Welsh Government

M4 Corridor around Newport

December 2016 Environmental Statement Supplement Appendix SS10.5 Draft Bat Mitigation Strategy

M4CaN-DJV-EBD-ZG_GEN-AX-EN-0054

At Issue | December 2016

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A Background and Supporting Information

A.1 Introduction

A.1.1 This bat mitigation strategy further develops bat mitigation included in the M4CaN Environmental Statement (ES) and ES Supplement. It also provides the basis for a method statement to be submitted to NRW with a bat licence application. The report has therefore been written in the format required for an NRW licence application.

A.1.2 The final method statement to be submitted to NRW in support of a licence application will be updated in response to results of pre-construction surveys that will be completed in 2017/2018. The licence application and method statement will be developed in accordance with the strategy described in this report and in consultation with NRW.

A.2 Background to Development

A.2.1 As part of the proposed improvements to the M4 Corridor around Newport (M4CaN), the Welsh Government proposes construction of a new section of motorway to the south of Newport between Castleton and Magor, as shown on Figure 1.

A.2.2 The new section of motorway would be approximately 24 kilometres in length and would provide three lanes in both directions between Junction 29 of the M4 at Castleton and Junction 23 of the M4 at Magor. After leaving the existing M4 motorway at Junction 29, the new section of motorway would pass to the south of Duffryn before crossing the Rivers Ebbw and Usk to the south of the A48 at Newport Docks. The new section of motorway would then continue to the south of the Solutia chemical works and the Tata Steel site at Llanwern before passing to the west of Magor and re-joining the existing M4.

A.2.3 In addition to the junctions at Castleton and Magor, two new junctions would be provided along the route of the new section of motorway at Newport Docks and at Glan Llyn.

A.2.4 New or diverted lengths of highway, public rights of way and private means of access would be provided to replace those affected by the Scheme.

A.2.5 The local highway network would also be realigned at ten locations and new road overbridges would be constructed at Church Lane and Lighthouse Road, New Dairy Farm, Nash Road, and North Row.

A.2.6 Extensions to existing structures will take place at ten locations along the length of the Scheme.

A.2.7 Road drainage would be provided through piped systems, which would discharge into a series of water treatment areas comprising attenuation ponds and reed beds along the new section of motorway. These water treatment areas would attenuate and treat the collected surface water prior to discharging it into existing watercourses.

A.2.8 Approximately two thirds of the route for the proposed new section of motorway crosses the Gwent Levels. The Gwent Levels are areas of flat reclaimed coastal marshes adjoining the Severn Estuary and comprising the Wentlooge Levels and Caldicot Levels to the west and east of Newport respectively. The Gwent Levels are low lying with an elevation typically of between 5 – 6 metres (m) above ordnance datum (AOD).

A.2.9 The Gwent Levels are dissected by an extensive network of tide-locked freshwater drains, locally known as reens. A number of designations apply to the Gwent Levels, including a number of Sites of Special Scientific Interest (SSSIs). In addition, the River Usk is designated nationally and internationally for its nature conservation value. At the location of the proposed crossing, the river is designated as a SSSI and Special Area of Conservation (SAC).

A.3 Proposed works on site to be covered by a licence

A.3.1 This mitigation strategy will form the basis of a method statement, the final version of which will be submitted to NRW with a bat licence application and updated in response to results of pre-construction surveys that will be completed in 2017. The licence application and method statement will be developed in accordance with the strategy described in this report and in consultation with NRW.

A.3.2 This mitigation strategy relates to any development works that could have an impact on habitats of value to bats, including those listed below.

- Clearance of land prior to construction
- Construction of the new M4 road scheme with associated embankments
- Construction of temporary works compounds
- Construction of temporary storage areas (equipment, vehicles, materials including soil etc.)
- Construction of temporary batching plants
- Excavation of temporary borrow pits
- Construction of Water Treatment Areas
- Construction of drainage systems
- Construction of temporary access roads (construction)
- Construction of access/slip roads (permanent)
- Construction of over bridges
- Construction of culverts on reens and main watercourses
- Construction of wildlife underpasses
- Infilling of watercourses and other waterbodies
- Construction and operational lighting
- Landscape and biodiversity planting

A.4 Actions Requiring Licensing

A.4.1 All species of bats in Britain are protected under Schedule 5 of the Wildlife and Countryside Act, 1981 (as amended). They are also listed under Schedule 2 of the Conservation of Habitats and Species (Amendment) Regulations 2012 (Habitats Regulations).

A.4.2 This legislation makes it an offence to intentionally kill, injure or capture (take) bats and intentionally or recklessly disturb any bat whilst it is occupying a structure or place that it uses for shelter or protection. It is also an offence to intentionally or recklessly

damage, destroy or obstruct access to any place that a bat uses for shelter or protection. This is taken to mean all bat roosts whether bats are present or not.

A.4.3 In accordance with the Habitats Regulations, an NRW development licence for bats is required for any works that would result in the loss of a bat roost or significant disturbance of roosting bats. A licence for bats is required to disturb, capture by hand and translocate bats, and to damage, disturb and destroy bat roosts. Licences are not authorised if the impacts would be detrimental to the maintenance of the population concerned at a favourable conservation status in its natural range.

A.4.4 Construction of the new section of motorway would require the felling of the following trees and the demolition of the following buildings of known or probable value to roosting bats. This work would require a NRW licence.

- Tree 274 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for individual soprano pipistrelle and noctule bats and possible additional unknown species (further survey will be undertaken in 2017 to attempt species confirmation);
- Tree 80 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for a small number of pipistrelle and brown long-eared bats;
- Tree 375 (Figure 1e), located near Knollbury at the eastern end of the scheme - a confirmed summer day roost for an individual bat of unknown species (further survey will be undertaken in 2017 to attempt species confirmation);
- Tree 39 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost;
- Tree 45 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost;
- Tree X3 (Figure 1f), located to the north of the M4 to the east of The Elms underpass – a probable common pipistrelle summer day roost;
- A disused lime kiln (ref. T335), located close to Tree X3 – a confirmed brown long-eared bat summer day roost;
- Barecroft House (Figure 1e) – a residential property located just to the east of the A4810 and south of the Wales to London mainline railway, to the south west of Magor - a confirmed summer day roost for a small number of common pipistrelle bats (up to two observed)
- Berryhill Cottage (Figure 1a) – a residential building undergoing renovation work following long-term neglect located to the north of Berryhill Farm and the A48 – a confirmed common pipistrelle summer day roost (up to four bats observed) and soprano pipistrelle summer day roost (one bat observed).
- The Conifers (Figure 1a) - a residential property located to the west of Berryhill Farm - a confirmed common pipistrelle maternity roost (up to 55 bats observed); brown long-eared summer day roost (up to three bats observed); and soprano pipistrelle summer day roost (one bat observed).
- Undy House (Figure 1e) – a vacant and boarded-up residential property and old derelict outbuilding located to the north of the existing M4 and south of Knollbury - both buildings are confirmed common pipistrelle summer day roosts (single bats observed from each building).

- San Remo (Figure 1a) - a vacant residential property located between the existing M4 and A48 east of Castleton - up to eight common pipistrelle bats were observed roosting.
- The Vicarage (also known as Woodland House) (Figure 1e) - a residential property at the eastern end of the scheme - a confirmed summer day roost for a small number of common pipistrelles (three bats observed); and
- The Old Stores building on the Newport Alexandra Docks, to the west of the River Usk (Figure 1b) – a possible roost for one or a small number of bats, likely to be pipistrelle (one unidentified bat possibly emerged from a broken window).

A.4.5 Bat roosts were also confirmed in the following buildings, which although would not be demolished to enable construction, are located relatively close to working areas and, therefore, works could result in disturbance to roosting bats:

- Berryhill Farm (Figure 1a) – a number of buildings located to the south of the existing M4 and A48 between Newport and Castleton, including an old large residential property (building 1), a garage and utility building (building 2), an old 'calf' shed (building 3) and another old shed used for cider making (building 4) - building 1 is considered to be a common pipistrelle maternity roost (up to 68 bats observed); building 2 is considered to likely to be a brown long eared maternity roost (up to nine bats observed) and a summer day roost for a small number of soprano pipistrelle bats (one bat observed) and *Myotis* sp. bats (one bat observed); building 4 is considered to be a summer day roost for common pipistrelle bats (up to two bats observed).
- Fair Orchard Farm (Figure 1b) – a complex of farm buildings, including residential and barns located on Lighthouse Road, to the south of the Wales to London Mainline railway, south of Duffryn - three confirmed common pipistrelle bat summer day roosts (up to eight bats observed in total).
- Pye Corner Farm house (Figure 1c) – a confirmed roost for a small number of common pipistrelles.
- Tatton Farm (Figure 1c) – a confirmed roost for a small number of common pipistrelles.

A.4.6 In addition, for the purpose of this mitigation strategy, Tree 90 (Figure 1d), located to the south of Queen's Way (A4810) on the Tata Steel UK Ltd site, which has not yet been surveyed during dusk and/or dawn due to access restrictions, is considered to be a possible bat roost due to the presence of features of high potential value to roosting bats. This tree would need to be felled in order to enable construction.

A.4.7 Should any additional roosts (confirmed, probable or possible) be identified prior to the commencement of works, the final Method Statement would include these features. Pre-construction surveys to be undertaken are summarised in Section C.7.4 below.

B Survey and Site Assessment

B.1 Existing Information on Bats at the Survey Site

B.1.1 A desk study was undertaken in 2015 (M4CaN ES Appendix 10.17) in order to inform the mitigation strategy and Environmental Impact Assessment (EIA) of the M4CaN scheme. As part of the desk study, records of bats from the M4CaN working area and an approximately 5 kilometres (km) wide surrounding area were requested from the South East Wales Biological Records Centre (SEWBReC).

B.1.2 Records of 13 bat species were reported for the study area, as listed in Table 1 below. Five records were of bats that had not been identified to species level (Chiroptera).

Table 1: Summary of bat records within 5 km of the M4CaN Scheme

Taxon name	Common name
Chiroptera	Unspecified bat
Myotis	Unidentified Myotis bat
Myotis daubentonii	Daubenton's bat
Myotis mystacinus	Whiskered bat
Myotis brandtii	Brandt’s bat
Myotis mystacinus/brandtii agg.	Whiskered/brandt's bat
Myotis nattereri	Natterer's bat
Eptesicus serotinus	Serotine
Nyctalus leisleri	Lesser noctule
Nyctalus noctula	Noctule bat
Pipistrellus	Unidentified pipistrelle bat
Pipistrellus nathusii	Nathusius's pipistrelle
Pipistrellus pipistrellus	Common pipistrelle
Pipistrellus pygmaeus	Soprano pipistrelle
Plecotus	Unidentified long-eared Bat
Plecotus auritus	Brown long-eared Bat
Rhinolophus ferrumequinum	Greater horseshoe bat
Rhinolophus hipposideros	Lesser horseshoe bat

B.1.3 Records provided by the SEWBReC are shown on Figure 4.

B.1.4 Reports of bat records were widespread across the study area but with the greatest concentration in the western half. Many records were in clusters at locations in Cardiff, Rogerstone, Cwmbran, Newport, Llanbeder, Wentwood Reservoir and Magor Marsh.

B.1.5 Common pipistrelle was the most frequently recorded species and was recorded across the search area.

B.2 Statutory sites notified for the species (SSSIs or SACs) within 10 km

B.2.1 The Wye Valley and Forest of Dean Bat Sites/Safleoedd Ystlumod Dyffryn Gwy a Fforest y Ddena SAC is designated for lesser horseshoe and greater horseshoe bats.

B.2.2 The site comprises a complex of sites on the border between England and Wales containing the greatest concentration of lesser horseshoe bats in the UK, equivalent to approximately 26% of the national population. The complex also represents the

northern part of the range for greater horseshoe bats and supports approximately 6% of the UK population. The sites contain maternity bat roosts, as well as suitable hibernation habitat in disused mines.

B.2.3 The SAC includes four SSSIs, of which two are within the study area: Mwyngloddfa Mynydd-Bach SSSI and Wye Valley Lesser Horseshoe Bat SSSI.

B.2.4 Mwyngloddfa Mynydd-Bach SSSI provides habitat for the lesser horseshoe bat, including disused mines providing hibernation habitat and is located approximately 9 km to the north east of Magor Interchange. Wye Valley Lesser Horseshoe Bat SSSI is a composite bat site, including summer nursery roosts for lesser horseshoe bat. The roost at Itton Court is located over 10 km to the north east of Magor Interchange.

B.2.5 Ruperra Castle and Woodlands SSSI is some 3.13 km from the western end of the Scheme. This site is of special interest as one of only five known nursery roosts for the greater horseshoe bat (*Rhinolophus ferrumequinum*) in Wales. The buildings at Ruperra Castle support a colony of greater horseshoe bats of national and international importance. A small number of lesser horseshoe bats (*Rhinolophus hipposideros*) also use the cellar of the old castle as a hibernation roost during the winter. Coed Craig Ruperra, the woodland area to the north of the roost, is well used by the bats for foraging and commuting to more distant feeding and roosting areas.

B.3 Objectives of the bat surveys 2014 - 2016

B.3.1 The 2014 and 2015 survey reports are in M4 CaN March 2016 ES Appendices 10.7, 10.23 and 10.24. The 2016 Bat Hibernation Roost Survey report is Appendix S10.7 of the M4Can ES Supplement (September 2016). Reports of the 2016 Bat Tree Survey and the 2016 Bat Building Survey will be appended to the second ES Supplement to be published before the start of the Public Inquiry.

2014

B.3.2 The objectives of the 2014 bat survey were to:

- assess the potential of trees and buildings within the study area to support bat roosts. The study area was based on a 500 metre (m) wide buffer zone surrounding the physical extents of the previous scheme studied in 2007/2008 including both the route alignment, potential junctions and water treatment areas; and
- establish levels of bat activity within the study area, identifying risk species and areas where further surveys and/or mitigation measures may be required.

2015

B.3.3 The objectives of the 2015 bat surveys were to:

- determine whether or not trees of high potential value to roosting bats that are located within the footprint, or within 100 m of the footprint of the M4CaN scheme, were supporting roosting bats;
- determine whether or not bats were roosting in any of the buildings to be affected by the development;
- identify key locations where bats follow linear features for commuting and foraging which may be intersected by the new section of motorway; and

- assess bat activity through several underpasses and over a bridge on the existing M4 to identify existing safe bat crossing locations and consider existing bat movements from/to the north of the M4.

2016

B.3.4 The objectives of the 2016 bat surveys were to:

- survey trees of high or medium potential value to roosting bats (i.e. category 1* and 1 trees as defined in Hundt, L. 2012) that would be affected by the works and that were not surveyed in 2015 due to access issues and late identification (i.e. the tree's potential value was determined after the bat survey season). These were surveyed following the same methodology as the 2015 surveys;
- undertake dusk emergence and dawn re-entry surveys of buildings assessed as suitable for roosting bats that were not surveyed in 2015 due to access issues and late identification; and
- undertake hibernation roost inspection of two trees (T38 and T62) and one building (T335) using tree climbing and ground inspection to search for bats, or evidence of bats.

B.4 Scaled plan/map of survey area

B.4.1 Figure 1 in Annex 3 shows the location of the M4CaN scheme along with trees and buildings surveyed in 2015 & 2016.

B.5 Site/habitat description

B.5.1 Phase 1 Habitat Surveys of the M4CaN footprint and a surrounding buffer zone of approximately 250 m width were undertaken in 2014 (M4CaN ES Appendix 10.2) and 2015 (M4CaN ES Appendix 10.17) in order to identify habitats within the footprint of the M4CaN scheme and a surrounding buffer zone approximately 250 m in width. Results of the desk study are shown in Figure 5 of this report.

B.5.2 Habitats recorded during the Phase 1 habitat surveys were predominantly agricultural, dominated by grassland fields with scattered arable fields, and a network of field boundary reens and other watercourses (wet and dry) and hedgerows. Scattered parcels of woodland and some scattered ponds were also recorded. The River Usk and Ebbw flow through survey area and bankside habitat includes areas of saltmarsh.

B.6 Bat Surveys - Methodology

Roost Surveys

Tree Surveys

B.6.1 Trees shown on Figure 1 are located within the footprint or approximately 100 m of the footprint of the M4CaN scheme and were assessed in 2014 to be of high potential value to roosting bats (i.e. category 1* trees as described in Hundt (2012) (M4CaN ES Appendix 10.7).

B.6.2 In order to update findings of the 2014 assessment of potential value to roosting bats, the trees shown on Figure 1 were re-assessed in 2015 by Thomson Ecology ecologists

Nia Bowen and Chris Wildblood. Nia Bowen is a bat licensed ecologist (Class 1 England and Wales NRW licence 56959:OTH:CSAB:2014) 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. The assessment was in accordance with best practice guidelines published by the Bat Conservation Trust (BCT) (Hundt, 2012).

B.6.3 The 2015 daytime assessment included a ground-level inspection of the trees using high powered binoculars where necessary and, where practicable and safe to do so, an aerial survey of potential roost sites using endoscopes. Features of potential value as roost sites included areas of lifted bark, rot holes, woodpecker holes, cracks or splits in branches and areas of dense ivy cladding. Signs that could indicate the presence of roosting bats were also surveyed for, such as scratchings and urine staining at potential roost entrances.

B.6.4 Three dusk emergence and dawn re-entry surveys of all trees assessed to be of high potential value to roosting bats, which had not been downgraded in potential value as a result of ground-level and aerial surveys, were then undertaken between August and early October 2015, during suitable weather conditions, i.e. avoiding periods of moderate to heavy rain or wind. 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. In addition, for trees that were reclassified as having lower than high bat roost potential after the initial tree climbing survey, two dusk emergence surveys were undertaken.

B.6.5 Further surveys (between one and three dusk and dawn surveys) of trees with high potential (surveyed in 2015) were undertaken between June and September 2016, plus three newly identified trees were included.

B.6.6 Tree T90, on Tata steelworks land, is considered to offer high potential as a bat roost. However, it has not been possible to undertake bat emergence/dawn surveys due to access constraints.

Buildings survey

B.6.7 The buildings surveys in 2015 and 2016 were undertaken by RPS ecologists RPS ecologists Sean Flynn (11 years' bat survey experience, NRW bat survey lic. 71624:OTH:CSAB:2016), Nicola Pyle (10 years' bat survey experience, NE bat survey lic. 2015-18259-CLS-CLS), Sarah Downing (9 years' bat emergence survey experience), Elizabeth White (6 years' bat emergence survey experience), Ruth Holland (4 years' bat emergence survey experience), Jay Allen (4 years' bat emergence survey experience), Nathan Redman (4 years' bat emergence survey experience), Marc Dino (3 years' bat emergence survey experience), and Georgia Kelly (3 years' bat emergence survey experience).

B.6.8 In 2015 a thorough inspection of both the interior and exterior of all surveyed 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. 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. In addition, due to access restrictions, Pye Corner Farm and the Vicarage (Woodland House) were only surveyed externally.

B.6.9 In 2016 full internal inspections of each building were not possible due to health and safety constraints and access restrictions.

B.6.10 In 2015 only two surveys visits were undertaken at The Old Stores, Alexandra Docks, Newport (Figure 1b/c) due to unfavourable weather conditions and access constraints. It was not possible to undertake an additional survey as planned, as access permission was not granted.

B.6.11 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.

B.6.12 Each building was then assigned a bat roosting suitability category in accordance with guidelines and categories published by the BCT.

B.6.13 With regard to the BCT guidance, two dusk emergence surveys were then undertaken on buildings classified as having medium bat roost suitability and a further dusk/dawn emergence survey was completed if there was evidence of a possible bat roost within the building after the initial two surveys.

B.6.14 Dusk emergence surveys of trees and buildings commenced at least 15 minutes prior to sunset and continued for at least two hours after sunset. Dawn surveys commenced around two hours before sunrise and concluded at sunrise.

B.6.15 During each survey visit, ecologists observed the trees and buildings, and in particular, features identified as potential roost sites during the 2015 daytime assessments, in order to determine whether or not roosting bats emerged (dusk surveys) or re-entered (dawn surveys) the potential roost sites.

B.6.16 Throughout each survey visit, bat activity was recorded using hand-held Anabat SD-1 detectors. Recordings were stored on integral compact memory flash cards and later analysed and interpreted using the AnalookW 3.7w programme (Titley Scientific) in order to identify the species of any roosting bats observed.

Hibernation Survey

B.6.17 During the 2015 surveys, two trees (T38 and T62) and one building (T335) were assessed as having potential to support hibernating bats. In February 2016, Steve Wadley (NRW Bat Survey Licence 61740:OTH:CSAB:2015) of Thomson Ecology undertook hibernation roost inspections of these potential hibernation roosts using tree climbing and ground inspection to search for bats, or evidence of bats.

Bat Activity Surveys

B.6.18 Bat activity surveys were undertaken in 2014 (M4CaN ES Appendix 10.7) and 2015 (M4 ES Appendix 10.23).

Walked Transect Surveys, 2014

B.6.19 Ten transects along the M4CaN route were surveyed during 2014. Where possible (i.e. where land owner permission allowed), transects concentrated on the central part of the study area, most likely to be affected by the scheme.

B.6.20 Transect surveys commenced approximately at sunset and continued for approximately 1 ½ - 2 hours. Each transect survey was repeated each month between April and October 2014 inclusive, in accordance with survey guidelines for a major infrastructure project in an area where habitats are of medium value to bat species, described in Table 7.2 of Hundt (2012). Although it was acknowledged at the time of the 2014 surveys that some areas of the Scheme are likely to cross areas of high quality habitat for bats, such as the woodlands near Castleton, other areas, such as the more open areas of the Gwent Levels, are likely to be of lower quality. The medium level was therefore used to reflect the average quality of habitats as a whole. This approach to survey effort and the indicative transect routes were agreed with NRW in advance.

B.6.21 Bat activity data was recorded during each transect survey using Anabat SD1 or SD2 detectors connected to GPS receivers. All bats encountered were recorded and their locations noted using the GPS modules. Species identification from recordings was completed using a combination of software packages designed for analysing and identifying bat calls. The primary software used was Analook.

B.6.22 Refer to Environmental Statement Appendix 10.7 for full survey method and results.

Static Detector Surveys, 2014 and 2015

B.6.23 Two locations at points on or near the route of each of the ten walked transects were selected for static detector surveys in 2014, giving a total of twenty locations along the M4CaN route. Wildlife Acoustic Song Meter 2 Ultrasonic Bat Detectors (SM2+BAT) were used to record bat activity for five consecutive nights in each month between April and October, inclusive. A total of ten detectors were used to cover the twenty locations with between four and ten detectors being used simultaneously. This level of survey effort was determined in accordance with Table 7.2 of Hundt (2012).

B.6.24 The locations of the static detectors were selected in order to provide a representative sample of the different habitats present.

B.6.25 This approach was agreed with NRW in advance.

B.6.26 Based on the results of the 2014 surveys and on subsequent consultation with NRW, the focus of the bat activity survey in 2015 was to survey linear features, located in suitable habitat, which could be used by commuting and foraging bats and would be severed by the new motorway. 50 locations were selected using professional judgement based on information from desk study and the previous surveys. The locations selected included hedgerows, woodland edges and reen banks.

B.6.27 It was agreed with NRW that three ‘survey visits’ of five consecutive nights at each location, would provide an adequate level of survey effort to monitor bat activity levels. With 50 survey locations, there was some degree of overlap between survey visits; however, the three survey visits were generally distinct enough to allow comparisons in activity levels to be made. The primary bat activity season was also fully covered during the survey period.

