



FoDDC Further Information Request

1. Collision risks

- i. Methodology (including any assumptions) and summary analysis of data that supports percentages attached to major and minor flyways 1-4.**
- ii. Information on wider dispersal patterns for the other 20% or so of LHBs that appear not to be using the major/minor flyways from the information provided.**
- iii. Further information and analysis of previous survey data to demonstrate that wider dispersal does not represent an additional collision risk along spine road and other northern quarter proposed roads.**

Bat Flyways

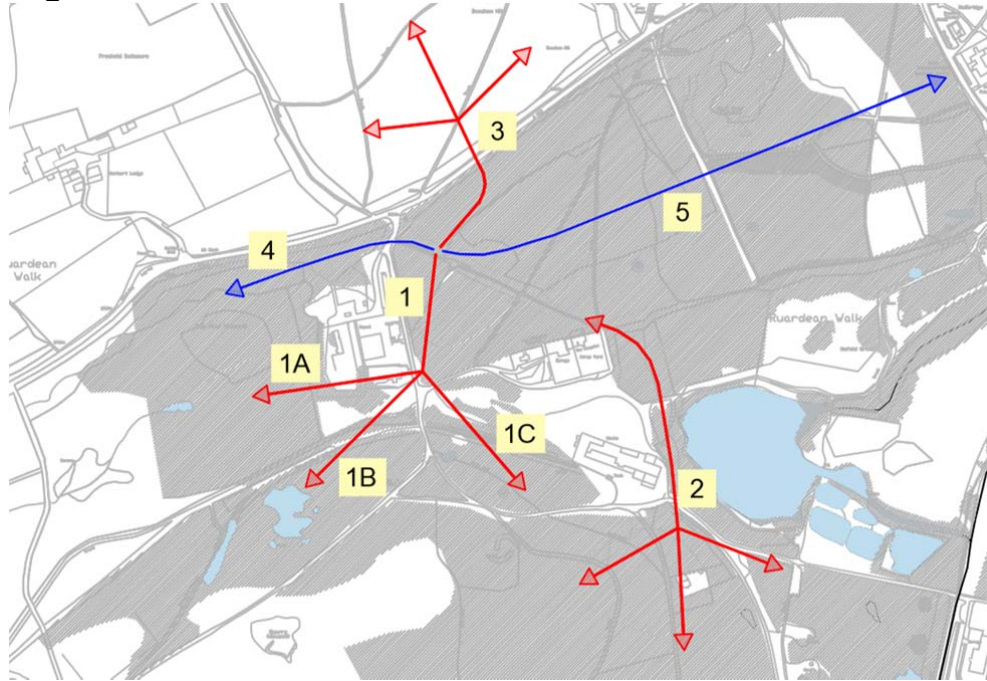
A range of survey techniques have been used to identify bat flight lines, these are the main communal commuting routes used by a number of bats, or rather percentage of the colony to move through the landscape between roost sites and foraging areas. Flight lines can change seasonally and with changes in foraging and can be more notably used by bats dispersing from a roost earlier in the evening when bats follow features as bats can use more open habitat to move throughout the landscape when dark.

The surveys conducted will identify main commuting routes, especially the radio tracking which follows bats throughout the night as a suitable percentage of the colony were radio tracked. It is impossible for surveys to identify every individuals commuting route, the surveys are to identify the core commuting routes used by a proportion of the colony, not individual movements. There will be a number of commuting routes that may be close or similar to identified routes, or could be completely different but these are odd individual routes and not main core commuting routes.

It should also be noted that as the Artificial roost (AR) is within a woodland there are no linear features that would cause bats to funnel along set

commuting routes and could disperse throughout the woodland especially for bats commuting north and east from the Artificial roost. There will also be bats that do not commute to foraging areas as they will forage close to the roost within Hawkwell Enclosure as identified from the radio tracking (Male LHB 03252, Fig 11 AEWC Bat report).

Flight lines



Comuting route 1

This is a general south south west movement for a number of bats from the artificial roost, at the corner of the wood/bath house junction bats split into different directions. These are grouped into three main identified movements which combined are believed to be used by a peak of 20% of the colony at any one time.

1A – This is where bats actually commute through the bath house moving west. On its own this is only a minor commuting route but is part of a more main movement for bats. This route is not used consistently with fluctuating numbers of bats identified through night vision camera surveys of the bath house. On some surveys this route was not used and was used by a peak of 16 individuals entering the eastern end of the bath house.

The 16 bats represent approximately 6.5% of the bats emerging from the AR

1B – This is a south east movement of bats that move through the area south of the bath house and west of the forest track. The number of bats and exact routes taken varies significantly throughout surveys. A low number of bats are on occasion observed commute along the southern side of the bath house. A number of bats are observed commuting along the permanent and heras fencing. The peak number of bats observed on any survey was 9 commute along different routes, this is believed to be a minor underestimate and could be used regularly by approximately 10-15 individuals representing about 6% of the colony.

