Welsh Government

M4 Corridor around Newport

December 2016 Environmental Statement Supplement

Appendix SS10.4: Draft Hazel Dormouse Mitigation Strategy

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A INTRODUCTION AND BACKGROUND

A.1 Introduction and background to the development

Introduction

A.1.1 This *Draft Hazel Dormouse Mitigation Strategy* sets out the proposals for the mitigation of likely effects on hazel dormice during construction of the new section of motorway proposed as part of the M4 Corridor around Newport (M4CaN) Scheme (the Scheme).

A.1.2 This report will form the basis of the *Hazel Dormouse Method Statement* that would be prepared and agreed with Natural Resources Wales (NRW) in advance of construction and would be submitted to NRW in support of the Scheme's application to NRW for a European Protected Species licence for hazel dormice.

A.1.3 This strategy has been developed in consultation with NRW and consultation would continue during the development of the *Hazel Dormouse Method Statement*.

A.1.4 The strategy has been informed by the results of hazel dormouse surveys undertaken in 2014 and 2015 to inform the Environmental Impact Assessment (EIA) of the Scheme as well as surveys completed in 2016. The methodologies and results of these surveys are summarised in this report. The final *Hazel Dormouse Method Statement* to support the NRW licence application would be informed by further surveys to be undertaken in 2017 and 2018, as described in this report.

Background to the development

A.1.5 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.1.6 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.1.7 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.1.8 The local highway network would also be realigned at ten locations and new road overbridges would be constructed at Church Lane, Lighthouse Road, New Dairy Farm, Nash Road and North Row.

A.1.9 Road drainage 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.1.10 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.1.11 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.2 Proposed Works on Site to be covered by a European Protected Species Licence

A.2.1 This *Draft Hazel Dormouse Mitigation Strategy* relates to any works for the M4caN Scheme that could have an impact on hazel dormice or habitat of value to hazel dormice. These works include those listed below.

- Establishment of temporary works compounds.
- Establishment of temporary storage areas (equipment, vehicles, materials including soil etc.).
- 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 the new motorway with associated embankments.
- Construction and operational lighting.

A.2.2 The construction and operational phases of the Scheme are expected to result in the following impacts with regard to dormice:

- temporary short-term disturbance of habitats by run-off of pollutants and dust deposition during construction;
- temporary small-scale disturbance of habitat of value to hazel dormice during construction;
- permanent loss of habitat of value to hazel dormice;
- temporary disturbance of hazel dormice;
- temporary and potential permanent disruption to hazel dormice movement due to construction and/or operation;
- temporary and permanent displacement of hazel dormice due to construction and/or operation; and
- potential trapping and translocation of hazel dormice during construction to a pre-prepared receptor site.

A.2.3 The Public Local Inquiry (PLI) for the Scheme is expected to commence in March 2017. Should planning consent be granted following the PLI it is expected that construction would commence in July 2018 and the new road would be operational in the autumn of 2021.

A.2.4 Early works to commence in July 2018 would include the construction of the haul road and enabling works, including the construction of works compounds, temporary Water Treatment Areas and replacement watercourses. It is expected that main construction would commence in late 2018.

A.2.5 Following construction, there would be a five-year maintenance period under the contract until autumn 2026.

A.2.6 Prior to the commencement of construction, pre-construction surveys would be undertaken in 2017 and 2018 (as described in Section B.6 below).

A.3 Actions requiring licencing

A.3.1 The hazel dormouse and its resting/breeding sites are protected in Wales under Schedule 2 of the Conservation of Habitats and Species Regulations 2010. The Regulations make it an offence to:

- intentionally or recklessly capture, injure or kill;
- intentionally or recklessly disturb;
- damage or destroy, or obstruct access to a breeding site or resting place; and
- possess, control, transport, and (offer to) sell or exchange any live or dead animal or part of an animal taken from the wild.

A.3.2 The construction of the M4CaN Scheme would require the clearance of vegetation of value to dormice within the Scheme boundary and, therefore, could result in injuries or fatalities of dormice during construction.

A.3.3 In order to help prevent injuries or fatalities, dormice would be displaced or translocated from working areas prior to the commencement of habitat clearance and construction in an area.

A.3.4 Therefore, a licence under the Conversation of Habitats and Species Regulations 2010 would be required for the following measures:

- capture of dormice and translocation from working areas to NRW approved receptor sites (temporary or permanent) prior to construction in an area;
- displacement of dormice from working areas to adjacent favourable habitat prior to construction in an area; and
- damage to or destruction of habitat of value to dormice, including breeding and resting sites.