B.6.28 In M4CaN ES Appendix 10.23 (Bat Activity Surveys 2015) average bat activity levels recorded were calculated for each survey location in order to aid comparisons between locations. Further to that report, bat activity indices (number of bat passes divided by number of nights surveyed) have been used (in accordance with ES Appendix 10.7 (Bat Survey 2014) to standardise and compare static detector survey results at each location in 2014 and 2015. Species particularly at risk of severance effects and

collisions with road traffic have been considered separately. These include greater and lesser horseshoe, brown long-eared, *Myotis* species and barbastelle bats.

B.6.29 Refer to Environmental Statement Appendix 10.7 and Appendix 10.23 for full survey method and results. Refer to Figure 3 in Annex3= showing bat activity indices for sensitive species.

M4 Crossing Points, 2015

B.6.30 In 2015 bat activity surveys were undertaken on several underpasses and a road bridge which cross the existing M4 in order to determine whether these are used as commuting routes by bats (and in particular lesser horseshoe bats).

B.6.31 Bat surveys were undertaken with regard to best practice guidelines and recommendations (Hundt, 2012). Three dusk or dawn surveys were undertaken at each of the underpass/bridge locations. Dusk surveys commenced half an hour before sunset and continued until approximately two hours after sunset. Dawn surveys commenced one and a half hours before sunrise and ended at sunrise (or fifteen minutes after the last bat was recorded if bats were present at sunrise). All surveys were carried out during optimal weather conditions for undertaking bat surveys.

B.6.32 During each survey visit, the underpass/bridge was surveyed continuously by suitably experienced RPS ecologists (refer to B.6.7) stationed within the underpass or on the bridge. The number of bats entering and passing through the underpasses or across the bridges was noted in addition to the direction from which they had appeared. Bat detectors were used to detect echolocation calls from any bats using the underpasses/bridges to assist with species identification. The data recorded was subsequently analysed on computer using BatScan v.9, Analook and Adobe Audition software.

B.6.33 Refer to Environmental Statement Appendix 10.23 for full survey method and results.

B.7 Survey Results

Tree Roost Surveys

B.7.1 Three confirmed tree roosts and three possible tree roosts were identified during the 2015 and 2016 bat surveys, as listed below and described in the survey report at M4CaN ES Appendix 10.24:

- Tree 274 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for individual soprano pipistrelle and noctule bats and possible additional unknown species;
- Tree 80 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for a small number of pipistrelle and brown long-eared bats;
- Tree 375 (Figure 1e), located near Knollbury at the eastern end of the scheme - a confirmed summer day roost for an individual bat of unknown species;
- Tree 39 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost;
- Tree 45 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost; and

- Tree X3 (Figure 1f), located to the north of the M4 to the east of The Elms underpass – a probable common pipistrelle summer day roost.

B.8 Building Surveys

B.8.1 Fourteen confirmed building roosts and one possible building roost were confirmed in the 2015 surveys as described below. The following buildings would be demolished so as to enable construction.

- A disused lime kiln (ref. T335), located close to Tree X3 – a confirmed brown long-eared bat summer day roost;
- Barecroft House (Figure 1e) – a residential property located just to the east of the A4810 and south of the Wales to London mainline railway, to the south west of Magor - a confirmed summer day roost for a small number of common pipistrelle bats (up to two observed)
- Berryhill Cottage (Figure 1a) – a residential building undergoing renovation work following long-term neglect located to the north of Berryhill Farm and the A48 – a confirmed common pipistrelle summer day roost (up to four bats observed) and soprano pipistrelle summer day roost (one bat observed).
- The Conifers (Figure 1a) - a residential property located to the west of Berryhill Farm - a confirmed common pipistrelle maternity roost (up to 55 bats observed); brown long-eared summer day roost (up to three bats observed); and soprano pipistrelle summer day roost (one bat observed).
- Undy House (Figure 1e) – a vacant and boarded-up residential property and old derelict outbuilding located to the north of the existing M4 and south of Knollbury - both buildings are confirmed common pipistrelle summer day roosts (single bats observed from each building).
- San Remo (Figure 1a) - a vacant residential property located between the existing M4 and A48 east of Castleton - up to eight common pipistrelle bats were observed roosting.
- The Vicarage (Woodland House) (Figure 1e) - a residential property at the eastern end of the scheme - a confirmed summer day roost for a small number of common pipistrelles (three bats observed); and
- The Old Stores building on the Newport Alexandra Docks, to the west of the River Usk (Figure 1b) – a possible roost for one or a small number of bats, likely to be pipistrelle (one unidentified bat possibly emerged from a broken window).

B.8.2 Bat roosts were also confirmed in the following buildings, which although would not be demolished to enable construction, are located relatively close to working areas and, therefore, works could result in disturbance to roosting bats:

- Berryhill Farm (Figure 1a) – a number of buildings located to the south of the existing M4 and A48 between Newport and Castleton, including an old large residential property (building 1), a garage and utility building (building 2), an old ‘calf’ shed (building 3) and another old shed used for cider making (building 4) - building 1 is considered to be a common pipistrelle maternity roost (up to 68 bats observed); building 2 is considered to likely to be a brown long eared maternity roost (up to nine bats observed) and a summer day roost for a small number of soprano pipistrelle bats (one bat observed) and *Myotis* sp. bats (one bat

observed); building 4 is considered to be a summer day roost for common pipistrelle bats (up to two bats observed).

- Fair Orchard Farm (Figure 1b) – a complex of farm buildings, including residential and barns located on Lighthouse Road, to the south of the Wales to London Mainline railway, south of Duffryn - three confirmed common pipistrelle bat summer day roosts (up to eight bats observed in total).
- Pye Corner Farm house (Figure 1c) – a confirmed roost for a small number of common pipistrelles.
- Tatton Farm (Figure 1c) – a confirmed roost for a small number of common pipistrelles.

B.9 Bat Activity Survey

Walked Transect Surveys

B.9.1 Bat species recorded during the walked transect survey visits completed in 2014 were generally common and widespread species, with common pipistrelle being the most frequently recorded. Less common species recorded include Leisler's bat, serotine and Nathusius' pipistrelle. No horseshoe bats were recorded during the walked transect surveys.

B.9.2 Full details of the walked transect surveys completed in 2014 are provided in the report at M4CaN ES Appendix 10.7.

Static Detector Surveys

B.9.3 Average bat activity levels recorded along the route of the scheme are shown on Figure 2.

B.9.4 The level of bat activity encountered during the 2014 static detector surveys was variable across the study area, with the highest levels recorded in fields to the west of Fair Orchard Farm (Figure 2b). With an average number of 554 bat passes per night, activity levels at this monitoring location were approximately twice that of the sites with the next highest levels of activity.

B.9.5 During the 2014 Arup bat activity surveys a total of nine individual bat species was 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. The most commonly recorded species during the 2014 static detector surveys was common pipistrelle, with soprano pipistrelles and *Myotis* species also frequently detected. Other notable species recorded include single passes of a barbastelle bat at Locations 13 and 14, Figure 3 (near Tatton farm), small numbers of Nathusius' pipistrelle at Locations 13, 14 and 15, Figure 3 (near Tatton farm) and lesser horseshoe bats at Locations 11, Figure 3 (near Pye Corner Laboratories), 15 (North Row), 16 (Bareland Street) and 19 (St Bride's Reen Culvert), Figure 3. A single greater horseshoe bat was recorded at Location 7 (Llandevenny), Figure 3, in October 2014.

B.9.6 Woodland areas, grazed grasslands and areas comprising tree lined lanes and watercourses were found to have the highest levels of bat activity within the study area.

B.9.7 Lesser horseshoe bats were recorded at eight of the 20 static detector locations, all of which were located to the east of the River Usk between Pye Corner and the eastern end of the study area, including locations to the south of the Tata Steelworks.

B.9.8 A greater horseshoe bat was recorded on a single occasion, approximately 8.5 km from Ruperra Castle and Woodlands 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 when it was recorded.

B.9.9 Full details of the results of the static detector surveys carried out in 2014 are provided in the survey report at M4 CaN ES Appendix 10.7.

B.9.10 In 2015, a total of 104,575 bat passes was recorded during the course of the static detector surveys. The maximum level of bat activity was recorded during the first survey visit carried out between 04 June and 22 July 2015.

B.9.11 The highest levels of bat activity recorded were from locations situated near to the western end of the M4CaN scheme and south of Duffryn, and near to Tatton Farm to the east of the River Usk (i.e. detector locations 43, 13 and 27, Figure 3). These results are broadly consistent with those of the 2014 survey when three of the four detector locations which recorded the highest levels of activity were located in areas to the south of Duffryn. However, the majority of the 2015 bat passes recorded in these areas were made by pipistrelles and other relatively common species.

B.9.12 The diversity of bat species recorded was consistently highest at the eastern end of the Scheme around Llandevenny and Magor. Although serotines were recorded along the length of the proposed new motorway, the levels of activity of this species were relatively low away from the eastern end of the Scheme. Similarly, Nathusius pipistrelles were recorded in very low levels in the central and western parts of the Scheme. Barbastelle and lesser horseshoe bats were only recorded at the eastern end of the Scheme in 2015. Log-eared bats were recorded throughout the Scheme in small numbers, apart from south of Tata steelworks, where there were no records.

B.9.13 These results are somewhat different to those of the 2014 surveys. For example, in 2014, low numbers of barbastelles and Nathusius' pipistrelles were recorded along the entire length of the proposed new motorway, including in the central and western areas of the Scheme. In contrast, serotines, which were recorded fairly consistently along the length of the scheme in 2015, were only recorded at three detector locations in three of the seven survey visits carried out in 2014. Two of these were situated to the south-east of Duffryn while the other was located to the south-west of Magor.

B.9.14 Lesser horseshoe bats were only recorded in the areas around Magor and Llandevenny in 2015. Activity levels for this species were highest during the first survey visit, with the levels recorded during survey visits 2 and 3 being broadly similar. The levels of lesser horseshoe bat activity in this area of the scheme were generally comparable with those observed in 2014. No lesser horseshoe bats were recorded around Pye Corner in 2015, or in the western half of the Scheme in either 2014 or 2015.

B.9.15 No greater horseshoe bats were recorded during the 2015 static detector surveys.

B.9.16 Full details of the results of the static detector surveys carried out in 2014 are provided at M4CaN ES Appendix 10.7 of the ES for the M4CaN scheme.

M4 Crossing Points

B.9.17 Survey results demonstrated that the St Bride's Brook/Public Footpath underpass and the underpasses at St Bride's Road, The Elms and Bencroft Lane were regularly used by a relatively limited number of commuting bats. Common and soprano pipistrelles and *Myotis* species were recorded commuting through the underpass both north and south throughout the dusk and dawn surveys.

B.9.18 Only a relatively small number of common pipistrelles were recorded commuting through the B4245 underpass during the dusk survey. No bats were recorded during either of the dawn surveys.

B.9.19 No bats were seen commuting over the M4 motorway bridges located at Pound Hill and Grange Road.

B.9.20 Generally bat activity during the dawn surveys in all areas was significantly lower than during the dusk surveys.

B.9.21 Full details of the results of the static detector surveys carried out in 2014 are provided at M4CaN ES Appendix 10.7.

B.10 Pre-construction surveys

B.10.1 Pre-construction surveys of buildings confirmed as bat roosts that would be affected by the scheme will be undertaken in 2017 to further inform a NRW bat licence application, required to enable construction. This will involve a total of two dusk or dawn emergence surveys spread between May and August. All buildings will be internally inspected once the Welsh Government takes possession of the buildings. Should any additional bat roosts be found during internal inspection, further emergence surveys of these buildings will be considered in discussion with NRW. All buildings with any bat roosting suitability, including those not confirmed as bat roosts, will be demolished under ecological watching brief, in case bats are present. Should bats be discovered, additional roost mitigation will be considered in discussion with NRW.

B.10.2 The following pre-construction surveys of trees will be undertaken where trees will require felling:

- Climbing survey of trees T346 and T390 (Figure 1) in 2017 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.
- Further tree climbing inspections in January and February 2018 of trees T38 and T62, and internal inspection of building T335 (Figure 1) to further investigate potential use by hibernating bats.
- Dusk and/or dawn roost surveys of confirmed roosts (T80, T274 and T375 on Figure 1) and probable roosts (T39, T45 and X3 on Figure 1) will be undertaken in order to gather additional data on the roosts such as how many bats use the roost across the bat activity season to inform the licence application. These surveys will be completed between May and August 2017.
- Further surveys of other high potential trees will be undertaken in order to establish bat use during the early bat activity season; two dusk emergence and dawn swarming surveys will be carried out of trees that have not already been surveyed

between May and August inclusive (T38, T328, and T331 on Figure 1), or where one of the recommended survey visits was not completed (T335, T346 and T359 on Figure 1). One survey visit will be carried out at trees that were surveyed in August and were visited the recommended amount of times (T82, T88, T273 and T358 on Figure 1). Survey visits will include a survey during the maternity season (between June and August inclusive) and for multiple survey visits these will be spaced approximately one month apart and may be spread over 2017 and 2018.

B.11 Interpretation/Evaluation of Survey Results

Tree Roost Surveys

B.11.1 In accordance with rarity classifications related to species ranges in Wales, published by Wray *et al*. (2010), pipistrelles are relatively common species in Wales, brown long-eared bats are rarer species and noctules are amongst the rarest of species in Wales.

B.11.2 In accordance with the methodology for valuing bat roosts published by Wray *et al*. (2010), the pipistrelle bat roosts in buildings and trees, supporting small numbers of bats, are considered to be of local/district level importance; the tree roost supporting a small number of non-breeding brown-eared bats is considered to be of county importance; and the possible noctule bat roost is considered to be of county importance.

Activity Surveys

B.11.3 Wray *et al*. (2010) developed a method for the evaluation of bats in environmental assessment, which considers various factors: the rarity of the bat species recorded; number of bat passes recorded during any one survey visit; number of (potential) bat roosts within the proximity; complexity of the surrounding habitat network; and the types and potential value of habitat in the surrounding area to foraging bats. This methodology has been taken into account for the assessment of the value of the proposed new section of motorway for bats.

B.11.4 Recognising that all bats are European Protected Species and taking into account the methodology of Wray et al. (2010), results of the 2014 and 2015 surveys indicate the corridor of the proposed new section of motorway is of at least district level importance for lesser horseshoe bats and brown long-eared bats and between district and county level importance for pipistrelles. For all other bat species, results of the surveys indicate that the route is of regional value with regard to foraging and commuting behaviour. Overall the route corridor is thus assessed as being of Regional (Medium) importance.

C Impact assessment – potential impact of proposed works in the absence of mitigation/compensation

C.1 Short-term impacts: disturbance

C.1.1 Temporary short-term disturbance of bat roosts in trees and buildings that would be retained but are located close to working areas could occur as a result of noise, vibration, movement and lighting relating to construction works.

C.1.2 Depending on the time of year when works are carried out, bat roosts could include young. If works are undertaken during the winter, they could result in the disturbance of bats in hibernation. Activity during the hibernation period uses up valuable stored energy reserves, which may not be easily replaced due to the limited amount of potential invertebrate prey available and if bats are disturbed from their roost they may be unable to locate alternative suitable hibernation sites. Therefore, disturbance at this time of year could significantly affect the chances of a bat surviving the winter months.

C.1.3 Construction works would result in the severance and loss of features of potential value to commuting (and foraging) bats along the full length of the M4CaN corridor, including hedgerows, woodland, scrub and watercourses. The loss and severance of these habitats may affect species more sensitive to habitat severance/loss of flight-line habitat, such as horseshoes, long-eared and *Myotis* species.

C.2 Long-term impacts: roost modification

C.2.1 No modification to bat roosts (trees or buildings) are proposed.

C.3 Long-term impacts: roost loss

C.3.1 The following confirmed or possible roosts would be lost to construction:

- Tree 274 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for individual soprano pipistrelle and noctule bats and possible additional unknown species;
- Tree 80 (Figure 1a), located on Berryhill Farm at the western end of the scheme - a confirmed summer day roost for a small number of pipistrelle and brown long-eared bats;
- Tree 375 (Figure 1e), located near Knollbury at the eastern end of the scheme - a confirmed summer day roost for an individual bat of unknown species;
- Tree 39 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost;
- Tree 45 (Figure 1b), located close to Fox Covert to the east of Green Lane in Coedkernew – a probable common pipistrelle summer day roost;
- Tree X3 (Figure 1f), located to the north of the M4 to the east of The Elms underpass – a probable common pipistrelle summer day roost;
- A disused lime kiln (ref. T335), located close to Tree X3 – a confirmed brown long-eared bat summer day roost;

- Barecroft House (Figure 1e) – a residential property located just to the east of the A4810 and south of the Wales to London mainline railway, to the south west of Magor - a confirmed summer day roost for a small number of common pipistrelle bats (up to two observed)
- Berryhill Cottage (Figure 1a) – a residential building undergoing renovation work following long-term neglect located to the north of Berryhill Farm and the A48 – a confirmed common pipistrelle summer day roost (up to four bats observed) and soprano pipistrelle summer day roost (one bat observed).
- The Conifers (Figure 1a) - a residential property located to the west of Berryhill Farm - a confirmed common pipistrelle maternity roost (up to 55 bats observed); brown long-eared summer day roost (up to three bats observed); and soprano pipistrelle summer day roost (one bat observed).
- Undy House (Figure 1e) – a vacant and boarded-up residential property and old derelict outbuilding located to the north of the existing M4 and south of Knollbury - both buildings are confirmed common pipistrelle summer day roosts (single bats observed from each building).
- San Remo (Figure 1a) - a vacant residential property located between the existing M4 and A48 east of Castleton - up to eight common pipistrelle bats were observed roosting.
- The Vicarage (Woodland House) (Figure 1e) - a residential property at the eastern end of the scheme - a confirmed summer day roost for a small number of common pipistrelles (three bats observed); and
- The Old Stores building on the Newport Alexandra Docks, to the west of the River Usk (Figure 1b) – a possible roost for one or a small number of bats, likely to be pipistrelle (one unidentified bat possibly emerged from a broken window).

C.4 Long-term impacts: fragmentation and isolation

C.4.1 Hedgerows, trees, scrub, areas of woodland and watercourses along the M4CaN corridor will be lost to enable construction and the long-term impacts of this could be the severance and fragmentation of foraging and roosting areas to species more sensitive to habitat severance/loss of flight-line habitat, such as horseshoes, long-eared and *Myotis* species.

C.4.2 It is possible that some bats may decide to cross over the new road at risk of mortality from vehicle collision.

C.5 Post-development interference impacts

C.5.1 On completion of the construction phase, the Contractor would be responsible for ensuring landscaping is monitored and maintained for a period of five years in order to ensure successful establishment. Monitoring and maintenance works are not expected to result in any significant disturbance impact.

C.5.2 In addition, following the five year monitoring and establishment period for landscaped areas, habitat management would be undertaken in landscaped areas. Management would include rotational clearance of vegetation and silts, and management of vegetation along channels and banks of watercourses and Water Treatment Areas, using methods sympathetic to the habitats present so as to minimise the impact on biodiversity. Due to the nature of management works, no significant disturbance impact

is expected. The detailed methods of management would be included in the scheme's Environmental Management Plan (EMP), which would be agreed in advance with NRW.

C.5.3 The new road would be partially lit (around junctions and over the River Usk crossing). LED lighting would be used, which has a more defined cut-off than the existing lighting and would therefore not spill as far into adjacent habitats.

C.6 Predicted scale of impact

C.6.1 Favourable conservation status is defined in the Habitats and Species Directive (Article 1(i)) as when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats; and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, or will probably continue to be, a sufficiently large habitat to maintain its populations on a long term basis.

C.6.2 In accordance with rarity classifications related to species ranges in Wales, published by Wray *et al*. (2010), pipistrelles are relatively common species in Wales, brown long-eared bats are rarer species and noctules are amongst the rarest of species.

C.6.3 As described in section C.8, pipistrelle bat roosts in buildings and trees are considered to be of local/district level importance; the brown-eared bat roost is considered to be of county importance, and the possible noctule bat roost is considered to be of county importance.

C.6.4 Habitat severance may also affect the movement of some species that are more sensitive to gaps in habitat connectivity, which include some of the rarer bat species.

C.6.5 Therefore, without mitigation, the conservation status of bat populations may be affected in the short-term to long-term and the impact of this could be of local-level significance with regard to the more common species, and up to county significance for the rarer species.

C.6.6 However, with the mitigation measures described below, the impact of roost loss is predicted to be of a temporary (short to medium-term) moderate adverse significance at a local scale, which would not have a significant effect on the bat populations' conservation status at a regional scale. Only a relatively small number of bat roosts used by small numbers of the more common bat species would be lost to construction, apart from a common pipsistrelle maternity roost at The Conifers. The same bats are also likely to use Berryhill Farm (to be retained). Proposed mitigation includes: measures to minimise the likelihood of injury to bats and limit the level of disturbance; new woodland and tree planting; consideration of increasing culvert sizes at detailed design; bat boxes to be provided along the Scheme; and a 'bat house' tobe constructed to the north of Magor.

D Delivery Information – Mitigation, Compensation and Monitoring

D.1 Works to be undertaken

Trees

D.1.1 Felling of trees X3, 39, 45,80, 274 and 375 (Figures 1a and 1e), which contain known or potential roosts of individual or small numbers of pipistrelles, noctules and brown long-eared bats, would be subject to licensing.

D.1.2 Although no bat roosts have been located in other trees, due to the changing nature of tree habitat, trees identified during the 2014 (M4CaN ES Appendix 10.7) and 2015 (M4CaN ES Appendix 10.24) as being of high potential value (Category 1*, Hundt, L. 2012) or definite potential value (Category 1, Hundt, L. 2012) to roosting bats, will be surveyed prior to construction and should they contain a roost they will be added to any licence application and will be soft-felled under the watching brief of the bat licensed ecologist as described below.

Buildings

D.1.3 Demolition of buildings, listed in C.3.1, which contain known or potential roosts of individual or small numbers of pipistrelles, *Myotis* sp. and brown long-eared bats, and maternity roosts of common pipistrelle and brown long-eared bats would be subject to licensing.

Risk Assessments and Safe Systems of Works

D.1.4 Health and safety issues relating to all works described in this section will be the primary responsibility of the contractor, the project ecologist and the NRW bat licensed ecologist. Risk assessments will be required for the works which recognise and address as a minimum the potential risks from the following issues:

- risk of slips, trips, falls and other dangers from accident at the site;
- risks associated with working near water-bodies;
- risks associated with the use of machinery/equipment/vehicles;
- risks of management activities upon any bats that might be present (whilst also recognising the potential for other species to be present).

D.1.5 In addition, detailed risk assessments relating to potential risks from coming into contact with bats should be produced by the NRW bat licensed ecologist undertaking the site works. The risk assessment and safe system of work should be produced taking into account up-to-date best practice guidelines, currently detailed in Mitchell-Jones, A.J. and McLeish, A.P. (2004). The bat licensed ecologist should provide the developer and project ecologist with confirmation of their up-to-date appropriate rabies vaccination prior to the commencement of works.

D.1.6 Contractors should be referred to Mitchell-Jones, A.J. and McLeish, A.P. (2004), in particular section 2: Health and Safety in bat work, and section 7: Handling, releasing and keeping bats.

D.1.7 The biosecurity risk assessment and safe system of works will be signed and followed by contractor and bat licensed ecologist and, as necessary, updated in response to potential changes in site conditions.