1C – This is a movement for bats south from the corner of the wood across the track and low across the short stretch of open grassland to scrub. The number of bats identified fluctuated from low numbers to a peak of 19 in May. This represented 15% of the colony at that time, however it is believed that about 10% of the colony use this route regularly as a main commuting route.

2 – It is not possible to accurately count bats commuting through this area as it is too wide and vegetated to observe and count them. The FPC varied significantly in the number of bats observed, this was a peak of 26 in September 2013 representing 12.5% of the colony at that time. The 2013 radiotracking however identified almost 50% of the bats using this route at some time and the 2011 tracking identified 7 of 8 bats use this at some time during the survey period (although not necessarily regularly or each day).

Using the mixture of the counts and radiotracking results it is identified that at least 25% and possibly as much as 40% of the colony use this route regularly as a main commuting route.

3 – This was the most consistently used commuting route regularly identified being used by high number of bats. A peak of 71 bats were counted crossing the main road at this location, representing approximately 23% of the bats emerging from the AR. This is considered to be an underestimate given the difficulty in observing bats along an active road in low light conditions radio tracking in 2011 and 2013 identified half of the bats using this route. It is estimated from the counts and radio tracking that at least a third of the colony regularly use this as the main commuting route.

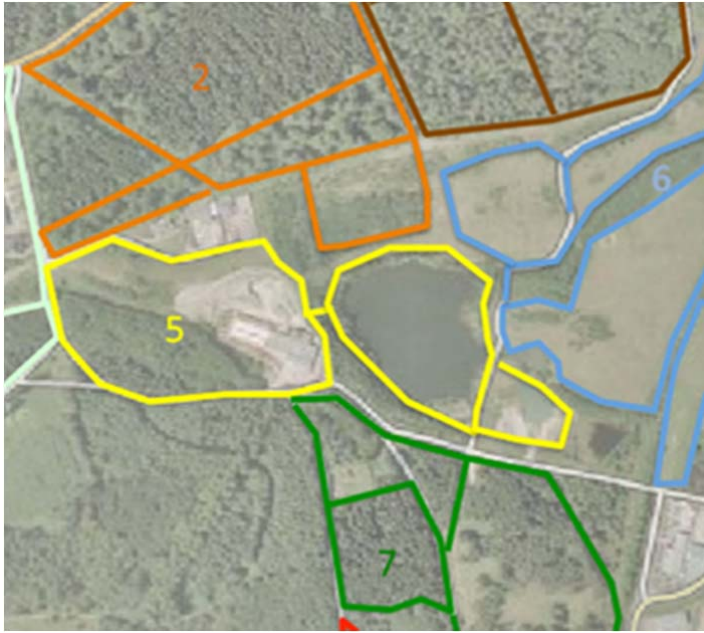
4 – The number of bats using this route has varied throughout surveys with a peak count of 12 individuals representing about 3%

5 – No bats were observed commuting through this route as it is within a wide area of woodland. This area is also used by foraging bats as a large area of woodland with some bats not identified leaving this area. However, radio tracking did identify some bats using this area to commute further east and move north east to more distant foraging areas. It is therefore estimated that only a low percentage regularly use this route.

Analysis of possible wider dispersal along eastern area of spine road.

Lesser Horseshoe bats were recorded at other areas across the site, notably just north of the lake at the corner of a plantation and in the scrub habitat to the south east of Hawkwell enclosure.

The low number of recordings of lesser Horseshoe bats at the northern junction of the lake is likely to be a biasness of the surveys. This location is where from July-October there were three transects, 2, 5 and 6 all intersecting this location which will result in increased survey effort at this location and hence more recordings made. See figure 33 from AEWG report.



Extract from AEWB bat report figure 33

In addition to the transect surveys, this was also a fixed point location to specifically monitor for commuting lesser horseshoe bats. The results from these surveys are detailed below

29th May – location 9 – 0 LHB recorded
20th June – location 9 – 1 LHB pass recorded - not seen
10th July – location 9 – 0 LHB recorded

There will be some foraging in this area as it is woodland edge, scrub and adjacent to the lake. The transect recordings from July to October is considered low given this is from 3 transects and these were all recorded from August onwards and after 2300hrs after the main commuting period and may consist of juveniles exploring.

The Lesser horseshoe bats recorded in the area to the south east of Hawkwell enclosure consist of 5 recordings in an area of scrub and woodland strip along a stream.

This area has been identified as sub quality foraging habitat, and while more than one bat has been radio tracked present in this area it formed a small part of the core foraging habitat for one individual L03280.

There were again fixed point counts in this area specifically to monitor for commuting Lesser Horseshoe bats. The results of these are shown below.

29th May –
Location 14 – 2 LHB passes recorded – flying in fig of 8 over track, possibly foraging.
Location 11 – 3 LHB passes recorded – all recorded between 2258hrs and 2319hrs late in the survey.

