Welsh Government

M4 Corridor around Newport

Environmental Statement Volume 3: Appendix 10.24

Bat Roost Survey 2015 Report

M4CaN-DJV-EBD-ZG_GEN-AX-EN-0015

At Issue | March 2016

CVJV/AAR
3rd Floor
Longross Court,
47 Newport Road,
Cardiff
CF24 0AD

Contents

Figures

Photographs

Annexes

Summary

S.1 RPS has undertaken a bat roost survey of buildings and trees along the route of the proposed M4 Corridor around Newport (M4CaN) between Castleton and Magor to inform the ecological baseline for Environmental Impact Assessment (EIA) of the Scheme. Thomson Ecology were contracted to carry out tree roost surveys on behalf of RPS. The EIA is reported in the M4CaN Environmental Statement (ES) of which this document is an appendix to the chapter on Ecology and Nature Conservation.

S.2 A bat roost survey previously undertaken by Arup on behalf of Welsh Government in 2014 is reported separately in Appendix 10.7 of the M4CaN ES.

S.3 This document reports the findings of the bat roost surveys that were undertaken from July to October 2015 using standard Bat Conservation Trust (BCT) survey methods (Hundt, 2012).

S.4 Several buildings within or close to the new section of motorway were identified as having bat roost potential. Further survey work was undertaken on these buildings to determine whether they were being used as a bat roost.

S.5 The following buildings which were surveyed have been identified as bat roosts or probable bat roosts.

- Old Stores, Associated British Ports (ABP).
- Pye Corner Farm.
- The Vicarage, Magor.
- Tatton Farm.

S.6 Only a small number of common pipistrelles were recorded emerging from the buildings. No roosts of other species have been recorded.

S.7 Of the trees with high roost potential surveyed, three have been identified as bat roosts and two trees identified as probable roosts. A brown long eared bat and three common pipistrelles were seen emerging from Tree 80 (T80). Bats were also seen emerging from T274 and T375, but with no audible call. These trees were confirmed as bat roosts.

S.8 A high level of bat activity was recorded around the canopy of trees T39 and T45 but no bats were seen to emerge from or return to roost in these trees; trees T39 and T45 were therefore identified as probable bat roosts.

S.9 Further survey work is recommended on buildings where access was not obtained during 2015 (Fair Orchard Farm) and on buildings where the recommended number of survey visits were not completed (Old Stores, ABP).

S.10 Further tree climbing surveys and further emergence surveys are required on trees within the new section of motorway footprint.

1 Introduction

1.1.1 RPS has undertaken a bat roost survey of buildings and trees along the route of the proposed M4 Corridor around Newport (M4CaN) between Castleton and Magor to inform the ecological baseline for Environmental Impact Assessment (EIA) of the Scheme. Thomson Ecology also undertook tree roost surveys on behalf of RPS. The survey focused on potential roosts within approximately 100 m of the proposed new section of motorway alignment and followed the methodology set out in Bat Survey: Good Practice Guidelines (Hundt, 2012). The EIA is reported in the M4CaN Environmental Statement (ES) of which this document is an appendix to the chapter on Ecology and Nature Conservation.

1.1.2 A bat roost survey previously undertaken by Arup on behalf of Welsh Government in 2014 is reported separately in Appendix 10.7 of the M4CaN ES. A review of that work was undertaken independently by Hyder (see Appendix 9.1 in the ES Scoping Report (ES Appendix 5.1)) and RPS (see ES Chapter 10). The conclusions of that review and the requirements for additional surveys in 2015 were set out in the Scope of Ecology Surveys Report (see Appendix 9.1 of the ES Scoping Report). This was discussed with Natural Resources Wales and they were further consulted on the scope of the proposed surveys through the consultation on the ES Scoping Report.

1.1.3 This document reports the findings of the bat roost surveys which were undertaken from July to October 2015 using standard Bat Conservation Trust survey methods (Hundt,2012).

1.1.4 This report document outlines the previous survey carried out and the reasons for this additional survey (Section 2), describes the methods used in the survey (Section 3) and the findings of the survey (Section 4). A discussion of the survey findings is provided in Section 5.

2 Previous Surveys

2.1 Introduction

2.1.1 The bat survey carried out by Arup in 2014 is reported in ES Appendix 10.7.

2.1.2 The bat report included both roost and activity surveys and the survey objectives were as follows.

- To assess the potential of trees and buildings within the study area to support bat roosts.
- To record bat activity levels and make observations on bat behaviour on ten walked transects, sampling habitats within the study area.
- To record and identify levels of bat activity at twenty locations spaced along the proposed route of the new motorway.
- To identify the range of species present and their relative abundance in terms of activity levels at these locations.

2.1.3 The study area for the purpose of this survey was based on a 500 m buffer around the physical extents of the previous scheme studied in 2007/8 including the route alignment, potential junctions and water treatment areas.

2.2 2014 Survey Method

Roost Potential Assessments

2.2.1 During the course of the Extended Phase 1 Habitat Surveys trees and buildings within the study area (which extended to 500 m from the previous alignment under consideration at that time) were assessed for their potential to support bat roosts in line with the guidance set out in the Good Practice Guidelines (Hundt , 2012). Trees within the study area were assessed from the ground for the presence of natural holes, woodpecker holes, cracks and splits, loose bark, cavities, and artificial bat boxes.

2.2.2 Buildings were also assessed for their potential to support roosting bats depending on their construction and the presence of possible bat access points.

2.2.3 The presence of such features was considered in determining the potential for bat roosts to be present. Trees were assigned potential based on their potential to support bat roosts as follows :

- High - Trees with multiple, highly suitable features capable of supporting larger roosts;
- Medium - Trees with definite bat potential, supporting fewer suitable features than High potential trees, or trees with potential for use by single bats;
- Low - Trees with no obvious potential, although the tree is of a size and age that suitable features may be present, or trees which have limited potential to support bats; and
- None - Small, young trees, or trees with no suitable features to support bat roosts.

2.2.4 Buildings were also categorised as high, medium or low potential for bats depending on the construction of the building and the presence of potential bat access points ascertained by external inspections if necessary using binoculars and torches.

2.2.5 During the surveys, the following information was recorded using electronic forms on tablet devices along with supplementary photographs.

Information Recorded for Buildings

- GPS location.
- Survey date.
- Building type.
- Age.
- Height of eaves.
- Pitch height at gable ends.
- Roof aspect.
- Roof complexity.
- Roof covering.
- Suitable features.
- Signs of bat use.

Information Recorded for Trees

- GPS location.
- Survey date.
- Species.
- Height.
- Diameter at breast height.
- Suitable features.
- Signs of bat use.

2.2.6 A total of 464 features with the potential to support roosting bats were recorded. This included 114 features with high potential, of which 109 were trees, four buildings or groups of buildings and one bridge. A total of 184 features of medium potential were recorded, comprising 181 trees and three groups of buildings. A further 157 features of low potential were identified, including 154 trees, two groups of buildings and a bridge.

2.2.7 Bats were heard in one building at the Dog Kennels on Rush Wall Track and droppings were found within two trees and one building at Grangefield, to the south of Tata Steelworks. The two trees are located adjacent to the A48(M) near to the Coach and Horses and outside of the study area near Whitson. The presence of bats or signs of bats confirms all of these features as roosts.

2.2.8 A further fourteen features had potential (but unconfirmed) signs of bats, including possible staining and fur polishing.

2.2.9 Full details of the results of the preliminary bat roost assessments carried out in 2014 are provided in ES Appendix 10.7.

2.3 Desk Study

2.3.1 A desk study of the proposed new section of motorway has been undertaken in 2015, which has been used to inform the bat roost surveys reported in this appendix.

2.3.2 No records of bat roosts were identified within the new section of motorway footprint. Bat roosts recorded within 5 km of the new section of motorway footprint include unidentified, pipistrelle species, common pipistrelle, soprano pipistrelle, Daubenton's, whiskered, noctule, brown long–eared bat, lesser horseshoe bat and Natterer's bat.

Further details of these records are provided within the desk study in ES Appendix 10.17.

2.4 Requirements for Further Survey

2.4.1 The 2014 bat survey report by Arup (ES Appendix 10.7) states that the surveys undertaken for bats during 2014 revealed the presence of a large number of trees and other features which have the potential to support bats. In addition, surveys identified the presence of a large number of bats of a range of species using habitats within the study area. The following comments and recommendations are made:

- Numerous trees and buildings within the study area have the potential to support bat roosts and further surveys and consideration will be required to establish the presence of roosts within any potential construction footprint and adjacent areas.
- A total of nine individual species have been recorded along with long-eared bat species and *Myotis* bats likely to include whiskered bat, Brandt's bat, Natterer's bat and Daubenton's bat, bringing the total to 14 out of the 17 species known to breed within the UK.
- Woodland areas, grazed grasslands and areas comprising tree lined lanes and watercourses were found to have the highest level of bat activity within the study area.
- Lesser horseshoe bats were recorded at eight of the 20 locations where static monitoring was undertaken. These were all located to the east of the River Usk between Pye Corner and the eastern end of the study area. These locations are spread out over 9 km of the potential route of any scheme and it is therefore concluded that at least two roosts may be present; one near to Pye Corner and Whitson and one in the area around Magor.
- A greater horseshoe bat was recorded on a single occasion at location 7 during the October monitoring session. This location is approximately 8.5 km from Ruperra Castle Site of Special Scientific Interest (SSSI) which is the nearest known roost. There is the potential that this bat was either foraging in the area or was moving between summer and winter roosts.

2.4.2 In light of these conclusions, the following recommendations are made in the Arup report to inform any potential scheme design and EIA.

- Emergence surveys should be undertaken of any buildings or trees with potential to support bat roosts within the construction footprint and within 100 m of any proposed construction work.
- Further survey work should be undertaken to establish the location of lesser horseshoe bat roosts within the vicinity of any scheme and to establish the main foraging areas and flight paths used by this species. It is highly likely that this will require radio-tracking work to be undertaken and the requirements for this should be discussed with Natural Resources Wales (NRW) prior to any further surveys being commenced.
- The design of any scheme will need to consider and include means to allow bats, and in particular horseshoe bats, to safely cross the scheme. Given the likely vertical alignment of any scheme this is likely to take the form of underpasses.

2.4.3 At a Hyder/NRW meeting on 30th January 2015, Hyder noted that although a very large number of potential bat roosts had been identified during the 2014 surveys, these were distributed over a relatively wide survey corridor. It was agreed that any climbing inspections or emergence surveys carried out in 2015 could be restricted to those high potential roost locations that would be within or adjacent to the footprint of the new section of motorway, once the alignment had been fixed.

2.4.4 It was also agreed that further identification of potential roost trees and buildings would be required in 2015 in the areas not accessible in 2014, but this could again focus on the footprint of the alignment once this is agreed. Indeed, it was agreed that, where possible, the 2014 results of high potential roost features should inform the design of the new section of motorway alignment.

2.4.5 NRW noted that lesser horseshoe bats had been recorded in the 2014 activity surveys, and that the implications of this in relation to the Wye Valley Special Area of Conservation (SAC),for which less horseshoe bats is a qualifying feature, would need consideration (i.e. within the Assessment of Implications on European Sites (AIES)). It was agreed that radio-tracking would unlikely be necessary to locate any lesser horseshoe bat roosts (as had been suggested by Arup), but that buildings in the vicinity of Pye Corner would instead need to be searched.

2.4.6 Having considered the report of the bat survey in the context of the above recommendations, RPS proposed the following further bat works.

- Identification and evaluation of further potential roost trees and buildings in areas not previously accessed within 100 m of the footprint of the new section of motorway.
- Climbing inspections followed where appropriate by emergence surveys of high potential tree roost locations and inspections and emergence surveys of suitable buildings within the scheme footprint or within 100 m, both already identified and in areas not previously accessible.
- A search of buildings in the vicinity of Pye Corner to investigate a potential lesser horseshoe bat roost.

3 2015 Survey Methods

3.1 Introduction

3.1.1 The preliminary bat roost assessment of building and trees was carried out over the period July – August 2015, which falls within the optimum period (buildings) and sub-optimum period (trees) for this type of survey. Further dusk emergence / dawn swarming surveys were undertaken on all buildings and trees which were considered to have bat roost potential between August and early October 2015, which falls within the optimum period for this type of survey.

3.1.2 The dusk emergence / dawn swarming tree surveys were undertaken outside the optimum period for maternity roosts which is May to August, inclusive. Therefore further survey work may be required for trees which were identified as having potential as a maternity roost.

3.1.3 The survey area was based upon the proposed alignment of the new section of motorway. All buildings identified as likely to be demolished or directly affected by the new section of motorway were assessed for their potential as a bat roost. All trees that fell within or adjacent to the footprint of the proposed new section of motorway and were assessed in the Arup 2014 survey as having high bat roost potential were tree climbed and reassessed.

3.1.4 After the initial assessments, further emergence surveys were carried out on all buildings which were assessed as having medium to high bat roost potential and all trees which were considered to have high bat roost potential.

3.2 Methodology

Buildings

3.2.1 The survey method was based on that described in in Bat Survey: Good Practice Guidelines (Hundt L 2012).

3.2.2 A preliminary bat roost assessment of several buildings within the new section of motorway footprint was carried out. These buildings were selected because they have been previously identified as having potential as a bat roost during previous surveys and/or they are of an age and style that is considered to have the potential as a bat roost.

3.2.3 The buildings where preliminary bat roost assessment was carried out and the dates the surveys took place are listed below. The locations of the buildings are shown on Figure 1.

- Associated British Ports (ABP) Buildings – 14th July 2015.
- Pye Corner Farm – 4th August 2015.
- The Vicarage and outbuilding, Magor – 11th August 2015.
- Tatton Farm – 12th August 2015.
- Fair Orchard Farm – 20th August 2015.

3.2.4 The preliminary bat roost inspections and further survey work were undertaken by RPS ecologists Sean Flynn, Elizabeth White, Nathan Redman and Georgia Kelly. The ecologists have between two to ten years' experience in undertaking preliminary bat roost assessments and bat emergence surveys.

3.2.5 A thorough inspection of both the interior and exterior of all buildings was undertaken where possible in order to locate any signs that could indicate the presence of bats. The buildings were also assessed for their potential to support a bat roost.

3.2.6 For health and safety reasons, Tatton Farm and some buildings within ABP were only surveyed externally. This is because access into the buildings was deemed unsafe and therefore an internal bat survey could not be undertaken.

3.2.7 Due to access restrictions, Pye Corner Farm and the Vicarage were only surveyed externally.

3.2.8 All potential access points into the interior of buildings and into features of potential value as roost sites, such as cracks and crevices in walls and beneath boarding and roofing materials, were inspected for signs of bats. All visible surfaces of the building, including the floor and any flat surfaces were inspected for signs that could indicate the presence of bats, such as bat droppings, urine staining, insect feeding remains or scratching.

3.2.9 Each building was then assigned a category of potential value for roosting bats in accordance with guidelines and categories published by the BCT.

3.2.10 Further survey work would need to be undertaken on all buildings that could not be fully assessed internally and/or that were identified as having medium or high bat roost potential. This further survey work would determine whether these buildings are being used as a bat roost.

3.2.11 The BCT guidance recommends that the further assessment of buildings with potential roost features should be undertaken in the form of dusk emergence and/or dawn re-entry surveys.

Trees

3.2.12 Climbing surveys were undertaken in July 2015 to inspect all high potential trees that are within or adjacent to (approximately 100 m) the new section of motorway footprint that are considered to be of high bat roost potential which had been identified by Arup in 2014 (ES Appendix 10.7). The locations of these trees are shown on Figure 1.

3.2.13 The tree climbing surveys were undertaken by Thomson Ecology ecologists Nia Bowen and Chris Wildblood. Nia Bowen is a bat licenced ecologist (Class 1 England and Wales) and has extensive survey experience with bats with over three years' experience of bat roost tree inspections. Chris WildBlood also has over three years' experience of bat roost tree inspections.

3.2.14 Where permission for access had been obtained and it was considered safe to do so, trees with the potential to support roosting bats were climbed with the aid of a ladder and/or ropes. A second surveyor was positioned at the base of the tree for safety reasons. All accessible potential roosting opportunities were inspected by the climber using a torch and endoscope. Further assessment of the suitably

of the potential roosting opportunities was also undertaken. Further details of the methods are provided in the Thomson Ecology report at Annex C.

3.2.15 The search for bats and evidence of bats focused on the areas around and within potential roosting opportunities for bats such as natural crevices and holes, woodpecker and rot holes, loose bark, splits and cracks, bird and bat boxes and dense ivy or epicormic growth. In addition, any inaccessible or partially accessible cavities were noted (Annex C).

3.2.16 The information recorded for each potential roost included the site type and a description of the potential roost and its location, including aspect and height above ground level.

3.2.17 From this, trees were re-assigned a level of potential to support a bat roost. Trees which could not be thoroughly inspected, but were nevertheless of a type which typically supports bat roost, were assumed to have high potential for roosting bats.

3.2.18 Trees 14, 23, 35, 57, 58, 90 and 302 are located within Tata Steelworks land. As only certain surveyors had access to survey this land, tree climbing was not undertaken. Therefore surveyors updated and undertook the tree assessment from the ground and reclassified the trees and provided recommendation for further survey work, if required.

Further Emergence Surveys

3.2.19 Bat surveys were undertaken in accordance with the latest best practice guidelines and recommendations published by the BCT in Bat Survey: Good Practice Guidelines.

3.2.20 The tree emergence surveys were undertaken by Thomson Ecology using a wide range of experienced bat surveyors ranging from one to eleven years' experience.

3.2.21 The building emergence surveys were undertaken by ecologists from RPS as discussed above in 3.2.4.

3.2.22 As recommended by the BCT guidance, two dusk emergence surveys were undertaken on buildings classified as having medium bat roost potential. A further dusk emergence survey was completed if there was evidence of a possible bat roost within the building after the initial two surveys.

3.2.23 As recommended by the BCT guidance, three dusk emergence/ dawn re-entry surveys were undertaken on all trees identified as having high bat roost potential between August – October 2015. However, if all potential roost features were fully inspected during the tree climbing survey, only two further dusk emergence/dawn swarming surveys were undertaken on that tree.

3.2.24 Two dusk emergence surveys were undertaken on any trees that were reclassified as having low bat roost potential after the initial tree climbing survey.

3.2.25 Dusk emergence surveys commenced ½ hour before sunset and continued until approximately 2 hours after sunset.

3.2.26 Dawn swarming surveys commenced 1½ hours before sunrise and ended at sunrise (or ¼ hour after the last bat was recorded).