D.2 Capture and exclusion

D.2.1 NRW licensed bat ecologists will work in accordance with best practice guidelines detailed in Mitchell-Jones and McLeish (2004).

D.2.2 Tree felling and building demolition works will be undertaken in accordance with the final agreed licence method statement. Works will be undertaken in October and/or April where possible so as to minimise the potential of significantly disturbing possible maternity groups or hibernating bats. Where maternity roosts are confirmed, works will be undertaken outside of the breeding season. October tree felling will be favoured where practicable, in order to avoid the bird-breeding season.

D.2.3 If felling trees or demolishing buildings of potential value to breeding birds in the bird nesting season, the trees and buildings will be surveyed immediately prior to the commencement of works in order to ensure no active bird nests are disturbed. If active nests are located, works will be delayed until it can be confirmed that young have fully fledged and left the nest. Due to the potential for this occurrence to delay construction works, it is likely that felling of known or potential tree roosts will be completed in October wherever practicable.

D.2.4 Felling and demolition works will be undertaken during daylight hours only; therefore, no lighting will be required.

D.2.5 Prior to the commencement of felling, if practicable and accessible, the bat licensed ecologist will survey the tree to be felled using an endoscope in order to locate any bats that might be present. If located these will be captured by hand by the bat licensed ecologist and dealt with as described below.

D.2.6 Trees will then be soft-felled under the on-site direction of a bat licensed ecologist. For each tree the bat licensed ecologist will identify sections of the tree containing features of potential/known value to roosting bats. As directed by the licensed ecologist, these sections will then be soft-felled, and carefully lowered to the ground and stacked adjacent to the tree and away from any vehicle tracks. After each section has been felled, contractors will stop works and allow the licensed ecologist to inspect the section for any potentially disturbed roosting bats and to ensure any potential roost access points remain clear of obstruction so that any bats that might be present can leave the roost.

D.2.7 Soft-felled sections will then be left undisturbed for a period of at least two nights of suitable weather (i.e. avoiding periods of prolonged heavy rain, high winds and night time temperatures below 0^{o}C) in order to provide time for any potentially roosting bats that were not located by the ecologist to leave the roost.

D.2.8 Features in buildings of known/potential value to bats* will also be removed under the watching brief of the licensed ecologist in order to help prevent injury or death to any bats that might be roosting. Works will include:

- prior checks of features of known/potential value by a licensed bat ecologist prior to the commencement of demolition works; and
- supervision of the removal of features of known/potential value, using hand tools.

**e.g. roof tiles, battens, sheathing felt, roof timbers, brickwork surrounding cavity spacing and areas of lifted lead flashing.*

D.2.9 Remaining demolition works will not commence until the bat licensed ecologist has confirmed that no bats are likely to be present and gives permission to commence.

D.2.10 Any bat(s) located by the bat licensed ecologist prior to or during soft-felling or building demolition works will be captured by hand by the bat licensed ecologist who will then temporarily transfer the bat(s) into a suitable holding bag (i.e. bags supplied by the British Trust for Ornithology, as described in Mitchell-Jones and McLeish (2004)). Only bats of the same species will be temporarily placed together in a bag and bats of different species will be kept in separate bags. Bags will not be placed on the ground, instead they will be hung or held suspended. Bats will be taken in their holding bags to pre-installed bat roost boxes located closest to the tree/building from which they were captured. The captured bats will then be carefully placed by the bat licensed ecologist into an appropriate box for their species (as listed in section E.2.3). Different species will not be placed into the same bat box. If necessary, additional boxes will be installed. Bats will not be left in temporary holding bags for any longer than two hours; due to the limited number of bats likely to be present and the proximity of the receptor sites (or roost boxes), it is likely that bats will be released from the holding bag within minutes of capture/immediately after capture.

D.2.11 If an unexpected species is located, which does not typically take to an artificial bat box, it will be temporarily held for the day by the bat licensed ecologist to later be released at dusk in a suitable location close to where it was captured.

D.2.12 In the unlikely event that a dead bat is located or a bat dies whilst in captivity, in accordance with and as described in Mitchell-Jones and McLeish (2004), the body of the dead bat will be sent to the Animal Health Veterinary Laboratories Agency (AHVLA) for testing for rabies. If a bat is found to be injured it will be cared for by the licensed ecologist/other registered carer, until in a suitable condition for re-release into a suitable location at dusk, or placed into an appropriate pre-installed bat roost box close to where it was captured. If considered necessary by the licensed ecologist, injured bats may also be humanely euthanised by the licensed ecologist.

D.2.13 The seasonal restrictions incorporated into this method statement are in place in order to avoid disturbing hibernating or nursing bats and placing their welfare at risk.

D.3 Bat roosts and habitat

In-situ Retention of Roosts

D.3.1 Construction works will not require the demolition of Pye Corner Farm, Tatton Farm, Berryhill Farm or Fair Orchard Farm, which are known to support roosting bats, although the buildings will be located close to working areas.

D.3.2 In addition, a considerable number of trees of potential value to roosting bats are located alongside the M4CaN route. Where it is practicable to ensure a works-free buffer zone of approximately 10 m or the width of the tree root protection zone, whichever is the greatest, trees will be retained in situ. No excavation, tracking of heavy vehicles or storage of vehicles, machinery, equipment or soils will take place in the works-free buffer zone.

D.3.3 In order to minimise the potential impact on bat activity on site, whenever practicable, works will be carried out during daylight hours only.

Modification of Existing Roosts

D.3.4 No modification to existing roosts is proposed.

New Roost Creation

Bat Roost Boxes

D.3.5 Prior to the commencement of tree felling or building demolition works, bat roost boxes will be installed under the instruction of, or by the bat licensed ecologist as alternative roost sites for any bats potentially displaced or captured during felling or demolition works. The roost boxes will be installed in suitable locations on mature trees or retained buildings (with regard to the demolition of The Old Stores in Newport Docks) close to the felled trees or demolished buildings. Exact locations of bat boxes will be pre-approved by NRW.

D.3.6 In addition, construction works could temporarily displace roosting bats/deter bats from roosting in trees located close to the works area. Therefore, prior to the commencement of construction, bat roost boxes will be installed under the instruction of, or by the bat licensed ecologist as alternative roost sites for any bats potentially displaced from retained category 1* or 1 trees (Hundt, L. 2012). The roost boxes will be installed in suitable locations on mature trees. Boxes will be installed prior to the commencement of works. Exact locations of bat boxes will be pre-approved by NRW.

D.3.7 The potential for locating bat roost boxes on the underside or base of the supporting pillars of the new bridge across the River Usk (Arnett and Hayes, 2000) will be considered.

D.3.8 Taking into account the species of roosting and potentially roosting bats recorded during the bat surveys, the roost boxes to be installed will be suitable for species recorded on site. Woodcrete boxes have been selected due to their greater durability than wooden boxes. Suitable boxes would be:

- Schwegler bat box 2F – a general purpose box, particularly attractive to the smaller species, including Nathusius' pipistrelle, Daubenton`s bat and common pipistrelle. A simple design with a narrow entrance slit on the front;
- Schwegler bat box 1FF – contains a narrow crevice-like internal space which is attractive to pipistrelle and long-eared bats; and
- Schwegler Bat Box 2FN – a larger box with both a wide access slit at the base and an access hole on the underside. This box is particularly successful in attracting larger species of bats and woodland species, including noctules and Natterer's bats.

D.3.9 At least three bat boxes, one of each of the above designs, will be installed for each tree roost to be lost during construction and six, two of each of the above designs will be installed for building day roosts to be demolished. However, as different bat species will not be placed into the same roost box, additional roost boxes will be installed in order to accommodate bats as necessary.

D.3.10 The following considerations will guide the selection of suitable locations for bat boxes:

- Each roost box will be sited at least 4m above ground and where practicable, between 5m and 7m high, as this greater height will attract more species, including higher-flying species such as noctules.
- The boxes will be placed on trees that are well-connected to other bat habitats, i.e., hedges/tree lines/woodland and not in overly exposed positions. Boxes will be fixed to an open section of trunk so that bats can easily find and access the boxes.

Bat House north of Magor

D.3.11 A new bat house building will be constructed to the north of the M4 at the eastern end of the scheme (shown on Figure 1e), closest to the Wye Valley and Forest of Dean Bat Sites Special Area of Conservation (SAC). The primary purpose of the building will be to provide new bat roosting opportunities for bats in the area including lesser horseshoe bats. By providing new roosting opportunities to bats that currently roost to the south of the existing M4, the bat house will help to prevent the need for bats (currently roosting to the south of the M4) crossing the existing M4 or new road to reach foraging habitat to the north.

D.3.12 The final design will be agreed with NRW but will be based on a design successfully implemented on the A465 Heads of Valleys Section 2 (refer to Annex 2). The building will be designed with regard to best practice guidelines for horseshoe roosts (including the Lesser Horseshoe Conservation Handbook (Schofield, 2008), Bat Mitigation Guidelines (Mitchell-Jones 2004) and the Bat Conservation Trust's Bat Roost Replacement and Enhancement Resource (available at http://roost.bats.org.uk).

Schwegler 2FTH box at WTA2

D.3.13 A pole mounted black Schwegler 2FTH will be installed adjacent to water treatment area 2, close to planted trees but receiving full sunlight to maximise thermal gain. This is aimed at providing replacement pipistrelle maternity roost conditions to replace the roost to be lost at The Conifers. Given the close proximity of The Conifers and Berryhill Farm (260m in a straight line), it is likely that the bats using both buildings are part of the same colony.

Maintenance and/or modification of new and existing habitat

Lighting

D.3.14 During the construction period, lighting will be provided as necessary during normal working hours in the autumn and winter and for night time working. Night working could be undertaken along the M4CaN route.

D.3.15 Operational lighting will be installed at the following locations, as shown on Figure 3:

- The approaches to and throughout the Castleton Interchange;
- The approaches to the Docks Way Junction and over the full extent of the River Usk Crossing;
- The approaches to and throughout the Glan Llyn Junction and on the new link road connecting the new section of motorway with the SAR and the SAR junction and approaches; and
- The approaches to and throughout the Magor Interchange.

D.3.16 Lighting columns are anticipated to be aluminium and to generally have the following characteristics:

- 15 metres high along the mainline of the new section of motorway, mounted in the verge in an opposite arrangement;
- 12 metres high along slip roads, mounted in a single sided arrangement; and
- 12 metres high on the River Usk Crossing.

D.3.17 Design of lighting will have regard to the guidance provided in Bat Conservation Trust and the Institution of Lighting Engineers (2008).

D.3.18 In order to minimise the impact of light on bats, the following measures will be set in place.

- Construction lighting for twenty-four hour security lighting at construction compounds will be set at low level and directed inwards, towards working areas and compounds.
- Construction and operational lighting will be designed and located so as to ensure required areas are precisely lit and light fittings are directed away from adjacent habitats of potential value to bats including the Bat House; any known roosts; watercourses including the River Usk and Ebbw and culverted reens; dry underpasses; and surrounding areas of woodland, trees, scrub and hedgerows.
- Where practicable and safe to do so, lighting associated with the new bridges over the River Usk and River Ebbw will be directed towards the road level and away from the underneath of the bridges so as to minimise the potential light spill impacts on the lower levels and underneath of the bridges.
- Construction and operational luminaires will be designed to emit no light above the horizontal level. LED luminaires will be used, as these can be aimed more precisely, reducing light spill. Warm white or neutral LEDs will be used where possible as these have a lower negative impact on bat insect prey than cool white (Stone 2013).

Landscaping

D.3.19 Following the completion of the construction and aftercare period, the Welsh Government will be responsible for ensuring habitat management is carried out by appropriately qualified and experienced professionals. Works will be undertaken in accordance with good horticultural and arboricultural practice. Where necessary, works will be completed under the direction of an appropriately qualified and experienced ecologist and in accordance with the biosecurity risk assessment and safe system of works.

D.3.20 Maintenance and management of landscaped areas will be detailed in the final EMP.

Crossing points

D.3.21 Potential bat crossing points along the M4CaN route will comprise box culverts along reens and dry mammal crossings, which will be constructed early on during construction so as to help minimise the impact on bat movement. Temporary pipes will be installed within the existing reens and ditches early in the construction programme to maintain connectivity of the watercourses and these will be replaced by permanent culverts once the haul road has been constructed.

D.3.22 The locations of culverts and underpasses which are estimated to provide over 1 metre of headroom in relation to static bat detector survey results for horseshoe and other sensitive bat species are shown in Figure 3. However, limited topographical survey information is available at this stage to define the width, bank and bed levels of the reens. The estimates are based on old records from the IDB and cannot be relied upon to provide an environmental commitment on clearance at this stage.

D.3.23 Limpens *et al*. (2005)[1] culverts 1m high by 2 m wide are considered to be suitable for lesser horseshoe, Natterer's and Daubenton's bats, whilst bridges over water less than or equal to 1 m (above water) are shown to be suitable for lesser horseshoe, Natterer's, Bechstein's, brown long-eared, grey long-eared and Daubenton's bats. Suitable structures for barbastelle and pipistrelle species to fly through are considered to be underpasses 4m x 4m or bridges over water with at least 2m headroom. Other high flying species, such as noctule and, to a lesser extent, pipistrelle species, are considered to be able to fly over the road with little severance effect evident. Average bat activity indices (number of passes per night) are presented for Myotis sp. (MS), long-eared (PA), barbastelle (BB), lesser horseshoe (RH) and greater horseshoe (RF) bats.

D.3.24 Figure 3 shows high levels of *Myotis* sp. activity (BAI of 10 or more) at the western end of the scheme, from the A48 to Lighthouse Road, and immediately to the east of the River Usk. This is considered to be associated with the greater amount of trees in these areas.

D.3.25 Long-eared bats were recorded throughout the scheme in small numbers, apart from south of Tata steelworks, where there are no records. The maximum BAI for long-eared bats was 2.2 passes per night at any one location (location 25 in 2015), with only seven locations with a BAI of 1 or more.

D.3.26 Barbastelle bats were recorded along the scheme in small numbers from Magor in the east to Lighthouse Road in the west. The maximum BAI for barbastelle bats was 0.9 passes per night at any one location (location 18 in 2014).

D.3.27 Lesser horseshoe bats were recorded in small numbers from Magor to Pye Corner. The maximum BAI for lesser horseshoe bats was 3 passes per night at any one location (location 19/St Bride's Brook Underpass in 2014), with only eight locations with a BAI of 1 or more.

D.3.28 Greater horseshoe bat was recorded once only, in 2014 to the east of Whitecross Farm. This equates to a BAI of 0.2.

D.3.29 At the western end of the Scheme, around the Berryhill Farm area, a large area will be cleared during construction. This will destroy any bat flight paths across the road trace during the construction period and it is not expected that there would be much bat activity across the road trace in this area following site clearance. During the construction phase large blocks of woodland planting will be provided either side of the

[1] Limpens H.J.G.A., Twisk P & Veenbaas G (2005). Bats and road construction. Brochure about bats and the ways in which practical measures can be taken to observe the legal duty of care for bats in planning, constructing, reconstructing and managing roads. Published by the Dutch Ministry of Transport, Public Works and Water Management Directorate-General for Public Works and Water Management, Road and Hydraulic Engineering Institute, Delft, the Netherlands and the Association for the Study and Conservation of Mammals, Arnhem, the Netherlands, 24 pages

new M4 in this area. As these mature, bats are likely to become active in the area again. Athensway Culvert (ch. 4,300) and Elm Culvert (4,500), both 1.2m diameter culverts will be available for bats to fly through, although these are at the lower end of culvert sizes that are considered to be used by Myotis species and brown long-eared bats present at this end of the Scheme. The road above at this location would be lit, forming a barrier to bats crossing over the road. Some bats, such as pipistrelles and noctules are likely to fly over the lights. Other, sensitive species, are likely to avoid flying just above the road surface, at risk of mortality. Therefore, there is likely to be some severance effects on bats in this area, including breeding brown long-eared bats using Berryhill Farm, should they remain or return to use the roost. However, given the height of the road in this area, there is availability to increase Athensway Culvert and this will be considered at detailed design stage. It is recommended that a 4m x 4m box culvert be provided at Athensway Culvert, which would allow all sensitive species, including barbastelle, and non-sensitive species, including pipistrelle, to cross under the road in safety.

D.3.30 The two lighting columns previously shown to the west of Church Lane Overbridge will be removed so that the bridge deck remains dark, enabling bats to use it to cross over the road. However, bat use of bridges to cross roads is less well documented than the use of culverts and no certainty of bats using it can be provided.

D.3.31 Across the Wentlooge Levels, SDR Reen Culvert will provide 1.26m of freeboard above summer penning level. This is at the lower end of culvert sizes that are considered to be used by Myotis species and long-eared bats present. Barbastelle and greater horseshoe (only one record) are less likely to fly through these culverts but will be able to cross the road by flying through the Duffryn Railway Underbridge, which is 29.91m wide by a minimum of 5.45m high. Bats may also choose to use Fair Orchard Farm Overbridge as a means of crossing over the road, although the use of bridges is less likely than the use of culverts and underpasses. The road across most of the Wentlooge Levels would not be lit and there is a risk that some bats would choose to fly over the road at risk of mortality. There is availability to increase the height of culverts under the road across the Wentlooge Levels, providing additional headroom above summer penning levels in Percoed Reen Bridge, Morfa Gronw Reen Culvert, Old Dairy Reen Culvert and Pont-y-Cwcw Reen Culvert between 1.2m and 1.9m, which would make the road much more permeable to bats along this section. This will be considered further at detailed design stage.

D.3.32 The road is on a viaduct/bridge from the River Ebw to south of the Solutia site and bats will be able to fly underneath the viaduct. Lighting on the viaduct/bridge will be confined to the road only, avoiding lighting of adjacent habitats.

D.3.33 From Nash Road east across the Caldicot Levels to the South Wales Mainline Railway, Tatton Farm Culvert (ch. 13,300), Field Culvert (ch. 13,500) and Monks' Ditch Bridge (ch. 14,800), all towards the western end of this section, provide headroom above summer penning level of 1.15m, 1.15m and 1m respectively. This is at the lower end of culvert sizes that are considered to be used by Myotis species, long-eared and lesser horseshoe bats, present in this area. Barbastelle, also present in small numbers, are unlikely to be able to cross the road safely in this area. At the eastern end of this section, bats, including Myotis species, long-eared, barbastelle and lesser horseshoe bats will be able to cross under the road using Bareland Street Underbridge (11m wide by min. 5.3m high) and the South Wales Mainline Railway Underpass (27m wide by min. 5.45m high). There is availability to increase the height of culverts under the road in this section, providing additional headroom above summer penning levels in Lakes

Reen Culvert, Julian's Reen Culvert, Tatton Farm Culvert, Field Culvert, Ellen's Reen Diversion Track Culvert, Black Wall Reen Culvert, Monks' Ditch Bridge, Elver Pill Reen Culvert, New Cut Reen Culvert, Cock Street Reen Culvert and Petty Reen Culvert between 0.67m and 1.7m, which would make the road much more permeable to bats along this section. This will be considered further at detailed design stage.

D.3.34 There are no potential crossing structures between the South Wales Mainline Railway Underpass and St Bride's Road. However, lesser horseshoe, long-eared, barbastelle and Myotis species bats in this area are considered unlikely to be crossing the existing A4810, which is lit from the Magor interchange/Junction 23A to the South Wales Mainline Railway and lies adjacent to the proposed line of the Scheme in this area. If crossing the existing A4810 presently, bats are likely to be using the existing South Wales Mainline Railway underpass on the A4810.

D.3.35 From the existing Magor interchange/J23A east to the new A48 junction, existing M4 underpasses would be extended at the same height and width dimensions as the existing structures. Bencroft Lane Underpass on the A48 (ch. 23,610) would be demolished. During construction, existing underpasses to be extended will be maintained open for bats to fly through. There may be some supporting structures required during construction, e.g., scaffolding, but sufficient space would be provided so that bats could negotiate the underpass/obstructions. They would also remain dark at night. A large area around Bencroft Lane would be cleared during construction. This will destroy any bat flight paths across the road trace during the construction period and it is not expected that there would be much bat activity across the road trace in this area following site clearance. During the construction phase large blocks of woodland planting will be provided either side of the M4 in this area. As these mature, bats are likely to become active in the area again. Alternative existing underpasses exist under the A48, approximately 1km to the east (beyond the Scheme), and under the M4 at Rockfield Lane (shown to be used by pipistrelles and Myotis species), approximately 900m to the west (ch. 22,650). It is expected that bats will adjust to using these underpasses should they wish to cross the road at this end of the Scheme. The road will be lit along this length, so the risk of bats flying over the road and being killed is low.

D.3.36 In order to improve the probability of bats finding and using crossing points, where the landscape requirements of the Gwent Levels do not conflict, strategic planting of trees and shrubs will be undertaken in order to provide habitat corridors to guide bats into entrances to culverts and dry underpasses (as shown in the EMP). Planting will be set back from the hard-shoulder of the new road so as to help deter bats away from the road.

D.3.37 Planting will be carried out as soon as practicable and as soon as it can be confirmed that ongoing construction would not result in damage to new plants.

D.3.38 Whilst planting becomes established, artificial "bat corridors" (e.g. lines of hazel hurdle fencing or 2m high debris netting fixed to Heras fencing panels) will be installed alongside new planting at culverts and underpasses of potential value to sensitive species, at least between March and October, i.e. the main period of bat activity, in order to help guide bats towards crossing points.

D.3.39 Mammal exclusion fencing will be installed along the boundaries of the construction site (excluding access roads) and the operational boundaries of the new road. Where fencing joins an underpass, it will be installed up to the entrance of the underpass in

order to help direct species including low flying horseshoe bats into these crossing points and, therefore, away from the construction site or new road.

Bat House

D.3.40 The Welsh Government will be responsible for ensuring the long term appropriate management of the Bat House.

Scaled maps/plans

D.3.41 Figure 1 shows the locations of trees and buildings surveyed in 2015 and 2016 and the locations of trees and building roosts (confirmed and potential).

D.3.42 Figure 2 shows the relative bat activity levels (all species combined) recorded during 2014 and 2015.

D.3.43 Figure 3 shows average bat activity indices (bat passes per night) for sensitive bat species (greater and lesser horseshoe, brown long-eared, *Myotis* species and barbastelle bats) recorded during the 2014 and 2015 activity surveys; and proposed reen culverts and underpasses that are estimated to provide one metre or more headroom clearance for bats to fly through. Operational lighting is also shown.

D.3.44 Figure 4 shows findings of the desk study undertaken to inform the M4CaN Environmental Impact Assessment.

D.3.45 Figure 5 shows results of the Phase 1 habitat survey undertaken in 2014 and 2015.

D.4 Mechanisms for ensuring delivery of mitigation and compensation measures

Measures to ensure compliance with this method statement

D.4.1 The Contractor will provide an Environmental Clerk of Works, who will oversee an Ecological Clerk of Works and a named NRW licensed bat worker(s)/accredited agents in the bat licence application.

D.4.2 The Contractor will ensure all authorised bat licensed ecologists and the ECoW are provided with a copy of the NRW licence and method statement.

D.4.3 Site inductions and toolbox talks provided to all personnel on site will cover the requirements of the NRW licence and method statement. All contractors will be informed of the need to notify the ECoW or on-site bat licensed ecologist(s) as soon as practicable if a bat is located during site works; to not handle any bat; and to await instruction from the ECoW/bat licensed ecologist before continuing works in the area.