20th June –

Location 14 – 1 LHB recorded – not seen at 2317hrs

Location 13 - 0 LHB recorded

10th July -

Location 11 – 0 LHB recorded

Location 12 – 0 LHB

23rd August –

Location 12 – 1 LHB pass recorded – 2119hrs not seen

20th September –

Location 12 – 2 LHB passes recorded – first bat recorded at 2031hrs over 1.5 hours after sunset (sunset 1857hrs)

The transect recordings from July to October were all in late August and early September when juveniles are most active.

The fixed point counts and transect surveys do not indicate that there is a commuting route through this area, there may be the odd bat that moved through this habitat and foraged within this area but there is no evidence to indicate that there is an early movement of bats dispersing from the artificial roost using this area as the number of recordings was consistently very low and always well after sunset when bats would be recorded commuting from the artificial roost.

All of the 2013 survey data and Lesser Horseshoe bat passes recorded are supported by the 2011 Kestrel surveys Foci of LHB activity (see figure 8) where very few if any recordings of Lesser Horseshoe bats were recorded in the eastern areas of the site and proposed spine road.



Figure 8:- Location of lesser horseshoe bat foci of activity where bats were encountered during the walked transects (all data combined). Open circles 1-2 encounters per foci, yellow dot- 3 to 5, orange dot- 6 to 9, red dot->10. Coloured points cross reference to data in Appendix 2.

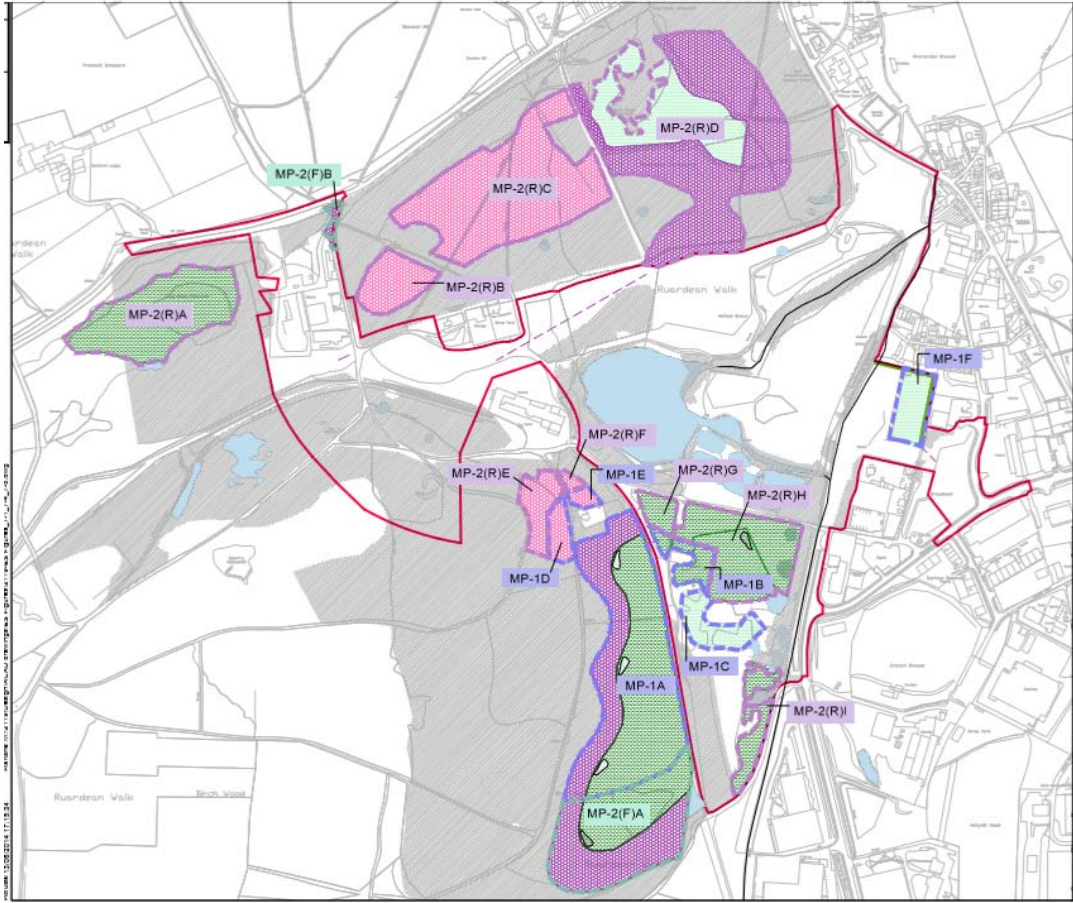
2. Flyways

i. Information in respect of the creation of permanent open habitat creation at MP1A and MP2(F) and its impact on flyways identified in current and previous survey's (including main long-distance flyways within the Kestrel Report fig. 12)

The creation of this new habitat should not have any impact on flyways, firstly the flyways shown on the kestrel report are not Key flyways, these are movements of individual bats between different approximate foraging areas, they are not precise flyways and bats do not move in straight lines as shown. These are indicative, as are the foraging areas, where bats are. The use of bats in this area is very low with only a partial movement flight line.