B SURVEY AND SITE ASSESSMENT

B.1 Existing information on hazel dormice

B.1.1 Historic dormouse records are shown on Figure 1.

B.1.2 Evidence of previous dormouse presence within the vicinity of the proposed M4CaN scheme was identified from records held by the local records centre (SEWBReC) and from results of previous studies in the area (including surveys undertaken by Jacobs for the M4 Widening Project between Junctions 29 and 32 in 2005/2006 and by Arup for earlier stages of the M4CaN Scheme in 2007/8).

B.1.3 To the west of the Scheme, the majority of dormouse activity was concentrated between the central and eastern areas of the M4 Widening Project and mostly to the north of the existing M4 corridor. Surveys in 2007/2008 revealed that dormice were also present further east, in hedgerows around Pen-y-lan Farm and Gwaunhonsbrown Farm in Castleton.

B.1.4 Dormouse monitoring surveys were also undertaken by Jacobs in 2014 and Atkins in 2015 as part of the M4 Widening project. Survey areas included parts of New Park Farm. Results of the surveys reported the presence of hazel dormice along the M4 road verge at New Park Farm - four dormice were recorded in a single box in October (one adult female and three juveniles (one female and 2 male)). No other evidence of dormouse was reported.

B.1.5 In addition, in 2015, NRW reported to RPS historic records of dormice in a number of woodlands in the surrounding area, namely: Cefn Mably woods, Ruperra Castle and woodlands, Park Wood, Coed Cefn Pwll-du, Plas Machen Wood, Penhow Woods and Wentwood as shown on Figure 1.

B.1.6 No historic records of dormice on the Gwent Levels were identified through the desk study process.

B.1 Statutory sites notified for the species (SSSIs) within 10 km

B.2.1 There are no statutory designated sites that have been designated for the presence of hazel dormice within 10 km of the Scheme.

B.2 Objectives of surveys

2014 survey (Appendix 10.9 to the M4CaN Environmental Statement (ES))

B.3.1 The objectives of the 2014 field surveys were to:

- identify the presence of dormice within the study area;
- identify areas where mitigation may be required; and
- identify further studies that may be required to ensure that dormice are fully considered within the development of the Scheme.

2015 survey (Appendix 10.26 to the M4CaN ES)

B.3.2 The objectives of the 2015 field surveys were to continue monitoring nest tubes installed in 2014 in areas where dormice had previously been recorded and where sufficient survey effort had not been achieved in 2014.

B.3.3 In addition, survey effort was focused at the far eastern end of the new section of motorway near Magor, near the proposed Ifton Quarry haul road and other areas not previously surveyed during 2014. The survey in the area of the Castleton Junction was also extended into connected hedgerows in order to further investigate the distribution of dormouse in that area.

2016 survey *(the survey report will be submitted to NRW in December 2016)*

B.3.4 The objectives of the 2016 field surveys were to continue monitoring nest tubes to the east of the River Usk in order to collate additional data to inform a population size estimate.

B.3.5 In addition in 2016, surveys of land along the M4 embankment and between the M4 and M48 at the eastern end of the Scheme (location Q, Figure 2f), where there was no access to survey in 2015.

2015-2016 off-site survey

B.3.6 Due to the potential need for an off-site receptor site for dormice translocated from the Scheme, consideration was given to identification of suitable woodlands in the nearby surrounding area.

B.3.7 Favourable receptor sites would require long-term management security and, therefore, woodlands owned and/or managed by Welsh Government or NRW were considered.

B.3.8 Results of consultation with NRW (as summarised under *Natural Resources Wales Consultation*) confirmed most woodlands in the nearby surrounding area already supported dormice; however, no records of dormice were reported for Coed Mawr (Figure 1). Coed Mawr is a woodland over 90 hectares in size, which is owned by Welsh Government and managed by NRW.

B.3.9 Chanin (2014) suggests dormouse receptor sites should form part of a cluster of sites, that are:

- 4 - 6 woodlands each at least 20 hectares and totalling >150 hectares (may be <20 hectares if well connected to other woods);
- located within a radius of no more than 5 km; and
- connected by parcels of woodland, scrub and/or hedgerows, excluding barriers (e.g. roads >12 m wide; or open rivers unless with connecting canopies or <10 m wide with bridges).

B.3.10 Figure 1b illustrates the suitability of Coed Mawr with regard to the above criteria. In addition to the M4 corridor, dormice have been recorded in a considerable number of large parcels of woodland within 5 km of Coed Mawr and there is a good network of interconnecting hedgerows and linear strips of woodland across the area.