D.4.4 A daily record of all licensed works undertaken will be produced by the bat licensed ecologist(s). Records will include a record of all works carried out; locations, numbers and types of bat boxes installed; date of bat box installation; species, sex, age and condition of bats captured; numbers of bats captured; receptor site (i.e. bat roost box); if any requirement to pass to a handler for monitoring/temporary homing ex-situ (e.g. due to injury or an unexpected species that does not take to an artificial bat box), measures required and name of handler; date soft-felled sections relocated.

D.4.5 The ECoW will be responsible for collating daily records and for monitoring works undertaken directly and under the instruction of the bat licensed ecologist(s). An environmental permit system will be used.

D.4.6 Regular progress updates will be provided by the ECoW to the Contractor and Welsh Government and, as requested or required to NRW. Regular meetings will be held between the Contractor and NRW throughout the pre-construction and construction phase, and as requested by NRW. The ECoW and/or bat licensed ecologist(s) will be available to attend these meetings as required or requested.

D.4.7 The bat licensed ecologist(s) will complete a licence return form as required under the NRW development licence for bats after the completion of licensed works. A copy of this form will be provided to the Contractor and the Welsh Government.

Independent Compliance Audit

D.4.8 The Welsh Government will be responsible for commissioning an external, appropriately qualified ecologist to undertake an independent compliance audit of works covered by the NRW licence and associated method statement. This will be done by the Employers Agent.

D.4.9 The compliance audit will include those checks listed in the draft compliance audit provided in Annex 3. The compliance auditing ecologist will undertake auditing site visits as considered necessary to monitor compliance with the NRW licence.

D.4.10 Compliance audit reports will include a completed and signed copy of the completed audit table (see draft table at Annex 3); details regarding work areas and works audited; confirmation of compliance/non-compliance with any NRW development licence for bats and associated method statement; and any required/recommended actions to be taken. Any actions required (and where necessary pre-approved by NRW) will be audited as part of the ongoing compliance audit.

D.4.11 The compliance auditing ecologist will report the findings of the audit to the Welsh Government, the Contractor and NRW. Reports will be provided on an agreed frequency.

Ensure that sufficient land has been acquired for compensation purposes

D.4.12 The Welsh Government will own the freehold of the final footprint of the new section of motorway and will have control of all land temporarily required for construction of the Scheme.

Ensure that designs of subsequent development are bat friendly and do not include features likely to result in incidental capture or killing

D.4.13 Results of pre-construction surveys will be taken into account to inform the finer detail of mitigation for the licence information.

Provide sufficient resources to ensure effective monitoring where relevant.

D.4.14 The Contractor will be responsible for commissioning an ECoW to oversee ecology works on site. Works detailed in the bat licence will be overseen and instructed on site by a licensed bat ecologist named on the NRW bat licence.

D.4.15 The Contractor will be responsible for commissioning the NRW licensed bat ecologist(s) named on the NRW licence in order to supervise and undertake all licensed ecology works as detailed in the licence method statement.

D.4.16 In addition, the Welsh Government will be responsible for commissioning an appropriately qualified and experienced ecologist in order to undertake the required independent compliance audit (pre, during and post construction).

D.4.17 A Construction Environmental Management Plan (CEMP) will be agreed with key stakeholders including NRW prior to the start of construction. It will be a mandatory requirement for both the main contractor and all subcontractors, to ensure best practice for all the work and to safeguard the environment. The CEMP will integrate the construction activities with the requirements of environmental legislation and best practice and comprise detailed statements for the methods and controls proposed to safeguard the environment and mitigate the adverse effects of the Scheme during its construction. The CEMP will refer to the requirements of the NRW bat licence and associated method statement.

Mitigation contingencies

D.4.18 The NRW bat licensed ecologist or accredited agents named in the NRW licence application will oversee all works covered by the licence and associated method statement.

D.4.19 Bat roost boxes will be installed on site prior to the commencement of works, as described in this method statement and under the direction and on-site guidance of the bat licensed ecologist. Any bats located on site will be relocated to these bat boxes prior to the clearance of any roosts by the bat licensed ecologist as they consider appropriate and as described in this method statement.

D.4.20 Site induction and toolbox talks will include the requirements of the NRW bat licence and associated method statement as appropriate. Contractors will be informed of the need to halt works in an area if a bat is located and to contact the project ecologist for instruction. If a bat is located, an additional NRW development licence may be required for works to continue in the area, the project ecologist will advise the developer and site manager as necessary. If required, an additional NRW development licence for bats will be obtained by the developer prior to works recommencing in the area.

D.4.21 The timing of the works period has been set so as to minimise the potential impact on any bats present and in particular to prevent the disturbance of any hibernating or nursing bats that could place their welfare at risk.

D.4.22 The bat licensed ecologist will be available throughout the works to ensure measures are set in place so as to minimise the impact on any bats disturbed by the works.

D.4.23 With regard to habitat reinstatement and creation – planting and habitats will be monitored throughout the establishment phase as described in the EMP. Contingency

measures include the replacement of failed plants as necessary to prevent the development of significant gaps in the canopy of planting.

D.5 Biosecurity risk assessment

D.5.1 Works will be undertaken in accordance with the biosecurity risk assessment and safe system of works.

E Post-development site safeguard

E.1 Habitat/site management and maintenance

E.1.1 The Contractor will be responsible for ensuring the successful establishment of all areas of new planting and habitat creation until the completion of the establishment period (up to five years post-planting). Establishment will be monitored so that any plants that fail can be replaced within this period.

E.1.2 The Welsh Government or SWTRA will be responsible for ensuring appropriate long term management of new habitats, planting, replacement and culverted watercourses and the Bat House located within the boundaries of the Scheme. Habitats, buildings and structures will be managed/maintained as set out in the operation and maintenance manual (OMM; to be produced before handover). The OMM will include the objectives of management/maintenance for bats where appropriate. The Provisions will also be made so as to ensure NRW could continue to manage the reen system as appropriate.

E.1.3 Habitat located outside the Scheme boundary, including construction sites at Duffryn, Tata and Magor, will be returned to land owners.

E.2 Population monitoring – roost usage

E.2.1 The Bat House and Schwegler 2FTH box at WTA2 will be monitored for a period to be agreed with NRW. The existing roosts at Berryhill Farm will also be monitored to see if they are affected by the Scheme.

E.2.2 Monitoring will be undertaken by a bat licensed ecologist, who will internally inspect the Bat House on four occasions each year, one each in spring (March/April), summer (May-August), autumn (September-November) and winter (December-February). The Schwegler 2FTH box will be inspected once each year in summer. During each monitoring visit, signs of bat presence will be recorded, along with any maintenance requirements. A bat emergence survey of the Berryhill Farm Bat House will also be undertaken in the summer period to confirm if bats are roosting between the roof slates and felt. A condition assessment of the replacement bat roosts will also be made during each monitoring visit so that should there be any damage or deterioration of roost conditions maintenance work can be instructed.

E.2.3 Monitoring will also be undertaken of a sample of under-road crossing points to be agreed with NRW. These should include a sample of large underpasses, such as Mill Reen Culvert (also known as St Bride's Brook underpass), ch. 21,400; new underbridges, such as Bareland Street underbridge (SBR-1980; ch. 19,800); reen culverts with over 1m freeboard, such as SDR Reen Culvert SMN-0550, ch. 5,500; reen culverts with less than 1m freeboard, such as Percoed Reen Bridge SBR-0570; and 900mm diameter mammal culverts.

E.2.4 Monitoring should involve using static bat detectors inside each culvert/underpass to record bat activity. Five nights survey of each structure should be undertaken in each period, April/May, June-August & September/October to cover seasonal differences. Construction phase monitoring should begin once culverts are constructed and temporary guidance measures are in place and the need for further monitoring be reviewed after each year's monitoring in discussion with NRW. Operational phase

monitoring should begin on road opening and reviewed after year 1. Further monitoring may be undertaken in year 5 and year 10 after opening, for example.

E.2.5 In conjunction with static detector monitoring of culverts/underpasses, manual observer surveys should be undertaken for one night each in each period to observe bats crossing over the road above the selected culverts/underpasses. Manual surveyors should be positioned at each end of the culvert/flightline and survey the period from sunset to one hour after sunset and one hour before dawn until dawn so that bats can be observed and position and direction of flight recorded. Between dusk and dawn on these nights, two static bat detectors should be positioned either end of the culvert/flightline, above the road, to record any bats flying over the road in conjunction with observations and to cover the dark period between dusk and dawn.

E.2.6 An annual report of monitoring results will be provided to the Welsh Government and/or SWTRA, NRW and, if requested, the Local Planning Authorities.

E.2.7 Records will also be provided to the local biological records centre as part of the requirements of the survey licence held by the ecologist.

E.3 Post-development mitigation contingencies

E.3.1 Results of the monitoring surveys will be reviewed and if considered necessary, boxes will be relocated to more suitable locations and/or minor alterations to the Bat House design will be undertaken in order to enhance their potential value to roosting bats.

E.4 Mechanism for ensuring delivery of post-development works

E.4.1 The licence method statement will include all post development measures that will form part of the licensed works.

E.4.2 Post-development works will be instructed and/or supervised as necessary and reported on by the ECoW, and works will be audited by an independent ecologist.

E.4.3 All land related permissions will be agreed and secured prior to the commencement of works.

E.4.4 The Welsh Government will be responsible for securing necessary funding and adhering to the requirements of the licence and method statement, which will include post-development works.

F Timetable of works

Table 2: Timetable of Works

Works	Timing	Description of Works
Construction of Bat House	As soon as practicable.	Bat House to be constructed in accordance with detailed design approved by NRW.
Installation of bat boxes.	Prior to the commencement of tree felling or demolition of buildings.	Install 3 bat roost boxes in appropriate locations on mature trees close to the tree to be felled, as directed by the on-site bat licensed ecologist.
Pre-felling survey of tree roosts that are to be felled.	October or April, where possible, with preference for October.	To be carried out by the bat licensed ecologist named in this application. Survey by endoscope where practicable.
Soft-felling.	October or April, where possible, with preference for October.	Carefully lower soft-felled sections of tree as directed by the on-site bat licensed ecologist, leave in suitable locations adjacent to the tree for at least two nights of suitable weather for bat activity, to enable any bats present to leave the roost.
Search of soft-felled sections for bats.	October or April, where possible, with preference for October.	Hand-search of soft-felled sections by bat licensed ecologist. Relocation of captured bats by bat licensed ecologist to pre-installed bat boxes, or removal from site for *ex situ* care prior to release at felling site by licensed ecologist.
Relocation of soft-felled sections of timber.	October or April, where possible, with preference for October.	Relocation of soft-felled sections to appropriate location after being left undisturbed for at least 2 nights of suitable weather for bat activity, to enable any bats present to leave the roost.
Clearance of buildings [– details TBC]		
Directional lighting.	Throughout construction.	Light fixtures to be directed away from bat habitats.
Landscaping.	November-February	Landscape planting in accordance with the Environmental Master Plan.

G Land Ownership – Mitigation Site/Compensation Site

G.1 Mitigation Site/Compensation Site Ownership

G.1.1 The Welsh Government will own the freehold of the footprint of the M4CaN scheme and all land acquired for mitigation works.

G.2 Mitigation Site/Compensation Ownership post construction

G.2.1 The SWTRA will be responsible for ensuring appropriate long term management of new habitats, planting, replacement and culverted watercourses and the Bat House located within the boundaries of the Scheme. Provisions will also be made so as to ensure NRW could continue to manage the reen system as appropriate.

G.2.2 Once established, habitat located outside the Scheme boundary, including construction sites at Duffryn, Tata and Magor, will be returned to land owners.

H References

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I Annexes

I.1.1 The following annexes are attached with this report:

- Annex 1: Bat House
- Annex 2: Compliance Audit

I.2 Pre-existing survey reports

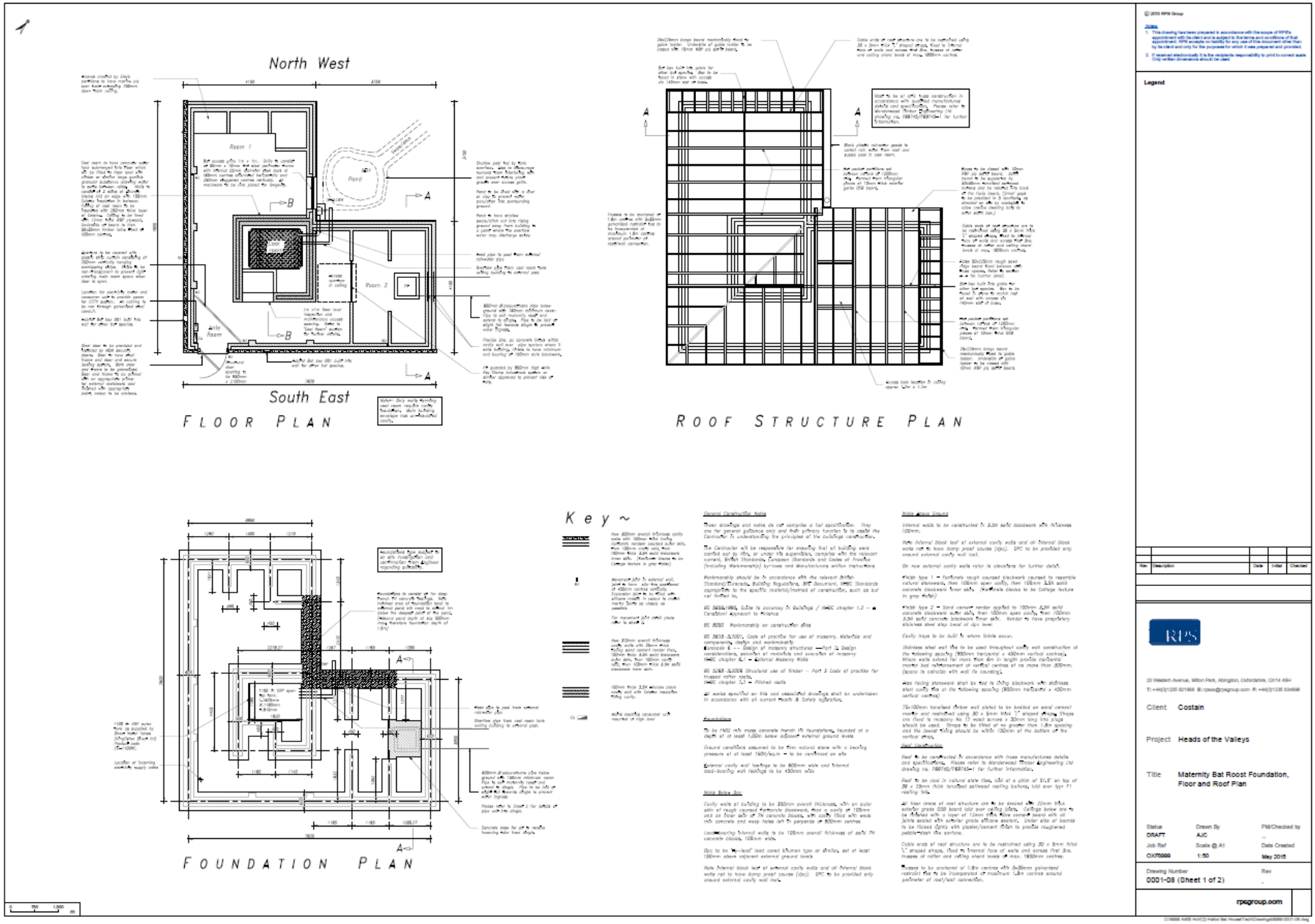
I.2.1 Bat surveys carried out in order to inform the EIA for the M4CaN scheme are attached at M4CaN March 2016 ES Appendices 10.7, 10.23 and 10.24, September 2016 ES Supplement and December 2016 ES Supplement..

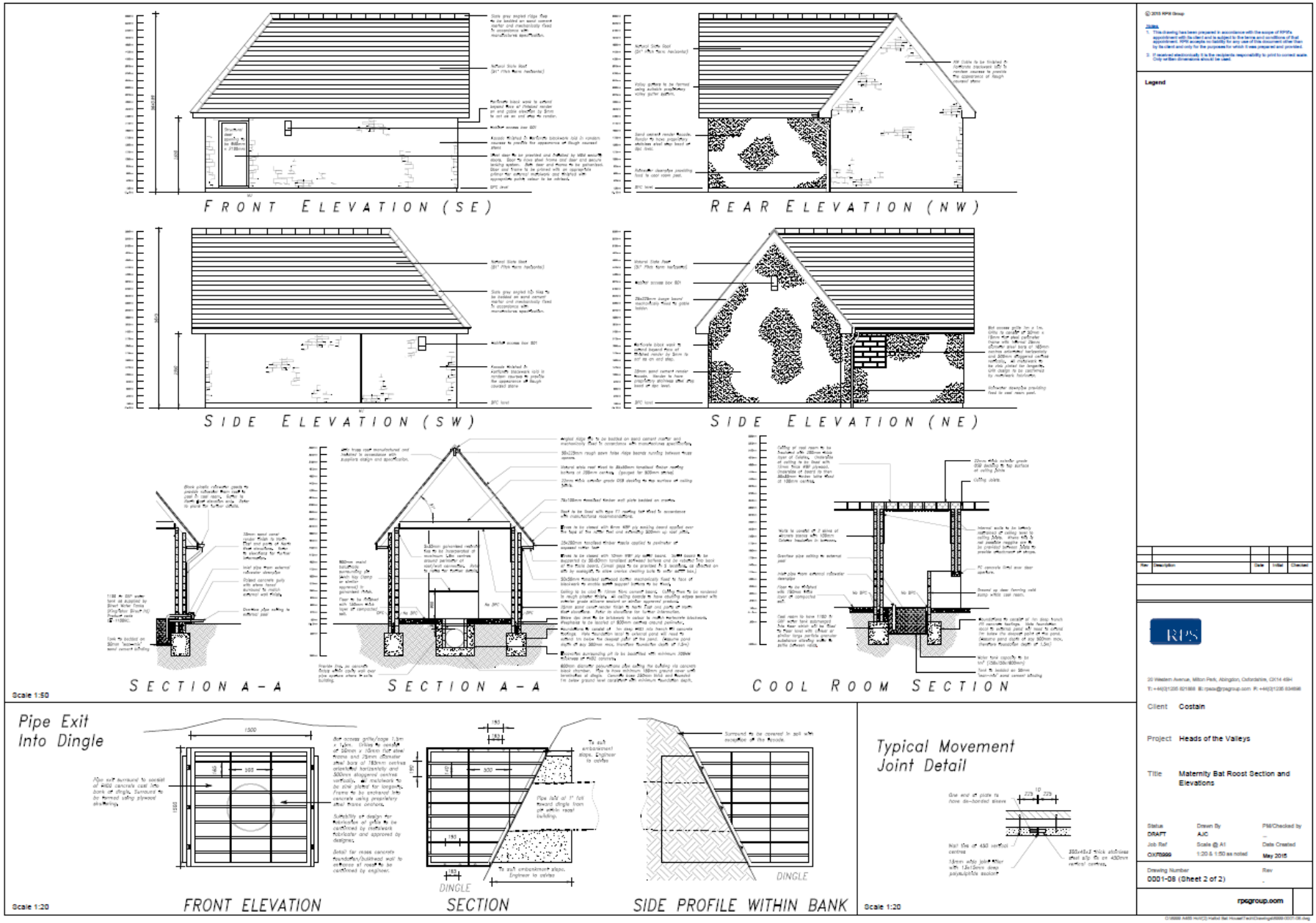
- Bat Survey 2014 (Arup)
- Bat Activity Surveys 2015 (RPS)
- Bat Roost Survey 2015 (RPS)
- Bat Tree Inspections, Dusk Emergence and Dawn Return to Roost Bat Surveys 2015 (Thomson Ecology)
- Bat Hibernation Roost Survey 2016 (Thomson Ecology)
- Bat Roost Survey of Buildings and Structures 2016 (RPS)
- 2016 Bat Surveys (Trees) (Thomson Ecology)

I.3 Survey data

I.3.1 Survey data are included in M4CaN March 2016 ES Appendices 10.7, 10.23 and 10.24, September 2016 ES Supplement and December 2016 ES Supplement.

Annex 1: Bat House (example design)


North West
South East
FLOOR PLAN
ROOF STRUCTURE PLAN
FOUNDATION PLAN
Key ~
Legend
RPS
Client Costain
Project Heads of the Valleys
Title Maternity Bat Roost Foundation, Floor and Roof Plan
Drawing Number 0001-08 (Sheet 1 of 2)
rpsgroup.com


FRONT ELEVATION (SE)
REAR ELEVATION (NW)
SIDE ELEVATION (SW)
SIDE ELEVATION (NE)
SECTION A-A
SECTION A-A
COOL ROOM SECTION
Scale 1:50
Pipe Exit Into Dingle
FRONT ELEVATION
SECTION
SIDE PROFILE WITHIN BANK
Scale 1:20
Typical Movement Joint Detail
Scale 1:20
Legend
Client Costain
Project Heads of the Valleys
Title Maternity Bat Roost Section and Elevations
Drawing Number 0001-08 (Sheet 2 of 2)
rpsgroup.com

Annex 2: Compliance Audit

Ref.	Performance Indicator	Evidence Required	Compliant (Yes/No) / comments and actions to be taken – to be completed and initialled by the auditing ecologist
General performance indicators			
1	NRW bat licence is held by the bat licensed ecologist on site during the works period and is available for inspection by any authorised persons on demand.	Licence is available for inspection on site.	
2	Prior to the commencement of licensed work, the Welsh Government will ensure the relevant NRW Species Officer is aware of the date when licensed works will commence.	Written or electronic documentation of notification of start of works.	
3	Pre-commencement inductions will be provided to the contractors by the ECoW and/or bat licensed ecologist and tool box talks will be provided by the bat licensed ecologist. Inductions will include the requirements of the NRW bat licence and associated method statement as appropriate.	Log book confirms contractors fully inducted.	
4	Preparation and implementation of the bio-security risk assessment and safe system of works.	Bio-security risk assessment and safe system of works is available for inspection. Required signatures are included on risk assessment and safe system of works, confirming implementation of biosecurity measures. Field observations shows evidence of biosecurity measures e.g. foot washes / vehicle cleaning / limited access routes / awareness by all on site.	
Ref.	**Performance Indicator**	**Evidence Required**	**Compliant (Yes/No) / comments**

			and actions to be taken – to be completed and initialled by the auditing ecologist
Felling works			
5	Bat roost boxes installed.	Log and field observations confirm correct boxes installed in suitable locations and bat licensed ecologist directed and signed off work.	
6	Soft-felling under direct instruction and overseen by bat licensed ecologist. Bats captured and translocated to bat boxes by licensed ecologist or taken for ex situ care if required. Dead or injured bats dealt with appropriately (as described in this method statement).	A suitable log has been maintained by the bat licensed ecologist and is available for inspection within 48 hours. Log includes: ▪ a record of all works carried out; ▪ locations, numbers, types of bat boxes; ▪ date of bat box installation; ▪ species, sex, age and condition of bats captured; ▪ numbers of bats captured; ▪ confirmation different species transported in different holding bags; ▪ receptor site (i.e. bat roost box); ▪ if any requirement to pass to a handler for monitoring/temporary homing ex-situ (e.g. due to injury or an unexpected species that does not take to an artificial bat box), measures required and name of handler; date soft-felled sections relocated.	
Ref.	**Performance Indicator**	**Evidence Required**	**Compliant (Yes/No) / comments and actions to be taken – to be completed and initialled by the auditing ecologist**

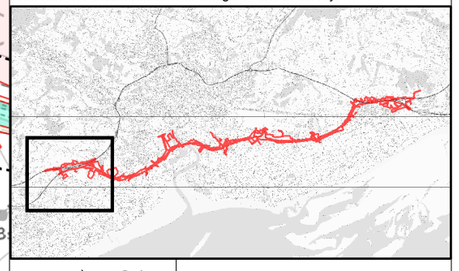
Felling works			
7	Soft-felled timber sections retained undisturbed for at least 2 days of appropriate weather conditions for bats to be active.	Log is available for inspection within 48 hours. Log and/or field observations show: ▪ timber sections stored appropriately so bats can leave the roost if present. ▪ Bat licensed ecologist signed off approval for storage. ▪ Bat licensed ecologist signed off approval to relocate after minimum 2 night period of no disturbance.	
Buildings demolition			
8	Bat licensed ecologist to undertake watching brief during soft-strip demolition of buildings	Written confirmation that building was demolished under watching brief and that full demolition was signed off by ecologist after watching brief.	