The habitat creation is a longer linear area running north to south, it does not bisect the commuting route therefore bats would simply follow the woodland edge/move through woodland around the edge to get to any foraging area to the south. It is also likely that any bats foraging in this area will roost in the new proposed nearby Artificial roost and so this flight line may not be used the same as before.

The 2013 surveys did not identify any flyways in this area but as per ES 7.279-280 it is used by some foraging bats.



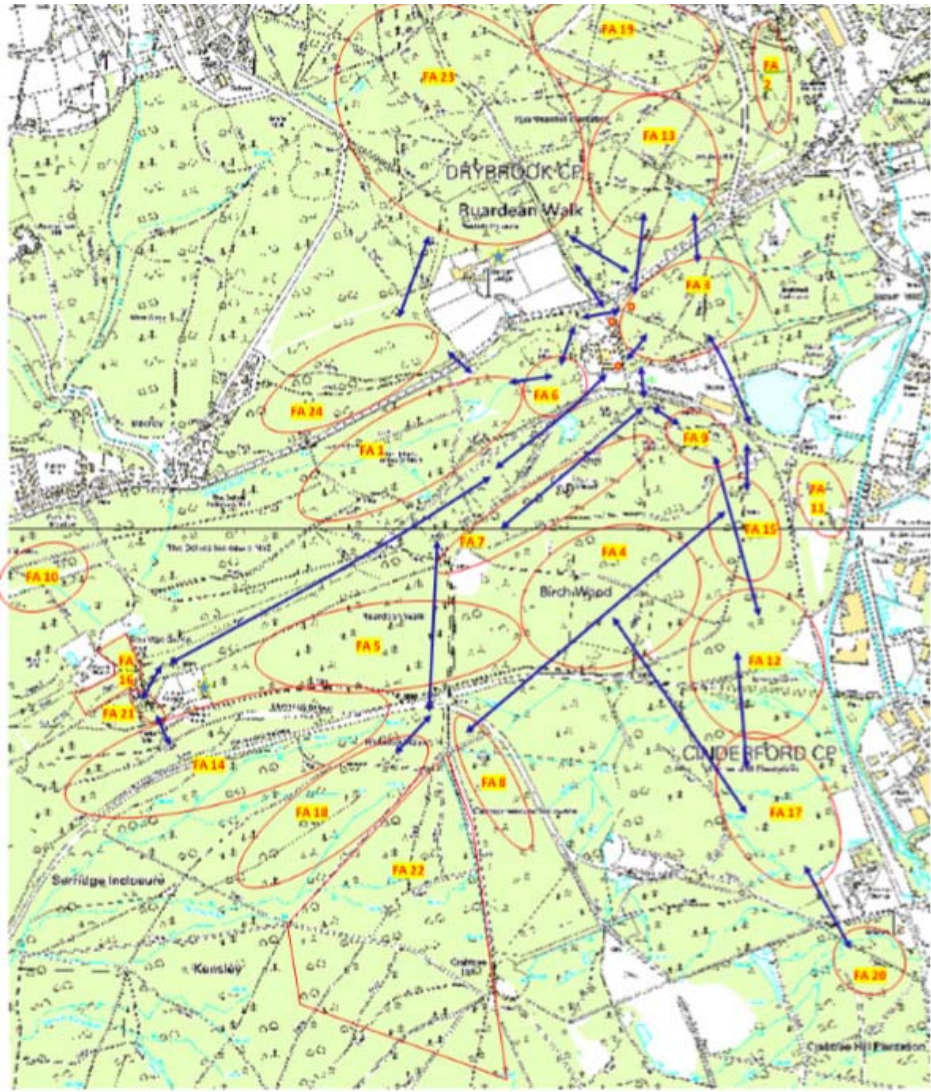


Figure 12:- Location of feeding areas on which lesser horseshoe bats were found, and main long-distance flyways used by the bats to travel between them.



3. Forage habitat

- i. **View on open grassland value as foraging habitat.**
- ii. **Breakdown of foraging habitat loss by phase/plot and how this loss will be addressed.**
- iii. **Clarification on habitats that LHBs forage in within 1.5 and 2.5km of the application site.**
- iv. **Quantitative assessment of forage habitat loss by phase/plot including methodology and any assumptions and summary data.**
- v. **Consideration of the impacts of an apparent mismatch between forage habitat loss and replacement in Phases 1.**

Lesser horseshoe bats have been found to predominantly foraging in native broadleaf woodland, although they do use other woodland, lowland habitats and often areas with a diversity of habitats including un-intensive farmland. Good open grassland will provide foraging value for LHB and the proposed grassland area which is sheltered, with the high length of woodland edge, scrubby edges and pond creation should provide some varied habitats and suitable foraging areas, although no as suitable as Broadleaf woodland it does have some foraging suitability.

