-eastern section.

Total of seven structures – six bridges and the building of Richer Sounds on Botley Road in 2018 were subject to dusk bat emergence surveys, one bridge was abandoned after the first survey as no potential for bats was found.
One bridge was almost certainly confirmed to serve as a lekking roosting site; Common pipistrelle bat was displaying around the south portal of the Botley Road Bridge. Such activity indicates the close presence of a bat roost.

1.2 Legislation

All UK bat species and their roosts are fully protected under the Wildlife and Countryside Act 1981 (as amended) through inclusion in Schedule 5, under the Countryside and Rights of Way Act 2000, and under Schedule 2 of the Conservation of Habitats and Species Regulations 2017. The Conservation Regulations designate bats as European Protected Species.

Taken together, the Acts and Regulations protecting bats make it an offence to:

- Deliberately kill, injure, capture or take bats
- Deliberately disturb bats. This particularly relates to disturbance that is likely to:
    - Impair their ability to survive, breed or reproduce, or to rear or nurture their young
    - Impair their ability to hibernate or (for migratory species) migrate
    - Affect significantly the local distribution or abundance of the species to which they belong
- Damage or destroy bat roosts
- Possess or transport a bat or part of a bat, unless acquired legally
- Sell, offer for sale or exchange bats or parts of bats.

A roost is any structure or place used for shelter or protection. Bats need to have access to a number of roosts because they use different roosts depending on season, breeding status and prevailing weather conditions. For this reason roosts are protected whether or not bats are present at the time.

As bats are designated European Protected Species (EPS), development and construction works that are likely to result in the disturbance of bats, damage to or destruction of their roosts, or require bats to be caught or translocated, usually require an EPS licence to be obtained from Natural England before any works begin. Obtaining a licence involves completing an Application Pack, including a Method Statement that details mitigation appropriate to maintaining the 'favourable conservation status' of the local bat population. Three conditions must be met before a licence can be granted:

- There is no satisfactory alternative
- The development will not be detrimental to the maintenance of local bat populations at a 'favourable conservation status' in their natural range
- The development must be for 'imperative reasons of overriding public interest including those of a social or economic nature'.

An EPS licence is required for all development activities if there is a reasonable likelihood that an offence against Conservation of Habitats and Species Regulations 2017, Wildlife and Countryside Act 1981 (as amended) or Environmental Damage Regulation 2009 (as amended) **will be committed.**

Barbastelle (*Barbastella barbastellus*), Bechstein's (*Myotis bechsteinii*), Greater horseshoe (*Rhinolophus ferrumequinum*) and Lesser horseshoe (*Rhinolophus*

hipposideros) bats are further protected, being listed on Annex II of the Habitats Directive which allows Special Areas of Conservation (SACs) to be designated for their presence. Projects or proposals which have the potential to adversely impact upon these designated sites should be screened and a determination of their likely impacts produced.

2. Aims and Objectives

This report provides an assessment of features which may be used by bats within the likely extents of the scheme. It states the methodology and results of the tree inspections undertaken and explains other methods used to assess the suitability of the area subject to the proposal to bats. It outlines the potential associated impacts of the proposed scheme on bats, a separate mitigation report (Billington 2018) and provides guidance on further surveys and mitigation measures which can be implemented as part of the scheme design to minimise potential adverse impacts to bats.