Annex 3: Figures

Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
- Reed bed; Storage lagoons; Water treatment areas
- 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

The scheme shown reflects the design at time of survey.



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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1a	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:15,000
0 245 490m

N

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Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
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- 100m Study area
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- Confirmed bat roost
- Probable bat roost
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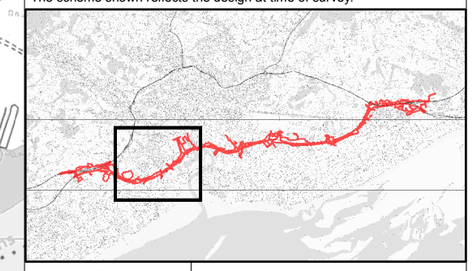
- Confirmed bat roost
- Probable bat roost

The scheme shown reflects the design at time of survey.



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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1b	Revision: -
Date: December 2016	Status: AT ISSUE
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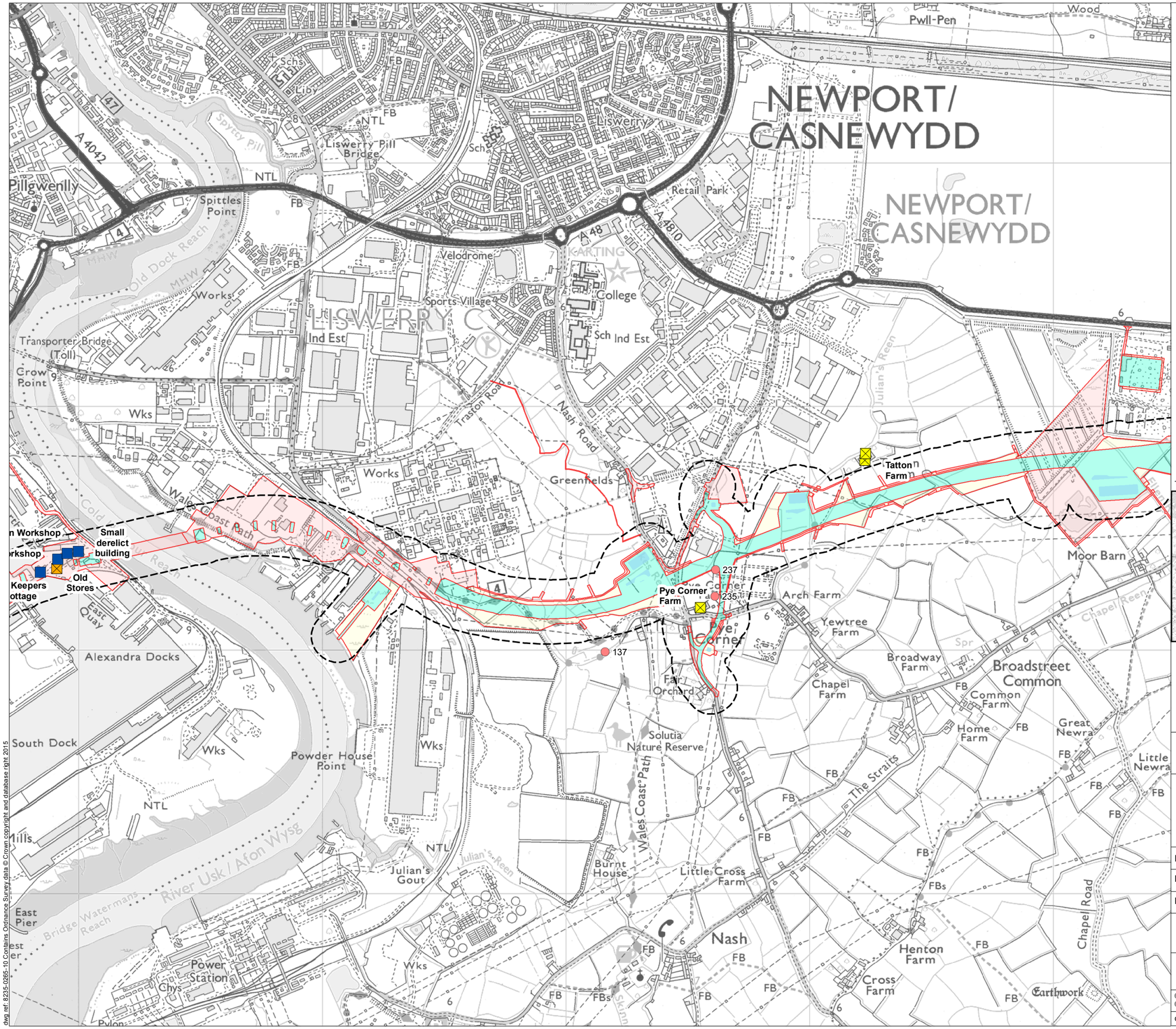

Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
- Reed bed; Storage lagoons; Water treatment areas
- 100m Study area
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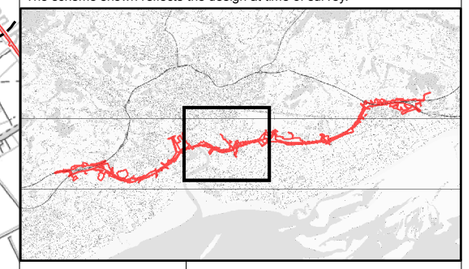
- Trees with high potential to support roosting bats – daytime aerial/ground level assessment and dusk/dawn surveys
- Trees downgraded to low/medium to support roosting bats – daytime aerial/ground-level assessment
- Trees of high potential value to bats identified after the 2015 bat survey season - unsurveyed
- Confirmed bat roost
- Probable bat roost
- Surveyed building
- Confirmed bat roost
- Probable bat roost

The scheme shown reflects the design at time of survey.



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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1c	Revision: -
Date: December 2016	Status: AT ISSUE
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Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
- Reed bed; Storage lagoons; Water treatment areas
- 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

The scheme shown reflects the design at time of survey.

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1d	Revision: -
Date: December 2016	Status: AT ISSUE
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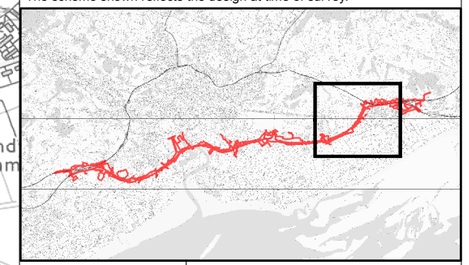
Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
- Reed bed; Storage lagoons; Water treatment areas
- 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

The scheme shown reflects the design at time of survey.



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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1e	Revision: -
Date: December 2016	Status: AT ISSUE
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Scale: A3 @ 1:15,000
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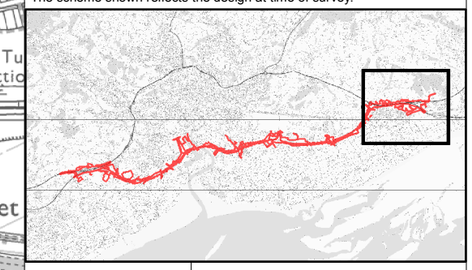
Legend

- Temporary construction land
- Other permanent land take e.g. mitigation planting.
- Permanent highway land within fenceline, including water treatment areas
- Reed bed; Storage lagoons; Water treatment areas
- 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

The scheme shown reflects the design at time of survey.



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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Survey Locations and Results, 2015 and 2016

Figure: 1f	Revision: -
Date: December 2016	Status: AT ISSUE
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Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2a	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: RG

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

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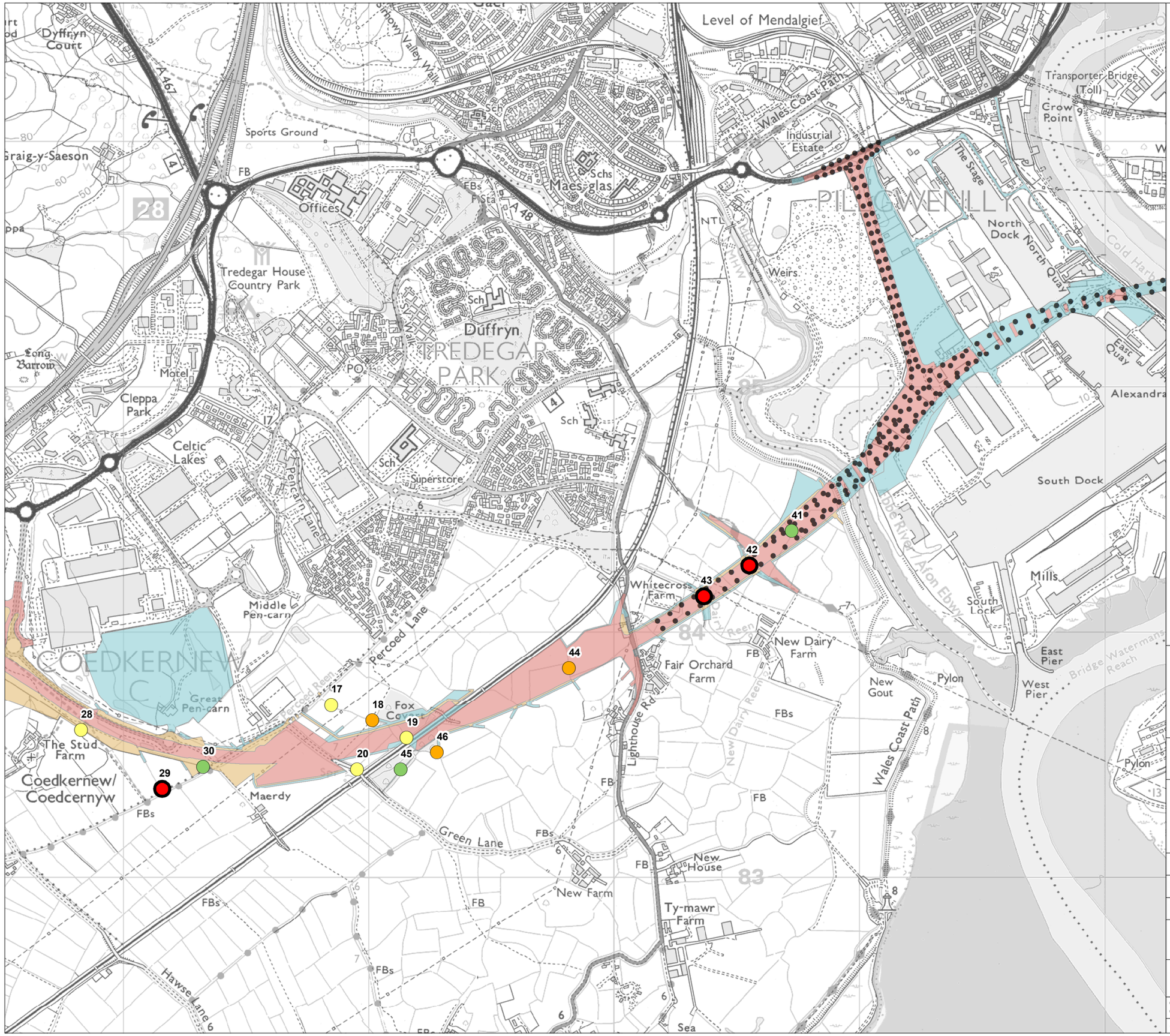

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2b	Revision:
Date: December 2016	Status: AT ISSUE
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Scale: A3 @ 1:15,000

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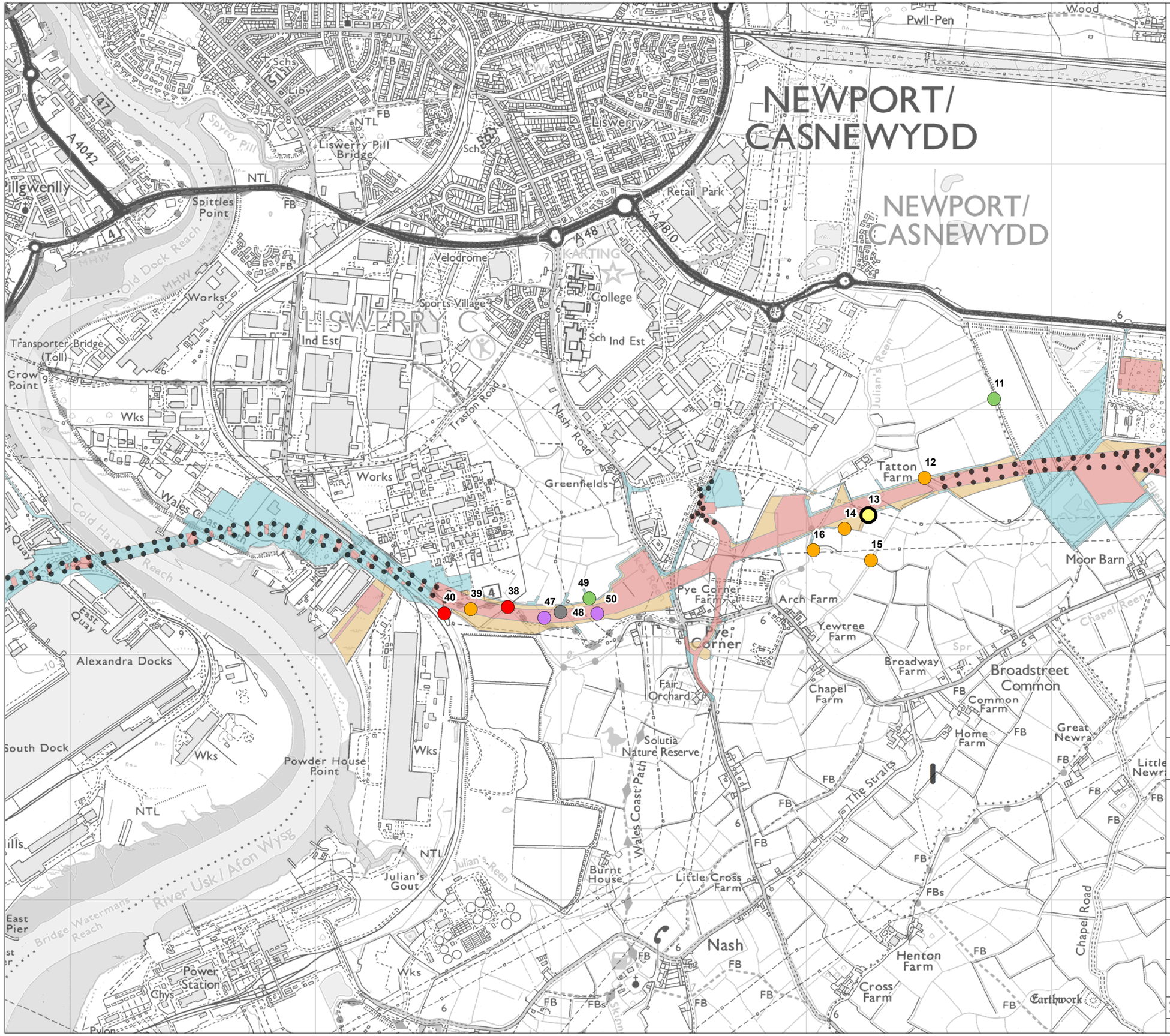

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2c	Revision:
Date: December 2016	Status: AT ISSUE
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Scale: A3 @ 1:15,000
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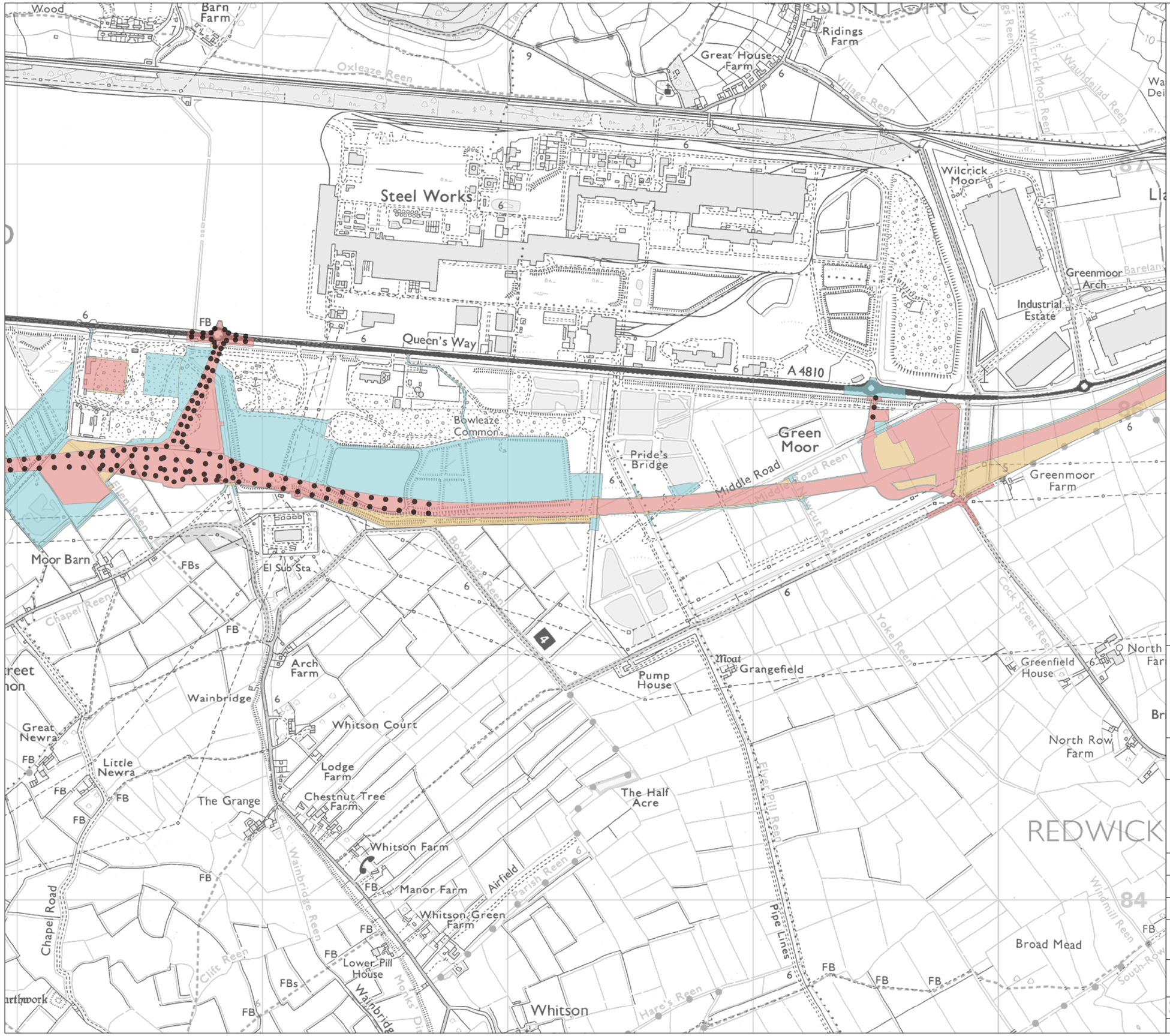

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2d	Revision:
Date: December 2016	Status: AT ISSUE
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0 250 500m

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Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2e	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: RG

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

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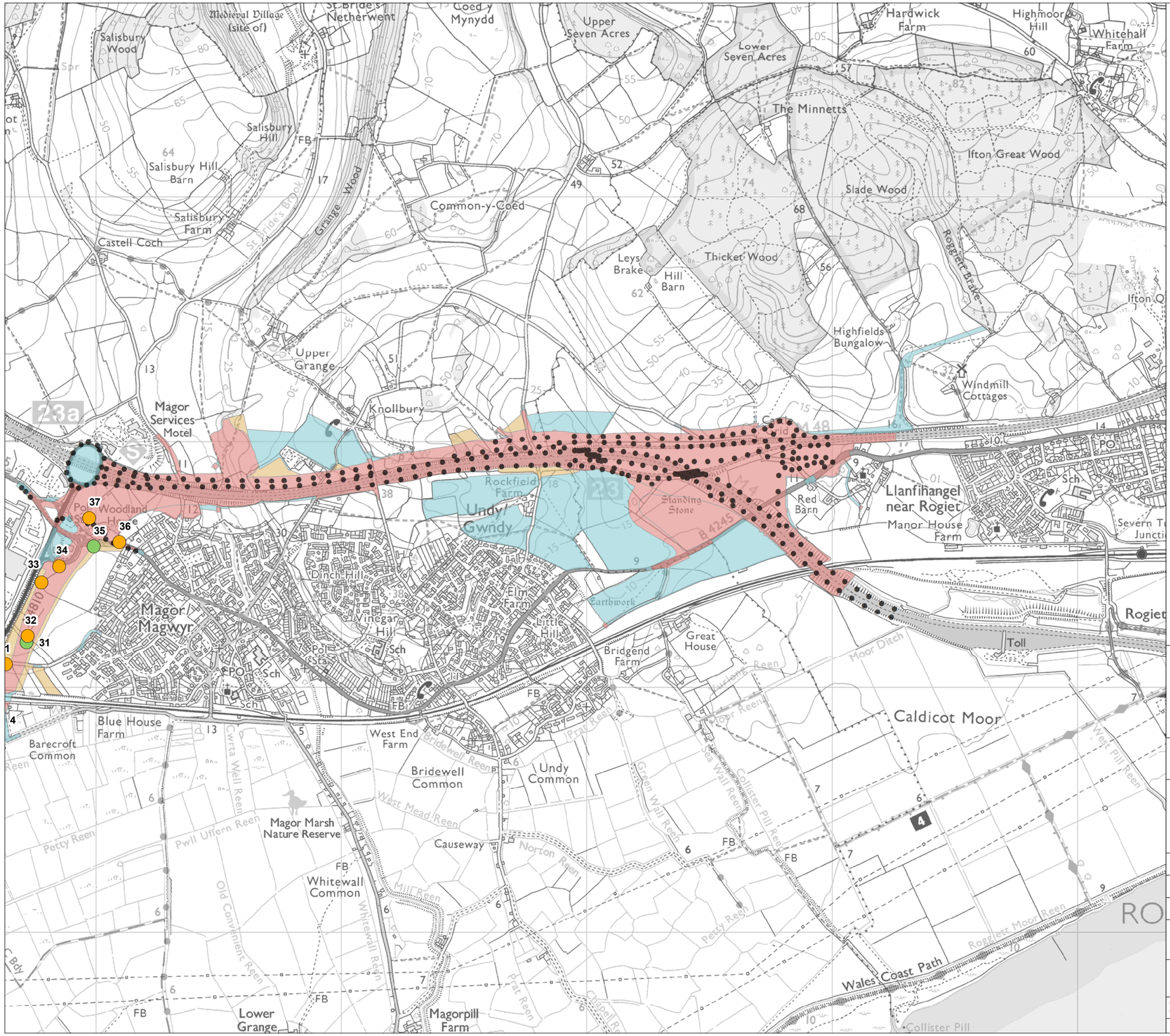