Surveys conducted across the site have identified Lesser horseshoe bats predominantly using woodland as foraging areas, however, despite the high area of woodland locally the bats have not been found exclusively using this habitat type, radiotracking has identified bats foraging in areas that are not woodland, Male LHB L03253 was identified foraging within open farmland between Ruardean and Drybrook approximately 2km to the NNW.

Radio racking has identified bats foraging up to 3.5km from the roost (LHB L03264), it will be likely that there are individuals that will forage further afield than this as only a small percentage of individuals were radio tracked, however, it is accepted that the majority of individuals will be foraging within 2.5km of the roost and the more important core foraging areas will be within 1.5km of the roost especially given the large colony size.

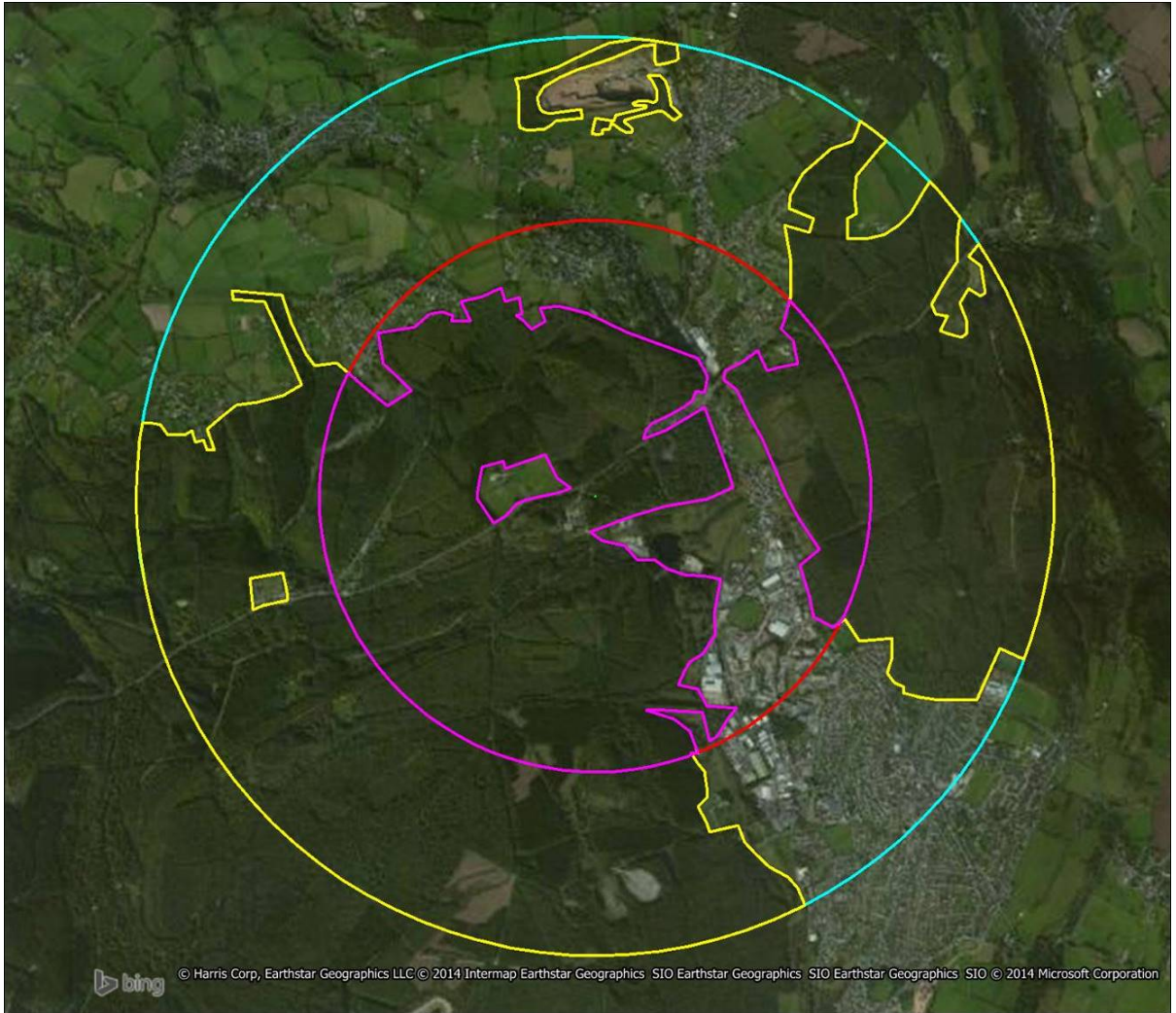
The majority of bats have been identified predominantly using woodland, either broadleaf or conifer plantation woodland. Scrub habitats and scrub grassland have been used and farmland to a lesser extent. Radio tracking fixes of all bats close to the roost and site area show that fixes are concentrated on woodland areas both in 2011 and 2014.