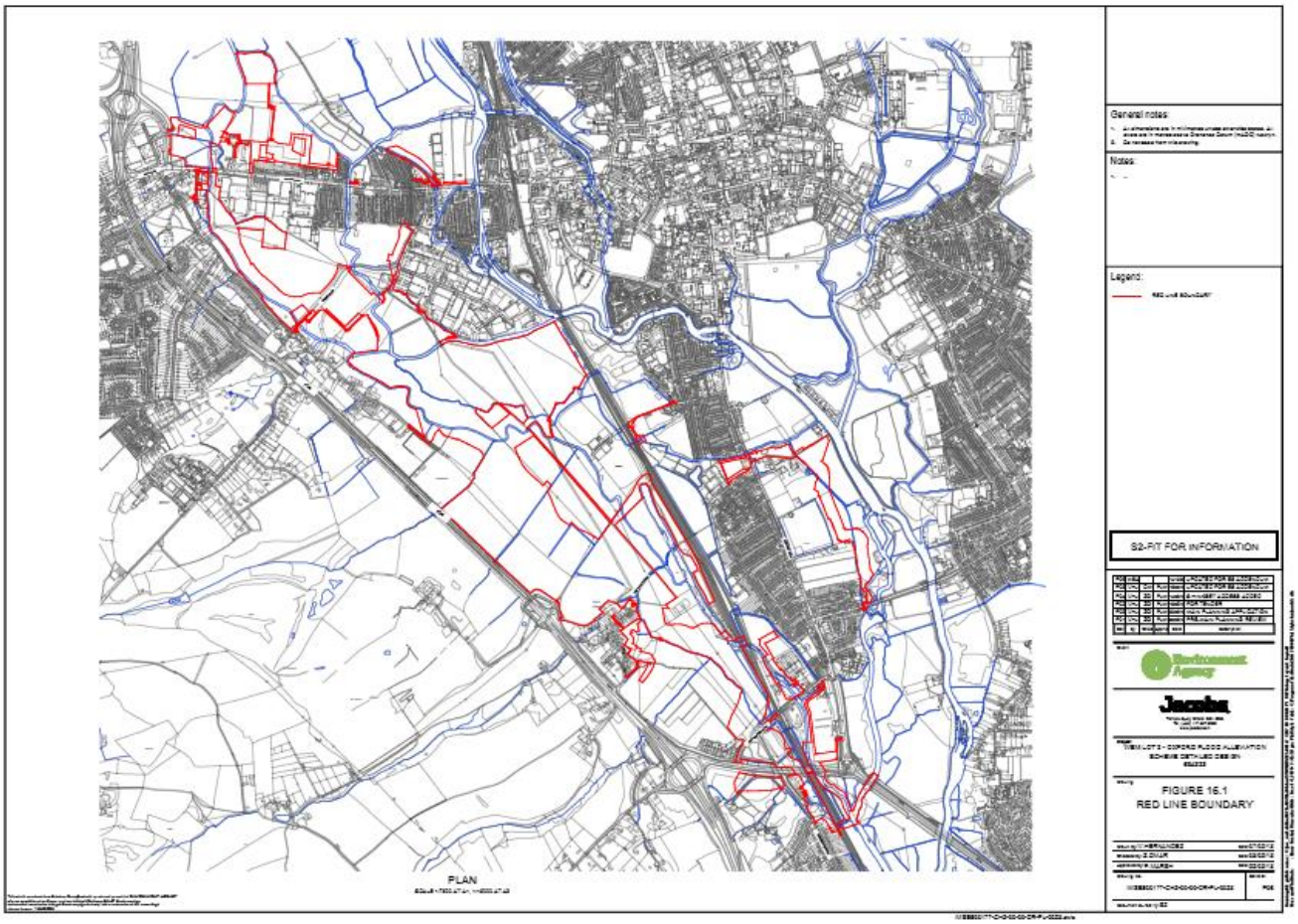
Objectives of the study were set as follows:

- Resurvey trees and structures containing bat potential that lie within 5m of the red line area to identify actual and potential roosting places throughout the site.
- Carry out inspection and activity surveys of trees occurring within new areas brought into the scheme so not previously surveyed.
- Collect comparable data as a part of the baseline information obtained for the site

3. Survey Area

The survey area is delimited by the red line in Figure 1 IMSE500177-CH2-00-00-DR-PL-0028 V6 overleaf.
The habitat is considered favourable for bats for reasons of evident roosting and foraging opportunities.

Figure 1 Survey Area, Oxford Flood Alleviation Scheme
(original drawing CH2M Figure IMSE500177-CH2-00-00-DR-PL-0028 V6)



The survey area consists of a mixture of semi-rural habitat with hedgerows, extensive water courses, meadows, woodland, scrub some of which is on old refuse tips particularly in the south. The entire area lies on the urban edge of West Oxford.

4. Methods

60 trees were actually inspected, 12 of these had collapsed so no longer contained any bat potential features, leaving 48 trees to inspect intensively. 126 bat potential features of moderate, high and confirmed potential were logged,
Additional preliminary tree inspections were undertaken of new scheme areas on arb. maps 5, 8 & 9 plus in and beside the railway sidings. These generated over 50 further inspections and from these eight further trees for activity surveys to be conducted.

4.1 Tree inspections

Tree inspections to determine the presence or likely presence of features used by roosting bats were undertaken in two stages:

Stage 1: Ground inspection of all trees within the survey area, to identify trees hosting likely characteristic features (for example rot or woodpecker holes, hazard beams, cracks, fissures or dense ivy) that may support roosting bats. Qualified and experienced ecologists systematically searched each tree with a torch and binoculars.
Potential roost features (PRF) were then recorded for inspection at Stage 2.

Stage 2: Aerial inspection of characteristic features identified during the Stage 1. The inspection included a thorough aerial search of the tree by experienced qualified bat workers from Greena Ecological Consultancy. Where appropriate and subject to safety constraints, suitable features were inspected with an endoscope.

Surveyors were suitably qualified and experienced.

Climber initially catapulted a lightweight line into desired area of the tree and hauled up the main rope. BCAP double rope access was used and the climber maintained two-point attachment at all times during the survey.

The findings were evaluated in accordance with Collins (2016) and tree bat roosting potential was judged on the scale from negligible to high.

- Negligible (N) – negligible habitat features on site likely to be used by roosting bats – these were not recorded as irrelevant
- Low (L) – a tree with one or more potential roost sites that could be used by individual bats opportunistically
- Moderate (M) – a tree with one or more potential roost sites that could be used by bats due to the size, shelter, protection, conditions and surrounding habitat but unlikely to support a roost of high conservation status
- High (H) – a tree with one or more potential roost sites that are obviously suitable for use by larger numbers of bats on a more regular basis and potentially for longer periods of time
- Confirmed (Hc/Mc) - If confirmed as roost 'c' attached to potential category

Plus an additional category of Unknown (U) was used for trees that could not be climbed / inspected in accordance with the set methods when containing large amount or dead wood, rot, fungus or swarming bees or wasps.