B.3.11 *To note: the A468 to the south-west of Coed Mawr (Figure 1b) is on average approximately 10 metres in width (increasing to approximately 15 metres in width at junctions) and is crossed by bridges and, therefore, should not present a significant barrier to the movement of dormice*.

B.3.12 Bright *et al.* (2006) and Chanin (2014) suggest suitable receptor sites should contain:

- a diverse, unshaded and productive understorey, preferably dominated by hazel;
- a high density and diversity of plant species for food throughout the year; and
- a commitment to appropriate long-term site management.

B.3.13 Therefore, surveys were undertaken of Coed Mawr with the objective of determining whether or not dormice are present and to assess the favourability of habitats for dormice.

B.4 Scaled plan/map of survey area

B.4.1 Figure 2 shows the location of the on-site survey areas. Figures 1 and 3 show the location of the Coed Mawr Survey areas.

B.5 Site/habitat description

2014 survey areas

B.5.1 During 2014 dormouse nest tubes were installed in five areas and these were monitored during four to seven survey visits in order to record dormouse presence. Survey areas were selected taking into account habitat preferences of hazel dormice and records of where dormice have previously been encountered. Survey sites were grouped into the following areas:

- New Park Farm area, Figure 2a
- Castleton area, Figure 2a
- Berryhill Farm/Coedkernew to the south of the M4, Figure 2a
- Gwent Levels – Pye Corner area, Figure 2c/d
- Gwent Levels – land to the south of Tata Steelworks, Figure 2d
- Magor area, Figure 2e/f

B.5.2 Descriptions of the 2014 survey locations are provided in Table 1 below.

Table 1: Description of the 2014 Survey Sites

Survey site	Description
New Park Farm area, Figure 2a	Surveys of the A48(M) verges. Consists of plantation broadleaved woodland with hazel and dense bramble scrub.
Castleton area, Figure 2a	Surveys of Pen-y-lan Farm and Pound Hill. The Pen-y-lan Farm survey area consists of plantation broadleaved woodland with bramble scrub, connected to well established species-poor hedgerows. Pound Hill is broadleaved plantation woodland with sparse bramble understory, connected to well established species-poor hedgerows.

Survey site	Description
Berryhill Farm/Coedkernew, Figure 2a	Areas of ancient broadleaved woodland, areas of broadleaved and mixed plantation woodland, and hedgerows, including species-rich hedges with trees.
Gwent Levels areas, Figure 2c/d	The Pye Corner survey area is a derelict laboratory site which has become overgrown with semi-natural broadleaved woodland, planted coniferous trees and bramble scrub. The hedgerow to the south of Tata Steelworks is a species-poor native intact hedgerow along a wet ditch.
Magor area, Figure 2e/f	Surveys on verges north of Rockfield Farm, Undy. Consists of plantation broadleaved woodland along the motorway verge and dense bramble scrub.

2015 survey areas

2015 nest tube surveys

B.5.3 Monitoring of nest tubes installed in the Castleton area (Figure 2a) in 2014 was continued into 2015. In addition, due to the known presence of dormice in the area, in 2015 nest tubes were installed in connecting hedgerows so as to further investigate the distribution of dormouse in the area (i.e. nest tubes shown as "RPS Dormouse nest tube survey ongoing" on Figure 2a).

B.5.4 The surveys which had partially undertaken within the Gwent Levels in 2014 (Areas M Figure 2c, and Area N Figure 2d) were completed in 2015. Due to access issues at Pye Corner (Area M, Figure 2c), some additional nest tubes were installed in the area to enable a continued survey. In addition, due to the identification of a dormouse nest in a nest tube alongside the southern boundary of the Tata Steelworks survey area (Area N, Figure 2d), additional nest tubes were installed in areas of scrub and hedgerows in the area.

B.5.5 No other areas within the Gwent Levels were surveyed due to the conclusions of Arup's previous consultation with NRW and results of the extended Phase 1 habitat surveys undertaken in 2014 (ES Appendix 10.2) and 2015 (ES Appendix 10.19), which reported the area to be unsuitable for dormice, due to the Levels being relatively wet, characterised by a network of drainage ditches and historic floodplain grassland, with no significant parcels of woodland or dense scrub.

B.5.6 However, new survey locations were identified outside the Gwent Levels in 2015. These primarily focussed on suitable habitat that had not been previously surveyed due to access restrictions. These locations were situated at the eastern end of the M4CaN Scheme, to the north of the M4 and Magor (Areas I and L, Figure 2f) and in woodland located along Minnet's Lane and adjacent to the proposed Ifton Quarry haul road (Areas E, F, H, Figure 2f).

B.5.7 Descriptions of the habitats recorded in the additional 2015 survey areas are provided in Table 2 below.