The plan below shows the foraging habitat within 1.5km (491ha, red buffer, fuchsia woodland boundaries) and 2.5km (1,217ha, turquoise buffer, yellow woodland boundaries) of the existing artificial bat roost (the small green blob in the middle) and a summary of the areas and percentages below:

- Phase 1 development and mitigation area losses = 5.39ha, 1.10% within 1.5km, 0.44% within 2.5km
- Phase 2 full permission development and mitigation area losses = 5.35ha, 1.09% within 1.5km, 0.44% within 2.5km
- Phase 2 reserved matters development and mitigation area losses = 14.80ha, 3.01% within 1.5km, 1.22% within 2.5km

Registered Office: Butlers House, North Street, Petworth, West Sussex, GU28 0DP

- Phase 3 = no habitat losses
- Total for entire application development and mitigation = 25.54ha, 5.20% within 1.5km, 2.1% within 2.5km



Assessment of forage habitat loss by phase including methodology and any assumptions and summary data.

Phase 1 - In terms of potential habitat loss, the site clearance work within this phase has been identified primarily as containing infrequently used bat foraging habitat. As such impacts of clearance will be minimal. The habitat creation measures proposed will adequately compensate for all these losses / impacts, particularly in relation to the loss of open grassland habitats, which is a majority of the habitat to be lost to the Phase 1 development.

By way of mitigation new species-rich grassland, scrub and riparian habitats to be created in October 2014 following clearance will become functional habitat for bats by spring 2015. This habitat will immediately attract a sufficient biomass of invertebrates to provide bat foraging opportunities in close proximity to sheltered newly created mature stock broadleaf woodland. The new riparian habitat next to the protection of newly created mature stock broadleaf woodland will be of particular relevance and attraction to Lesser Horseshoe bats so that impacts on this species will be fully mitigated. This is also the case in the short to medium term in relation to the semi-mature woodland and scrub habitat losses from the phase 1 development footprint, where mature stock broad leaf woodland will be included within the planting works. This planted mature stock broadleaved woodland will provide an immediate foraging resource which will improve over time resulting in an overall improved roosting, commuting and foraging resource for the bat populations using the site. The impacts from the short term loss of the semi-mature woodland and scrub habitats will be minimal given the planting of the mature stock broadleaved woodland as described.

Phase 2 - The loss of potential foraging habitat from the phase 2 development area and potentially from the phase 2 mitigation areas will, without mitigation, have minimal impact on bat foraging activity, in particular for Lesser Horseshoe bats. In the case of the phase 2 mitigation areas this is due to the proximity of the existing artificial roost to Phase 2 mitigation areas MP-2(R)B and MP-2(R)C where enhancement works will take place. It should be noted that the majority of foraging activity has been recorded within the woodland habitats to the south and south west of the Northern Quarter (refer to the bat survey report Figures 11 to 31, pages 47 to 67 Appendix 7.4).

The Phase 2 development area consists of mostly hard standing and buildings in Northern United and more open habitat in the east of the Northern Quarter and sub quality habitat for foraging bats and so the development of this area will only represent a minor loss of sub quality foraging habitat of Lesser Horseshoe bats. This will be fully mitigated by the habitat creation measures to be delivered within the indicative phase 2 mitigation areas. The phase 2 mitigation areas will compensate for these minor losses of sub-optimal foraging opportunities within Phase 2 development by, where necessary, with open habitat creation providing replacement foraging habitat including such as riparian habitats within the grassland enhancement areas in the proximity of nearby vegetation and new mature stock broadleaf woodland (to serve as protection for bats using the riparian habitats) which will immediately deliver an effective foraging resource for Lesser Horseshoe bats to mitigate against any immediate impacts, while mature stock broad- leaved woodland and

scrub habitat creation will provide good foraging habitat within the medium term, although these latter areas will have some foraging potential in the short term as well.

4. Other mitigation measures

- i. Inclusion of post development land management prescriptions for LHB within mitigation areas (e.g. 11.1 BS 42020: 2013)**
- ii. Mitigation measures in relation to recreational disturbance.**

LHB require a dense canopy cover and well-structured native understorey which will be created within the broad-leaved woodland and scrub creation areas as specified within the woodland and scrub aims and objectives within Appendix B.3.

To minimise recreational disturbance there will be no paths or track leading to the artificial roosts minimising the possibility of people following these to the roost buildings.

All the buildings will be monitored once per month for a period of 10 years to be checked for disturbance or negative impacts.