Only trees of moderate, high or confirmed roosts are listed, negligible and low potential ones will not require any actions so are not listed.
12 trees had completely collapsed so now have no potential features remaining plus one tree that had partially collapsed so retaining some features.

Where features could not be inspected e.g. ivy or unsafe to access features these were subject mainly to just activity survey but odd ones that had both features accessible and not inspectable features had dual surveys.

4.2 Emergence Bat Surveys

Emergence bat surveys were carried out on 6 structures and 27 trees, the target list was set to be 28 trees but one tree (no. 2 map 1) was removed from the list as it had fallen onto the ground so having no potential anymore. This did not alter the number of surveys as the tree was previously surveyed together with tree 1 map 1.
The selected structures fall within/ adjacent to the scheme and may be affected by the proposal, they include the following in table 1 below.

Table 1 Structures surveyed

Notation	Structure	Location	Grid ref	No. surveys
SA	Richer Sounds building	Botley	SP 49048 06280	2
SB	Botley Road bridge	Botley	SP 49066 06301	3
SC	Willow Walk bridge	North Hinksey	SP 49490 05594	3
SD	Southern bypass bridge	New Hinksey	SP 51860 03502	2
SE	Railway bridge	Kennington	SP 52001 03242	3
SF	Culvert bridge	Old Abingdon Road	SP 51645 03704	2

Table 2 below summarises 2020 survey requirements arboricultural maps produced by Middlemarch were used (Middlemarch 2018).

Table 2 Emergence surveys of trees in 2020 identified 2016 - 2018 plus further new trees identified in 2020

Tree	Arb map no.	Location	Surveys
1	1	SP 49008 06316	2
812	1	SP 49008 06316	2
815	1	SP 49020 06316	3
22	1	SP 49389 06325	2
62	3	SP 49618 05758	3
84	3	SP 49551 05643	2
1139	3	SP 49950 05892	2
1	4	SP 50052 05610	2
2	4	SP 50040 05617	3
4	4	SP 49525 05611	2
21	4	SP 50331 05194	3
H	5	SP 50320 04944	3
I	5	SP 50349 04982	2
J	5	SP 50354 04990	2
K	5	SP 50355 04997	3
7	8	SP 51763 03924	2
8	8	SP 51792 03584	2
9	8	SP 51970 03423	2
81	8	SP 51938 03439	3
94	8	SP 51970 03429	3
4a	9	SP 51644 04989	3
E	9	SP 51081 04892	3
F	9	SP 51078 04901	2
G	9	SP 51067 04905	3
H	9	SP 51069 04910	3
9	10	SP 51906 04865	2
20	10	SP 52073 04596	2

Where more than one feature occurred, the tree was surveyed according to the highest identified potential feature.

Emergence surveys started around 10 minutes before sunset and lasted for about an hour after sunset, ending when it became too dark to observe potentially emerging bats and after when bats would have normally emerged.
Manual bat surveys were conducted by surveyors monitoring with Batbox Duet ultrasound detectors, D240X and D1000X detectors and a Pulsar thermal imaging scope was used on some surveys with a tablet to view it. Also to assist with viewing on manual surveys and for unmanned surveys a SpyCamera CCTV 1080HD cameras with built in infrared illumination were used viewed on an LCD screen.
The CCTV specifications of high-definition cameras lists its range for both, colour (daytime, dusk) and black & white (post-dusk to complete darkness) during infrared illumination up to 100ft (30.48metres). The cameras are fitted with a varifocal (adjustable) 2.8-12mm lens covering the field view from very wide (up to 100 degrees) to narrow and zoomed in. The setting is manual, and a maximum possible view of the surveyed structure is always ensured prior to the start of the survey. The smart IR technology enables the cameras to automatically adjust the intensity of the infrared lighting based on the distance objects are located from the camera (wide dynamic range enhancement).
The camera was used with a time-synchronized bat detector and recorder EcoObs Batcorder.
The recording from each night are subsequently viewed by an experienced licensed bat ecologist with the possibility to rewind and view segments repeatedly, providing much higher accuracy of the assessment than the traditional in-field survey method alone.

Slight deviation was made from BCT survey ‘guidelines’ which has been adapted from volunteer enthusiasts. Almost all bats emerge between 10 minutes after sunset and the end of civil twilight (around 45min after sunset) so this period was covered and expanded on by starting pre sunset and finishing 1hr after sunset, this we have used as an effective methodology before the birth of BCT. This is adapted from the proven count methodology used by ITE was to stop counting when 10 min had lapsed since last bat. The continuing up to 2hr after sunset is unnecessary and a waste of clients funds. At larger sized roosts cons may need to be started up to an hour before sunset and ended up to 2.5hrs after, but rarely needed not in Oxford with small numbers/ individual bats at sites.