3.2.27 Weather conditions during the surveys were recorded and provided in Annex B for buildings and Annex C for trees.

3.2.28 During each survey visit, the building/tree was surveyed continuously by suitably experienced ecologists and visual observations were made of where bats emerged and in what direction they were flying to or from. Behavioural observations were also recorded for any bats encountered on site or within the vicinity, including direction of flight, and activity observed e.g. foraging or commuting.

3.2.29 Bat detectors were used to detect echolocation calls from any bats emerging/entering the buildings to assist with species identification. The data recorded was subsequently analysed on computer using BatScan v.9, Analook software and Adobe Audition software.

Additional Trees

3.2.30 During the further hedgerow surveys undertaken in 2015 a number of additional trees were identified and considered to have some bat roost potential. Therefore, further investigation would be required next year to determine whether these trees had the potential to and were being used as a bat roost. These trees are discussed below and shown on Figure 1.

3.3 Limitations

3.3.1 Due to health & safety considerations and owner permissions full access wasn't possible into some of the buildings identified as having bat roost potential. This was compensated however by further dusk emergence surveys.

3.3.2 Access for further dusk emergence surveys on the buildings at Fair Orchard Farm was restricted by the land owner.

3.3.3 Further ground based investigations were undertaken instead of aerial investigations within the Tata Steelworks land as only certain surveyors had access.

3.3.4 Access was restricted in some parcels of land at the eastern end of the new section of motorway for tree climbing, therefore aerial survey could not be completed to establish the current potential for bats. All trees were given an overall potential of high and further activity surveys were recommended.

3.3.5 Tree climbing surveys could also not be undertaken on trees unsafe to climb. Therefore, all trees were given an overall potential of high and further activity surveys were recommended.

3.3.6 A couple of the dusk emergence and dawn return tree surveys were cancelled due to poor weather. Some were undertaken in sub-optimal conditions; however, bat activity was recorded during these surveys.

Due to land access, second visits to five trees and third visits to two trees were undertaken during early October which is outside the optimum time of year. However the weather in early October was such that conditions were optimal or suitable for bat survey other than two trees surveyed at dusk and dawn return on the night of 5th - 6th October, when conditions were sub-optimal due to rain.

4 Results

4.1 Introduction

4.1.1 A brief description and the bat roost potential of the buildings surveyed during the initial bat roost assessment are provided in Table 4.1 below. Full descriptions are provided in Annex A. A summary of the results of the further emergence surveys undertaken has also been included below. Full details including the weather conditions at the time of survey are provided in Annex B.

4.1.2 A summary of the results of the tree climbing surveys and further emergence surveys are discussed below, full results are provided in Annex C.

4.1.3 The locations of the buildings and trees included in the survey are provided on Figure 1.

4.2 Results

Buildings

Preliminary Bat Roost Assessment

4.2.1 A summary of each of the buildings surveyed and the level of bat roost potential is provided below. Full descriptions of the buildings are provided in Annex A.

4.2.2 All buildings within ABP Docks land that are located within the footprint of the new section of motorway were assessed for their potential as a bat roost. A list of buildings accessed is provided in Table 4.1 below. All other buildings located within this area were discounted as they were of an age and style that was considered not to offer bat roost potential.

Table 4.1: Buildings Assessed and Bat Roost Potential

Building	Description	Potential
Large Modern Warehouses, ABP	Three large warehouses. Relatively new and well used buildings, constructed of corrugated metal.	No
Victorian red brick Buildings, ABP	Red brick buildings located in planning office yard. Buildings had a roof replacement in 2010, now a corrugated metal roof. Well used buildings.	No
Small derelict building, ABP	Small building located at the entrance to planning yard. Damaged door, broken windows and roof tiles. Potential access into roof space.	Medium
Old Victorian Workshop, ABP	Three connected buildings of different style and age. Two storage/workshop areas and a small outbuilding. Several broken windows, holes in wall and gaps above doors and under soffit boards providing potential access into buildings and roof space.	Low - Medium
Carpenter's Workshop, ABP	Regularly used workshop with roof space in part of the building. Potential access points into building include under soffit boards and gap above hatch on wall near roof.	Medium

Building	Description	Potential
Old Stores, ABP	Several broken windows, building has a hanging ceiling with roof space with missing panels. Otherwise roof and walls intact.	Low – Medium
Old Lock Keepers Cottage, ABP	Small building with broken windows and damaged door. Has a hanging ceiling with broken panels and dark roof space. Missing and broken roof tiles.	Medium
Pye Corner Farm	Only accessed externally. Farmhouse is of an age and style that is considered to have a roof space. Small gap under soffit board under roof of building and very large door sized gap at one end which may lead into roof space.	Medium
Main building, The Vicarage	Only accessed externally. Building is of an age and style that is considered to have a roof space. Small gaps under soffit boards and gable ends providing potential access. Gap under cladding of top floor windows.	Medium
Coach House, The Vicarage	Only accessed externally. Small stone derelict building with damaged roof covered in netting. Gaps in walls and above door. One side covered in dense ivy.	Medium
Garage, The Vicarage	Only accessed externally. Building is in a very good condition, intact walls and roof and no gap under soffit board.	No
Tatton Farm	Only accessed externally. Derelict building with cracks/holes in stone walls, broken windows, missing roof tiles, gaps under soffit boards. Age and style of building likely to have a roof space.	Medium
Fair Orchard Farm	Outbuilding and cowsheds considered to have bat roost potential. Sections of the cowshed have a hanging roof with potential roof space and potential access points into roof. Outbuilding has a dark open roof space with wooden beams and rafters. Large holes in building design offering potential access into building.	Medium

Further Emergence Surveys

4.2.3 The results of the dusk emergence surveys of the buildings are described below.

Buildings within ABP Docks Land

4.2.4 A bat possibly emerged from the broken window on the southern edge of the Old Stores on 21st September 2015. The bat flew westwards towards the open water in the dock. No other bat emergence was recorded at the site.

4.2.5 A second survey was completed on 28th September 2015 and no emergences were recorded. Only two of the proposed three survey visits were completed on this building.

4.2.6 Two emergence surveys were undertaken on the following buildings and no bats emerged during either survey.

- Small derelict building.
- Old Victorian Workshop.
- Carpenter's Worksop.

- Old Lock Keepers Cottage.

4.2.7 Low levels of bat activity were recorded across the ABP site throughout the surveys.

Pye Corner Farm

4.2.8 A common pipistrelle emerged from the roof near the chimney at the western end of the building and flew westwards at 20:48 hours (hrs) during the first dusk emergence survey undertaken on 18th August 2015.

4.2.9 A pipistrelle bat possibly emerged from under the roof soffit board at the western end of the building and flew westwards at 20:01 hrs during the second dusk emergence survey undertaken on 3rd September 2015.

4.2.10 During the final dusk emergence survey on the 15th September 2015, a common pipistrelle possibly emerged from under the soffit board near the roof at eastern edge of the house at 19:40 hrs and flew eastwards.

The Vicarage and Coach House, Magor

4.2.11 Two common pipistrelles emerged from the main Vicarage building during the first survey on 28th August 2015, one at 20:22 hrs from near the chimney on the western side of the house and one at 20:28 hrs from out of the cladding at the top floor window at the front of the house. Both bats flew southwards away from the house.

4.2.12 No bats were recorded emerging from the main Vicarage building during the second survey on 2nd September 2015.

4.2.13 Two common pipistrelles emerged from the main Vicarage building during the final survey on 9th September 2015, one at 19:56 hrs from within the front door and on at 2014 again from out of the cladding at the top floor window at the front of the house. Both bats flew southwards away from the house.

4.2.14 No bats emerged from the Coach House during any of the three dusk emergence surveys.

Tatton Farm

4.2.15 No emergence was recorded during the first survey on the 17th August 2015.

4.2.16 Two common pipistrelles emerged from the top right window at the front of the house at 20:22 hrs during the second dusk emergence survey undertaken on the 1st September 2015. Both bats flew southwest into surrounding farmland.

4.2.17 During the final dusk emergence survey on the 1st October 2015, a common pipistrelle was recorded emerging from near the chimney at 19:17 hrs and another from the middle right hand side window at 19:19 hrs.

Fair Orchard Farm

4.2.18 Permission was not granted by the landowner to survey these buildings. During the preliminary bat roost assessment, the property owner commented that he has observed bats in the vicinity of the buildings and surrounding yard and a bat roost was likely to be present in the buildings.

Trees

Preliminary Bat Roost Assessment

4.2.19 A summary of the trees surveyed is provided below. Full results are provided in Table 4, Annex C.

4.2.20 Within the 2014 Arup preliminary bat roost assessment (ES Appendix 10.7), 109 trees within the survey area were classified as having high bat roost potential. Of these, 36 trees and one group of five trees were within or adjacent to the footprint of the proposed new section of motorway.

4.2.21 To identify whether these trees are bat roosts and to investigate the potential roost features further, tree climbing surveys were undertaken and the high potential trees classified as follows.-

- Four were considered to have no potential roost features that were considered suitable for roosting bats and there was no evidence of bat use.
- Two had their potential reduced to low as it was considered that the potential roost features would not provide suitable habitat for long term roosting due to their exposure to the elements.
- Four remained as high potential as the tree was unsafe to climb due to dense ivy or deadwood, which itself provided a potential roost feature.
- Thirteen remained as high potential as the tree was climbed but not all potential roost features were inspected fully due to their extent.
- Three remained as high potential as all potential roost features were fully inspected and have the potential to support roosting bats, although not current bat evidence was found.
- Ten trees were not climbed due to access restrictions; therefore further emergence surveys were required.
- The group of five trees remained classified as high. Three trees were not fully inspected due to the extent of potential roost features and two were fully inspected and have the potential to support roosting bats, although not current bat evidence was found.

4.2.22 From these results the number of further dusk emergence/dawn re-entry surveys were determined and undertaken to identify those trees that are being used as a bat roost. Details of the further requirements required for each tree is provided in Table 4, Annex C.

4.2.23 Trees 14, 23, 35, 57, 58, 90 and 302 which are located within Tata steelworks land were reassessed from the ground only. Other than T90, all other tree classifications were reduced to medium potential and further emergence surveys were not recommended. These trees only had potential for use by single bats with only some small holes and splits, many which were quite exposed.

4.2.24 Tree 90 is still considered to offer high potential as a bat roost. It has four woodpecker holes and a frost crack which are potential roost features for bats to roost. No other evidence of bat use was recorded. It is recommended that the tree is climbed to determine whether any of the features have a sizable cavity for a bat to roost or have any signs of bat use.

Further Emergence Surveys

4.2.25 A summary of the dusk emergence/dawn re-entry surveys of the trees are provided in Table 4.2 below. Full results are provided in Annex C.

Table 4.2: Summary of Trees Confirmed as Bat Roosts

Tree Number	Visit Number	Date	Sunrise/ Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T80	2	01/09/2015 Dusk	19:58	NE	One brown long – eared bat flew from behind surveyor toward tree at 20:50 hrs; it was not observed/heard to leave the tree and was assumed to have entered a roost
T80	2	02/09/2015 Dawn	06:26	SW	Bat seen flying into roost in tree at 05:41 hrs, no audible sound heard
T80	3	17/09/2015 Dusk	19:22	SW	Three common pipistrelles seen emerging at 19:48, 19:50 &19:56 hrs
T80	3	18/09/2015 Dawn	06:52	SW	One bat seen flying into roost in the south side of the tree at 06:20 hrs, no audible sound heard
T274	2	09/09/2015 Dusk	19:43	E	One bat seen flying from tree at 20:12 hrs near downward facing woodpecker hole, no audible recording
T375	1	02/09/2015 Dusk	19:56	W	One bat seen emerging at 20:19 hrs, no audible recording

Table 4.3: Summary of Probable Bat Roost Trees

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T39	1	24/08/2015 Dusk	20:16	S	Possible emergence from tree at 20:50. Bat not seen leaving
T45	1	24/08/2015 Dusk	20:16	S	Possible emergence at 20:50 hrs. Bat came out of shadow of tree

4.2.26 Further emergence surveys on T237 located at Pye Corner were not undertaken due to health and safety concerns within the area.

Additional Trees

4.2.27 Two trees with bat roost potential along the new section of motorway footprint were identified during further hedgerow survey work undertaken late in 2015, after the bat survey season.

4.2.28 The locations of these trees are illustrated on Figure 1. Further survey work is recommended on these trees to determine the level of potential and if they are a bat roost.

5 Discussion

5.1 Introduction

5.1.1 This section discusses the main findings of the bat roost surveys of buildings and trees. It sets out key considerations for M4CaN and the requirements for further survey.

5.2 Survey Findings

5.2.1 Several buildings within the new section of motorway footprint were identified as having bat roost potential. Further survey work was undertaken on these buildings to determine whether they were being used as bat roosts.

5.2.2 After the further survey work, the following buildings have been identified as bat roosts or probable bat roosts.

- Old Stores, ABP.
- Pye Corner Farm.
- The Vicarage, Magor.
- Tatton Farm.

5.2.3 Only a small number of common pipistrelles were recorded emerging from the buildings. No roosts of other species have been recorded.

5.2.4 The preliminary bat roost assessment and further emergence surveys of buildings around Pye Corner did not identify any lesser horseshoe bat roosts. No radio tracking was undertaken as a result of this, as the location of the roost is required to successfully carry out a radio tracking process.

5.2.5 Of the high potential trees surveyed, three have been identified as bat roosts and two trees identified as probable roosts. A brown long eared bat and three common pipistrelles were seen emerging from T80. Bats were also seen emerging from T274 and T375, but with no audible call. These trees were confirmed as bat roosts.

5.2.6 A high level of bat activity was recorded around the canopy of trees T39 and T45 but no bats were seen to emerge from or return to roost in these trees. Trees T39 and T45 were therefore identified as probable bat roosts.

5.3 Further Surveys

5.3.1 Further survey work is recommended on buildings where access was not obtained during 2015 (Fair Orchard Farm) and on buildings where the recommended number of survey visits were not completed (Old Stores, ABP).

5.3.2 In addition to this, further survey work of additional buildings close to the new section of motorway may be required to establish the location of any lesser horseshoe bat roosts. However, other than Fair Orchard Farm, all buildings that would be lost to the new section of motorway have been surveyed and no lesser horseshoe bat roosts were identified.

5.3.3 Tree climbing surveys are recommended of trees that were not accessed following the ground based assessment to establish potential to support maternity and/or hibernating bats. Trees include T90 (Tata), T346 and T390. Based on the results of these surveys, further emergence surveys maybe required.

5.3.4 Trees identified as having high potential to support hibernating bats (T38, T62 and T335) should be tree climbed during the optimal survey period (December – February, inclusive) following the BCT survey methods (Hundt, 2012).

5.3.5 Two further dusk emergence or dawn swarming surveys are recommended for the trees with confirmed and probable roosts (T39, T45, T80, T274 and T375) in order to gather additional data on the roosts. These surveys should be undertaken between May and August to cover the period of the activity season missed in the surveys, with at least one survey undertaken during the maternity season (June to August, inclusive).

5.3.6 Further surveys should be undertaken on trees (T38, T328, and T331) which had no visits between May and August in 2015 or those where one of the recommended survey visits was not completed (T335, T346 and T359).

5.3.7 An additional visit should be carried out on trees (T82, T88, T273 and T358) which were considered to have potential as a maternity roost. This survey should be undertaken during the maternity season (June to August, inclusive).

5.3.8 Further ground level and aerial investigation should be undertaken of two trees identified after the bat survey season.

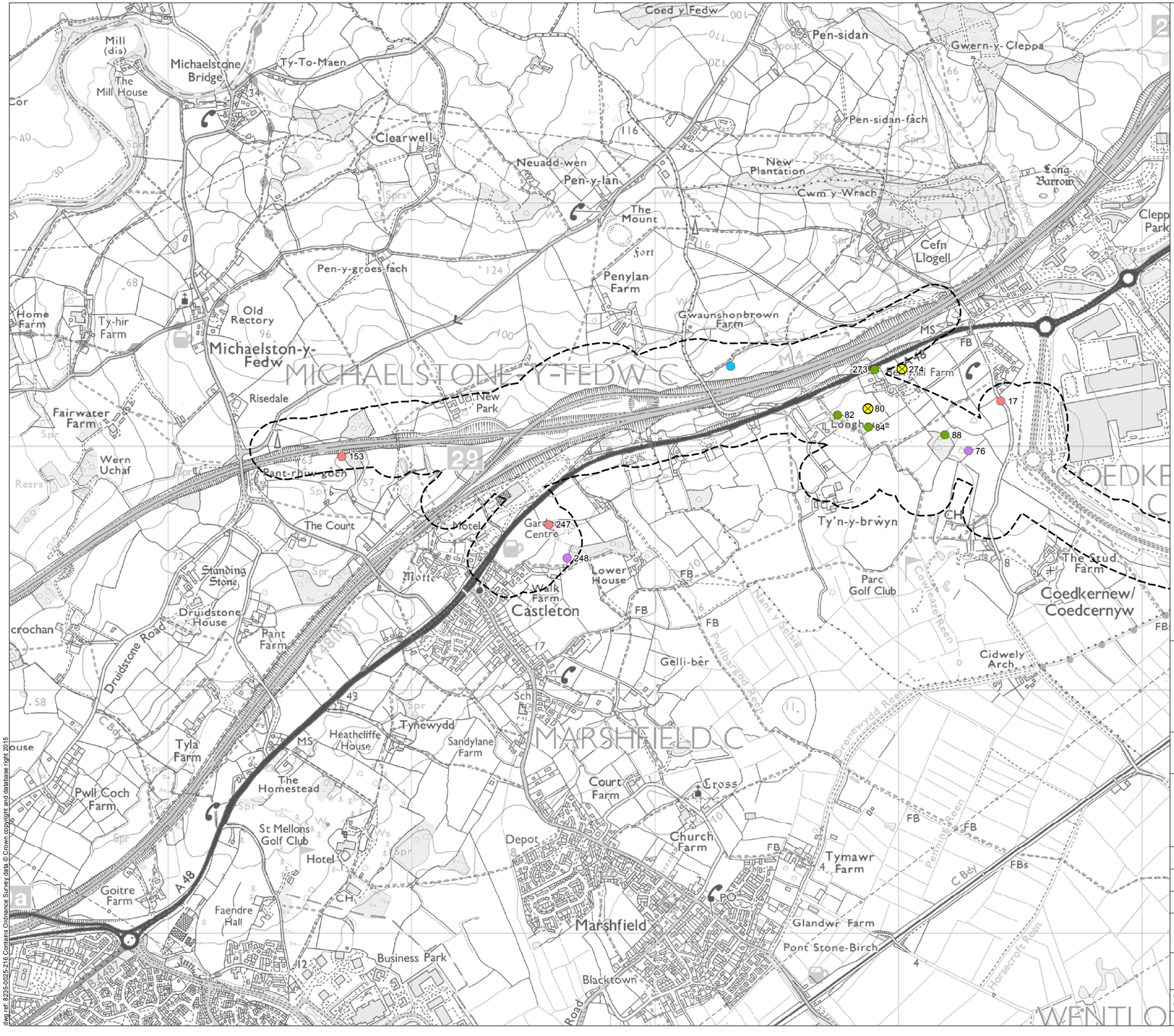
5.3.9 Further emergence surveys were not undertaken on Tree 237 at Pye Corner due to health and safety reasons. This will need to be reviewed to determine whether the tree is being used as a bat roost.