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting

Average number of bat passes for survey visit

- 0-25
- 25-50
- 50-100
- 100-250
- 250-500
- 500-1500
- >1500
- >2500 bat passes recorded during one survey visit

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Relative Level of Bat Activity

Figure: 2f	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: RG

Scale: A3 @ 1:15,000
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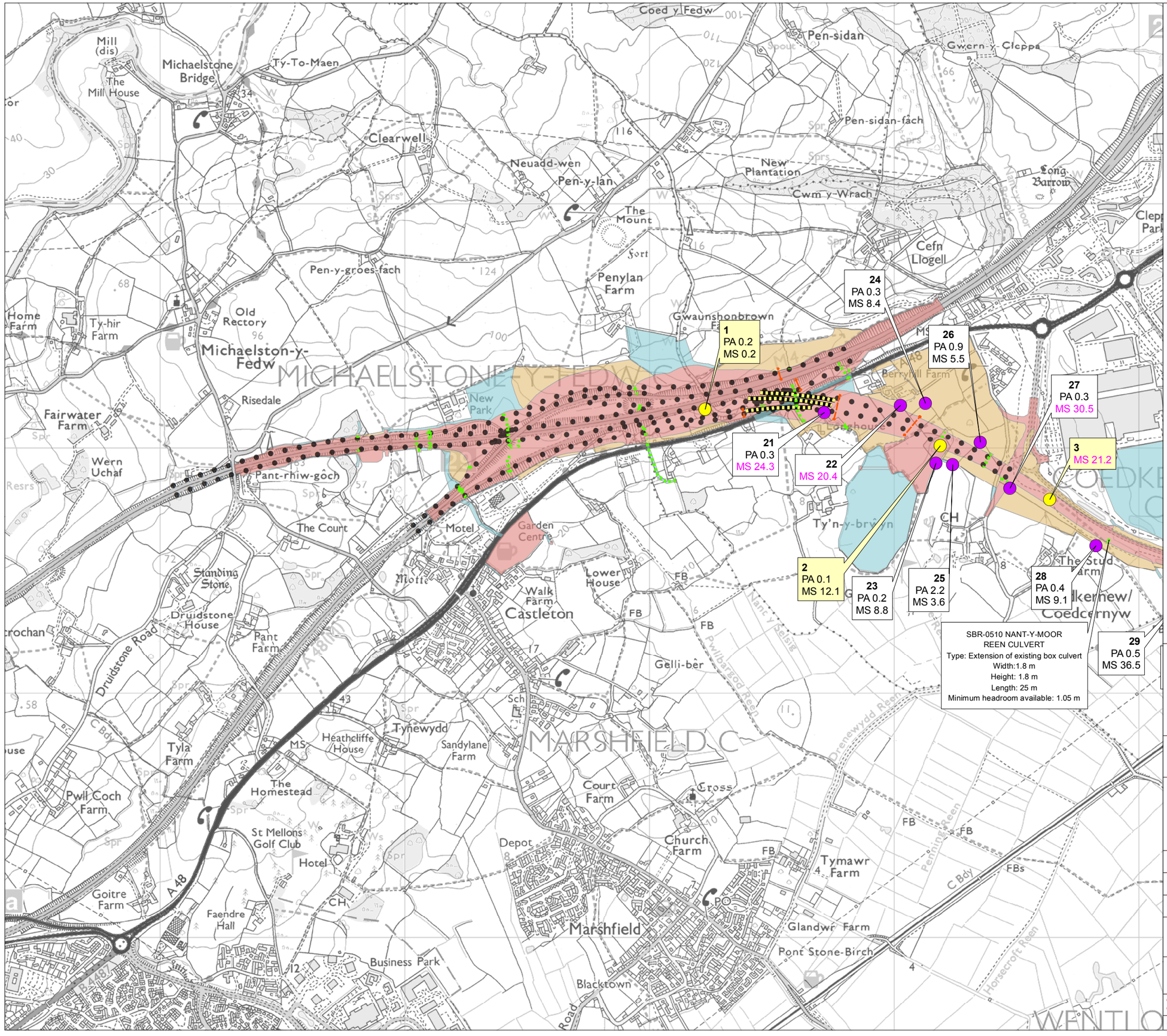

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3a	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JG

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

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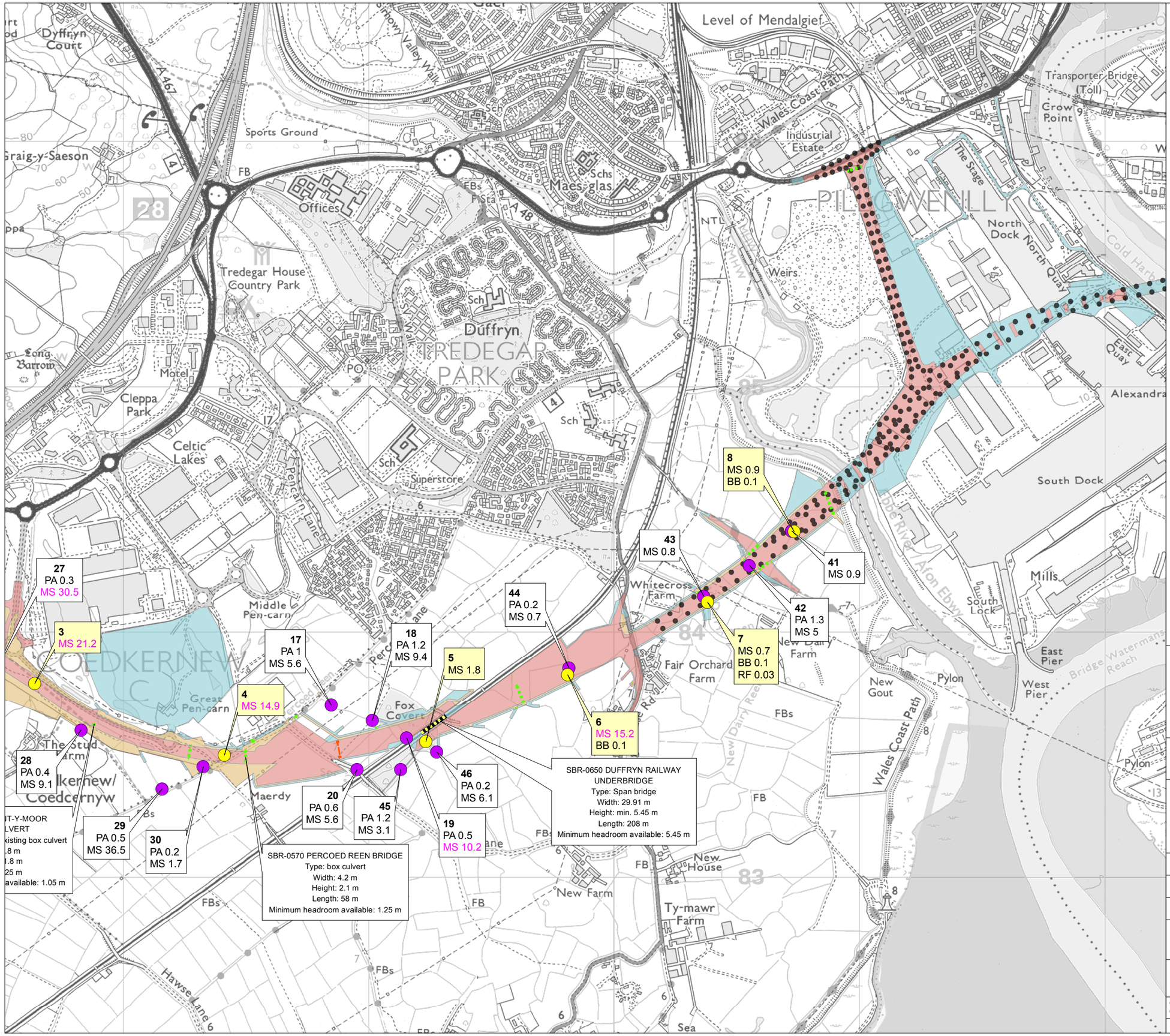

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3b	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JG

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

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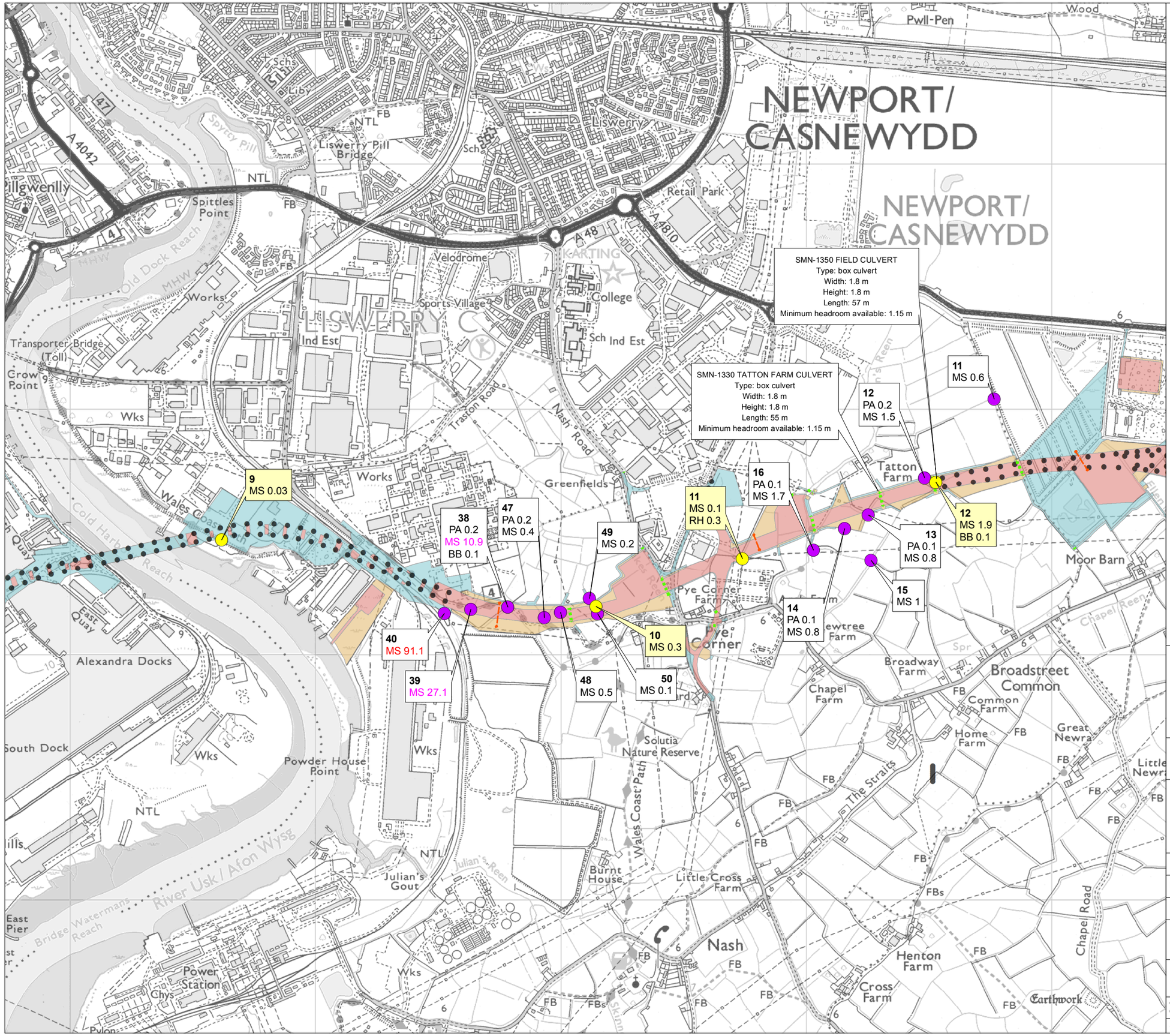

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3c	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JG

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

N

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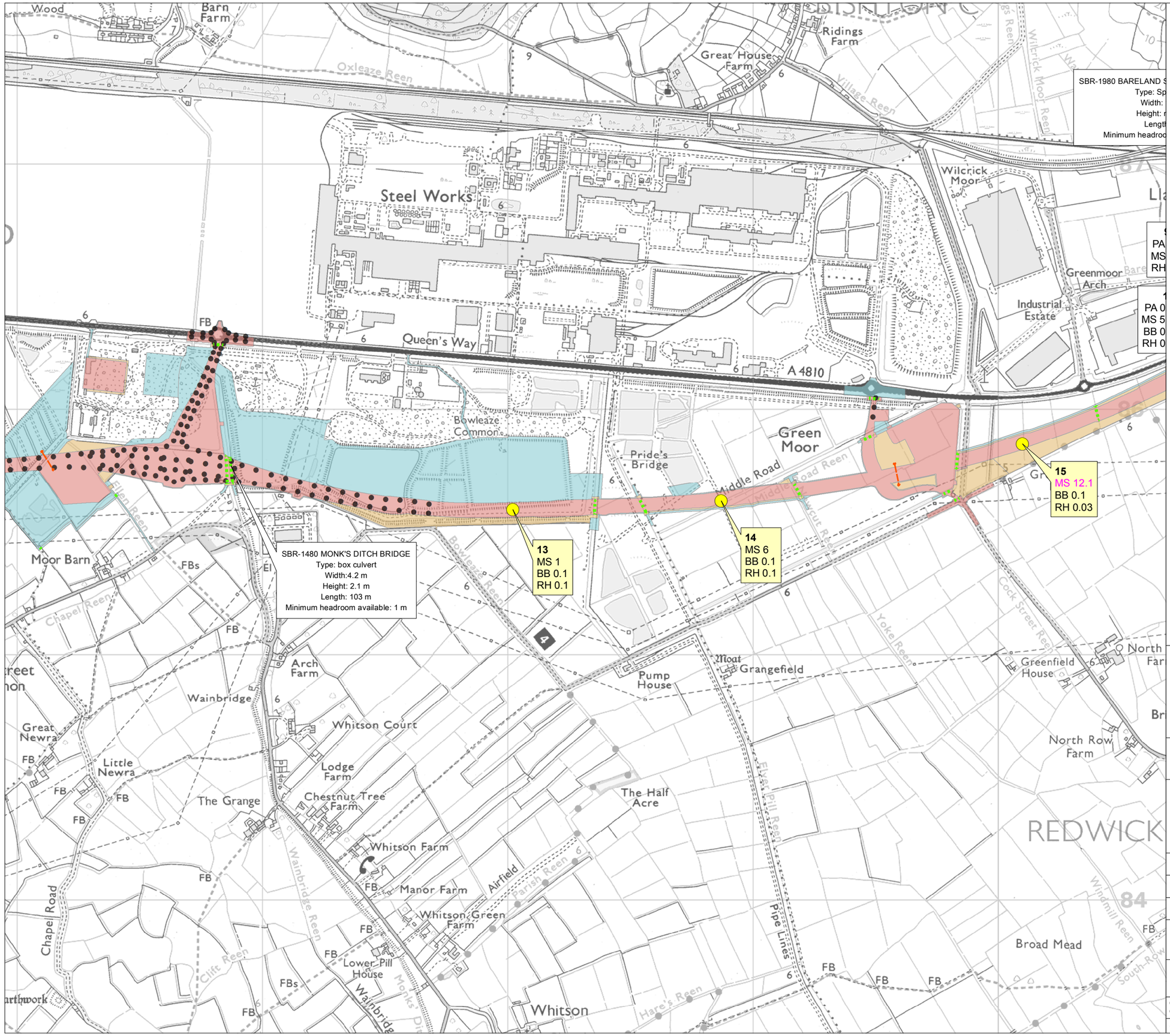

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3d	Revision:
Date: December 2016	Status: AT ISSUE
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Scale: A3 @ 1:15,000
0 250 500m

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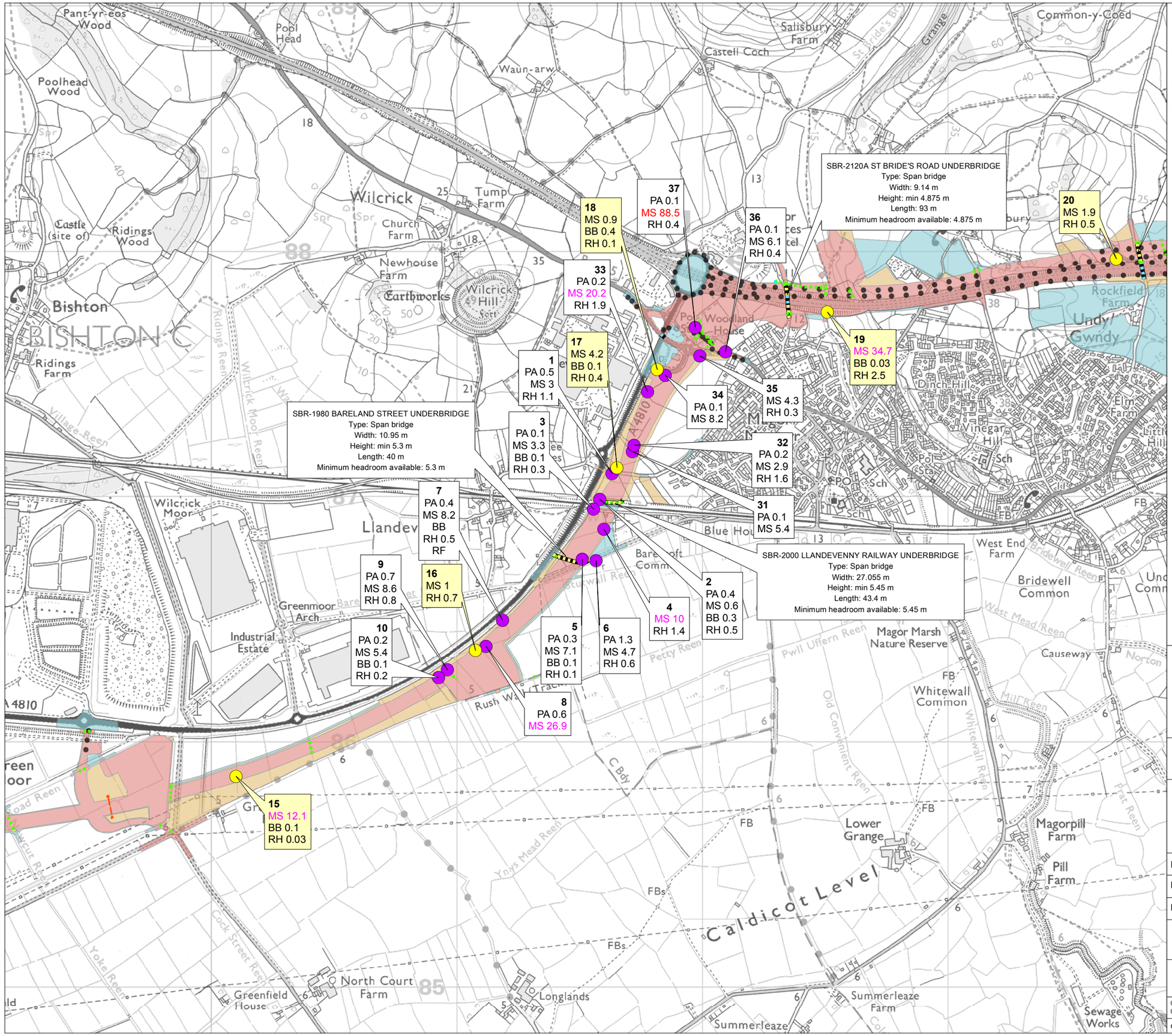

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3e	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JG

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

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SBR-2120A ST BRIDE'S ROAD UNDERBRIDGE
Type: Span bridge
Width: 9.14 m
Height: min 4.875 m
Length: 93 m
Minimum headroom available: 4.875 m

SBR-2265 ROCKFIELD LANE UNDERBRIDGE 2
Type: Span bridge
Width: 7.9 m
Height: min 5.3 m
Length: 42 m
Minimum headroom available: 5.3 m

SBR-2365 LLANFIHANGEL UNDERBRIDGE
Type: Span bridge
Width: 14.665 m
Height: min 5.3 m
Length: 20.5 m
Minimum headroom available: 5.3 m

SBR-260A CALDICOT ROAD UNDERBRIDGE 1
Type: Span bridge
Width: 1.485 m
Height: min 5.3 m
Length: 52.35 m
Minimum headroom available: 5.3 m

SBR-2000 LLANDEVENNY RAILWAY UNDERBRIDGE
Type: Span bridge
Width: 27.055 m
Height: min 5.45 m
Length: 43.4 m
Minimum headroom available: 5.45 m

37
PA 0.1
MS 88.5
RH 0.4

36
PA 0.1
MS 6.1
RH 0.4

20
MS 1.9
RH 0.5

19
MS 34.7
BB 0.03
RH 2.5

35
MS 4.3
RH 0.3

34
PA 0.1
MS 8.2

32
PA 0.2
MS 2.9
RH 1.6

31
PA 0.1
MS 5.4

2
PA 0.4
MS 0.6
BB 0.3
RH 0.5

4
MS 10
RH 1.4

A 1.3
S 4.7
H 0.6

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Operational lighting
- Indicative location of mammal crossing: 900 mm diameter pipes
- Indicative location of proposed culvert to include a minimum of 200 mm free board above the summer penning level of reens
- Underbridge (new)
- Underbridge (to be retained)
- 2014 static bat detector locations
- 2015 static bat detector locations

Bat activity index- number of bat passes per night

PA : Plecotus auritus
MS : Myotis species
BB : Barbastella barbastellus
RF : Rhinolophus ferrumequinum
RH : Rhinolophus hipposideros

The scheme shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Bat Activity Levels for Sensitive Species

Figure: 3f	Revision:
Date: December 2016	Status: AT ISSUE
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Scale: A3 @ 1:15,000
0 250 500m

N

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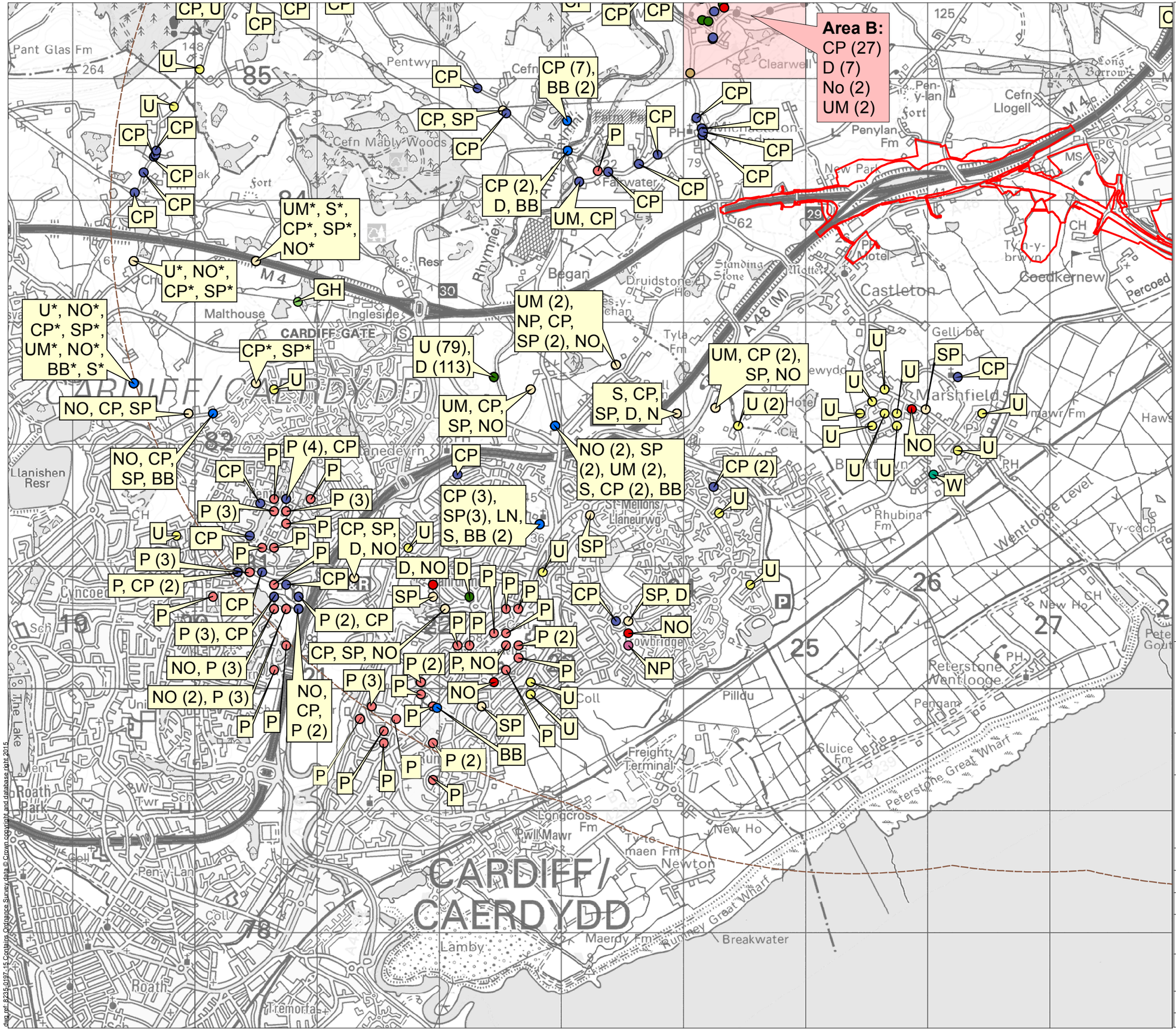

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

Records within areas A, B, C, D and E have been combined to generate a total count.
Rules regarding grid-references still apply.