5. Survey Constraints and Limitations

Tree inspections are reliant on the identification and inspection of potential bat roosting features; bats are cryptic species and may not always use specific features. Inspections can also be limited when safe access to a tree may not be feasible for example if the tree is overhanging a water course or rail corridor.

Many of the structures are bridges spanning water courses, accordingly their elevated location and position over a water course often means that full site access was restricted to inspect but could be fully covered by activity surveys. All target features in 2020 could be fully accessed.

Significant roosts of bats will not have been missed during the aerial inspections and / or emergence surveys, though nomadic individual bats may have been.

Where bat droppings were seen by viewing endoscopes they could not be accessed to recover them.

No other constraints to the bat surveys occurred.

6. Results

6.1 Tree Inspections

The results of tree inspections are shown in Tables 3 – 10. Tables are divided based on Arboricultural maps for the scheme included in Oxford Flood Alleviation Scheme, Arboricultural Method Statement (RT-MME-124555-04).

Table 3 Results of tree inspection surveys Map 1

Tree no.	Tag/group	Species	DBH [cm]	Grid ref	Feat.	Height [m]	Feature details	Orient.	Grade	Tree needs bat survey just before felling	ECW during felling
6	854	Crack Willow	150	SP 48965 06367	1	1.3	Cavity 50cm deep	S	M	Y	Y
					2	1.6	Cavity extends in 40cm, 2 entrances	W	M		
					3	1.8	Cavity extends up 60cm, down 30cm	N	H		
					4	1	Cavity extend in 60cm, 2 entrances	E	M		
					5	1	Cavity 50cm deep	C	M		
7	853	Crack Willow	120	SP 48968 06367	1	1.6	Cavity extends in 60cm, 3 entrances	S	M	Y	Y
8	855	Crack Willow	100	SP 48954 06358	1	1.8	Cavity in horiz. Limb, extends in 50cm	C	H	Y	Y
					2	1.2	Cavity extends in 1.2m open	W	M		
10	856	Crack Willow	90	SP 48948 06329	1	1.1	Cavity extends in 20cm	N	L	Y	Y
					2	2	Cavity extends in 60cm	N	M		
					3	1.8	Cavity extends in 80cm	SW	M		
					4	2	Cavity extends in 40cm	S	M		
11	809	Crack Willow	70	SP 48984 06333	1	1.7	Cavity extends in 65cm	C	H	N	Y
					2	1.7	Cavity extends in 20cm	C	M		
15	851	Crack Willow	120	SP 49016 06391	1	1.5	Cavity extends in 90cm	S	H	Y	Y

					2	1.7	Cavity extends in 60cm	S	M		
					3	1.9	Cavity extends in 20cm	S	L		
					4	2.3	Cavity extends in 35cm, open	SW	L		
					5	2.2	Cavity extends in 40cm	SW	M		
					6	1.9	Cavity extends in 40cm	W	M		
					7	2	Cavity extends in 90cm	W	H		
					8	3	Cavity extends in 60cm	C	M		
					9	1.6	Cavity extends in 20cm	E	M		
16	852	Crack Willow	110	SP 49006 06395	1	2.2	Cavity extends in 65cm, 35cm down, 30cm up	SE	H	Y	Y
					2	2	Cavity extends in 40cm	SE	M		
					3	2	Cavity extends in 80cm	N	H		
17	853	Crack Willow	90	SP 48995 06384	1	1.5	Cavity extends in 20cm	N	M	Y	Y
					2	1	Cavity extends in 50cm	E	M		
					3	1.3	Cavity extends in 40cm	E	M		
					4	1.4	Cavity extends in 50cm	S	M		
					5	1.1	Cavity extends in 40cm	N	M		
18	849	Crack Willow	100	SP 48983 06389	1	1	Cavity extends in 70cm	N	H	N	Y
23	G15	Crack Willow	100	SP 49361 06387	1	2.25	Hollow limb extends in 30cm	E	M	N	Y or inspection
					2	2.2	Hollow branch extends in 60cm	S	M		
19	829	Willow	100	SP 49054 06411	1	2.6	Cavity extends 75cm, two entrances	W	M	Y	Y

73	828	Willow	120	SP 49052 06387	1	0.7	Cavity extends in 60cm	C	M	Y	Y

Table 4 Results of tree inspection surveys Map 2

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Tree needs bat survey just before felling	ECW during felling
26	G146	Unknown	35	SP 49900 06394	1	3	Cavity extends in 130cm, 80cm up, 50cm down	SW	H	N	Y

Table 5 Results of tree inspection surveys Map 3

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Tree needs bat survey just before felling	ECW during felling
	1122	Willow	100	SP 50005 06010	1	1.8	Cavity extends in 25cm	E	L	Y	Y
					2	0.75	Cavity in hollow limb extends in 35cm	C	M		
	1130	Willow	110	SP 49973 05934	1	1.6	Cavity in trunk extends in 50cm	SW	M	Y	Y
					2	2	Hole in cut off branch extends in 22cm	SW	M		
	1134	Willow	90	SP 49956 05913	1	1.4	Cavity in trunk extends in 80cm dusty	NE	H		
					2	1.6	Cavity in trunk extends in 50cm	NW	M	Y	Y
	1139	Willow	70	SP 49950 05892	1	1.2	Cavity in core extends in 45cm	N	M	Y	Y
					2	1.2	Cavity in core extends in >100cm	N	H		
	1140	Willow	90	SP 49942 05873	1	3.2-3.9	Hollow core cavity extending in 70cm, two entrances	NE	M	Y	Y