5.3.10 After the initial ground investigation and tree climbing surveys, further dusk and dawn return emergence surveys were only undertaken on trees within the new section of motorway footprint or 10 m of the footprint at the time (August 2016). As the new section of motorway footprint may change a review of whether any additional trees will need to be further surveyed will need to be undertaken.

References

Hundt, L. (2012) Bat Surveys: Good Practice Guidelines, 2nd Edition. Bat Conservation Trust, London.

Figures



Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1a	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216

Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

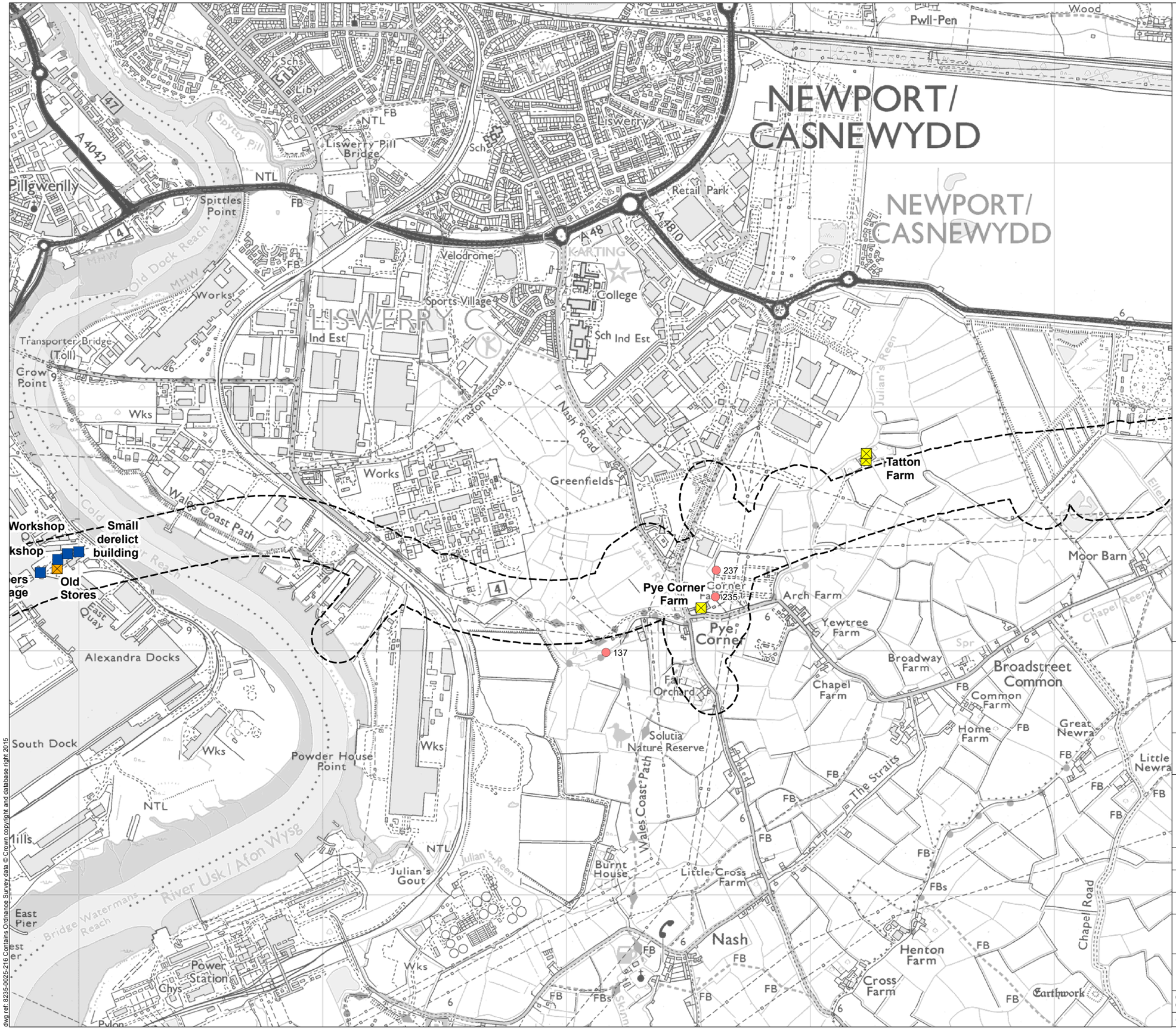
Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1b	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216



Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

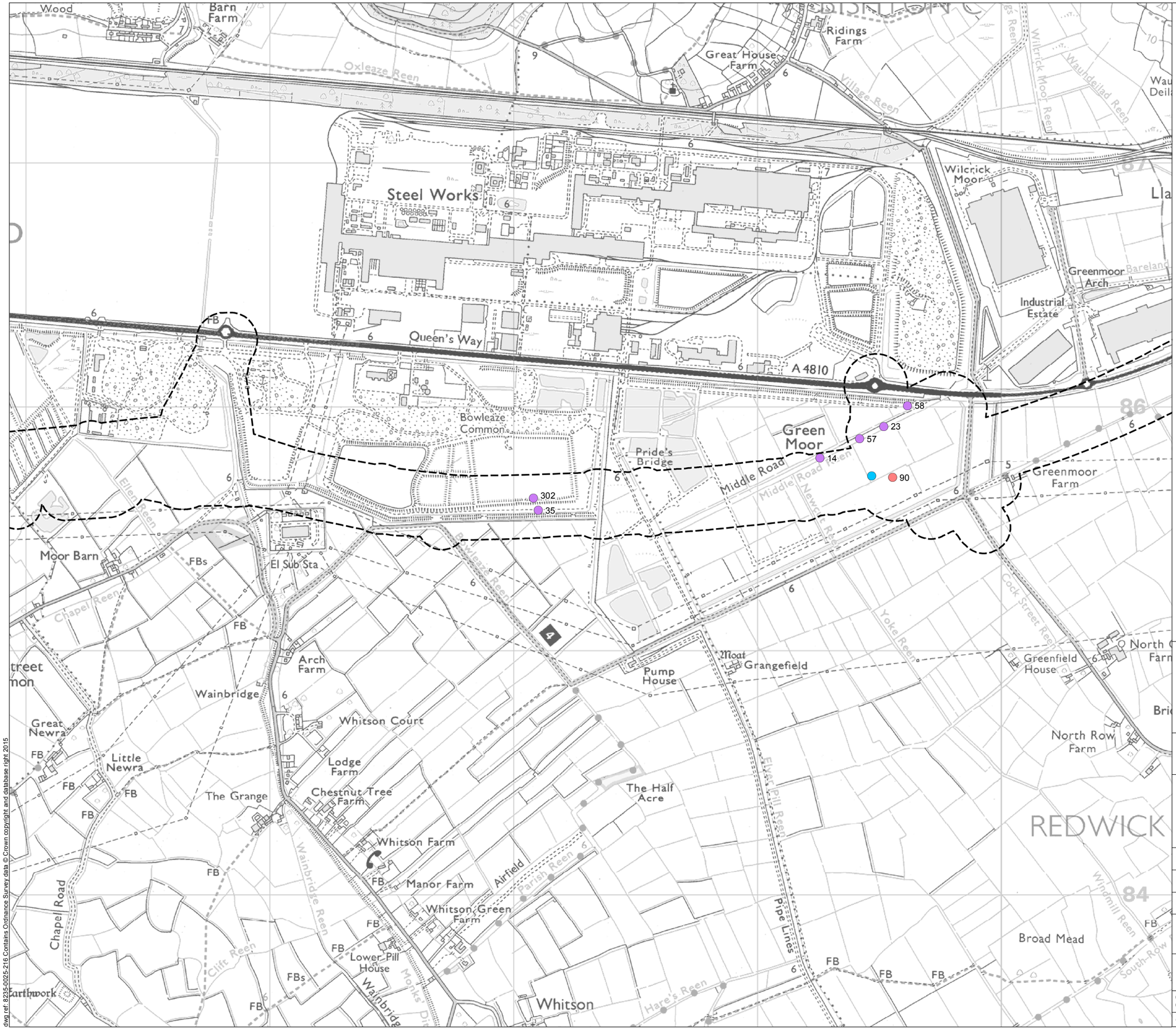
Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1c	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216



Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

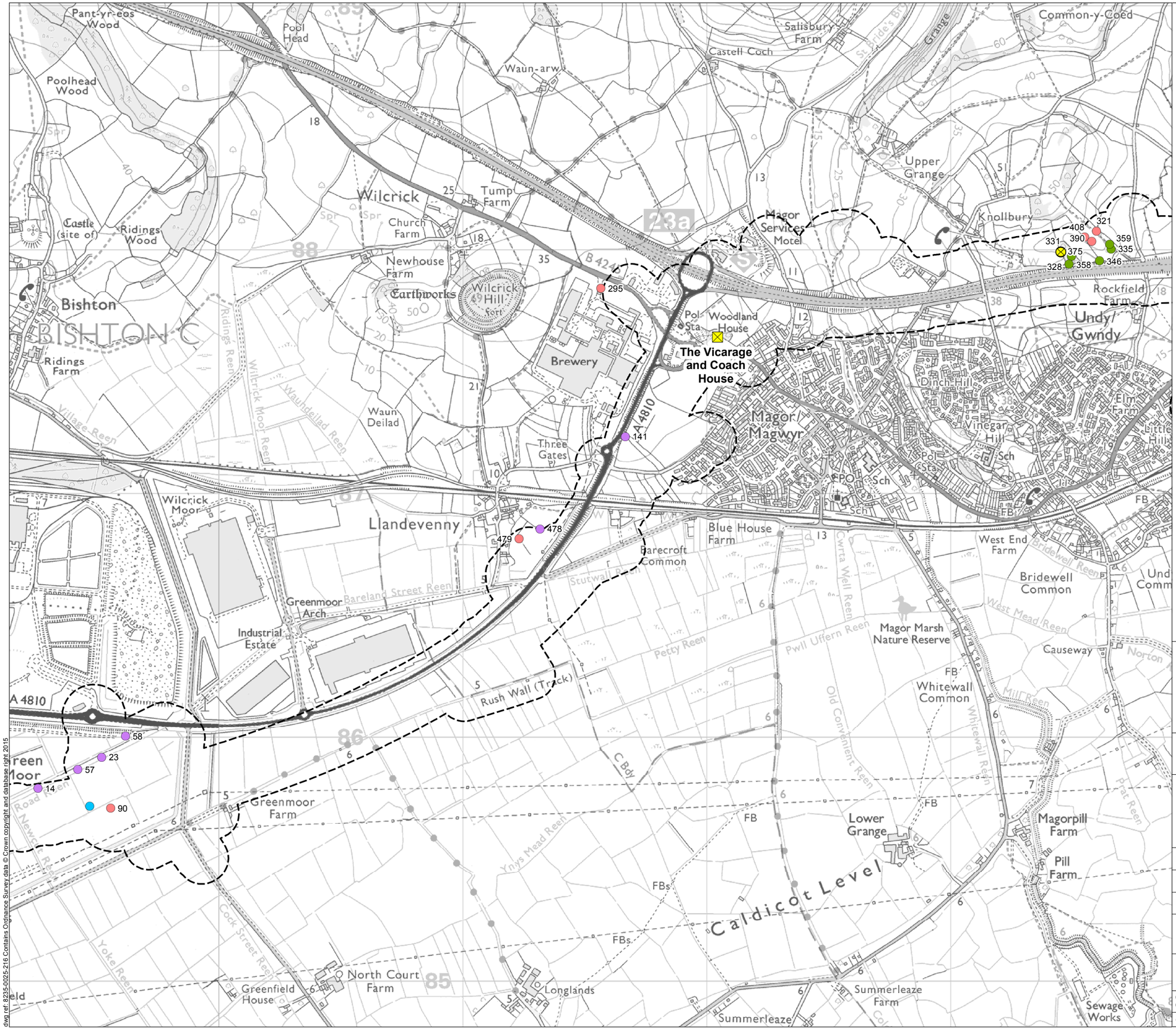
Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1d	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216



Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1e	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216

Legend

- 100m Study area
- Trees with high potential to support roosting bats – daytime aerial/ground-level assessment
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

Study area shown reflects the scheme design at the time of the survey

Llywodraeth Cymru
Welsh Government

Appendix 10.24 – Bat Roost Survey

Bat Survey: 2015 tree climbing, emergence and dawn swarming surveys

Figure: 1f	Revision: -
Date: March 2016	Status: AT ISSUE
Drawn: CR	Checked: LW

Scale: A3 @ 1:15,000
0 250 500 m

N

dwg ref: 8235-0025-216

Photographs

Photograph 1: Small derelict building, ABP

Photograph 2: Old Victorian Worksop, ABP

Photograph 3: Carpenter's Worksop, ABP

Photograph 4: Old Stores, ABP

Photograph 5: Old Lock keeper's Cottage, ABP

Photograph 6: Pye Corner Farm

Photograph 7: Main Building, the Vicarage

Photograph 8: Coach House, the Vicarage

Photograph 9: Tatton Farm

Photograph 10: Fair Orchard Farm

Annexes

Annex A – Descriptions of Buildings

Buildings within ABP Newport Docks Land

All buildings located within the footprint of the new section of motorway within ABP Docks land were assessed for their potential as a bat roost. Below is a list of buildings accessed, all other buildings located within this area were discounted as they were of an age and style that was considered not to offer bat roost potential.

Table 4.1: Buildings accessed for bat roost potential within ABP Newport Docks

Building	Description	Potential?
Large Modern Warehouses	Three large warehouses used for animal feed. The buildings are all constructed of a concrete retaining wall with corrugated steel wall and roofing panels. Several of the roofing panels are clear corrugated plastic allowing light into the building, in addition to this the warehouses are well lit and regularly used, sometimes 24hrs. The exterior walls and roof are all intact other than a few gaps within the steel structure. There is no roof space and the exposed beams are constructed of metal and have no gaps for bats to roost. It is considered that the metal beams are unsuitable for bats to roost as it is too cold. As these buildings are predominately constructed of steel and well-lit it is considered that they offer no potential for roosting bats.	No
Victorian red brick Buildings	These are buildings located within the planning office area that are used for the general maintenance of the port. They are all regularly used, including overnight. They have large doors which are left open and each building has several windows allowing light permanently into the building. Internally the buildings are well lit with artificial lights. The roofs are constructed of steel panels which were a replacement for the original roof in 2010; these roofs are all intact with no gaps. The walls are constructed of red brick and are intact. The interior roof is steel panelled, with steel and timber beams with no potential bat roosting spaces. The walls are clean and intact with no cracks/potential roosting spaces. The buildings are sometimes in operation 24hrs including the use of heavy machinery.	No
Small derelict building	The building is located at the entrance to the planning office yard. It is derelict with missing roof tiles, broken windows and the door left open. There is no gap under wooden soffit boards. The interior walls are intact and clean with no evidence of bats. There is a hanging ceiling with a good sized roof space (which could not be accessed safely) where there are several missing ceiling panels offering potential access into the roof. The main room is well lit offering no potential roosting space however the roof space provides a dark area with several potential access points into the roof externally and from inside the building. The age and style of the roof makes it likely to be constructed of beams and rafters providing potential roosting places.	Medium

Building	Description	Potential?
Old Victorian Workshop	Three connected buildings of different styles and age offering different levels of bat roost potential. 1 – Old workshop/storage – no roof space, exposed wooden beams and rafters with some small gaps. The main building is intact with no broken windows, the room is relatively well lit during the day, but there are some small dark corners at the back away from the windows. All surfaces/walls are clean with no bat evidence. There are small gaps under the soffit boards and under the tiles on the roof, offering a small possible roost space. Otherwise roof and roofing tiles are intact. 2 – Connected with an open doorway to building 1. This building is constructed of stone walls (intact), corrugated iron steel roof with wooden beams and rafters. There are large broken windows, making the building well-lit and a gap above the old wooden door. This building is considered as Low potential for roosting bats – but it does allow access to Buildings 1 and 3 which do offer potential for bats to roost. 3 – A very small old store attached to Building 2, by an open doorway. It is constructed of stone walls and slated roof with roof space. There is a gap in the stone wall providing a small access point into the building; The wooden panelled internal hanging roof has collapsed in places offering potential access into the roof space for bats to roost. The room was searched with no bat evidence found; the roof space could not be safely accessed to search.	Low-Medium
Carpenter's Workshop	The building is still in use, containing noisy machinery. There is a very large enclosed roof space in half of the building which was not accessible. It had an open hatch which showed the inside of the loft to be in darkness. The other section of the roof space is fully open and used as a workspace. In this area the roof is constructed of steel with a wooden hanging ceiling, consisting of wooden timber beams and boards with a small gap between. Externally, there is a small gap under the soffit board allowing potential access into the roof space. Otherwise the external steel roof is intact. There are some small gaps in the walls.	Medium
Old Stores	Corrugated iron roof with hanging ceiling with wooden beams. There are several broken/missing windows and the room is well lit. Quite a few of the roofing panels are missing allowing external access into the roof space, which has dark corners and potential roost spaces. The walls are intact and the exterior roof is intact. The back part of the stores was not accessed internally, so the assessment was only completed from outside the building.	Low
Old Lock Keepers Cottage	Several broken/open windows into main room which is well lit. The building has a hanging roof with a roof space and holes in ceiling allowing access. The roof space has wooden beams providing potential roosting places and is dark. There are missing roof tiles creating a further external access point. The roof space could not be safely accessed. The building's doors and windows had been boarded up by the date of the first emergence survey.	Medium

Pye Corner Farm

The house was only accessed externally as access was not granted at the time of survey to assess the interior of the building. The main farmhouse is of an age and style that is considered to have a roof space with wooden beams and rafters. The roof and walls of the main farmhouse are intact with no obvious features i.e. loose or missing tiles allowing access into the roof space.

At the eastern end of the main farmhouse building there is a very large door sized gap. The gap is quite large and would allow light into the entrance of the hole. There may be additional gaps that lead further into the main building and the roof space from this entrance.

There is a small gap under the soffit board and guttering on all sides of the roof which again may allow access into the roof space.

This building was considered as having medium bat roost potential and emergence surveys recommended as there were features that may support a potential bat roost that could not be further investigated.