5. Monitoring

- i. Detailed early warning monitoring scheme to BS 42020: 2013 for the following elements:**
 - a. spine road mitigation measures (including culverts, bridges hop overs, unlit/un-vegetated sections of the road) and collision risks;**
 - b. Main Office and Bath House;**
 - c. Establishment/improvement of forage habitat**
- ii. Each early warning monitoring scheme should include:**
 - a. clear purpose /aims/objectives**
 - b. consider how adequate baseline data will be acquired prior to construction**
 - c. appropriate success criteria**
 - d. data gathering methods**
 - e. monitoring locations**
 - f. timing/duration**
 - g. responsible persons and line of communication**
 - h. review and where appropriate publication of results/outcomes**
- iii. adaptive management that will be implemented if success criteria are not met (see below for example)**
 - a. Vegetation removal and/or additional planting**
 - b. Walls/fences for hop overs**
 - c. Introduction of dissuatory lighting**
 - d. Alterations to lighting times?**

Monitoring

Spine road mitigation measures (including culverts, bridges hop overs, unlit/un-vegetated sections of the road) and collision risks

A – Monitoring is to identify the level of use of the mitigation measures along the spine road, and hence, identify the success of the mitigation measures across/under or along the spine road by Lesser Horseshoe bats. The monitoring will identify which mitigation measures have been successful and where mitigation is or is not working to inform where additional mitigation may be necessary.

B – Baseline data has been conducted which has identified the minimum populations of the colony that are using each of the main commuting routes through a range of fixed point counts, activity surveys and radio tracking. Surveys have accurately identified the colony population monthly and activity levels monthly to act as accurate baseline info on levels of activity at different locations. Monitoring of the site will continue consisting of continued monthly counts of all buildings used by bats to identify the colony population.

C – The mitigation measures to be implemented across the spine road are to enable bats to continue to commute through this area to access their foraging areas, therefore, the mitigation will be a success if bats are still using the identified flight lines and mitigated crossing areas of the spine road to access foraging areas and similar proportions of the colony are still accessing the foraging area to the south of the spine road.

D – In addition to the mitigation for the spine road there will be other mitigation and enhancements including the creation of new artificial roosts and night roosts specifically designed for Lesser Horseshoe bats, these will create roosting areas that are already close to the southern foraging areas and any bats using these roosts will negate the need for bats to cross the spine road to access these areas.

To monitor the population and use of mitigation areas along the spine road monthly counts of all the artificial roosts will be conducted, this will identify the total colony count as well as the population of bats that are already roosting in the new artificial roosts to the south of the spine road. Surveys will be conducted during the active season (May-October) by conducting emergence surveys with night vision cameras to accurately count all bats that emerge from the buildings during the emergence period. Surveys during the winter hibernation season will be conducted by a hibernation survey of all buildings by a suitably qualified licenced ecologist.

Monthly surveys will be conducted during May, June, July and August at the mitigation areas along the spine road including the Hop over, eastern and western culverts and bridge. Surveys will include an activity surveys, possibly using night vision equipment to accurately count the number of bats using each crossing point.

This will identify if bats are still using the flight lines and crossing locations and the number of bats that are using each location.

The surveys to identify the whole colony population and use of each roost by bats will identify the distribution of bats across the site and what population is already roosting in the new artificial roosts to be erected to the south of the proposed spine road. The count of bats crossing the mitigation points of the spine road will identify what proportions of the colony are successfully foraging to the south of the spine road which can be compared to the existing baseline data.

Twice per summer (approx. late May/early June and mid-July) surveys will be conducted along the length of the road using surveyors and night vision cameras / thermal imaging cameras to identify if there are Lesser Horseshoe bats crossing the road at unmitigated locations and where there may be a collision risk.

Radio tracking can be used to identify foraging areas and use of commuting routes/movements between roost sites. Fixed loggers can be used to automatically monitor tagged bats that move through any underpasses or enter roost sites. Continuous tracking can identify foraging areas and new commuting routes that may be a result of changed habitats.

It would be recommended to radio track a minimum of 10 or 3% of the colony over two years (1st and 2nd summer) following the completion of all works on the site with a suitable proportion of bats tagged from each roost site. Radio tracking should be conducted in late July/August period.

E – For the monthly population monitoring each of the buildings and emergence location for each building will be monitored simultaneously once per month to get a total colony count for the site.

For the summer months and monitoring of commuting routes each of the mitigation areas along the spine road will be monitored to identify the number of bats crossing each of these locations.

For the road crossing surveys surveyors will be lined along the route as required depending on the equipment capabilities to survey the length of the road (night vision cameras and thermal imaging cameras) to ensure all of the road is covered.

F – Monthly colony counts will be conducted for a minimum of 10 years post construction of all artificial roosts on the site.

Monthly counts of all mitigation areas along the spine road will be surveyed for a minimum of 5 years post construction.

Surveying for bats crossing the spine road at unmitigated locations will be conducted for a minimum of 5 years post construction.