					2	3.2	Cavity extends in 60cm	NE	M		
					3	3.5	Hole extends in 20cm	S	H		
	1141	Willow	95	SP 49944 05875	1	3.5	Cavity in rot hole extends in 50cm	S	H	Y	Y
					2	1.6	Hole extends up 70cm	N	H		
					3	2	Flaking bark in 45cm	SW	H		
					4	1.2	Flaking bark in 30cm	N	H		
					5	3	Two hole extend in 30cm	C	M		
	1142	Willow	90	SP 49940 05863	1	2.5	Hole extends in 60cm	C	H	Y	Y
					2	1-1.8	Hollow core extends in 80cm dusty	C	M		
90	1096	Willow	75	SP 49564 05648	1	2.3	Cavity extends in 50cm	SE	M	Y	Y
					2	1.7	Hole 60cm down	W	H		
					3	1.8	Flaking bark 30cm up	W	M		
					4	1.9	Flaking bark 20cm up	SE	M		
					5	2.1	Flaking bark 40cm up	W	H		

Table 6 Results of tree inspection surveys Map 4

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient	Grade	Tree needs bat survey just before felling	ECW during felling
1	G72	Willow	Copp.	SP 50052 05610	1	2	Split extends over 10cm	SW	L	Y	Y
					2	1.2	Cavity in split extends in 50cm	N	H		
					3	1.3	Hollow branch extends in >100cm	S	L		
					4	3	Cavity extends over 120cm, 50cm up, 70cm down	C	H		
2	G72	Willow	Copp.	SP 50040 05617	1	2.5	Cavity extends down 100cm+	C	H	Y	Y
					2	2	Cavity extends in 80cm down	SE	H		
					3	1.8	Hollow branch cavity extends 100cm+ up & 70cm down	SW	H		
					4	1.3	Hollow branch cavity extends 20cm in	S	L		
4	G72	Willow	Copp.	SP 50013 05599	1	3-4	Cavity >200cm but open	C	M	Y	Y
					2	1.6	Cavity in trunk extends up 90cm	N	H		
6	G83	Willow	70	SP 50124 05466	1	1.9	Cavity extends in 20cm	C	M	Y or inspection	N
					2	1.7	Cavity extends in 40cm	E	M		
	1203	Ash	60	SP 49956 05565	1	4.5	WP hole 50cm down, 12cm up	NW	H	Y or inspection	N
	1204	Willow	110	SP 49966 05568	1	4.5	Cavity extends 60cm down	C	M	Y	Y
					2	1.9	Cavity extends in 40cm	N	M		

					3	2.1	Cavity extends up 60cm	N	M		
					4	2.3	Cavity extends in 30cm	NW	L		
					5	2.1	Split extends in 20cm	W	L		
					6	3	Hollow core extends in 60cm	W	M		
6	G83	Willow	70	SP 50124 05466	1	1.9	Cavity extends in 20cm	C	M	Y or inspection	N
					2	1.7	Hole extends in 40cm	E	M		

Table 7 Results of tree inspection surveys Map 5

Tree no.	Tag/group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Tree needs bat survey just before felling	ECW during felling
H		Willow	Copp.	SP 50320 04944	1	2.2	Extensive cavity >100cm	C	M	Y	Y
I		Willow	90	SP 50349 04982	1	0.9	Cavity 65cm up	NW	H	Y	Y
					2	1.7	Cavity 40cm up, 40cm down	SE	M		
J		Willow	100	SP 50354 04990	1	1.4	Cavity two entrances, 50cm in extent	N	M	Y	Y
K		Willow	120	SP 50355 04997	1	0.5	Cavity extends in >100cm	S	M	Y	Y
					2	1.5	Cavity extends in 30cm	N	M		
					3	1.8	Hollow limb extends in70cm	C	H		

Table 8 Results of tree inspection surveys Map 8

Tree no.	Tag/ group	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient	Grade	Tree needs bat survey just before felling	ECW during felling
4	G143	Crack willow	100	SP 5201403468	1	0.6-1.9	Hollow core, open, multi entrances, crevices to 8cm depth	C	M	Y	Y
					2	1.7	Cavity in cut off branch extends in 90cm	N	H		
5	G143	Crack willow	90	SP 52024 03456	1	1.7	Hollow limb, open and hole down 90cm	W	M	Y	Y
94		Willow		SP 51979 03424	1	1.2	Cavity extends in 80cm **with medium sized bat dropping**	C	Hc	Y	Y

Table 9 Results of tree surveys Map 9

Tree no.	Tag	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient	Grade	Tree needs bat survey just before felling	ECW during felling
4		Crack Willow	80	SP 51648 64990	1	0.9	Hole 60cm depth	NW	M	Y	Y
					2	1.2	Hole 75cm depth	NW	M		
					3	3	? Bees not inspected	N	?		
					4	1.8	Cavity >100cm	N	H		