The Vicarage and Coach House, Magor

These buildings were only assessed externally as internal access was not permitted.

The Vicarage is in very good condition externally, with no loose roof tiles or gaps within the roof. The roof is of a style which is likely to have a roof space with beams and rafters. There is no evidence of a gap under the soffit boards and there is no gap where the roof connects to the walls.

There are large gaps around the top floor windows where the roof cladding attaches to the windows (there are about four windows where this occurs). These gaps may lead into the roof space, although even if these areas do not lead into the roof, they can provide a small roosting space.

On the corners of the roof there are ridge tiles with some small holes which may provide a potential access or a resting place. The Vicarage offers medium potential as a bat roost.

There is an old outbuilding attached to the north western edge of the main house, it is in a poorer condition than the rest of the main house with small gaps in the corners of the roof under the ridge tiles.

The coach house is an old stone building with a damaged roof which is covered by netting – although there are still several gaps for potential access within the damaged roof. There is a large gap above the door and several holes in some of the stone walls. The building is attached to a wall on one side which has dense ivy; there may be more damage such as cracks in the wall here. This building offers medium potential as a bat roost.

In 2007, the coach house was recorded as a small Common Pipistrelle bat roost (reported by Arup – ES Appendix 10.7).

The garage is in very good condition with an intact roof with no loose tiles and no potential access under soffits boards and no gaps where roof and walls join. No potential as a bat roost.

In 2007, the garage was recorded as a possible *Myotis* bat roost (reported by Arup – ES Appendix 10.7).

Tatton Farm

The buildings were only accessed externally as the house and surrounding outbuildings are in a derelict condition and an internal inspection was not possible due to health and safety concerns.

The farmhouse is derelict with the majority of windows broken at the front of the house allowing access into the rooms inside. Due to the damage the rooms will be well lit during the day, however there may be further damage/ open doors in these rooms allowing access further into the building roof/darker spaces.

The downstairs windows and rooms could be viewed from the outside. There was no evidence of bats within the areas that could be easily observed. The rooms were well lit during the day and there was no damage to the ceiling or doors offering no potential access further into the building.

There was a broken window upstairs that could not viewed to determine whether there was further access into the rest of the house. The other windows were boarded up with small gaps allowing possible access into the house.

There was a gap under the soffit boards along all edges of the house which offers potential access for bats into the roof. The roof was of a style and age which was likely to have a roof space with beams, offering a potential roost space.

At the front of the house, there was also a small hole under one of the front downstairs windows which could lead to a possible cellar under the house.

The back of the house had boarded windows with small gaps around the edges. The wall at the back of the house had a lot more damage with some small holes in the brickwork and quite a large one at one end over the outbuilding near the chimney.

There are some dense patches of vegetation growth within the walls and roof which may hide further gaps and damage.

The upstairs rooms and roof that offer the most potential for roosting bats. The downstairs rooms were assessed more easily and found to have limited potential to support a bat roost. The main farmhouse offers medium to high potential at a bat roost.

Several buildings are present around the farmhouse. These are all located adjacent to and within the farm yard. The types of buildings include large barns as well as smaller stone buildings. The majority of the buildings all have large open entrances facing the yard which can be viewed.

The large barns are constructed of corrugated iron, are very derelict and open with no roof space to provide potential for roosting bats.

The smaller outbuildings are constructed of stone with a corrugated iron roof; several sections of the roofs are slightly damaged and collapsed. There is no roof space; however the roof beams are wooden which could provide potential roost opportunities. These buildings could not be entered but from the open

doorways which were left fully open or were completely removed it was quite light. However some of the buildings were piled high with old furniture and appliances. This provided much darker spaces behind which provided some potential for bats to roost.

There was also a young tawny owl in one of the farm outbuildings.

The farm outbuildings offer low potential for a bat roost.

Fair Orchard Farm

The buildings assessed at Fair Orchard farm include the main farmhouse which is currently lived in, an old store outbuilding connected to the north of the house and cowsheds which are connected to the southern edge of the main farmhouse.

All other buildings at the farm including large corrugated iron barns were not accessed and considered to have no potential as a bat roost.

The main farmhouse is in a very good condition and is currently in use. The roof is intact with no lose or cracked tiles. The house is of a style and age to have a roof space; however the roof space has been converted, has skylights and is used as a living space. The main farmhouse has no/low potential as a bat roost.

The old outbuilding is currently used as a store and is unlit. The roof space is open and is constructed of wooden beams and rafters providing small crevices as a potential roost space. There are two large circular holes (old features of the building), approximately 50 cm in diameter, at the top of the northern and eastern walls. The eastern hole is completely open to allow for nesting swallows to enter/leave and the northern hole has been boarded up with wooden panels, however there are some small gaps between the panels. There are several small gaps between the stone walls and roof, particularly on the corners – providing additional small access points. There are two large wooden doors on the east and western walls which both have gaps above, allowing access into the buildings. The roof is intact with no lose tiles or potential access points.

The interior of the building was fully accessed where possible and no evidence of bats were identified i.e. droppings on flat surfaces etc. The room is very dark during the day and has dark corners in the roof where bats could roost.

The owner of the farm mentioned seeing bats coming out of the buildings and bats flying around the buildings at dusk and dawn suggesting that they are likely to be roosting in the buildings or at least there is a roost near to these buildings.

The cowsheds are attached to the southern edge of the main farmhouse. There are three sections to the cowshed. The middle section is considered to offer low potential as a bat roost. There is no roof space, the roof is held up by wooden beams and rafters and the roof is covered by plastic sheeting. There is a possibility that there may be a gap between this and the roof tiles, but it is likely to be too cold. The exterior roof is intact with no lose tiles or cracks; however there may be a very small gap between the roof and walls, under the guttering, which is possibly too small for bats.

The two end sections offer the most potential for a bat roost (medium) as they have roof spaces with potential access points.

The shed directly connected to the farmhouse has a hanging ceiling constructed of ceiling board, which offers a dark space which is absent from the middle section. The ceiling board is damaged in several sections creating potential access points into the roof space. The roof is exactly the same in all sections of the cow shed i.e. wooden beams/plastic sheeting.

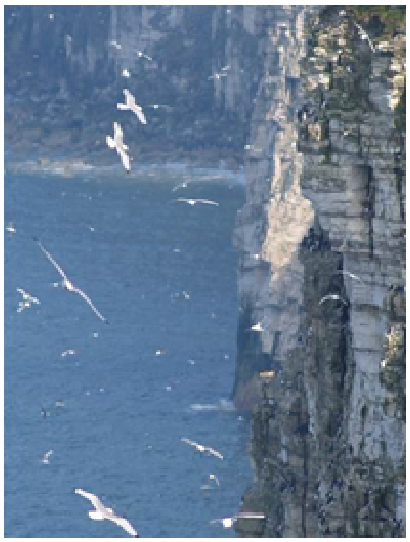
This section of the cowshed furthest from the farmhouse has an attic. It is constructed of a wooden hanging ceiling and a roof space with wooden beams offering a potential roost.

The cowshed has several doors and windows which have small gaps above providing access into the buildings. No evidence of bats was identified within any of the cowshed buildings.

Annex B - Weather conditions during building dusk emergence surveys

Date	Weather	Location
17th August 2015	Dry, cloud, no wind 18C	Tatton Farm
18th August 2015	Dry, scattered cloud, light wind 16C	Pye Corner Farm
24th August 2015	Dry, clear, light wind 15C	Carpenters Workshop and Victorian Workshop, ABP
25th August 2015	Dry, cloudy, light wind 16C	Small derelict building, ABP
26th August 2015	After light rain shower, some cloud, no wind 15C	Main Building, The Vicarage
27th August 2015	Dry, clear, no wind 13C	Coach House, The Vicarage
1st September 2015	After light rain shower, some cloud, no wind 11C	Tatton Farm
2nd September 2015	Dry, scattered cloud, no wind, 13C	Main Building, The Vicarage
3rd September 2015	Dry, clear, still 10C	Pye Corner Farm
8th September 2015	Dry, scattered cloud, no wind, 14C	Coach House, The Vicarage
9th September 2015	Dry, clear, no wind, 15C	Main Building, The Vicarage
10th September 2015	Dry, scattered cloud, no wind 12C	Coach House, The Vicarage
15th September 2015	Dry, cloudy, no wind 14C	Pye Corner Farm
21st September 2015	Dry, scattered cloud, light wind 12C	Old Keepers Cottage and Old Stores, ABP
22nd September 2015	Dry, clear, no wind 10C	Carpenters Workshop and Victorian Worksop, ABP
24st September 2015	Dry, cloudy, light wind 15C	Old Keepers Cottage, ABP
28th September 2015	Dry, clear, no wind 12C	Old Stores, ABP
29th September 2015	Dry, scattered cloud, light wind 13C	Small derelict building, ABP
1st October 2015	Dry, clear, light wind	Tatton Farm

Annex C - Thomson Ecology - Bat Tree Inspections, Dusk Emergence and Dawn Return to Roost Bat Surveys, M4 Corridor around Newport


Bat Tree Inspections, Dusk Emergence and Dawn Return to Roost Bat Surveys

M4 Corridor around Newport

For

RPS Planning and Development

London & South East
Compass House
Surrey Research Park
Guildford
GU2 7AG . UK
t: +44 (0)1483 466 000

North & Borders
Calls Wharf
2 The Calls
Leeds
LS2 7JU . UK
t: +44 (0)113 247 3780

Wales & South West
Williams House
11-15 Columbus Walk
Cardiff
CF10 4BY . UK
t: +44 (0)2920 020 674

Scotland
20-23 Woodside Place
Glasgow
G3 7QF . UK
t: +44 (0)141 582 1333

Enquiries

e: enquiries@thomsonecology.com

w: www.thomsonecology.com

Project Number	Report No.
MRPS108/005	003

Revision No.	Report Status	Date of Issue	Author	Reviewer	Approver
003	FINAL	19/11/15	Chris Wildblood Sali Palmer	Louise Bunn	Natalie Drury

thomson ecology

Contents

1. Summary and Main Recommendations

1.1 Summary

1.1.1 RPS Planning and Development Ltd (RPS) commissioned Thomson Ecology to carry out bat tree surveys along the route of the proposed new section of motorway to the south of Newport as part of the M4 Corridor around Newport project.

1.1.2 In July 2015, Thomson Ecology carried out bat tree surveys to inspect trees for evidence of use by bats identified by RPS as being of high potential for bat roosts within 250m of the proposed new section of motorway and/or proposed construction compounds. A ground level tree inspection was carried out on 37 trees, followed by tree climbing inspections of 23 trees which were accessible and/or safe to climb. The surveys resulted in the reclassification of the bat roost potential of four trees (T12, T54, T248 and T478 on Figure 1a to 1f) as negligible and two trees (T76 and T141 on Figure 1a to 1f) as low. Dusk emergence and dawn return to roost surveys were recommended for all other trees.

1.1.3 RPS commissioned Thomson Ecology on 17th August 2015 to undertake dusk emergence and dawn return to roost bat surveys of those trees confirmed to have high potential following the tree inspections within the footprint of the proposed new section of motorway. Surveys of 18 trees meeting this criteria were commissioned, and following health and safety concerns at one location, the brief was amended to exclude tree T237.

1.1.4 During the dusk emergence and dawn return to roost bat surveys, three trees (T80, T274 and T375 on Figure 2a and 2d) were confirmed as bat roosts for common pipistrelle, *Pipistrellus pipistrellus* and brown long-eared bat, *Plecotus auritus.* High levels of bat activity were recorded around the canopy of two trees (T39 and T45 on Figure 2b) bats were not seen directly emerging from or returning to roosts in these trees, but were also not seen to fly in from the surrounding area, and therefore were classified as being probable roosts.

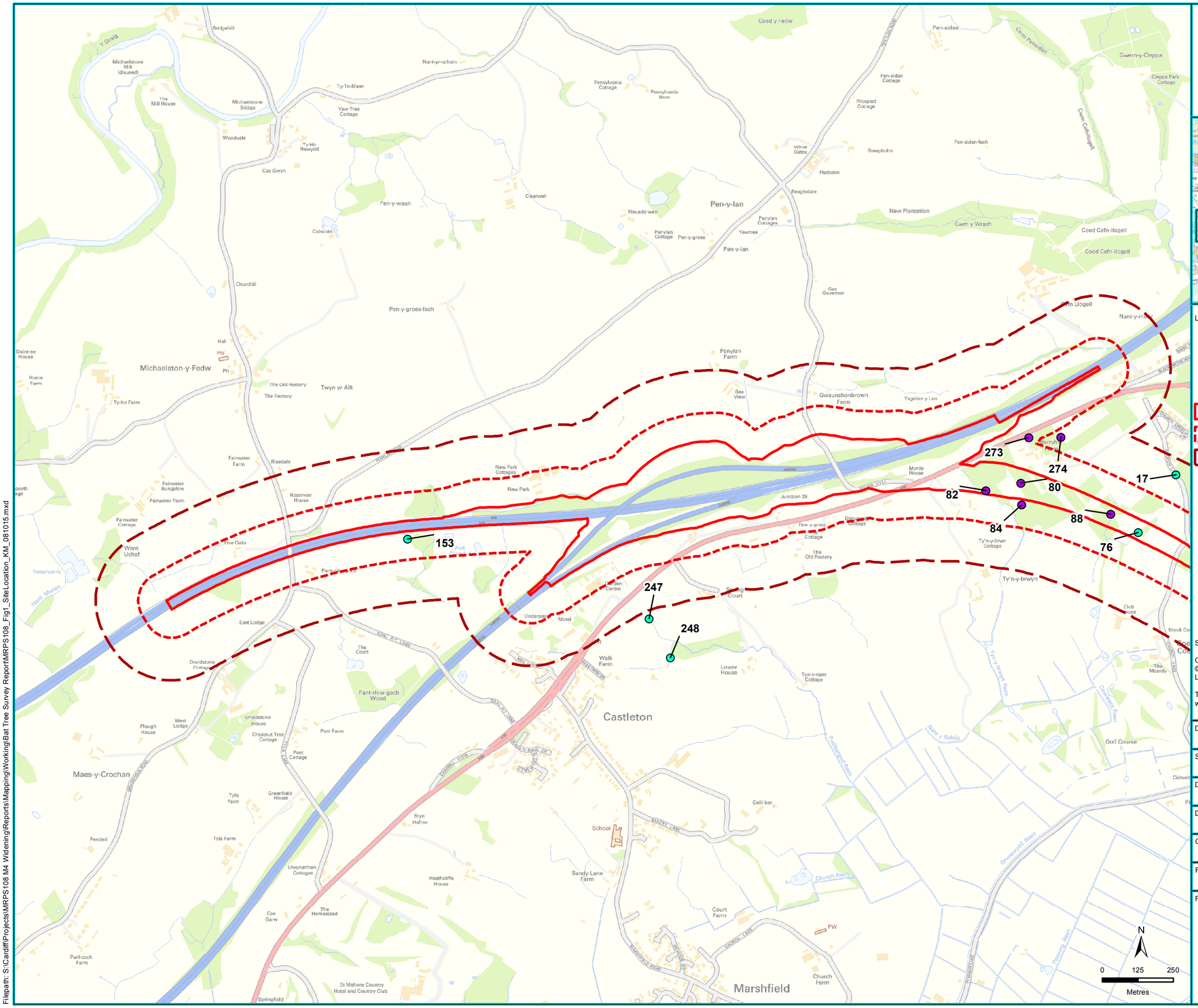
1.2 Further Survey

1.2.1 Tree climbing surveys should be carried out of trees T346 and T390 to establish potential to support maternity and/or hibernation roost potential as no tree climbing survey was undertaken due to access restrictions but the trees were assessed as safe to climb.

1.2.2 During the inspection survey, trees (T38, T62 and T335) were assessed to have potential to support hibernating bats, a hibernation survey by tree climbing to check for use by hibernating bats is recommended in both January and February following best practice guidelines.

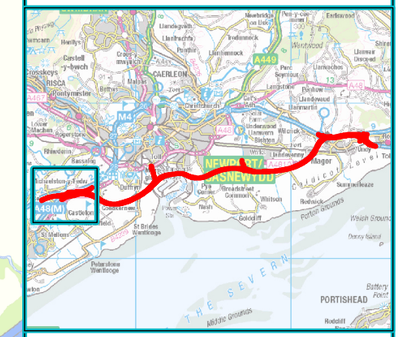
1.2.3 Two dusk emergence and dawn return to roost surveys are recommended for the confirmed roosts of T80, T274 and T375 and probable roosts T39 and T45 in order to gather sufficient evidence to inform a European Protected Species Licence (EPSL) in due course. Surveys should include at least one visit in the maternity season (June to August inclusive) with surveys ideally being spaced one month apart.