Counts have been calculated using available data. Records without counts were assumed to represent one single sighting. Counts are estimates and should only be used to infer presence.

The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4a	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:30,000
0 500 1,000 m

N

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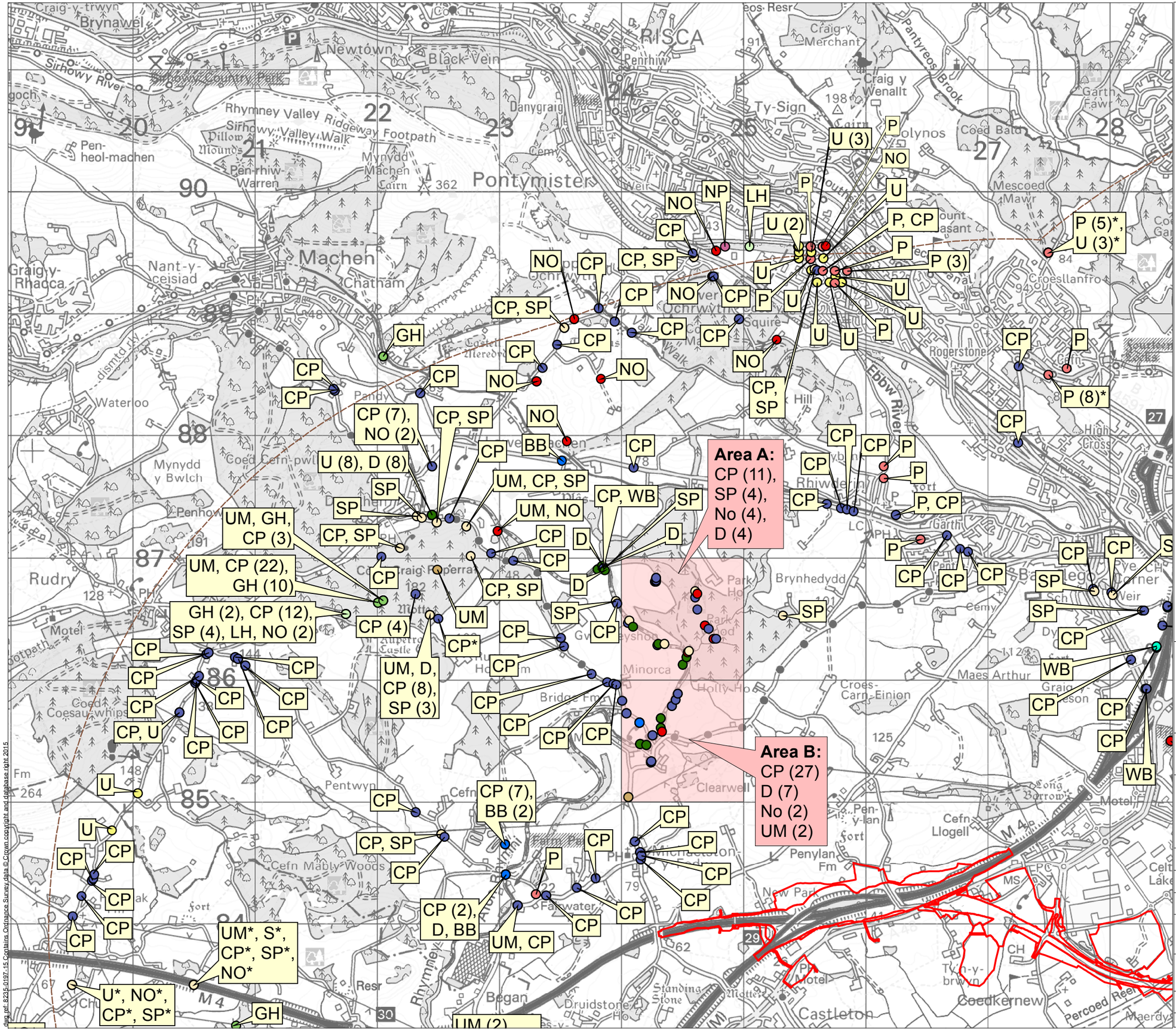

Legend

▭ Limit of Permanent and Temporary Works for New Section of Motorway

▭ 5km Search Area

Protected and Priority Species: Bats

- ● B: Brandt's Bat
- ● BB: Brown Long-eared Bat
- ● CP: Common Pipistrelle
- ● D: Daubenton's Bat
- ● GH: Greater Horseshoe Bat
- ● LH: Lesser Horseshoe Bat
- ● LN: Lesser Noctule
- ● NP: Nathusius's Pipistrelle
- ● N: Natterer's Bat
- ● NO: Noctule Bat
- ● P: Unidentified Pipistrelle
- ● S: Serotine
- ● SP: Soprano Pipistrelle
- ● UL: Unidentified Long-eared Bat
- ● UM: Unidentified Myotis Bat
- ● U: Unspecified Bat
- ● W: Whiskered Bat
- ● WB: Whiskered/Brandt's Bat
- ✖ Ifton Quarry Survey Locations

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

Records within areas A, B, C, D and E have been combined to generate a total count.
Rules regarding grid-references still apply.

Counts have been calculated using available data. Records without counts were assumed to represent one single sighting. Counts are estimates and should only be used to infer presence.

The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4b	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:30,000
0 500 1,000 m
N

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dwg ref: 8235-0197-15

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 5km Search Area

Protected and Priority Species: Bats

- B: Brandt's Bat
- BB: Brown Long-eared Bat
- CP: Common Pipistrelle
- D: Daubenton's Bat
- GH: Greater Horseshoe Bat
- LH: Lesser Horseshoe Bat
- LN: Lesser Noctule
- NP: Nathusius's Pipistrelle
- N: Natterer's Bat
- NO: Noctule Bat
- P: Unidentified Pipistrelle
- S: Serotine
- SP: Soprano Pipistrelle
- UL: Unidentified Long-eared Bat
- UM: Unidentified Myotis Bat
- U: Unspecified Bat
- W: Whiskered Bat
- WB: Whiskered/Brandt's Bat
- Ifton Quarry Survey Locations

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

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The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4c	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:40,000
0 650 1,300 m

N

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Area D: CP (40), NO (9), D (6), SP

CP*, SP*, D*, NO*

U, NO (2), CP, SP, UL

CP (4), BB (2), W

UM, CP, SP

CP, NO (2)

CP (2), SP (2)

CP, SP

CP (2), SP

P, U

P, CP

P (11)*, U (6)*

P*, U*

CP (2), SP, NO

CP, WB

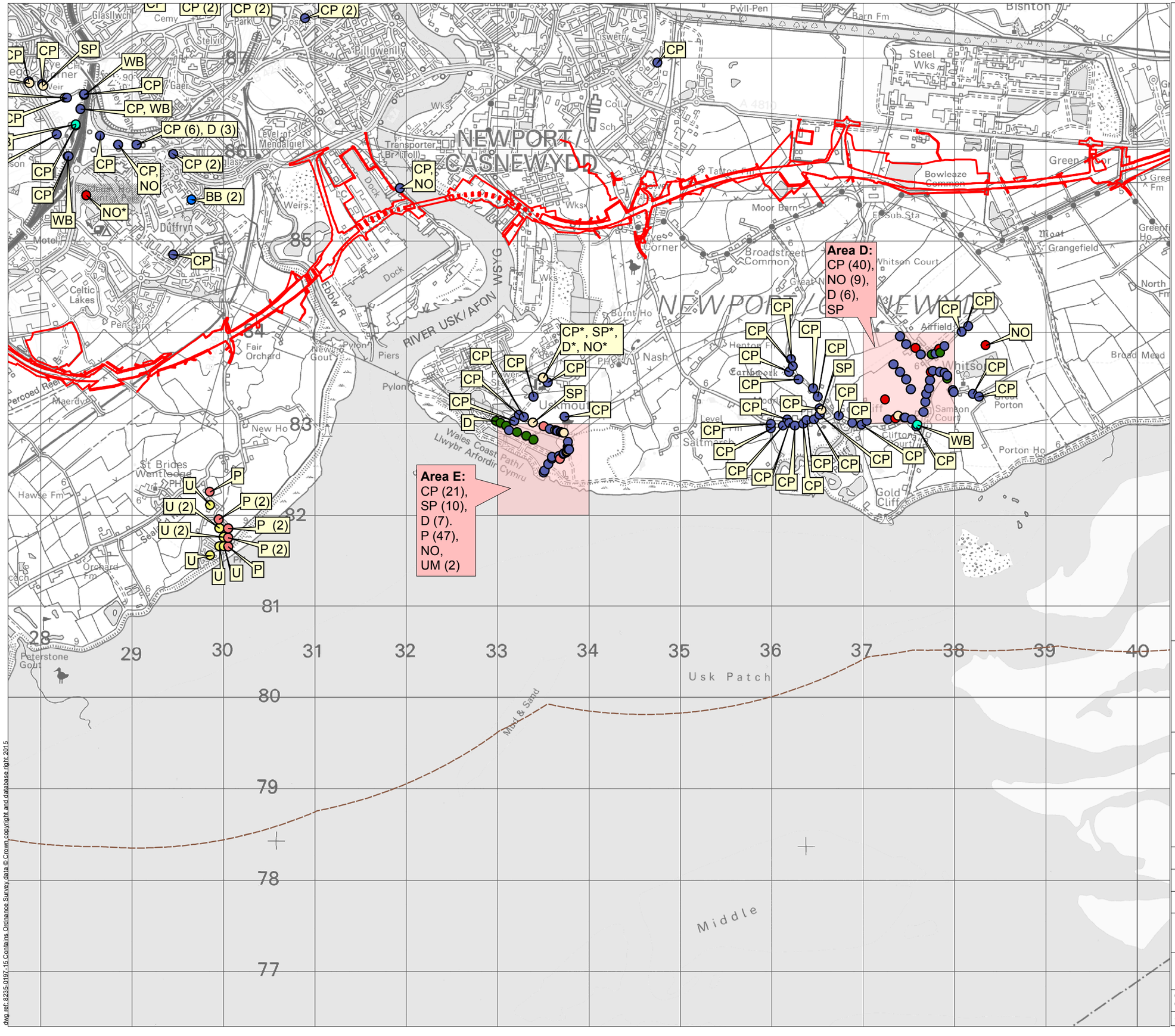
CP (6), D (3)

BB (2)

CAERLEON/ CAERLLION

NEWPORT/ CASNEWYDD

RIVER USK/AFON WYSG



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 5km Search Area

Protected and Priority Species: Bats

- B: Brandt's Bat
- BB: Brown Long-eared Bat
- CP: Common Pipistrelle
- D: Daubenton's Bat
- GH: Greater Horseshoe Bat
- LH: Lesser Horseshoe Bat
- LN: Lesser Noctule
- NP: Nathusius's Pipistrelle
- N: Natterer's Bat
- NO: Noctule Bat
- P: Unidentified Pipistrelle
- S: Serotine
- SP: Soprano Pipistrelle
- UL: Unidentified Long-eared Bat
- UM: Unidentified Myotis Bat
- U: Unspecified Bat
- W: Whiskered Bat
- WB: Whiskered/Brandt's Bat
- Ifton Quarry Survey Locations

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

Records within areas A, B, C, D and E have been combined to generate a total count.
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Counts have been calculated using available data. Records without counts were assumed to represent one single sighting. Counts are estimates and should only be used to infer presence.

The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4d	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:40,000
0 650 1,300 m

N

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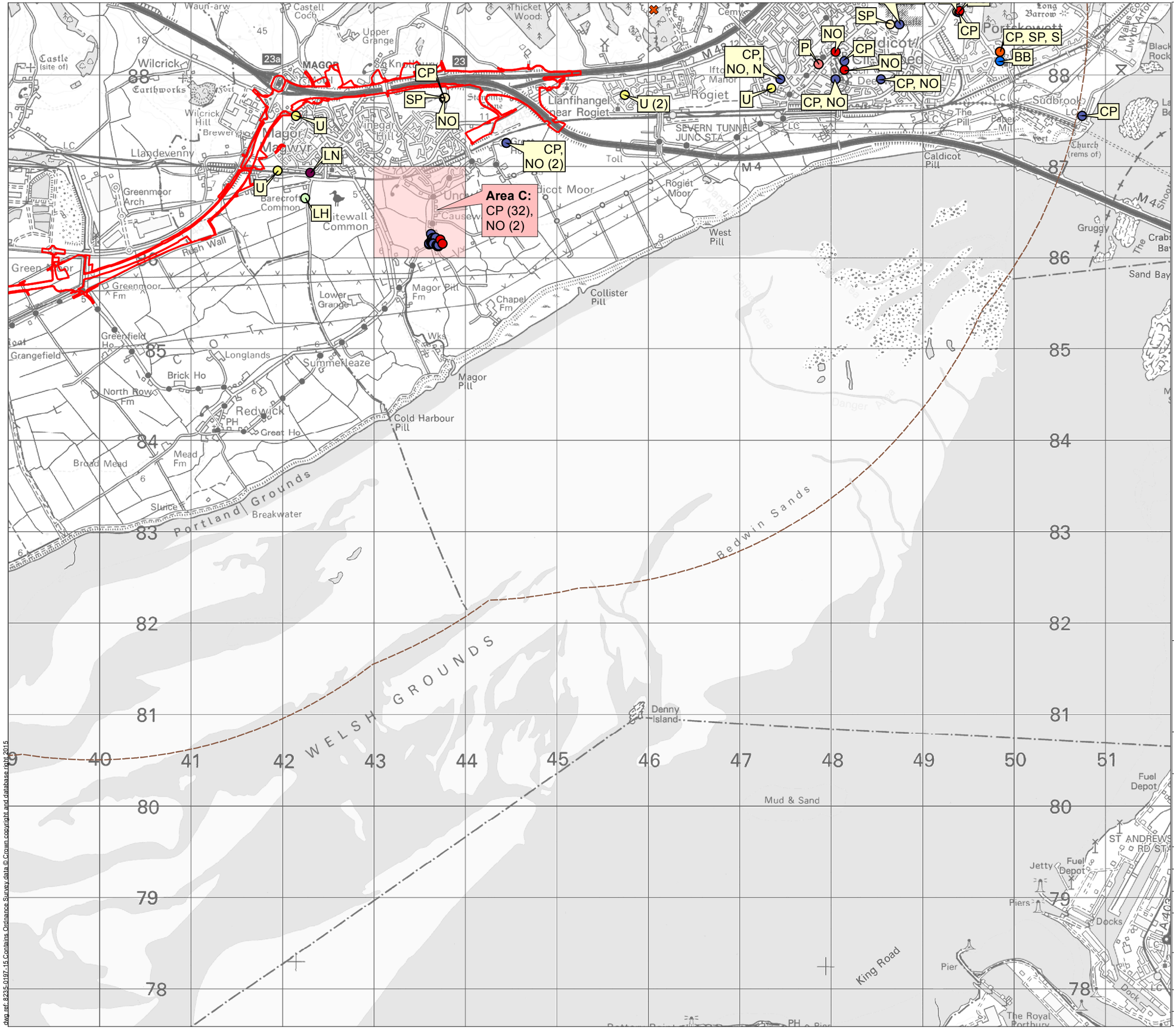

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 5km Search Area

Protected and Priority Species: Bats

- B: Brandt's Bat
- BB: Brown Long-eared Bat
- CP: Common Pipistrelle
- D: Daubenton's Bat
- GH: Greater Horseshoe Bat
- LH: Lesser Horseshoe Bat
- LN: Lesser Noctule
- NP: Nathusius's Pipistrelle
- N: Natterer's Bat
- NO: Noctule Bat
- P: Unidentified Pipistrelle
- S: Serotine
- SP: Soprano Pipistrelle
- UL: Unidentified Long-eared Bat
- UM: Unidentified Myotis Bat
- U: Unspecified Bat
- W: Whiskered Bat
- WB: Whiskered/Brandt's Bat
- Ifton Quarry Survey Locations

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

Records within areas A, B, C, D and E have been combined to generate a total count.
Rules regarding grid-references still apply.

Counts have been calculated using available data. Records without counts were assumed to represent one single sighting. Counts are estimates and should only be used to infer presence.

The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4e	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:40,000
0 650 1,300 m

N

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Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 5km Search Area

Protected and Priority Species: Bats

- B: Brandt's Bat
- BB: Brown Long-eared Bat
- CP: Common Pipistrelle
- D: Daubenton's Bat
- GH: Greater Horseshoe Bat
- LH: Lesser Horseshoe Bat
- LN: Lesser Noctule
- NP: Nathusius's Pipistrelle
- N: Natterer's Bat
- NO: Noctule Bat
- P: Unidentified Pipistrelle
- S: Serotine
- SP: Soprano Pipistrelle
- UL: Unidentified Long-eared Bat
- UM: Unidentified Myotis Bat
- U: Unspecified Bat
- W: Whiskered Bat
- WB: Whiskered/Brandt's Bat
- Ifton Quarry Survey Locations

Note: * highlights records with a four-figure grid reference (records have been plotted at the centre of the 1 km by 1km grid square they were recorded within). All other records fall within a 100 m by 100 m grid square or less and have also been plotted within the centre of the grid square they were recorded in.

Records within areas A, B, C, D and E have been combined to generate a total count.
Rules regarding grid-references still apply.

Counts have been calculated using available data. Records without counts were assumed to represent one single sighting. Counts are estimates and should only be used to infer presence.

The scheme and search area shown reflects the design at time of survey

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

New Section of Motorwa y Bat Activity Records

Figure: 4f	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JB

Scale: A3 @ 1:40,000
0 650 1,300 m

N

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CP (4), BB (2), W

BB (2), NO (3), LH (2), N, P, U (2), CP (3)

UM, CP, NO

CP

N

LH (12)

LH (5)*

LH

BB, NO (2), SP, UM, S, CP (2)

CP, SP

NO, N

U

CP, NO

SP

NO

P

CP, NO, N

CP, SP, S

BB

U (2)

LN

CP, NO (2)

Quarry Faces A, B, C:
CP, NO, UM, S, BB, LH

Area C:
CP (32), NO (2)

Michaelston-y-Fedw

Penylan Road

New Park Farm

M4 Junction 29

Pound Hill

Gwaunshonb Farm

Pwl Diwaeold

Castleton

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5a	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

Scale: A3 @ 1:10,000
0 200 400m

N

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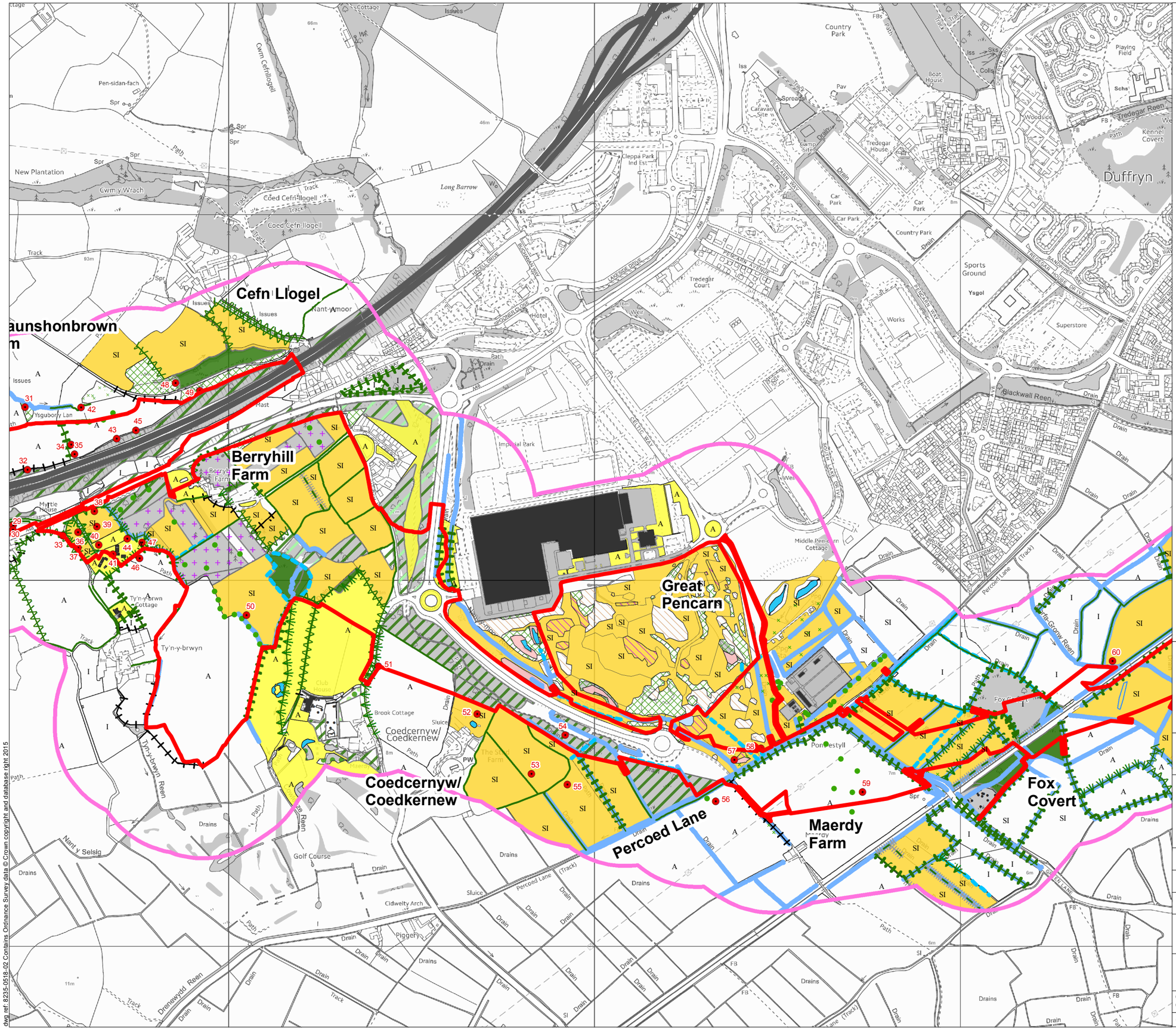