Table 10 Results of tree inspection surveys Map 10

Tree no.	Tag	Species	DBH (cm)	Grid ref	Feat.	Height (m)	Feature details	Orient.	Grade	Tree needs bat survey just before felling	ECW during felling
7	G164	Crack Willow	100	SP 51894 04876	1	2.5	Cavity 30cm in	W	L	Y	Y
					2	2	Cavity 20cm in	NE	L		
					3	1.6	Cavity 20cm up	N	M		
					4	1.1	Hollow core cavity	C	M		
					5	0.5	Hole extends in 15cm	C	M		
8	G164	Crack Willow	100	SP 51894 04867	1	2-2.6	Several cavities up to 20cm deep in hollow trunk	C	L	Y	Y
					2	3	Hole 70cm up	E	H		
					3	2.5	Hole 30cm in	W	L		
					4	2	Hole 30cm in, two entrances	C	M		
					5	2.3	Hole 40cm in	C	M		
10		Crack Willow	90	SP 51908 04849	1	1.7	Cavity 20cm in	NW	M	Y	Y
					2	1.1	Cavity 30cm in	NW	M		
11		Crack Willow	90	SP 51918 04847	1	0.9-2	Several cavities up to 20cm deep in trunk void	C	M	Y	Y
					2	1.7	Cavity 20cm down	SW	L		
18	G165	Crack Willow	120	SP 52067 04622	1	1.6	Deep pocket behind flaking bark, extends 60cm	E	H	Y	Y
					2	3	Cavity extends in 50cm	N	H		
19	G165	Crack Willow	100	SP 52071 04610	1	1.3	Cavity in main stem extends 100cm+ open	N	M	Y	Y

					2	1.7	Cavity extends in 50cm	W	H		
21	1352	Oak	95	SP 52094 04446	1	3-8	Cavity behind callous extends in 30cm	W	H	Y	Y
22A	1353	Crack Willow	75	SP 52099 04412	1	1.8	Deep cavity in main stem extends 100cm+	NW	H	Y or inspection	Y
					2	1.6	Cavity 50cm up, 40cm in	C	M		

6.2 Structure Inspections

Table 11 Structure inspected

Structure	Date	Findings
Willow Walk bridge (SC)	08-07-20	Medium sized bat droppings in crevice (see appendix I)

6.3 Bat activity surveys

Table 12 overleaf shows survey dates and environmental conditions at the time of the survey and any results.

Structures are denoted starting ‘S’ i.e. SA, SB etc.

Trees are denoted T/no. of tree/arb. map no. e.g. T/999/4

Table 12 Dates of emergence surveys, weather conditions and bat emergence results

site	date		start	end	bat emergence
T/62/3	**11/07/2020**	time	2114 (sunset 2120)	2220	
SC		temperature	13C	13C	
T/62/3		wind	2	1	
T/84/3		cloud	70%	70%	
T/21/3		rain	0	0	
SA	**14/07/2020**	time	2105 (sunset 2118)	2218	
T/1/1		temperature	16C	15C	
T/815/1		wind	0	0	
T/22/1		cloud	90%	90%	
		rain	0	0	
T/2/4	**15/07/2020**	time	2110 (sunset 2117)	2217	
T/2/4		temperature	17C	16C	
T/4/4		wind	0	0	
T/1/4		cloud	100%	95%	
		rain	0	0	
T/812/1	**16/07/2020**	time	2110 (sunset 2116)	2216	
T/828/1		temperature	22C	21C	
SB		wind	0	0	
		cloud	100%	100%	
		rain	0	0	

T/4a/9	**18/07/2020**	time	2110 (sunset 2113)	2213	
T/9/9		temperature	16C	15C	
T/4a/9		wind	3	3	
T/9/10		cloud	80%	80%	
T/20/10		rain	0	0	
T/H/5	**22/07/2020**	time	2106 (sunset 2108)	2208	
T/I/5		temperature	17.1C	15.6C	
T/K/5		wind	1	0	
T/J/5		cloud	80%	60%	
		rain	0	0	
SD	**23/07/2020**	time	2100 (sunset 2106)	2206	1x 55Pip
SF		temperature	19.3C	16.7C	
		wind	0	0	
		cloud	80%	80%	
		rain	0	0	
SF	**24/07/2020**	time	2100 (sunset 2105)	2205	
		temperature	16C	14C	
		wind	2	1	
		cloud	40%	20%	
		rain	0	0	
T/9/8	**26/07/2020**	time	2057 (sunset 2102)	2202	
T/81/8		temperature	14C	12C	
T/94/8		wind	2	2	

		cloud	30%	30%	
		rain	0	0	
T/7/8	**28/07/2020**	time	2055 (sunset 2059)	2150	
T/8/8		temperature	16.5C	11C	Possible 1x 45Pip
SE		wind	0	0	2x 45Pip
		cloud	80%	80%	
		rain	0	0	
T/E/9	**29/07/2020**	time	2050 (sunset 2058)	2158	
T/F/9		temperature	14C	13C	
T/G/9		wind	1	1	
T/H/9		cloud	10%	10%	
1139		rain	0	0	
T/1/4	**30/07/2020**	time	2050 (sunset 2056)	2156	
T/2/4		temperature	22C	17.5C	
T/4/4		wind	0	0	
		cloud	0	0	
		Rain	0	0	
SC	**01/08/2020**	Time	2049 (sunset 2053)	2153	
T/62/3		temperature	16C	16C	
T/84/3		wind	2	2	
T/21/3		cloud	100%	100%	
		rain	10%	10%	