1.2.4 It is also recommended that further survey be undertaken of all high potential trees to establish bat use in the early bat activity season including the maternity season (June to August inclusive). Two survey visits are recommended for trees T38, T328, T331, T335, T346, and T359, and one visit is recommended at T82, T88, T273 and T358. Survey effort is justified in Section 5.2.



thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

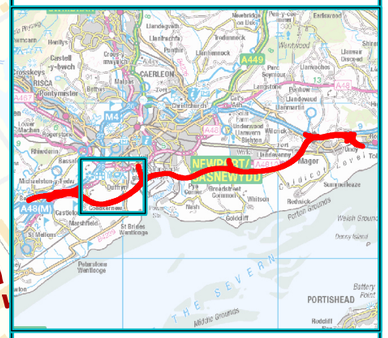
Site Grid Reference: 325,400 184,083

Drawing Ref	MRPS108/19636/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1a
Figure Title	Site Location and Tree Locations

Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

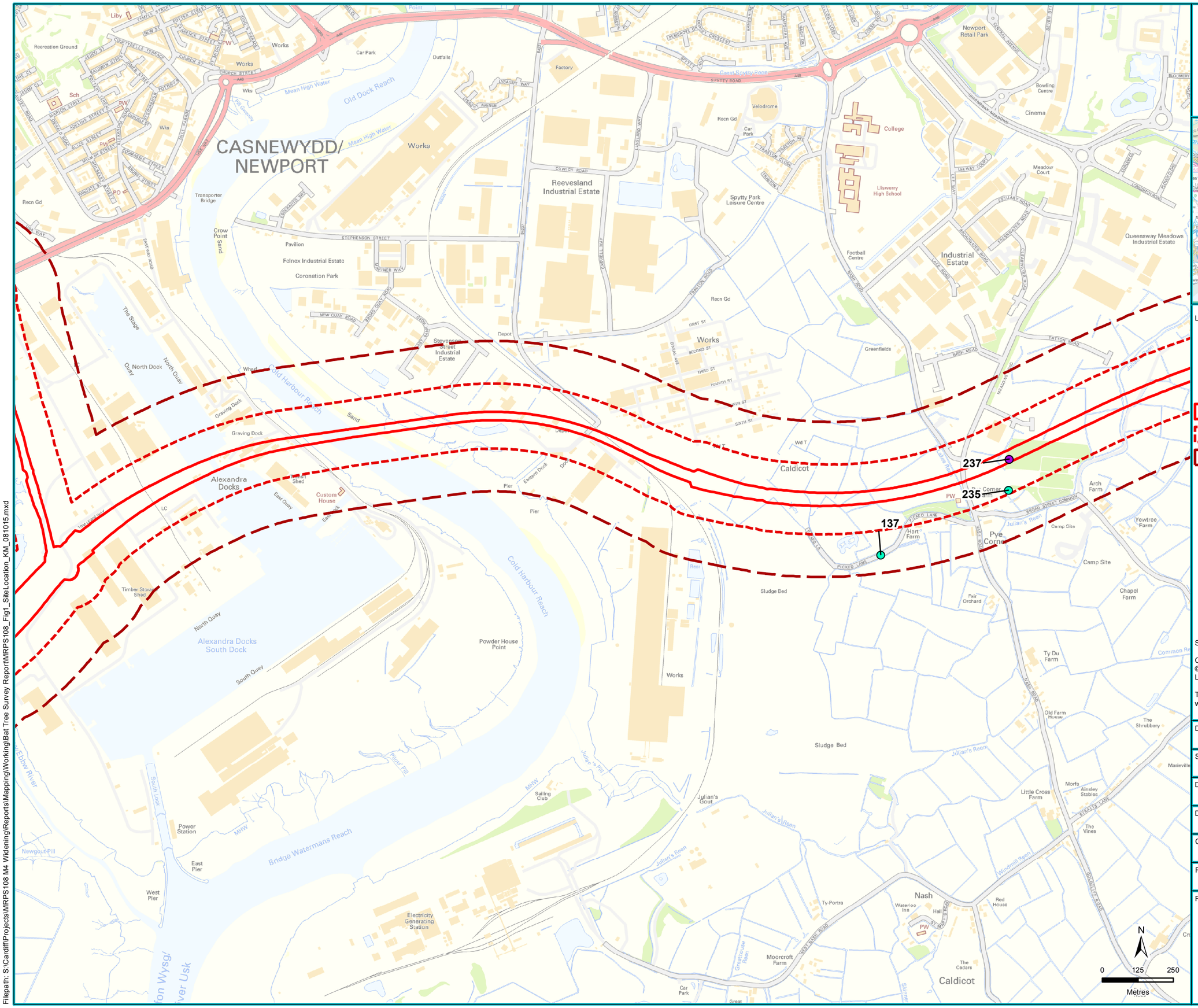
Site Grid Reference: 329,331 184,662

Drawing Ref	MRPS108/19844/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1b
Figure Title	Site Location and Tree Locations

N

0 125 250
Metres

Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd



thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com

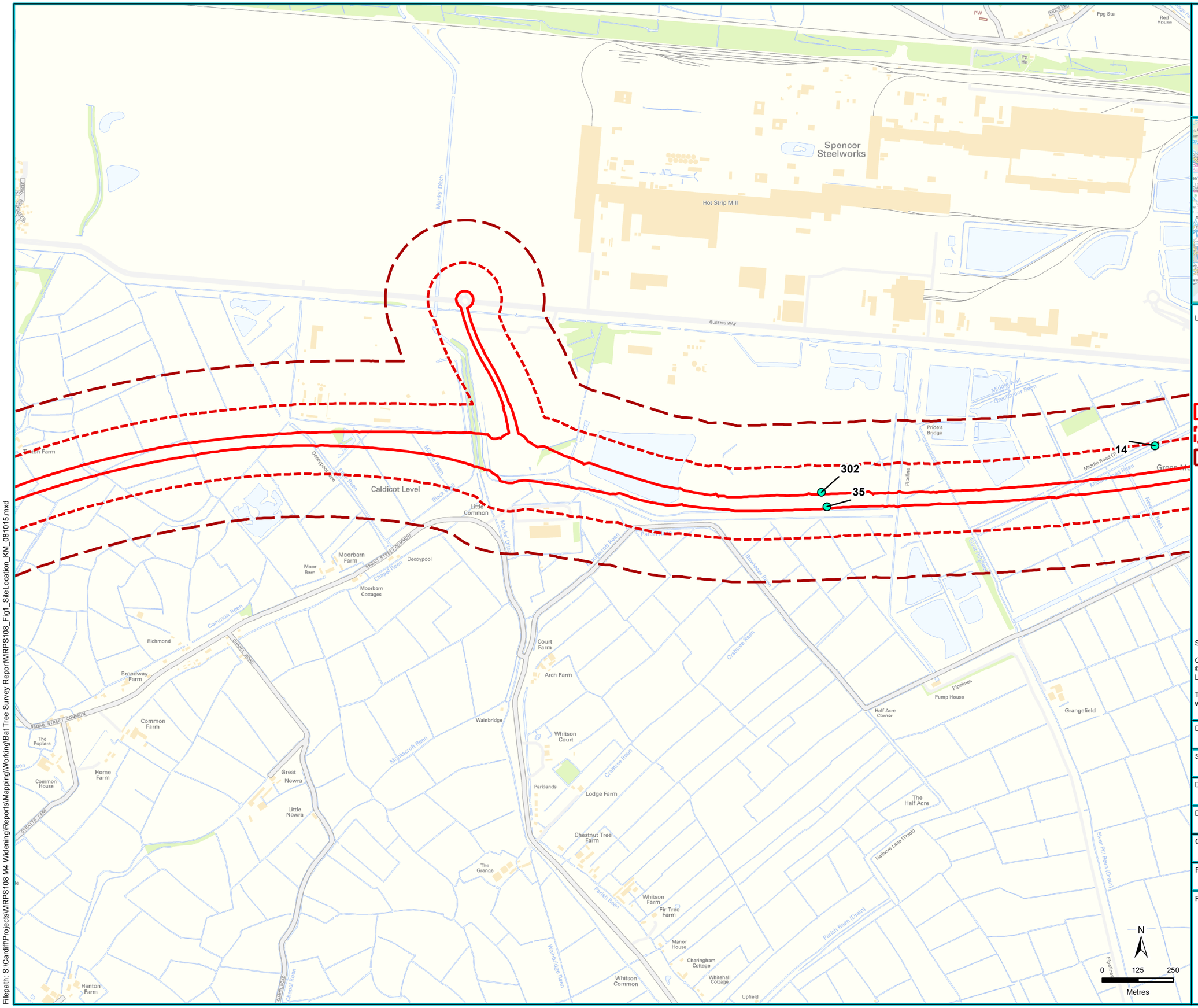
Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 333,182 185,172

Drawing Ref	MRPS108/19845/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1c
Figure Title	Site Location and Tree Locations

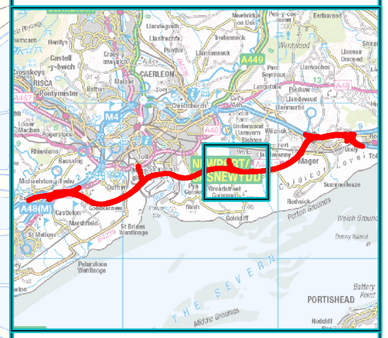
Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd



Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com

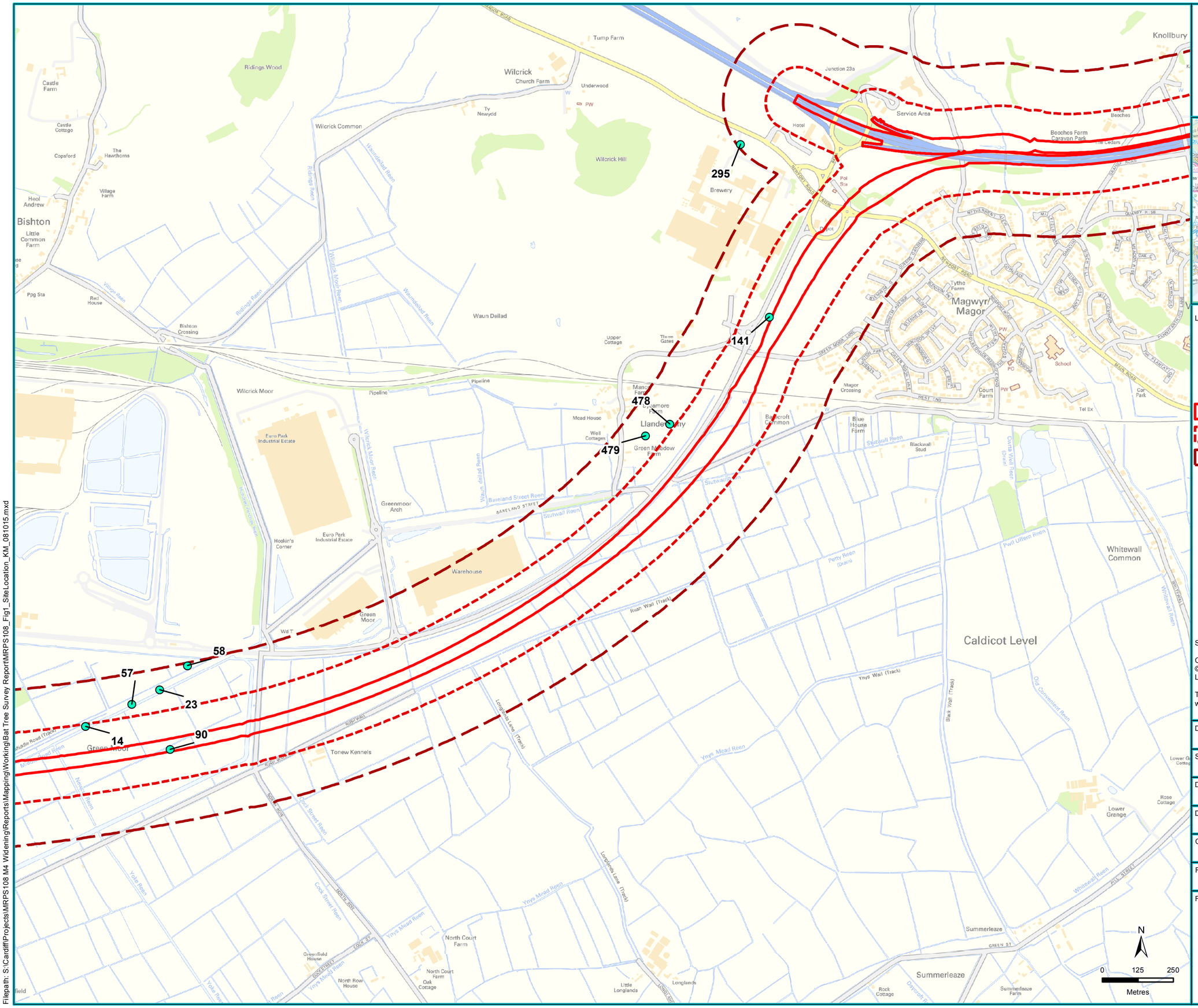


Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 337,310 185,585

Drawing Ref	MRPS108/19846/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1d
Figure Title	Site Location and Tree Locations



thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com

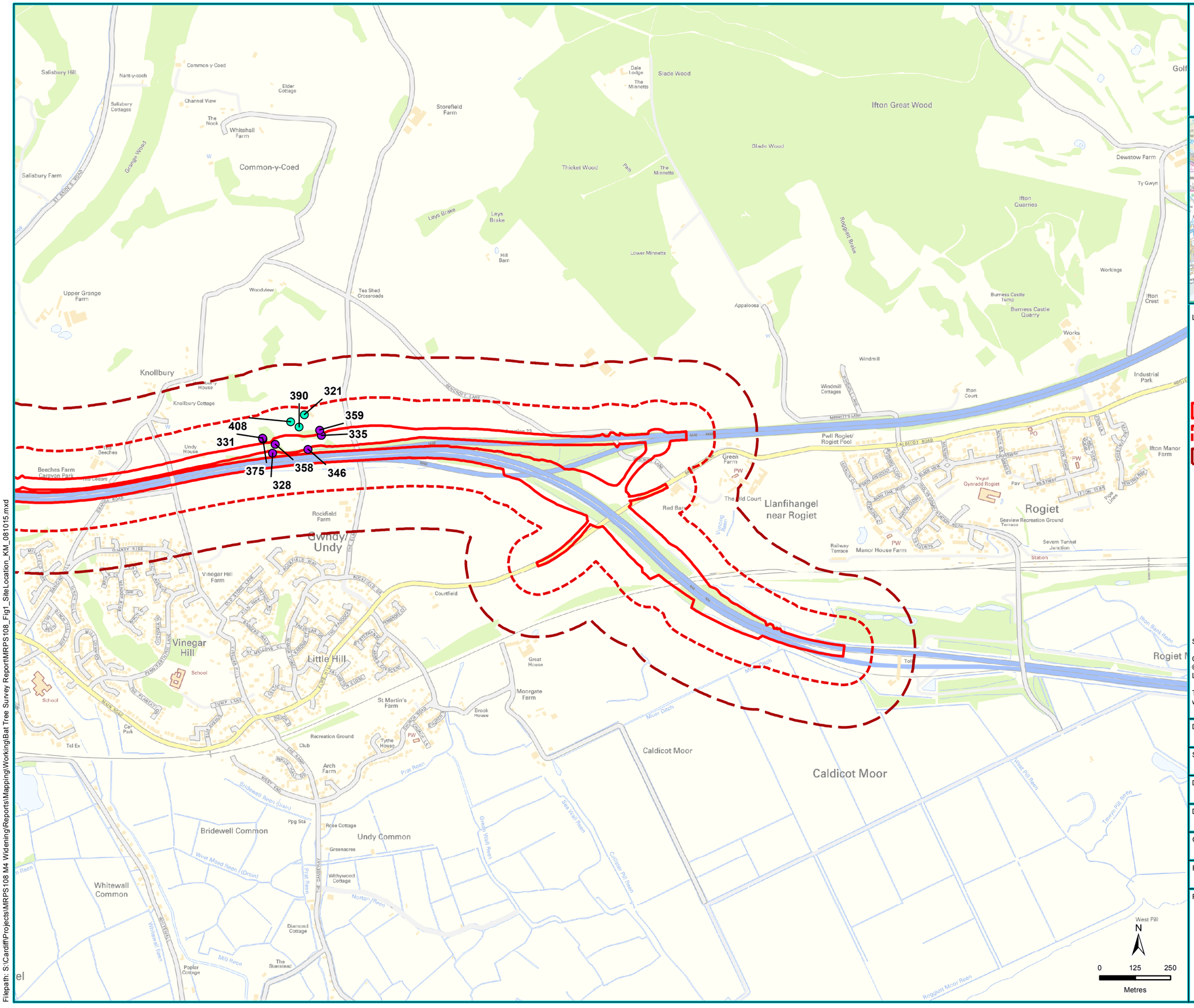
Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 341,079 186,575

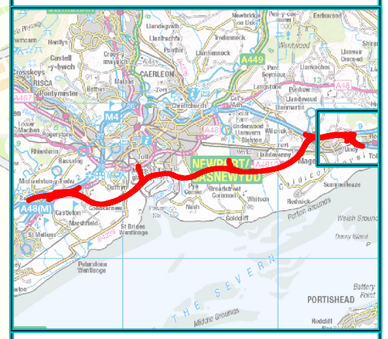
Drawing Ref	MRPS108/19847/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1e
Figure Title	Site Location and Tree Locations

Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd



thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



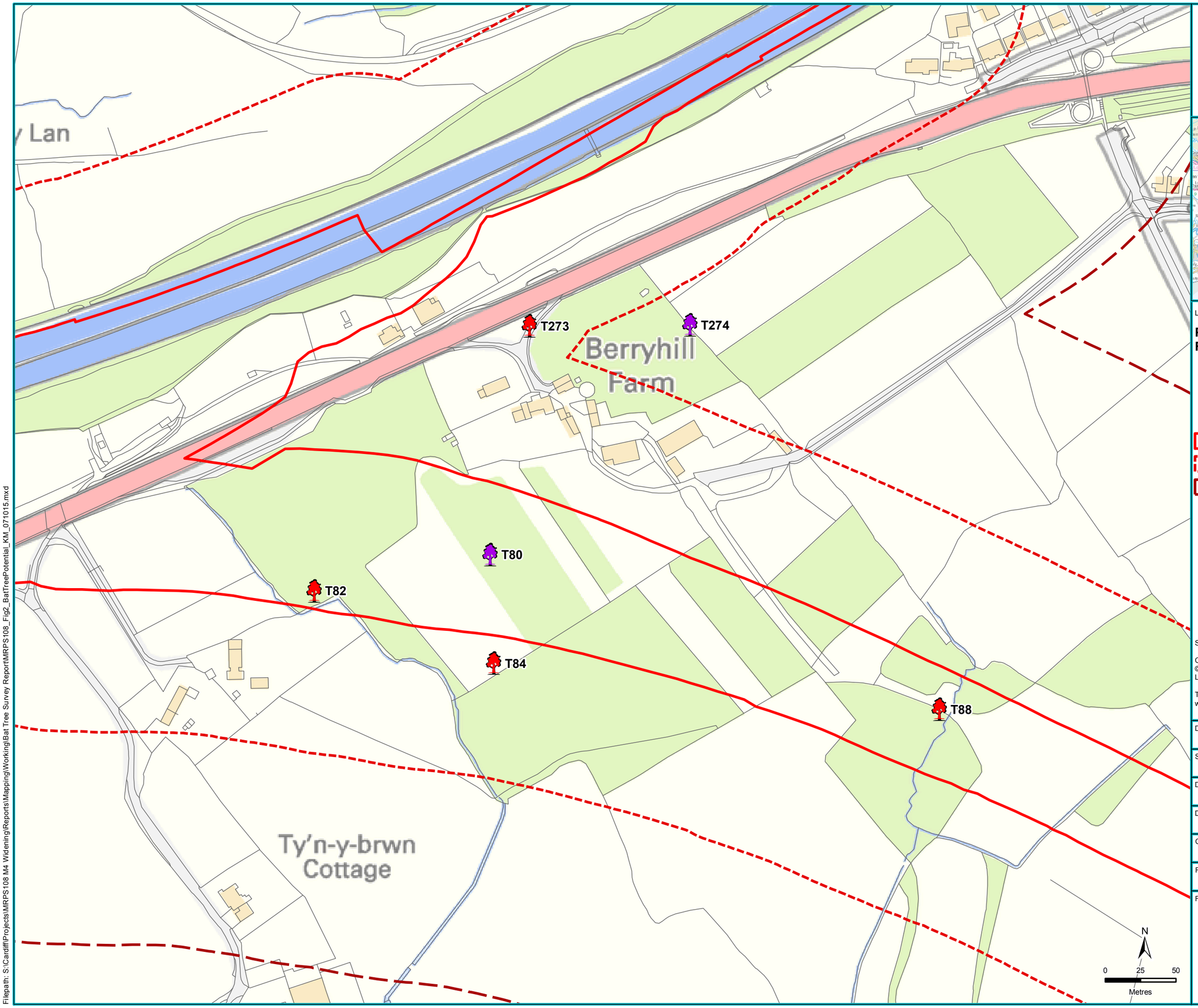
Legend

- Location of Tree Inspected for Bats
- Location of Tree Inspected During Dusk/Dawn Surveys
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 344,647 187,766