G – this will be defined within the Section 106 that is currently being drafted as part of the planning application. All monitoring results and reports will be submitted to FoDDC and Natural England

H – Monitoring reports will form the basis of on-going consultation with FoDDC and Natural England. It is not anticipated that the reports themselves will be made available to the general public however the monitoring results will be submitted to the local biological records centre

Adaptive Management

If any of the above surveys and monitoring identify that the Lesser Horseshoe bats are not using the spine road mitigation areas successfully then additional management / mitigation will be implemented.

In each case the individual mitigation will need to be looked and the behaviour of the bats or identified problems addressed. This will very much be case specific to each potential problem with each of the different mitigation areas.

For culverts this may include additional planting or control of planting to suitably lead bats to and from the culvert.

For hop overs if bats are flying to low and creating a collision risk then walls or fences may be necessary or low level lighting to keep bats higher.

Main Office and Bath House Bat roosts

A – Monitoring is to identify the level of use of the existing bat roosts the Office and Bath house and to ensure that there is no disturbance that causes the buildings to reduce or cease to be used as a roost by Lesser Horseshoe bats during Phase 1 and to enable quick mitigation measures to be implemented to ensure these can continue to be used.

B – Baseline data has been conducted historically and detailed counts during 2013 to accurately identify the total colony count for the site and the proportions of the colony using the Bath House and the Office building roosts. Surveys are continuing during 2014 to provide continued accurate monitoring.

C – The mitigation will be considered to be a success if similar proportions of the colony continue to use the existing Artificial roost and the proportions using this building does not increase. The erection of two new artificial roosts may result in a reduction of the number of bats using the Bath House and Office building, however, if during Phase 1 there is a reduction of the number or proportion of bats using the new buildings or Bath House and Artificial roost and an increase in the number or proportion of bats using the existing Artificial roost then this will not be successful.

D – Monthly surveys will continue to be conducted following the existing survey methodology on all the buildings on the site, existing Acritical

roost, Bath House and Office buildings and the new Artificial roosts. These surveys will consist of Monthly counts to identify the population using each building and total colony count. Surveys will be conducted during the active season (May-October) by conducting emergence surveys with night vision cameras to accurately count all bats that emerge from the buildings during the emergence period. Surveys during the winter hibernation season will be conducted by a hibernation survey of all buildings by a suitably qualified licenced ecologist.

E – For the monthly population monitoring each of the buildings and emergence location for each building will be monitored simultaneously once per month to get a total colony count for the site.

F – Monthly colony counts will be conducted for a minimum of 10 years post construction of all artificial roosts on the site.

G – this will be defined within the Section 106 that is currently being drafted as part of the planning application. All monitoring results and reports will be submitted to FoDDC and Natural England

H – Monitoring reports will form the basis of on-going consultation with FoDDC and Natural England. It is not anticipated that the reports themselves will be made available to the general public however the monitoring results will be submitted to the local biological records centre

Adaptive Management

If the surveys identify the population or proportion of bats using the Office and/or Bath house is decreasing without the new artificial roosts being used by Lesser horseshoe bats during the development of Phase 1 then all potential reasons for disruption and or disturbance causing a reduction in use will be explored and addressed.

Additional mitigation may include the use of sound baffles, movement of any nearby works or work compounds away from the roosts or continued security of the site from access/vandalism

Establishment/improvement of forage habitat

A – Monitoring is aimed to identify the level of use of the established and improved foraging areas by Lesser Horseshoe bats and enable a comparison between the previously identified foraging levels and expected foraging activity to enable identification of the success of the mitigation implemented.

B – Baseline data has been collected through the summer of 2013 through transects and static loggers to identify activity levels in different habitats.

C – The foraging habitat mitigation areas will be considered a success if surveys identify that they are being used to a similar foraging level to that which would be expected for the habitat area.

D – Surveys of the foraging habitat areas will be conducted through the use of Static loggers and transects.

Static loggers will be located within each area for a minimum of 5 days for three occasions a month apart between May and August.

Lesser horseshoe specific transects of all areas will be walked simultaneously one night one three separate occasions at least a month apart between May and August. Transects will be walked between 1.5 hours after sunset for 3 hours so commuting bats are not recorded and it is aimed at recording foraging bats.

E – Surveys will be conducted for each of the foraging habitat creation and enhancement areas across the whole development.

F – Specific monitoring of the mitigation habitats will be conducted annually for the first 5 years following the creation/enhancement works and as specified within Appendix B.3 thereafter.

G – this will be defined within the Section 106 that is currently being drafted as part of the planning application. All monitoring results and reports will be submitted to FoDDC and Natural England

H – Monitoring reports will form the basis of on-going consultation with FoDDC and Natural England. It is not anticipated that the reports themselves will be made available to the general public however the monitoring results will be submitted to the local biological records centre

Adaptive Management

If the surveys identify the foraging level expected of any area is not being achieved consistently then additional enhancements, planting will need to be implemented. This will be dependent on each area and habitat type but planting should be aimed at maximising the suitability for Lesser Horseshoe bats.

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