T/22/1	**03/08/2020**	time	2045 (sunset 2049)	2150	
T/1/1		temperature	17.5C	16.5C	
T/812/1		wind	0	0	
T/828/1		cloud	25%	25%	
		rain	0	0	
SA	**04/08/2020**	time	2041 (sunset 2048)	2150	
SB		temperature	18C	17.5C	
T/815/1		wind	1-2	1	
SF		cloud	90%	90%	
		rain	0	0	
T/H/5	**05/08/2020**	time	2040 (sunset 2046)	2146	
T/K/5		temperature	19C	18C	
T/I/5		wind	2	1	
T/J/5		cloud	90%	10%	
		rain	0	0	
T/4a/9	**08/08/2020**	time	2032 (sunset 2040)	2140	
T/9/10		temperature	19C	17C	
T/20/10		wind	2-3	2	
		cloud	20%	40%	
		rain	0	0	
SD	**09/08/2020**	time	2032 (sunset 2039)	2139	
		temperature	23C	20C	
		wind	3	2	

		cloud	10%	10%	
		rain	0	0	
T/E/9	**12/08/2020**	time	2028 (sunset 2033)	2133	
T/H/9		temperature	25C	22C	
1139		wind	2	2	
		cloud	100%	100%	
		rain	10%	10%	
SF	**14/08/2020**	time	2025 (sunset 2029)	2129	
		temperature	17C	16C	
		wind	3	3	
		cloud	100%	100%	
		rain	10%	10%	
SC	**25/08/2020**	time	2000 (sunset 2006)	2106	
		temperature	16C	14C	
		wind	4	4	
		cloud	30%	30%	
		rain	0	0	
T/81/8	**29/08/2020**	time	1953 (sunset 1957)	2057	
T/94/8		temperature	12C	10C	
		wind	2	2	
		cloud	10%	10%	
		rain	0	0	

SE	**08/09/2020**	time	1930 (sunset 1934)	2038	
		temperature	18.4C	16.6C	
		wind	1	1	
		cloud	5%	80%	
		rain	0	0	
T/H/5	**09/09/2020**	time	1932 (sunset 1932)	2033	
T/E/9		temperature	17C	14C	
T/G/9		wind	0	0	
T/H/9		Cloud	0	0	
		rain	0	0	
T/2/4	**10/09/2020**	time	1925 (sunset 1930)	1931	
T/812/1		temperature	15C	14C	
T/1/1		wind	0	0	
		cloud	95%	90%	
		rain	0		
SB	**11/09/2020**	time	1922 (sunset 1928)	2028	
		temperature	10C	9C	
		wind	2	1	
		cloud	10%	20%	
		rain	0	0	
T/H/9	**19/09/2020**	time	1902 (sunset 1909)	2009	
T/F/9		temperature	15C	13C	
T/G/9		wind	2	2	

		cloud	20%	20%	
		rain	0	0	
T/4a/9	**20/09/2020**	time	1900 (sunset 1907)	2010	
		temperature	13C	11C	
		wind	2	2	
		cloud	20%	10%	
		rain	0	0	
T/7/8	**25/09/2020**	time	1845 (sunset 1855)	2000	
SE		temperature	9	8	
T/8/8		wind	2	2	
		cloud	5%	5%	
		rain	0	0	
T/K/5	**26/09/2020**	time	1850 (sunset 1853)	1955	
		temperature	8C	8C	
		wind	1	0	
		cloud	5%	5%	
		rain	0	0	
T/9/8	**27/09/2020**	time	1844 (sunset 1850)	1958	
T/81/8		temperature	9C	8C	
T/94/8		wind	1	1	
		cloud	10%	10%	
		rain	0	0	

6.3 Confirmed roost results

Bat activity surveys and inspections determined the following bat roosts in 2020, plus previous roost records are also included below:

Table 13 Confirmed and possible bat roosts

Site	Year	Day bat roost results
Kennington Rail bridge (SE)	2020	2x Common pipistrelle bats 28-07-20
Willow Walk bridge (SC)	2020	Individual medium myotis or long eared bat species – droppings July 2020
Southern Bypass bridge (SD)	2020	1x Soprano pipistrelle bat 23-07-20
Tree 94	2020 & 2018	Individual medium myotis or long eared bat species – droppings July 2020
Tree 8 (map 8)	2020	Possible Common pipistrelle bat emerged 28-07-20
Botley road bridge	2018	Likely male Common pipistrelle lekking bat roost
Tree 81	2017 & 2018	2x Long eared bats emerged in both years
Tree 84	2018	Likely male Common pipistrelle lekking bat roost
Tree 90	2018	Likely male Common pipistrelle lekking bat roost

See appendix I for details of Willow Walk bridge (SC) and Southern Bypass (SD) roosts.