Drawing Ref	MRPS108/19748/1
Scale at A3	1:12,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	1f
Figure Title	Site Location and Tree Locations

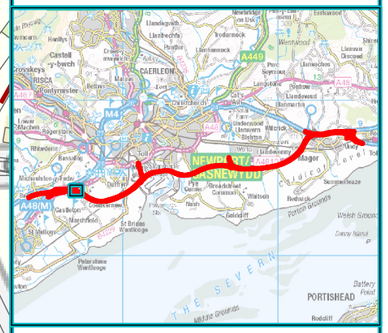
Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig1_SiteLocation_KM_081015.mxd



Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig2_BatTreePotential_KM_071015.mxd

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



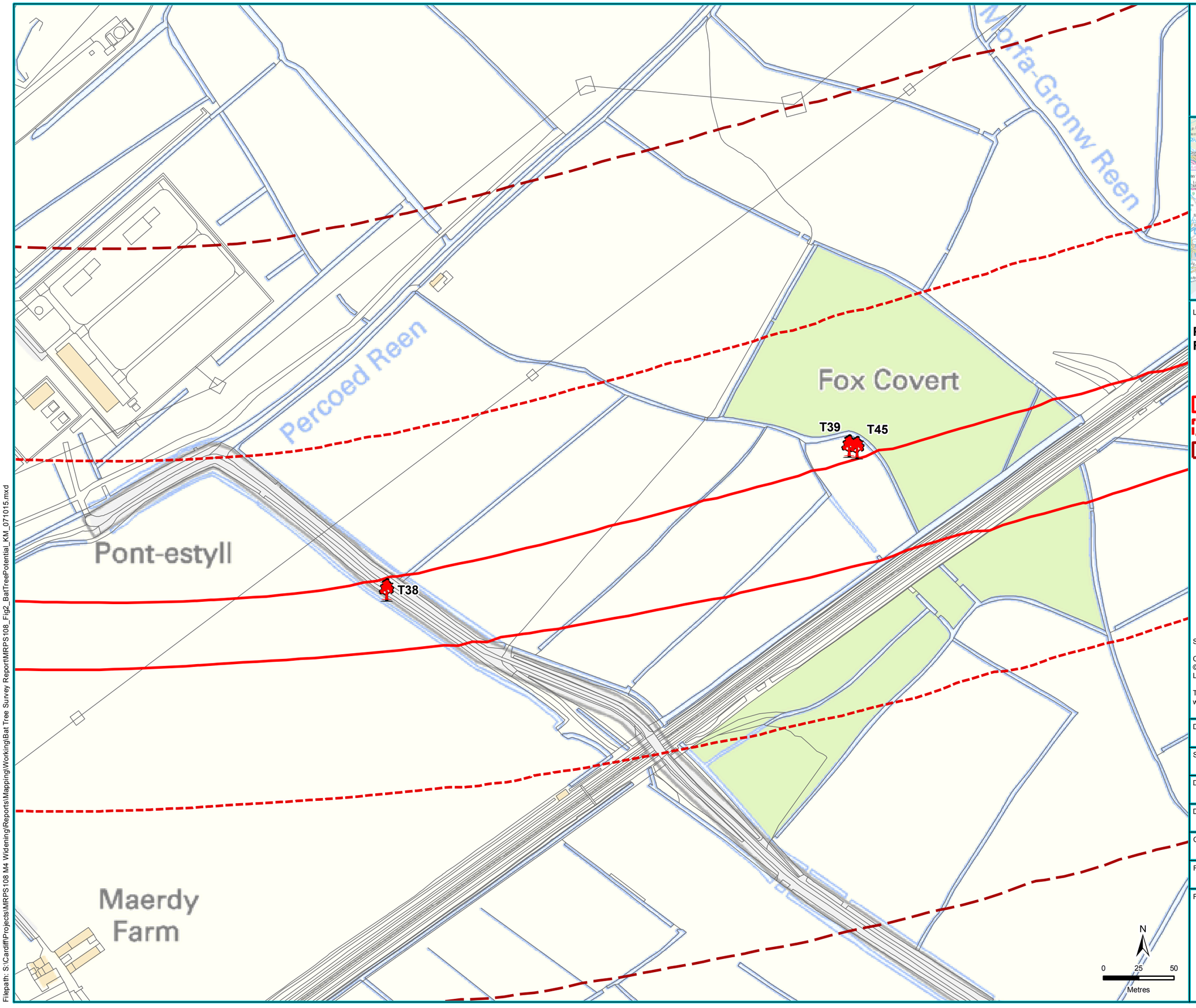
Legend

Potential of Trees to Support Roosting Bats

- Confirmed Roost
- High
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

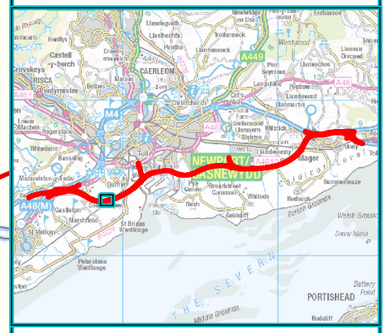
Site Grid Reference: 326,954 184,193

Drawing Ref	MRPS108/19637/1
Scale at A3	1:2,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	2a
Figure Title	Confirmed and Potential Bat Tree Roosts



thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



Legend

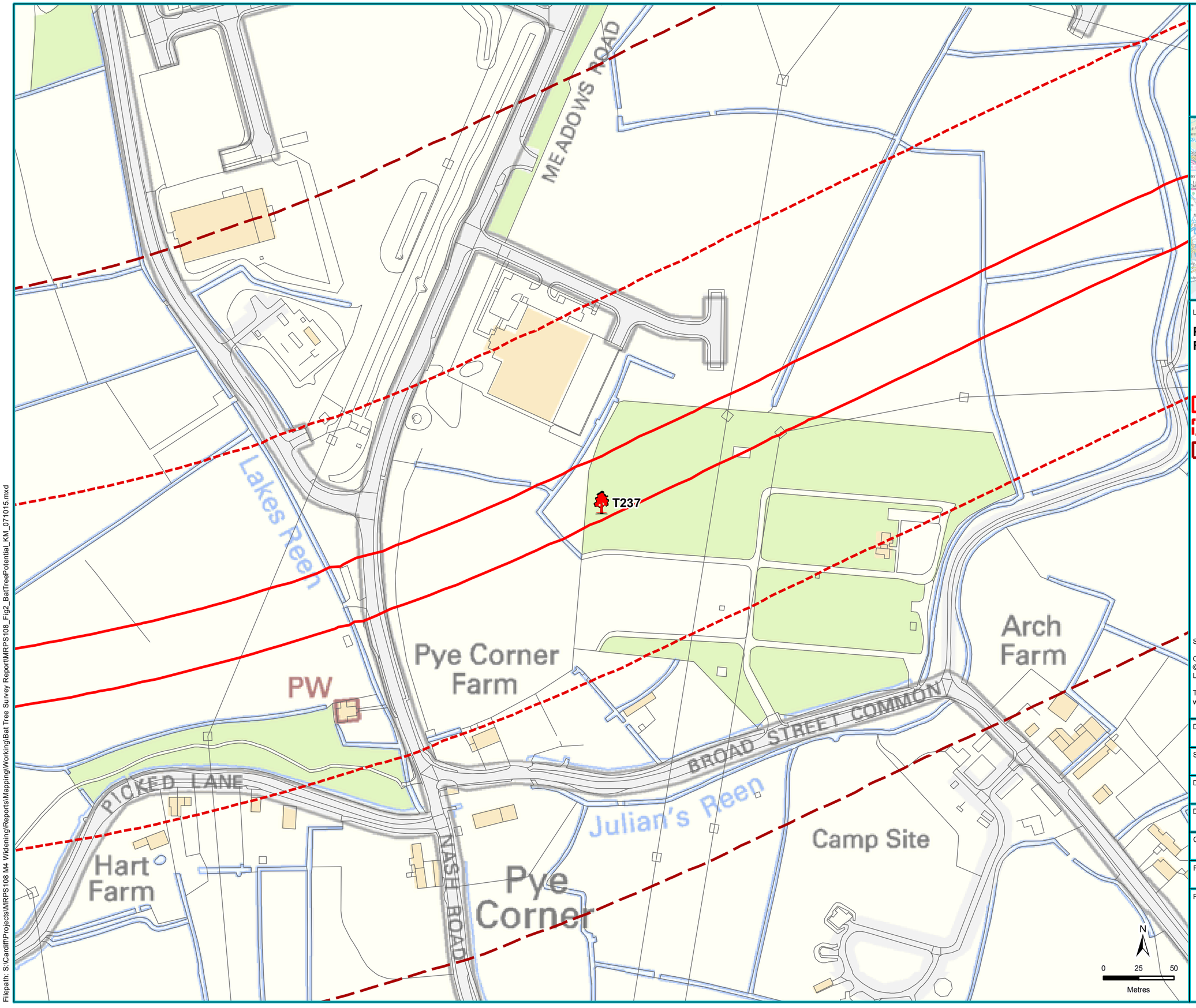
Potential of Trees to Support Roosting Bats

- High
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 328,935 183,587

Drawing Ref	MRPS108/19638/1
Scale at A3	1:2,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	2b
Figure Title	Confirmed and Potential Bat Tree Roosts

Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig2_BatTreePotential_KM_071015.mxd



Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig2_BatTreePotential_KM_071015.mxd

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com

Legend

Potential of Trees to Support Roosting Bats

- High
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 334,614 185,331

Drawing Ref	MRPS108/19639/1
Scale at A3	1:2,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	2c

Figure Title

Confirmed and Potential Bat Tree Roosts

Knollberry House

nollbury Cottage

Undy House

Rockfield Farm

Gwndy

T331

T359

T335

T375

T358

T346

T328

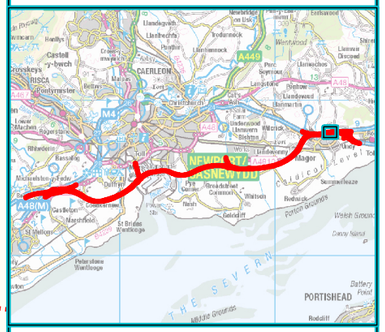
N

0 25 50

Metres

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com



Legend

Potential of Trees to Support Roosting Bats

- Confirmed Roost
- High
- Scheme Outline
- Scheme Outline 100m Buffer
- Scheme Outline 250m Buffer

Site Grid Reference: 343,561 187,979

Drawing Ref	MRPS108/19640/1
Scale at A3	1:2,500
Drawn: KM	Checked: NS
Date: 08/10/2015	Date: 08/10/2015
Client	RPS Group PLC
Figure Number	2d
Figure Title	Confirmed and Potential Bat Tree Roosts

Filepath: S:\Cardiff\Projects\MRPS108 M4 Widening\Reports\Mapping\Working\Bat Tree Survey Report\MRPS108_Fig2_BatTreePotential_KM_071015.mxd

Photograph 1:
T80 - Confirmed bat roost.

Photograph 2:
T375 - Confirmed bat roost.

Photograph 3:
T39 - High potential bat roost.

Photograph 4:
T45 - High potential bat roost.

Client: RPS Group PLC		Drawing Ref: MRPS108/19655/1	
Figure Number: 3		Scale at A4: Not applicable	
Figure Title: Photographs of Potential/Confirmed Bat Tree Roosts		Drawn: KM	Checked: NS
		Date: 08/10/2015	Date: 08/10/2015

thomson ecology

www.thomsonecology.com
enquiries@thomsonecology.com

2. Introduction

2.1 Development Background

2.1.1 The Welsh Government proposes to build a new section of motorway to the south of Newport, Gwent, extending between Castleton to the west and Magor to the east (see Figure 1).

2.2 Ecology Background

2.2.1 Surveys of trees within 250m of the 2007/08 alignment were carried out in 2014 by Arup to record features suitable for use by bats. Details of potential roost features in trees identified as having high potential within or adjacent to (approximately 100 m) the proposed new section of motorway were provided to Thomson Ecology in a spreadsheet; information taken from this spreadsheet is included in Table 4 in Section 4.

2.3 The Brief and Objectives

2.3.1 As part of a wider scheme of works, RPS commissioned Thomson Ecology on 29th April 2015 to:

- Carry out inspections of all trees identified as being of High Potential (1*) (as defined in Hundt, L. 2012) for bat roosts by RPS for evidence of use by bats.

2.3.2 Forty-five trees were identified as to be inspected; access to eight trees (T14, T23, T35, T57, T58, T90, T295 and T302 on Figures 1a to 1f) could not be accessed by Thomson Ecology and it was agreed that surveys on these trees would be carried out by RPS.

2.3.3 Following the inspection surveys, RPS commissioned Thomson Ecology on 17th August 2015 to:

- Undertake dusk emergence and dawn return to roost bat surveys of 17 trees within the footprint of the proposed new section of motorway identified as having high potential to support roosting bats; and
- Produce a combined report providing the methods, results of the tree inspection survey and emergence/return to roost surveys, and our recommendations for further surveys if required, supported by appropriate digitised mapping.

2.3.4 It was agreed via email on 18th August 2015 that one group of trees (T237) located at Pye Corner would not be surveyed due to previous health and safety concerns raised during other surveys in this location, therefore the brief was amended to survey 16 trees.

2.4 Limitations

2.4.1 Following the ground level inspection survey, access to trees T321, T328, T331, T346, T358, T359, T375, T380, and T408 (see Figures 1a to 1f) was not possible and aerial tree surveys could not be carried out to establish current potential for bats. However all except two of the trees (T346 and T390) were assessed as being unsafe to climb. All trees were given an overall potential of high, and activity surveys were recommended.

2.4.2 Tree climbing inspections could not be carried out at trees T17, T39, T80, and T247 (see Figure 1a to 1f) because they were unsafe to climb due to the poor condition of the trees.

2.4.3 The dawn of the first survey visit to trees T84 and T88 was cancelled due to poor weather conditions on 26th August 2015. The third dusk emergence and dawn return to roost survey visit to tree T328 and third visit to tree T358 was carried out in sub-optimal weather conditions on 5th - 6th October 2015; however bat activity was recorded during the survey visits.

2.4.4 The second dusk emergence and dawn return to roost survey visits of trees T328, T331, T335, T346, and T375 and third survey visits to trees T358 and T375 were undertaken during early October 2015 (outside of the optimum time of year - May to September inclusive) due to land access delays. However the weather in early October was such that conditions were optimal or suitable for bat surveys other than for two trees surveyed at dusk and dawn on the 5th/6th October when conditions were sub optimal due to rain.

2.4.5 Third survey visits could not be carried out at trees T328, T331, T335, T346 and T359 due to land access issues.

2.4.6 Emergence surveys were carried out from August to October and so missed the early months of the optimal survey season from May to July, which includes the breeding season when maternity roosts are used.

3. Methodology

3.1 Ground Level and Climbing Inspections of Trees

Ground Level Tree Inspection for Bats

3.1.1 Trees T4, T7, T12, T17, T38, T39, T45, T54, T62, T76, T80, T82, T84, T88, T137, T141, T153, T235, T237, T247, T248, T249, T255, T273, T274, T321, T328, T331, T335, T346, T358, T359, T375, T390, T408, T478 and T479 (see Figure 1a to 1f) were inspected from ground level for roosting opportunities for bats. Close-focusing binoculars and a high-powered torch were used. Potential roosting opportunities searched for included:

- Natural crevices and holes;
- Woodpecker and rot holes;
- Loose bark, splits and cracks;
- Bird and bat boxes; and
- Presence or absence of dense ivy or dense epicormic growth.

3.1.2 The search for bats and evidence of bats focused on these roosting opportunities and the surfaces and ground beneath them.

Tree Climbing Inspection for Bats

3.1.3 Where permission for access had been obtained and it was considered safe to do so, trees with the potential to support roosting bats (T4, T7, T12, T38, T45, T54, T62, T76, T82, T84, T88 T137, T141, T153, T235, T237, T248, T249, T255, T273, T274, T478 and T479 on Figure 1a to 1f) were climbed with the aid of a ladder and/or ropes. A second surveyor was positioned at the base of the tree for safety reasons. All accessible potential roosting opportunities were inspected by the climber using a torch and endoscope. Further assessment of the suitability of the potential roosting opportunities was also undertaken.

3.1.4 The search for bats and evidence of bats focused on the areas around and within potential roosting opportunities for bats, such as:

- Natural crevices and holes;
- Woodpecker and rot holes;
- Loose bark, splits and cracks;
- Bird and bat boxes; and
- Dense ivy or dense epicormic growth.

3.1.5 Any inaccessible or partially accessible cavities were noted.

3.1.6 The information recorded for each potential roost included the site type and a description of the potential roost and its location, including aspect and height above ground level.

3.2 Categorisation of Results

3.2.1 Each tree was assigned a level of potential to support a bat roost. This was achieved by placing the results for each of four attributes recorded during the survey into three categories (see Table 1). The combination of categories for each tree was then used, together with the judgement of the surveyor, to arrive at a level of potential (see Table 2). Trees which could not be thoroughly inspected, but were nevertheless of a type which typically support bat roosts, were assumed to have high potential for roosting bats.

Table 1. Attributes influencing the likelihood of a bat occupying a tree as a roost.

Category / Attribute	A	B	C
Life Stage	Veteran, Senescing or Dead	Mature or Mid-aged tree	Formative growth, before optimum crown size achieved
Exposure of crevice/void to wind and rain	Low	Moderate	High
Setting	Rural	Sub-urban	Urban
Distance from woodland or water body	>200m	200m – 400m	>400m
Level of disturbance/ lighting	Low	Moderate	High

Table 2. Levels of bat potential together with an indication of the types of tree which qualify.