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5b	Revision:
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

Scale: A3 @ 1:10,000
0 200 400m

N

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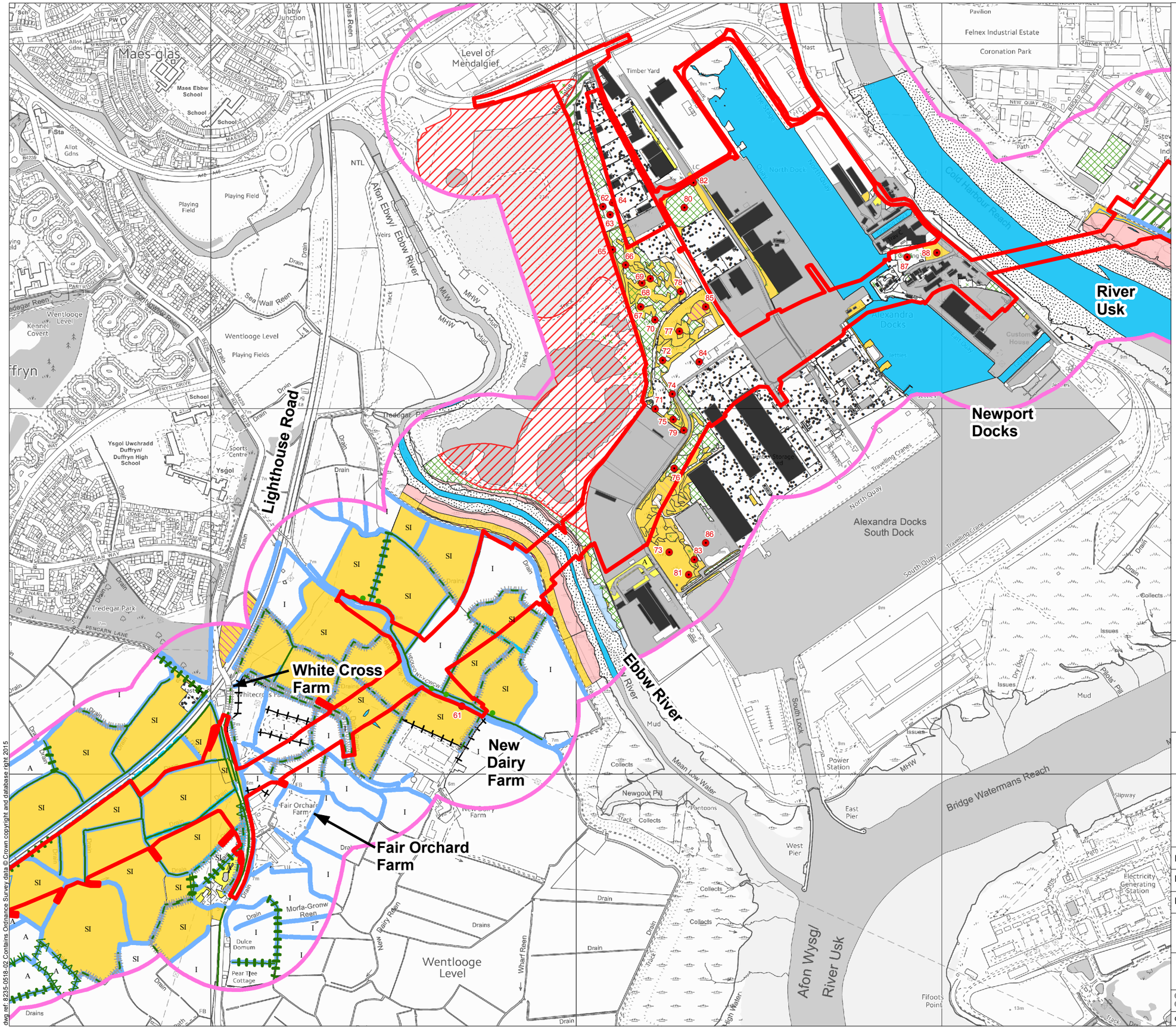

Legend

- 🟥 Limit of Permanent and Temporary Works for New Section of Motorway
- ▭ 250m Buffer area
- ● Target note
- ● Tree
- × Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- 🟨 Unimproved neutral grassland
- ▦ Caravan site
- ▨ Introduced shrub
- Scattered saltmarsh
- 🟩 Broad leaved semi-natural Woodland
- ▨ Broad leaved plantation Woodland
- ▨ Coniferous plantation woodland
- Mixed semi-natural Woodland
- ▨ Mixed plantation Woodland
- ▦ Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- ▨ Marsh/marshy grassland
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- SI Poor semi-improved grassland
- ▨ Tall ruderal
- Swamp
- ▨ Inundation vegetation
- ▨ Marginal vegetation
- 🟦 Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- ⬜ Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- ⬛ Building
- Bare Ground
- ☐ Other habitat
- + Orchard
- ▨ No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5c	Revision:
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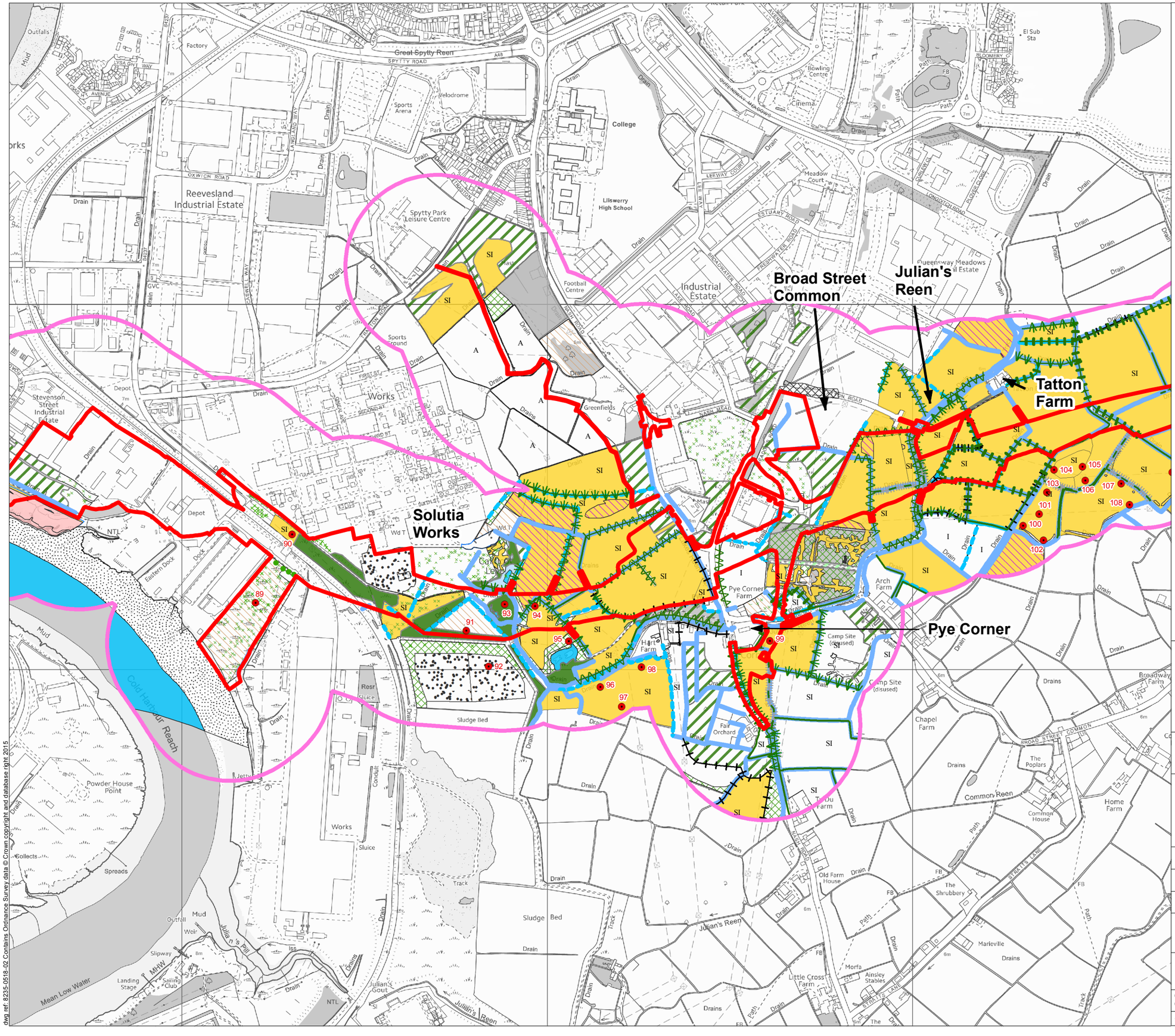

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5d	Revision:
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Moor Ditch

Tata Steelworks

Tata Steel Land

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5e	Revision:
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Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5f	Revision:
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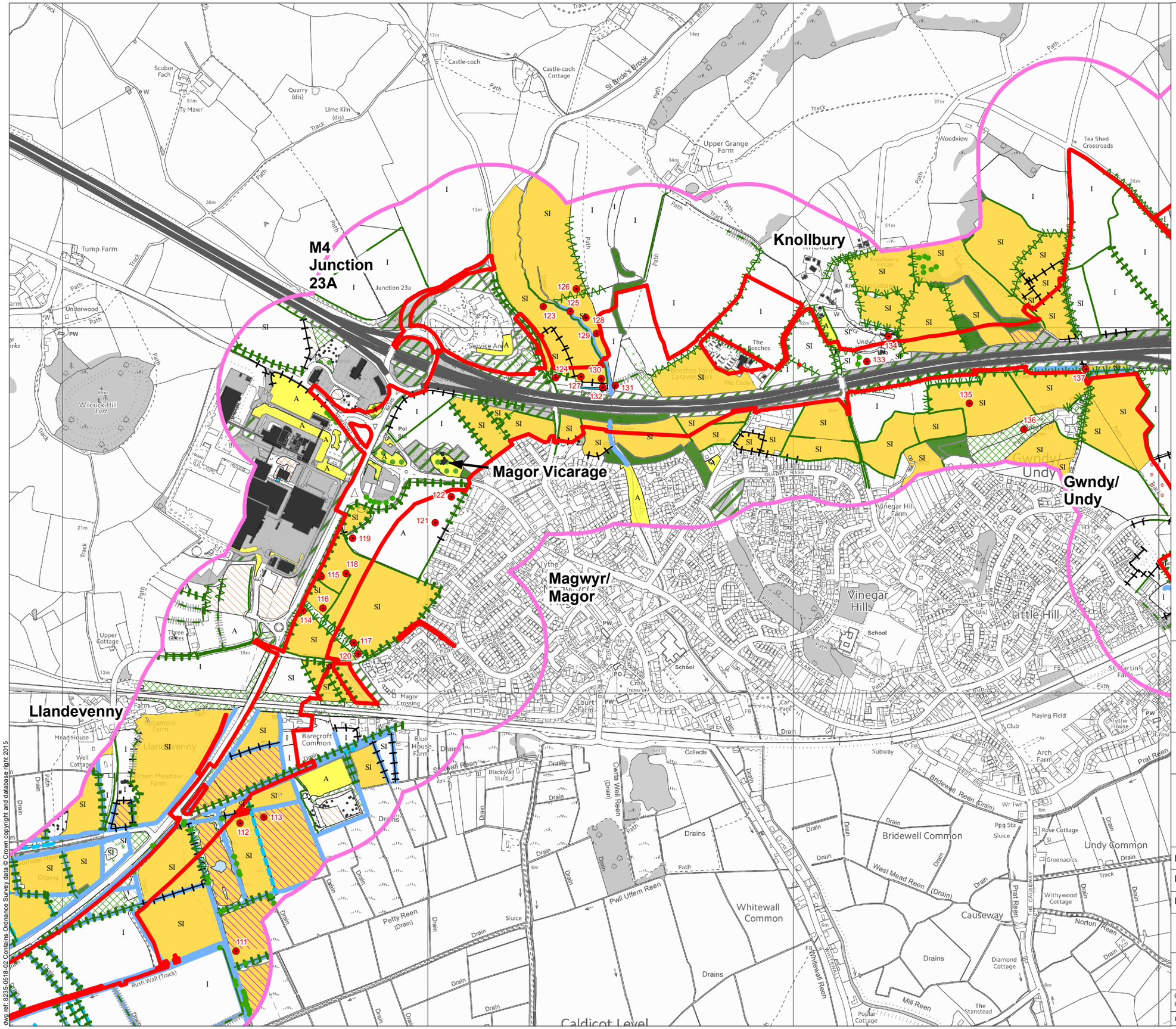

Legend

- 🟥 Limit of Permanent and Temporary Works for New Section of Motorway
- 🟪 250m Buffer area
- ● Target note
- ● Tree
- × Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- 🟨 Unimproved neutral grassland
- ▨ Caravan site
- ▨ Introduced shrub
- Scattered saltmarsh
- 🟩 Broad leaved semi-natural Woodland
- ▨ Broad leaved plantation Woodland
- ▨ Coniferous plantation woodland
- Mixed semi-natural Woodland
- ▨ Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- ▨ Marsh/marshy grassland
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- SI Poor semi-improved grassland
- ▨ Tall ruderal
- Swamp
- ▨ Inundation vegetation
- ▨ Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- × Ephemeral/short perennial
- ■ Building
- Bare Ground
- Other habitat
- + Orchard
- ▨ No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

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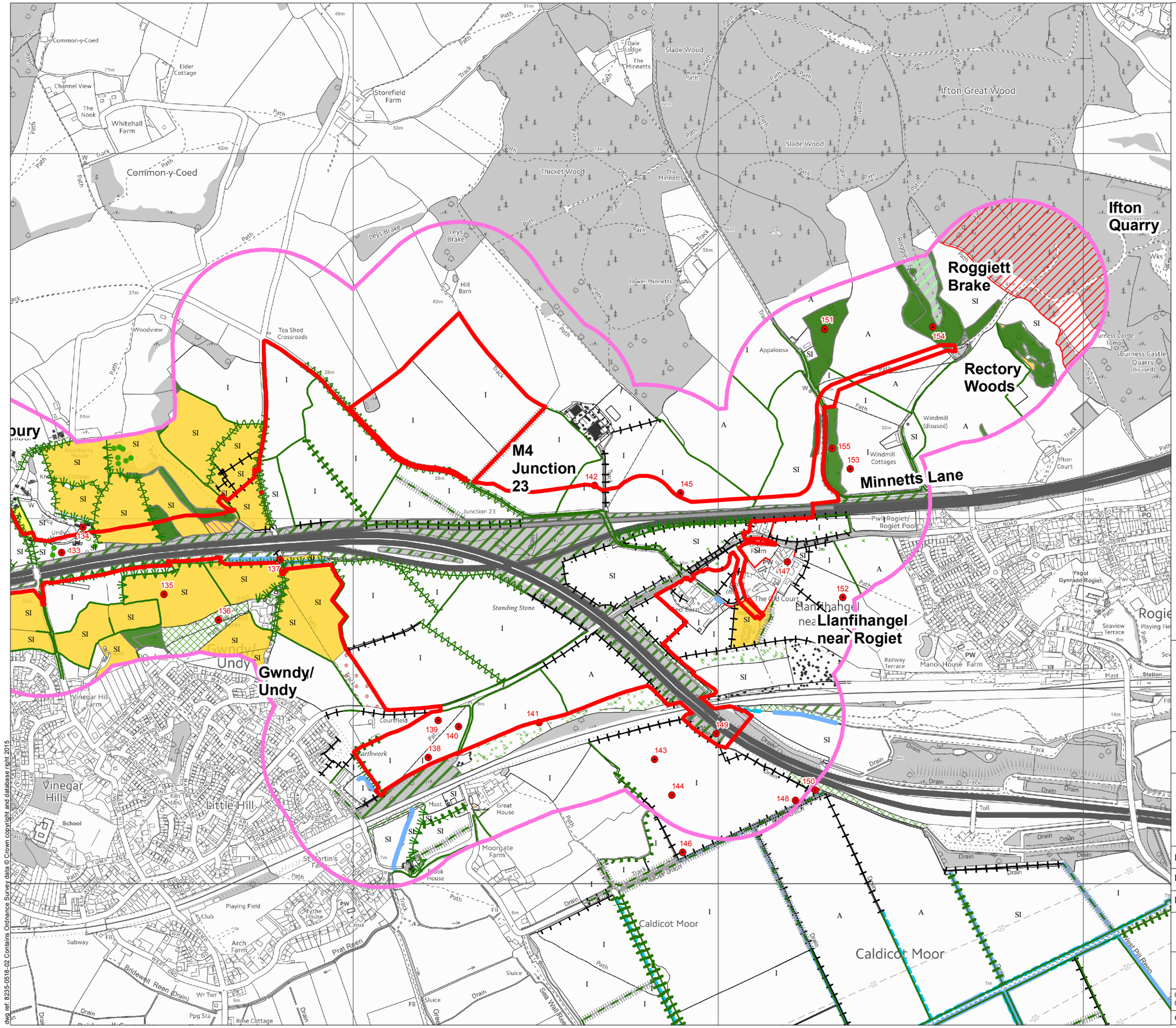

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- SI Semi-improved Neutral grassland
- I Improved grassland
- Marsh/marshy grassland
- SI Poor semi-improved grassland
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- A Arable
- A Amenity grassland
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

Figure: 5h	Revision:
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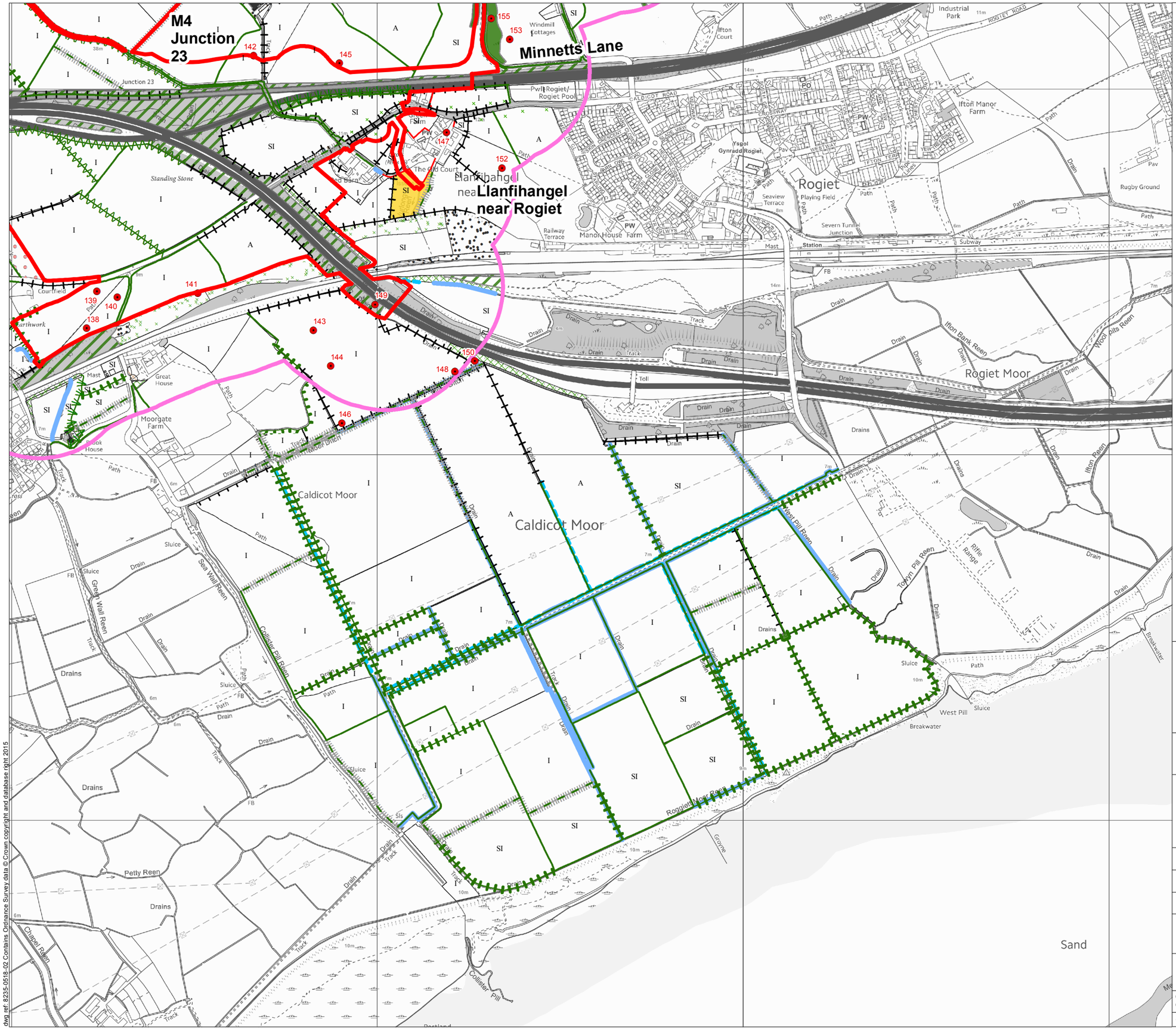

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- 250m Buffer area
- Target note
- Tree
- Scrub
- Watercourse
- Species-rich intact hedge
- Species-poor intact hedge
- Species-rich defunct hedge
- Species poor defunct hedge with fence
- Species-rich hedge with trees
- Species-poor hedge with trees
- Fence
- Wall
- Dry ditch
- Boundary removed
- Earth bank
- Unimproved neutral grassland
- Caravan site
- Introduced shrub
- Scattered saltmarsh
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous
- Scrub scattered
- Broadleaved plantation woodland
- Mixed parkland
- Semi-improved Neutral grassland (SI)
- Improved grassland (I)
- Marsh/marshy grassland
- Poor semi-improved grassland (SI)
- Tall ruderal
- Swamp
- Inundation vegetation
- Marginal vegetation
- Standing water
- Intertidal mud/sand
- Saltmarsh dense/continuous
- Hardstanding
- Arable (A)
- Amenity grassland (A)
- Ephemeral/short perennial
- Building
- Bare Ground
- Other habitat
- Orchard
- No access
- Allotment

Note: 2015 survey area includes Peter Sturgess 2015 NVC survey area

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Appendix SS10.5: M4CaN Bat Mitigation Strategy

Phase 1 Habitat Plan

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