Trees requiring removal will be re-surveyed in advance of removal in suitable weather conditions (November through to the end of February). Re-inspection of accessible features can be carried out at any time of the year, ideally immediately prior to the removal of the trees.

7. Discussion / Conclusions

The site was proven to be utilised by bats on regular basis from surveys conducted in 2016, 2017, 2018 & 2020 years including static monitoring, emergence surveys and transects. Species recorded on site during activity surveys included: Common pipistrelle, Soprano pipistrelle, Long-eared bat, bats of Myotis species (including Daubenton's bat, Natterer's bat and small Whiskered or Brandt's bat, Geoffroy's bat, and Alcathoe), Noctule, Lesser horseshoe bat, Serotine, Noctule and Lesser horseshoe.

Surveys confirmed that Common pipistrelle is the most abundant bat species utilising the site for commuting or foraging. Soprano pipistrelles and Myotis species were also represented in high numbers.
Common pipistrelle was distributed more or less equally throughout the site. Other bat species utilised tree lines and hedgerows as well as sheltered areas for foraging and commuting.

Four bat roosts were confirmed during the inspection and activity surveys plus a further possible roost in tree 8. Four trees and a structure were determined in 2018 to be roosts one tree was found to be a roost in both years. All records were of individual bat use in trees/ structures with one tree found to be occupied by two long eared bats.

Lekking sites are occupied by individual males mainly in late summer August-October but in some cases in April/ May, they try to entice female bats and may be successful in attracting up to five females who will stay frequently for a day or two before moving on, so a risk of up to six bats in sites.

No trees or structures surveyed seem to support colonies of bats.

Despite the fact the site is utilised by bats, it does not provide a particularly good quality or unique habitat in the wider context of the surrounding landscape. Similar habitats are available in the surrounding environment.
Wytham Wood lies only a few kilometres to the west contains an extensive ancient woodland surrounded but pastures/ meadows managed for wildlife.

The bat records made along watercourses are much lower than experienced at a lot of other watercourses suggesting an negative impact of the urban area of Oxford.

Trees identified to hold moderate of high bat roosting potential will have to be re-surveyed (re-inspected and/ or subject to bat activity surveys) most will also require ecological watching brief during removal.in the season immediately prior to their removal or trimming, as specified in in tables 3-10 and of all activity survey trees in table 12.

Any works within 10m of structures should be assessed for potential to harm or disturb bats present in them.

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Appendix I Bat roosts

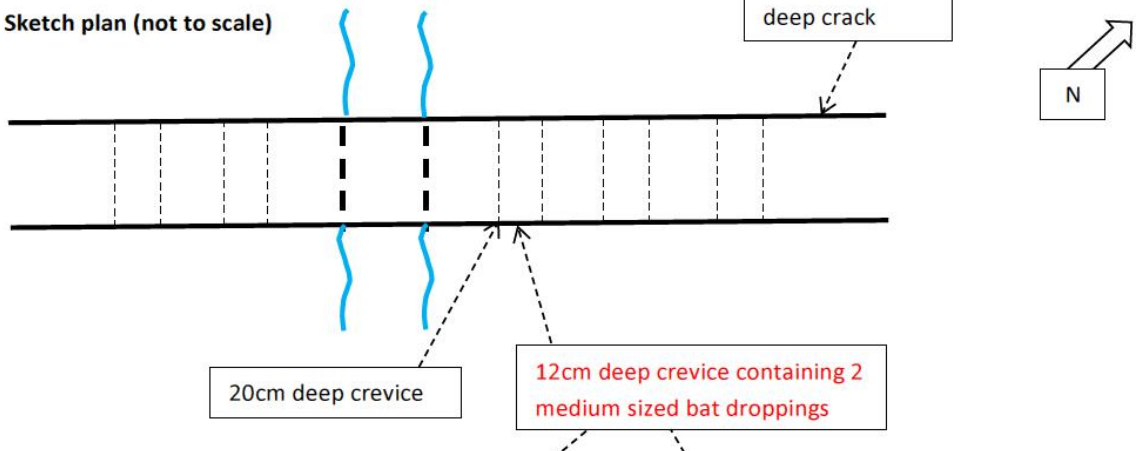
Willow Walk Bridge over Bulstake Stream

This was inspected on 8th July 2020 by detailed inspection using ladders and endoscope viewing probes by Geoff Billington & Tereza Rush.

The bridge comprises a traditional stone structure with a single arch barrel over the stream and five flood inverts.

Very limited suitable crevices/holes for bats are present as follows.

Sketch plan (not to scale)



One crevice on the south east side of the bridge was confirmed to be used by individual bats

One very deep crack on the northwest side was too deep to examine fully so was subjected to activity surveys – no bats emerged

Southern bypass bridge

Roost point indicated in red 23rd July 2020