Type of roost / Level of potential	Maternity roost	Summer or transitional roost used by non-breeding bats	Hibernation roost
Confirmed	Presence of bats or evidence of bats. Determining the level of current use and the type and number of bats may require further survey.		
High bat potential	Tree with suitable maternity roost space* and Category As only.	Tree with accessible crevice(s) and Category As only.	As summer roost and Category As only.
Moderate bat potential	Tree with suitable maternity roost space* and mostly Category As, maximum 2 Category Bs and maximum 1 Category C.	Tree with accessible crevice(s) and mostly Category As, maximum 2 Category Bs and maximum 1 Category C.	As summer roost.
Low bat potential	Tree with suitable maternity roost space* and more than 2 Category Bs or maximum of 2 Category Cs.	Tree with accessible crevice(s) and more than 2 Category Bs or maximum of 2 Category Cs.	As summer roost.
Negligible bat potential	Tree without a suitable maternity roost space* or with one but lacking access points or more than 2 Category Cs.	Tree without crevices or with them but lacking access points or more than 2 Category Cs.	Tree without voids or crevices or with them but lacking access points or more than 2 Category Cs.

* void or large crevice which is accessible to bats.

Dusk Emergence and Dawn Return to Roost Survey

3.2.2 A minimum of two ecologists were stationed on opposite corners of each tree, chosen to give the best view of as much of the potential roost features as possible. At dusk potential egress points were watched constantly by the ecologists. At dawn bats were tracked back to any access points within the view of the ecologist. A Duet frequency division bat detector was used by each ecologist to detect bats emerging from or returning to the potential roost site. An MP3 player (Zoom H1) attached to the detector was used to record all bat passes. Bat calls were retained for later analysis using Adobe Audition software where emergence or return to roost is confirmed or probable.

3.2.3 The dusk surveys began 30 minutes before sunset and ended 120 minutes after sunset. The dawn surveys began 90 minutes before sunrise and ended at sunrise (or 15 minutes after last bat was recorded). The cloud cover, wind strength, rain and temperature were all noted.

3.3 Dates of Surveys and Weather Conditions

3.3.1 The dates and times of the dusk emergence and dawn return to roost surveys are provided in Table 3 with the weather conditions recorded during the surveys provided in Appendix 1.

Table 3: Dates and times of the dusk emergence and dawn return to roost surveys

Date	Tree No. (Surveyor aspects)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Survey Start and Finish Time
19/08/2015	T273 (N+S), T274 (E+W)	Dusk	20:26	19:56-21:56
20/08/2015	T273 (N+S), T274 (E+W)	Dawn	06:05	04:35-06:05
20/08/2015	T80 (NE+SW), T82 (NW+NE)	Dusk	20:24	19:54-21:54
21/08/2015	T80 (NE+SW), T82 (NW+NE)	Dawn	06:06	04:36-06:06
24/08/2015	T39 (S+SE), T45 (SW+SE)	Dusk	20:16	19:56-21:46
25/08/2015	T39 (S+SE), T45 (SW+SE)	Dawn	06:13	04:50-06:13
25/08/2015	T84 (W + E), T88 (S+N)	Dusk	20:14	19:44-21:44
26/08/2015	T359 (SE+NW), T358 (E+W)	Dusk	20:12	19:42-21:42
27/08/2015	T359 (S+N), T358 (S+N)	Dawn	06:16	04:46-06:16
27/08/2015	T335 (E+W), T346 (NE+NW)	Dusk	20:09	19:39-21:39
28/08/2015	T335 (E+W), T346 (NE+NW)	Dawn	06:18	04:48-06:18
01/09/2015	T80 (SW+NE), T38 (SW+NE)	Dusk	19:58	19:28-21:28
02/09/2015	T80 (SW+NE), T38 (SW+NE)	Dawn	06:26	04:56-06:26
02/09/2015	T375 (E+W), T331 (N+S)	Dusk	19:56	19:26-21:26
03/09/2015	T375 (E+W), T331 (N+S)	Dawn	06:28	04:58-06:28
03/09/2015	T84 (W+E), T82 (W+E), T328 (W+E)	Dusk	19:54	19:24-21:24
04/09/2015	T84 (W+E), T82 (W+E), T328 (W+E)	Dawn	06:29	04:59-06:59
07/09/2015	T88 (N+S)	Dusk	19:45	19:15-21:15
08/09/2015	T88 (N+S)	Dawn	06:36	05:06-06:36

Date	Tree No. (Surveyor aspects)	Survey type (dusk or dawn)	Sunset / Sunrise Time	Survey Start and Finish Time
08/09/2015	T273 (N+S), T274 (E+W)	Dusk	19:43	19:13-21:13
09/09/2015	T273 (N+S), T274 (E+W)	Dawn	06:37	05:07-06:37
09/09/2015	T39 (W+SE), T45 (S+W)	Dusk	19:40	19:10-21:10
10/09/2015	T39 (W+SE), T45 (S+W)	Dawn	06:39	05:09-06:39
10/09/2015	T359 (SE+NW), T358 (E+W)	Dusk	19:38	19:09-21:09
11/09/2015	T38 (SE+NW), T359 (SE+NW), T358 (E+W)	Dawn	06:40	05:10-06:40
15/09/2015	T88 (NE+N+E), T82 (NW+NE)	Dusk	19:26	18:56-20:56
16/09/2015	T88 (NE+N+E), T82 (NW+NE)	Dawn	06:48	05:18-06:48
17/09/2015	T273 (N+S), T274 (E+W), T80 (NE+ NW)	Dusk	19:22	18:52-30:52
18/09/2015	T273 (N+S), T274 (E+W), T80 (NE+NW)	Dawn	06:52	05:22-06:52
21/09/2015	T38 (SE+NW), T39 (W+SE), T45 (S+W)	Dusk	19:13	18:43-20:43
22/09/2015	T38 (SE+NW), T39 (W+SE), T45 (S+W)	Dawn	06:58	05:30-07:00
30/09/2015	T331 (N+S), T375 (W+E)	Dusk	18:52	18:22-20:22
01/10/2015	T331 (N+S), T375 (W+E)	Dawn	07:13	05:43-07:13
01/10/2015	T335 (E+W), T346 (E+W)	Dusk	18:50	18:21-20:21
02/10/2015	T335 (E+W), T346 (E+W)	Dawn	07:14	05:44-07:14
05/10/2015	T328 (W+N), T358 (S+N)	Dusk	18:40	18:11-20:10
06/10/2015	T328 (W+N), T358 (S+N)	Dawn	07:21	05:50-07:20
06/10/2015	T331 (N+S), T375 (W+E)	Dusk	18:38	18:10-20:10
07/10/2015	T331 (N+S), T375 (W+E)	Dawn	07:23	05:53-07:23

4. Results

4.1 Ground Level Inspection and Tree Climbing Inspection Surveys

4.1.1 Thirty-seven trees (T4, T7, T12, T17, T38, T39, T45, T54, T62, T76, T80, T84, T88, T137, T141, T153, T235, T237, T248, T249, T255, T273, T274, T321, TT28, T331, T335, T346, T375, T390, T408, T478, T470 on Figures 1a to 1f) with high potential for roosting bats that are within 100m of the footprint of the proposed new section of motorway were inspected from ground level and of these trees it was possible to carry out tree climbing inspection of 23 trees (T4, T7, T12, T38, T45, T54, T62, T76, T82, T84, T88, T137, T141, T153, T235, T237, T248, T249, T255, T255, T273, T274, T478, T479 on Figures 1a to 1f) with aid of a ladder and/or ropes to inspect potential roosting opportunities. Details of the results from the ground level inspection survey and tree climbing inspection survey for bats are shown in Table 4.

4.1.2 Four (T12, T54, T248 and T478 on Figures 1a to 1f) of the inspected trees were reassessed to have negligible bat potential as all potential roost features were inspected and were found not the be suitable for roosting bats. Trees T76 and T141 (see Figures 1a to 1f) were reassessed to have low potential to support roosting bats.

Table 4. Summary of ground level and climbing inspection of high potential trees.

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T4 (Willow *Salix* sp.)	Ground level inspection and tree climbing inspection (roped)	Natural holes, fur polishing, scratch marks on hole Woodpecker and knot holes 10m, split in branch and loose bark 9m, tear out 12m.	Fur polishing; scratch marks on hole 10m	Transitional - High, Maternity - Moderate, Hibernation - Low, Overall - HIGH	N/A	Three dusk and dawn surveys
T7 (Oak *Quercus* sp.)	Ground level inspection and tree climbing inspection (roped)	Natural holes Multiple knot holes 3-5m and 10m, tear out 6m, branch fracture 4m, canker 6m.	None	Transitional - High, Maternity - Moderate, Hibernation - Low, Overall - HIGH	N/A	Two dusk and dawn surveys (climb replaces one visit)
T12 (Oak)	Ground level inspection and tree climbing inspection (ladder)	Natural holes	None	Transitional - Negligible, Maternity - Negligible, Hibernation - Negligible, Overall - NEGLIGIBLE	All features inspected fully and were deemed unsuitable due to lack of suitable sized crevice and exposure to elements.	No further survey required
T17 (Oak)	Ground level inspection only	Natural holes Knot hole 3m, split in branch 5m, 90% ivy coverage	None	Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T38 (Oak)	Ground level inspection and tree climbing inspection (roped)	Hollows/cavities Canker 1.5m, hazard beams 8m, branch fracture 9m, cavity in trunk 8m.	Fur polishing and scratch marks on branch fracture 9m	Transitional - High, Maternity - High, Hibernation - High Overall - HIGH	N/A	Three dusk and dawn surveys
T39 (Oak)	Ground level inspection only	Dense ivy	None	Overall - HIGH	N/A	Three dusk and dawn surveys
T45 (Oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes Hole on topside of branch to cavity (east of central fork), woodpecker hole in trunk 5m, key shaped callous roll on underside of branch on western aspect 5m.	None	Transitional - High, Maternity - Moderate, Hibernation - Low Overall - HIGH	N/A	Three dusk and dawn surveys
T54 (Willow)	Ground level inspection and tree climbing inspection (roped)	Natural holes, possible scratch marks	None	Transitional - Negligible, Maternity - Negligible, Hibernation - Negligible, Overall - NEGLIGIBLE	All features inspected fully and were deemed unsuitable due to lack of suitable sized crevice and exposure to elements.	None

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T62 (Oak)	Ground level inspection and tree climbing inspection (roped)	Hollows/cavities Knot hole 3m, branch fracture 7m, hollow trunk from ground to 7m.	None	Transitional - High, Maternity - High, Hibernation - High Overall - HIGH	N/A	Three dusk and dawn surveys
T76 (Oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes, cracks/splits in major limbs, Hollow branch on south-eastern aspect 6m and hole on same branch	None	Transitional - Low, Maternity - Negligible, Hibernation - Negligible, Overall - LOW	All features inspected fully, remaining PRFs are very exposed to the elements and would not provide adequate shelter for long term roosting	One dusk and dawn survey (climb replaces one visit)
T80 (Oak)	Ground level inspection only	Dense ivy, cracks/splits in major limbs Knot hole and woodpecker hole 9m on same branch, minimal deadwood.	None (Pipistrelle maternity roost in house and horseshoe roost in barns <100m - personal communication with landowner)	Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T82 (Oak)	Ground level inspection and tree climbing inspection (ladder)	Natural holes, dense ivy, Knot hole 4m on northern aspect, split in branch 18m on north-eastern aspect, bees nest in lower fork.	None	Transitional - High, Maternity - Moderate, Hibernation - Low, Overall - HIGH	N/A	Three dusk and dawn surveys
T84 (Oak)	Ground level inspection and tree climbing inspection (roped)	Cracks/splits in major limbs Hazard beam 6m, knot hole 6m and 15m	None	Transitional - High, Maternity - Low, Hibernation - Negligible, Overall - HIGH	N/A	Two dusk and dawn surveys (climb replaces one visit)
T88 (Oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes, clicks/splits in major limbs PRFs on all aspects; Hazard beams and branch fractures 5m -10m, woodpecker holes 5m, 8m, tear-out 7m-10m, knot holes 6m -15m, loose bark up to 10m	None	Transitional - High, Maternity - Moderate, Hibernation - Moderate, Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T137 (Willow)	Ground level inspection and tree climbing inspection (roped)	Natural holes, woodpecker holes, cracks/splits in major limbs Hazard beam 4m, woodpecker hole 8m leading into cavity in trunk, dense ivy on one branch.	None	Transitional - High, Maternity - High, Hibernation - Moderate Overall - HIGH	N/A	Three dusk and dawn surveys
T141 (Oak)	Ground level inspection and tree climbing inspection (ladder)	Cracks/splits in major limbs, hollows/cavities Rotten trunk from base to 3m where trunk has rotted from within, split in branch 5m	None	Transitional - Low, Maternity - Negligible, Hibernation - Negligible, Overall - LOW	All features inspected fully, remaining PRF's are very exposed to the elements and would not provide adequate shelter for long term roosting	One dusk and dawn survey
T153 (Peduncu-late oak, *Quercus robur*)	Ground level inspection and tree climbing inspection (roped)	Natural holes, cracks/splits in major limbs, hollows/cavities, staining Hazard beam 3m & 6m, knot holes 7m, canker 1.5m, knot holes in formation 5m, 6m, 8m, 11m, 15m, loose bark throughout	None	Transitional - High, Maternity - Moderate, Hibernation - Moderate, Overall - HIGH	N/A	Two dusk and dawn surveys (climb replaces one visit)

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T235 (Goat willow, *Salix caprea*)	Ground level inspection and tree climbing inspection (ladder)	Natural holes, woodpecker holes, cracks/ splits in major limbs Woodpecker hole 3m, tear out and exposed bark 3m, split between two branches 3.5m, hole in branch 4.5m.	None	Transitional - High, Maternity - Moderate, Hibernation - Low Overall - HIGH	N/A	Three dusk and dawn surveys
T237 (White willow, *Salix alba*)	Ground level inspection and tree climbing inspection (roped)	No information from 2014 A (west)- woodpecker and knot holes. B (middle) - ivy, knot holes, splits in dead limbs. C (east) - woodpecker holes). D (west) - woodpecker holes in trunk, hollow trunk. E (east) cankers and loose bark on southern aspect, bees nest in woodpecker hole on north aspect.	None	Transitional - High, Maternity - Low, Hibernation - Low Overall - HIGH	N/A	Trees A, B & E - Three dusk and dawn surveys. Trees C & D - Two dusk and dawn surveys
T247 (Oak)	Ground level inspection only	Natural holes, cracks/splits in major branches, loose bark, hollows/cavities 80% of tree is dead.	None	Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T248 (Elm, *Ulmus* sp.)	Ground level inspection and tree climbing inspection (ladder)	Woodpecker holes	None	Transitional - Negligible, Maternity - Negligible, Hibernation - Negligible, Overall - NEGLIGIBLE	All features inspected fully (woodpecker hole at 3m & 6m) and were deemed unsuitable due to lack of suitable sized crevice and exposure to elements.	No further survey required
T249 (Oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes, woodpecker holes, cracks/ splits in major limbs Multiple hazard beams 4m-8m, knot holes 10m & 11m, woodpecker holes, exposed bark 4m, cankers 3m -7m.	None	Transitional - High, Maternity - High, Hibernation - Moderate Overall - HIGH	N/A	Three dusk and dawn surveys
T255 (Oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes, woodpecker holes, cracks/ splits in major limbs Woodpecker holes 3m - 5m into trunk, hazard beam 3.5m, tear out 7m.	None	Transitional - High, Maternity - High, Hibernation - Low Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T273 (Willow)	Ground level inspection and tree climbing inspection (roped)	Natural holes, woodpecker holes, cracks/ splits in major limbs, mostly 12m on south aspect Woodpecker holes in trunk up to 6m (one leads into large cavity), tear out 8m on northern branch.	None (pipistrelle maternity roost in house and horseshoe roost in barns <30m - personal communication with landowner)	Transitional - High, Maternity - High, Hibernation - Moderate, Overall - HIGH	N/A	Three dusk and dawn surveys
T274 (Pedunc-ulate oak)	Ground level inspection and tree climbing inspection (roped)	Natural holes, woodpecker holes, cracks/ splits in major limbs, large cavity 8m on east aspect Branch fracture 15m, woodpecker hole 9m (with bees nest) and 11m, multiple tear outs on upper side of branches 5m - 7m, splits in deadwood at 8m, cavity in branch 8m.	None (pipistrelle maternity roost in house and horseshoe roost in barns <100m - personal communication with landowner)	Transitional - High, Maternity - Low, Hibernation - Low, Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T321 (Ash, *Fraxinus excelsior*)	Ground level inspection only	Loose bark, dense ivy Tree A - knot hole, B - dense ivy, C - shallow split in trunk, D - branch fracture, E - multiple splits in trunk.	None	Overall - HIGH	N/A	Dusk/ Dawns required - not effective to climb 321b due to ivy Assessing all five trees as one
T328 (Oak)	Ground level inspection only	Natural holes, cracks/ splits in major limbs	None	Overall - HIGH	N/A	Three dusk and dawn surveys
T331 (Oak)	Ground level inspection only	Natural holes, cracks/ splits in major limbs, dense ivy Trunk splits into two limbs, one limb has dense ivy cover with possible features beneath, other limb has split in dead branch 15m.	None	Overall - HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T335 (Brick arch)	Ground level inspection (tree climbing survey not applicable)	Small brick structure with internal cracks and voids Missing brickwork and mortar gaps on external face, gaps and voids within internal stonework.	None	Transitional - High, Maternity - Unknown, Hibernation – High Overall - HIGH	N/A	Three dusk and dawn surveys and hibernation survey
T346 (Oak)	Ground level inspection only	Natural holes, loose bark, staining Knot hole 5m, open wound on top side of branches, stripped bark on trunk, crack 12m some dead branches.	None	Overall - HIGH	N/A	Climbing inspection recommended Three dusk and dawn surveys
T358 (Peduncu-late oak)	Ground level inspection only	Natural holes, dense ivy	None	Overall – HIGH	N/A	Three dusk and dawn surveys
T359 (Oak)	Ground level inspection only	Natural holes, loose bark, dense ivy Tree A – lower limbs dead, cracks and holes up to 10m. Tree B – dense ivy	None	Overall – HIGH	N/A	Three dusk and dawn surveys

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T375 (Field maple, *Acer campestre)*	Ground level inspection only	Natural holes, dense ivy Two trees, both covered with ivy	None	Overall - HIGH	N/A	Three dusk and dawn surveys
T390 (Oak)	Ground level inspection only	Natural holes, dense ivy Knot holes up to 11m, some dead branches with splits up to 8m, loose bark	None	Overall - HIGH	N/A	Climbing inspection recommended Three dusk and dawn surveys
T408 (Oak)	Ground level inspection only	Natural holes, dense ivy Knot holes visible up to 10m, split in dead limb 7m	None	Overall - HIGH	N/A	Three dusk and dawn surveys
T478 (Willow)	Ground level inspection and tree climbing inspection (ladder)	Natural holes, loose bark, dense ivy Multiple cankers, wounds and cavities at trunk up to 2.5m.	None	Transitional - Negligible, Maternity - Negligible, Hibernation - Negligible, Overall - NEGLIGIBLE	All features inspected fully and were deemed unsuitable due to lack of suitable sized crevice and exposure to elements.	No further survey required

Tree ID (Species)	Surveys type undertaken	Potential Roost Features (PRFs) *1	Evidence of bats *2	Bat potential after 2015 inspection *3	Reason for change in potential	Recommendations for further survey
T479 (Ash)	Ground level inspection and tree climbing inspection (ladder)	Cracks/splits in major limbs, hollows/cavities <u>Large cavity at base with internal splits/ cracks. Split in branch up to 7m</u>	None	Transitional - High, Maternity - High, Hibernation - Moderate Overall - HIGH	N/A	Three dusk and dawn surveys

*1 Features identified during 2014 RPS surveys are given in roman font, additional features/details identified during 2015 Thomson Ecology surveys are underlined

*2 Identified during 2015 Thomson Ecology surveys

*3 Overall potential only is provided for trees which could not be surveyed sufficiently to establish the potential for different roost type

4.2 Dusk Emergence and Dawn Return to Roost Surveys

4.2.1 Following the ground level and climbing inspections of trees, dusk emergence and dawn return to roost surveys were recommended. The level of survey recommended for each tree is detailed above in Table 4 and in Appendix 1. Three dusk emergence and dawn return to roost surveys were undertaken at ten trees (T38,T39, T45, T80, T82, T88, T273, T274, T358, and T375 on Figures 2a to 2d) and two survey visits were undertaken at six trees (T84, T328, T331, T335, T346 and T359 on Figures 2a to 2d).

4.2.2 A long-eared bat (*Plecotus* sp.) and three common pipistrelle (*Pipistrellus pipistrellus*) were seen emerging from tree T80. Bats were recorded emerging from or returning to roost within trees, T274 and T375, but with no audible call; therefore these trees are confirmed roosts.

4.2.3 A high level of bat activity was recorded around the canopy of trees T39 and T45; no bats were seen to obviously emerge from or return to roost in these trees but there was no evidence to suggest the bats had come from elsewhere; trees T39 and T45 were therefore identified as probable bat roosts. Probable roosts were defined by Thomson Ecology staff as being those trees that had bat activity located around the canopy but with no clear evidence to suggest that the bats had come from elsewhere other than the tree in question.

4.2.4 Table 5 provides a summary of all trees that were confirmed as supporting a bat roost. Table 6 provides a summary of the probable bat roost trees where high levels of activity were recorded. For photographs of these roosts see Figure 3.

Table 5. Summary of trees confirmed as bat roosts.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T80	2	01/09/2015 Dusk	19:58	NE	One brown long-eared bat flew from behind surveyor toward tree at 20:50; it was not observed/heard to leave the tree and was assumed to have entered a roost.
		02/09/2015 Dawn	06:26	SW	Bat seen flying into roost in tree at 05:41, Detectors did not take a recording and no audible sound heard from the detectors whilst on site.
	3	17/09/2015 Dusk	19:22	SW	Three common pipistrelles seen emerging at 19:48, 19:50 & 19:56.
		18/09/2015 Dawn	06:52	SW	One bat seen flying into roost in the south side of the tree at 06:20, Detectors did not take a recording and no audible sound heard from the detectors whilst on site.
T274	2	09/09/2015 Dusk	19:43	E	One bat seen emerging from tree at 20:12 near downward facing woodpecker hole Detectors did not take a recording and no audible sound heard from the detectors whilst on site.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T375	1	02/09/2015 Dusk	19:56	W	One bat seen emerging at 20:19, Detectors did not take a recording and no audible sound heard from the detectors whilst on site.

Table 6. Summary of probable bat roost tree.

Tree Number	Visit Number	Date	Sunrise/Sunset Time	Surveyor Location	Details of Bat Emerging/Returning
T39	1	24/08/2015 Dusk	20:16	S	Probable emergence from tree at 20:50. Bat not seen leaving.
T45	1	24/08/2015 Dusk	20:16	S	Probable emergence at 20:50, Bat came out of shadow of the tree.

5. Recommendations

5.1 Mitigation

5.1.1 All activities which may result in the killing and injury of bats and the disturbance or destruction of a bat roost, may only take place under a European Protected Species Licence (EPSL) granted by Natural Resources Wales. Trees T80, T274 and T375 (see Figures 2a to 2d) are confirmed bat roosts, therefore an EPSL should be applied for to ensure works are carried out lawfully. A project licence is recommended that will include mitigation for known roosts that will be impacted and roosts in trees which have not been surveyed.

5.1.2 The hibernation roost potential of trees T17, T39, T80, T247 could not be confirmed as the trees were unsafe to climb. Hibernation surveys would not be possible on these trees for the same reason. The project bat licence should include appropriate mitigation for potential hibernation bat roosts and a precautionary method of works should employed if these trees are removed.

5.2 Further Survey

5.2.1 Tree climbing surveys are recommended of trees that were not accessed following the ground based assessment (T346 and T390) to establish potential to support maternity and/or hibernating bats. Based on the results of these surveys, hibernation surveys may be required (see Section 5.2.2 below).

5.2.2 Hibernation surveys are recommended of trees with high potential to support hibernating bats within the footprint of the proposed new motorway (T38, T62 and T335 on Figures 2a to 2d). The surveys will involve a tree climbing inspection to check for use by hibernating bats with one check in January and one check in February following the National Bat Monitoring Programme Methodology (Bat Conservation Trust, 2015).

5.2.3 Further activity survey is recommended for the trees with confirmed roosts (T80, T274 and T375 on Figure 2a to 2d) and probable roosts (T39 and T45 on Figures 2a to 2d) in order to gather additional data on the roosts such as how many bats use the roost across the bat activity season to inform an EPSL.

5.2.4 The further surveys of confirmed and probable roosts should consist of two dusk emergence and/or dawn return to roost bat surveys, timed to cover the period of the activity season missed in the surveys, i.e. May to August, inclusive. Surveys should be carried out in optimal weather conditions, ideally spaced one month apart with at least one survey undertaken in the maternity season (June to August, inclusive).

5.2.5 Further surveys of other high potential trees should be undertaken to establish bat use during the early bat activity season; two dusk emergence and dawn return to roost surveys should be carried out of trees with no visits between May to August (T38, T328, and T331 on Figures 2a to 2d), or where one of the recommended survey visits was not completed (T335, T346 and T359 on Figures 2a to 2d). One survey visit should be carried out at trees that were surveyed in August and were visited the recommended amount of times (T82, T88, T273 and T358 on

Figures 2a to 2d). Survey visits should include a survey during the maternity season (June to August, inclusive) and if multiple surveys visits are recommended they should be spaced approximately one month apart.

5.2.6 Our recommendations for further survey are summarised below in Table 7.

Table 7. Summary of further survey recommendations for high potential trees within the footprint of proposed new motorway.

Further Survey Required	Tree Numbers Requiring Further Survey
Hibernation surveys	T38, T62, T335
Two dusk and/or dawns of confirmed or probable roosts	T39, T45, T80, T274, T375
Two dusk and/or dawns of high potential trees	T38, T328, T331, T335, T346, T359
One dusk and/or dawn of high potential trees	T82, T88, T273, T358

6. References

6.1 References

6.1.1 Bat Conservation Trust (2015). National Bat Monitoring Programme (Accessed online on 26/10/2015) (http://www.bats.org.uk/pages/nbmp.html)

6.1.2 Hundt, L. (2012). Bat Surveys, Good Practice Guidelines (2nd Ed). Bat Conservation Trust. London.

7. Appendix 1 - Date, Time and Weather Data for Dusk Emergence and Dawn Return to Roost Bat Surveys

Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Date	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
T273 N+S	Dusk	19/08/2015	20:26	19:56-21:56	15.0	13.0	3	Drizzle	0-2	Optimal
T274 E+W	Dusk	19/08/2015	20:26	19:56-21:56	15.0	13.0	3	Drizzle	0-2	Optimal
T273 N+S	Dawn	20/08/2015	06:05	04:35-06:05	15.0	15.0	2	Drizzle	0-1	Optimal
T274 E+W	Dawn	20/08/2015	06:05	04:35-06:05	15.0	15.0	2	Drizzle	0-1	Optimal
T80 NE+SW	Dusk	20/08/2015	20:24	19:54-21:54	16.0	15.0	3	Dry	1-3	Optimal
T82 NW+NE	Dusk	20/08/2015	20:24	19:54-21:54	16.0	15.0	3	Dry	1-3	Optimal
T80 NE+SW	Dawn	21/08/2015	06:06	04:36-06:06	17.0	18.0	2	Dry	1-3	Optimal
T82 NW+NE	Dawn	21/08/2015	06:06	04:36-06:06	17.0	18.0	2	Dry	1-3	Optimal
T39 S+SE	Dusk	24/08/2015	20:16	19:56-21:46	13.0	12.0	1	Dry	0-1	Optimal
T45 SW+SE	Dusk	24/08/2015	20:16	19:56-21:46	13.0	12.0	1	Dry	0-1	Optimal
T39 S+SE	Dawn	25/08/2015	06:13	04:50-06:13	10.0	12.0	1	Dry	0-1	Optimal
T45 SW+SE	Dawn	25/08/2015	06:13	04:50-06:13	10.0	12.0	1	Dry	0-1	Optimal
T84 W + E	Dusk	25/08/2015	20:14	19:44-21:44	15.8	14.5	1	Dry	2	Optimal
T88 S+N	Dusk	25/08/2015	20:14	19:44-21:44	15.8	14.5	1	Dry	2	Optimal
T359 SE+NW	Dusk	26/08/2015	20:12	19:42-21:42	16.6	15.0	3	Dry	2-3	Optimal
T358 E+W	Dusk	26/08/2015	20:12	19:42-21:42	16.6	15.0	3	Dry	2-3	Optimal
T359 S+N	Dawn	27/08/2015	06:16	04:46-06:16	13.8	15.6	2	Drizzle	2-3	Optimal
T358 S+N	Dawn	27/08/2015	06:16	04:46-06:16	13.8	15.6	2	Drizzle	2-3	Optimal
T335 E+W	Dusk	27/08/2015	20:09	19:39-21:39	16.0	12.6	1	Dry	0-1	Optimal
T346 NE+NW	Dusk	27/08/2015	20:09	19:39-21:39	16.0	12.6	1	Dry	0-1	Optimal

Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Date	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
T335 E+W	Dawn	28/08/2015	06:18	04:48-06:18	13.0	15.4	3	Dry	2	Optimal
T346 NE+NW	Dawn	28/08/2015	06:18	04:48-06:18	13.0	15.4	3	Dry	2	Optimal
T80 SW+NE	Dusk	01/09/2015	19:58	19:28-21:28	14.5	10.0	1	Dry	2	Optimal
T38 SW+NE	Dusk	01/09/2015	19:58	19:28-21:28	14.5	10.0	1	Dry	2	Optimal
T80 SW+NE	Dawn	02/09/2015	06:26	04:56-06:26	8.5	9.0	1	Dry	2	Suitable
T38 SW+NE	Dawn	02/09/2015	06:26	04:56-06:26	8.5	9.0	1	Dry	2	Suitable
T375 E+W	Dusk	02/09/2015	19:56	19:26-21:26	14.0	12.0	2	Dry	2	Optimal
T331 N+S	Dusk	02/09/2015	19:56	19:26-21:26	14.0	12.0	2	Dry	2	Optimal
T375 E+W	Dawn	03/09/2015	06:28	04:58-06:28	11.5	10.5	2	Dry	2	Optimal
T331 N+S	Dawn	03/09/2015	06:28	04:58-06:28	11.5	10.5	2	Dry	2	Optimal
T84 W+E	Dusk	03/09/2015	19:54	20:13-21:24	18.8	12.6	2	Dry	2	Optimal
T82 W+E	Dusk	03/09/2015	19:54	20:13-21:24	18.8	12.6	2	Dry	2	Optimal
T328 W+E	Dusk	03/09/2015	19:54	19:24-21:24	14.5	12.0	2	Dry	2	Optimal
T84 - W+E	Dawn	04/09/2015	06:26	04:56-06:56	11.2	11.3	2	Dry	2	Optimal
T82 - W+E	Dawn	04/09/2015	06:26	04:56-06:56	11.2	11.3	2	Dry	2	Optimal
T328 - W+E	Dawn	04/09/2015	06:26	04:56-06:56	12.0	12.0	2	Dry	2	Optimal
T88 - N+S	Dusk	07/09/2015	19:45	19:15-21:15	19.5	13.5	3	Dry	0	Optimal
T88 - N+S	Dawn	08/09/2015	06:36	05:06-06:36	11.5	11.0	1	Dry	0	Optimal
T273 - N+S	Dusk	08/09/2015	19:43	19:13-21:13	12.5	11.5	1	Dry	1	Optimal
T274 - E+W	Dusk	08/09/2015	19:43	19:13-21:13	12.5	11.5	1	Dry	1	Optimal
T273 - N+S	Dawn	09/09/2015	06:37	05:07-06:37	11.0	11.0	2	Dry	1	Optimal

Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Date	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
T274 - E+W	Dawn	09/09/2015	06:37	05:07-06:37	11.0	11.0	2	Dry	1	Optimal
T39 W+SE	Dusk	09/09/2015	19:40	19:10-21:10	17.0	12.0	1	Dry	0	Optimal
T45 S+W	Dusk	09/09/2015	19:40	19:10-21:10	17.0	12.0	1	Dry	0	Optimal
T39 W+SE	Dawn	10/09/2015	06:39	05:09-06:39	11.5	11.5	1	Dry	2	Optimal
T45 S+W	Dawn	10/09/2015	06:39	05:09-06:39	11.5	11.5	1	Dry	2	Optimal
T359 SE+NW	Dusk	10/09/2015	19:38	19:09-21:09	17.0	15.5	1	Dry	0	Optimal
T358 E+W	Dusk	10/09/2015	19:38	19:09-21:09	17.0	15.5	1	Dry	0	Optimal
T359 SE+NW	Dawn	11/09/2015	06:40	05:10-06:40	13.0	13.0	2	Dry	2	Optimal
T358 E+W	Dawn	11/09/2015	06:40	05:10-06:40	13.0	13.0	2	Dry	2	Optimal
T88 NE+N+E	Dusk	15/09/2015	19:26	18:56-20:56	15.0	13.0	0	Dry	1	Optimal
T82 NW+NE	Dusk	15/09/2015	19:26	18:56-20:56	15.0	13.0	0	Dry	1	Optimal
T88 NE+N+E	Dawn	16/09/2015	06:48	05:18-06:48	14.2	12.2	3	Dry	2	Optimal
T82 NW+NE	Dawn	16/09/2015	06:48	05:18-06:48	14.2	12.2	3	Dry	2	Optimal
T273 N+S	Dusk	17/09/2015	19:22	18:52-30:52	17.2	14.5	3	Continuous Drizzle	1	Optimal
T274 E+W	Dusk	17/09/2015	19:22	18:52-30:52	17.2	14.5	3	Continuous drizzle	1	Optimal
T80 NE+ NW	Dusk	17/09/2015	19:22	18:52-30:52	17.2	14.5	3	Continuous drizzle	1	Optimal
T273 N+S	Dawn	18/09/2015	06:52	05:22-06:52	13.2	12.5	2	light occasional drizzle	1	Optimal
T274 E+W	Dawn	18/09/2015	06:52	05:22-06:52	13.2	12.5	2	light occasional drizzle	1	Optimal
T80 NE+NW	Dawn	18/09/2015	06:52	05:22-06:52	13.2	12.5	2	light occasional drizzle	1	Optimal
T38 SE+NW	Dusk	21/09/2015	19:18	18:43-20:43	13.8	8.6	1	Dry	1	Suitable

Tree No. (Surveyor Locations)	Survey type (dusk or dawn)	Date	Sunset / Sunrise Time	Time	Temperature °C		Cloud cover	Rain	Wind (Beaufort Scale)	Suitability of Weather Conditions
					Start	End				
T39 W+SE	Dusk	21/09/2015	19:18	18:43-20:43	13.8	8.6	1	Dry	1	Suitable
T45 S+W	Dusk	21/09/2015	19:18	18:43-20:43	13.8	8.6	1	Dry	1	Suitable
T38 SE+NW	Dawn	22/09/2015	07:00	05:30-07:00	13.0	10.0	1	Dry	1	Suitable
T39 W+SE	Dawn	22/09/2015	07:00	05:30-07:00	13.0	10.0	1	Dry	1	Suitable
T45 S+W	Dawn	22/09/2015	07:00	05:30-07:00	13.0	10.0	1	Dry	1	Suitable
T331 N+S	Dusk	30/09/2015	18:52	18:22-20:22	16.1	14.0	0	Dry	1	Optimal
T375 W+E	Dusk	30/09/2015	18:52	18:22-20:22	16.1	14.0	0	Dry	1	Optimal
T331 N+S	Dawn	01/10/2015	07:13	05:43-07:13	12.8	11.4	1	Dry	1	Optimal
T375 W+E	Dawn	01/10/2015	07:13	05:43-07:13	12.8	11.4	1	Dry	1	Optimal
T335 E+W	Dusk	01/10/2015	18:51	18:21-20:21	13.0	11.0	1	Dry	1	Optimal
T346 E+W	Dusk	01/10/2015	18:51	18:21-20:21	13.0	11.0	1	Dry	1	Optimal
T335 E+W	Dawn	02/10/2015	07:14	05:44-07:14	8.0	7.0	1	Dry	2	Suitable
T346 E+W	Dawn	02/10/2015	07:14	05:44-07:14	8.0	7.0	1	Dry	2	Suitable
T328 W+N	Dusk	05/10/2015	18:41	18:11-20:10	17.0	16.0	3	Light rain first 20min, heavy rain last 30 min	2	Sub optimal
T358 S+N	Dusk	05/10/2015	18:41	18:11-20:10	17.0	16.0	3	Light rain first 20min, heavy rain last 30 min	2	Sub optimal
T328 W+N	Dawn	06/10/2015	07:20	05:50-07:20	15.5	14.5	2	light rain last hour	1	Sub optimal
T358 S+N	Dawn	06/10/2015	07:20	05:50-07:20	15.5	14.5	2	light rain last hour	1	Sub optimal
T331 N+S	Dusk	06/10/2015	18:40	18:10-20:10	15.0	14.0	2	None until 19:41	2	Optimal
T375 W+E	Dusk	06/10/2015	18:40	18:10-20:10	15.0	14.0	2	None until 19:41	2	Optimal
T375 W+E	Dawn	07/10/2015	07:23	05:53-07:23	12.5	11.5	3	Very light rain throughout	2	Optimal