Table 2: Description of Additional 2015 Survey Sites

Survey site	Description
New Park farm, Figure 2a	– Plantation woodland. Species include hazel, dogwood, hawthorn, sycamore, oak and ash. – Species–rich hedgerow along Pen-y-land Farm access track. Species include bramble, hawthorn, elder, holly, ash, hazel and goat

Survey site	Description
	willow. – Semi-natural broadleaved woodland and connecting hedgerow beside Pwll Diwaelod, between the M4 and A48(M). Species include hazel, holly, hawthorn and willow. Hedgerow species include elder, hawthorn, bramble, hazel and alder. – Broadleaved semi-natural woodland dissected by A48 (M) and M4. Species include hazel, hawthorn, alder, sycamore, hazel, oak, ash and goat willow.
Castleton Figure 2a	– Species–rich hedgerows on Gwaunshonbrown Farm. Species include hazel, hawthorn, ivy, holly, field maple, willow and bramble. – Plantation woodland along Poundhill Road. Species include dogwood, hawthorn, field maple and oak.
Castleton - Cefn Llogell, Figure 2a	– Species-rich hedgerows lining small road, plantation woodland alongside A48 (M), dense scrub lining bridleway. Species include holly, bramble, elder, hawthorn, dogwood, hazel, oak, goat willow, field maple, ash, rose, alder and Buddleia.
Gwent Levels - Pye Corner Farm, Figure 2c	– Mixture of scattered scrub and hedgerow. Species include willow, bramble, hawthorn and ash.
Gwent Levels - Tata Steelworks, Figure 2d	– Species poor hedgerow and scattered scrub. Species include bramble, hawthorn, willow, sycamore, blackthorn and Buddleia.
Magor, Figure 2f	– Species poor hedgerows (Area I). Species include holly, hazel, hawthorn, rose and elder. – Two sections of semi-natural broadleaved woodland and species-rich hedgerows (Area L). Species include hazel, hawthorn, sycamore, holly, privet, elder, field maple, blackthorn and elm.
Minnetts Lane/ haul road to Ifton Quarry Figure 2f	– Species-poor hedgerow and two small areas of semi-natural broadleaved woodland along Minnet's Lane. Species include elder, blackthorn, field maple, hazel, hawthorn and holly. – Semi-natural broadleaved woodland and pine plantation at Roggiet Brake Wood. Species include field maple, hazel, elm, ivy, sycamore and holly. – Small section of semi-natural broadleaved woodland at Quarry Wood. Species include hawthorn, field maple, rose, elm, hazel, bramble, oak, ivy and ash.

2016 survey areas

B.5.8 In 2016 surveys of habitat on Tata Steelworks land were continued in order to gain a better understanding of dormouse activity in the area.

B.5.9 Nest tubes were also installed in a small parcel of woodland to the north of the M4 at the eastern end of the scheme (Woodview woodland in survey area L, Figure 2f). The woodland contained abundant ash with understory of occasional hazel, field maple and hawthorn. Semi-mature silver birch was present throughout and had substantial bark damage inflicted by grey squirrels. Approximately 10 old apple trees were present in the north of the woodland. In the east of the woodland areas of dense bramble had been cleared and a mix of native and non-native tree species had been planted, including young common oak, turkey oak, hornbeam and pine. This area had not been surveyed in 2015 due to access issues.

B.5.10 In addition, areas of young to semi-mature broadleaved plantation with areas of dense bramble scrub and occasional hazel located along the embankments of the M4 and M48 at the eastern end of the scheme (survey area Q, Figure 2f) were also surveyed. These areas had not been surveyed in 2015 due to access issues.

B.5.11 Nest tubes were also installed in Coed Mawr (Figure 1) in order to inform the assessment of its potential value as a receptor site.

B.6 Field survey methods

2014 survey methods

B.6.1 The dormouse survey comprised a combination of a nest tube survey and a hazel nut search as recommended in the Design Manual for Roads and Bridges (DMRB) (Highways Agency, 2001) and in accordance with guidelines set out in the *Dormouse Conservation Handbook* (Bright *et al*., 2006).

2014 nest tube survey

B.6.2 A total of 310 dormouse nest tubes were installed in areas of woodland and suitable hedgerows in April and May 2014. Survey locations were:

- New Park Farm area, Figure 2a
- Castleton, Figure 2a
- Berryhill Farm/Coedkernew, Figure 2a
- Gwent Levels - Pye Corner, Figure 2c
- Gwent Levels - Tata Steelworks, Figure 2d
- Magor area, Figure 2e

B.6.3 All the tubes at the Magor (Figure 2e) and Gwent Levels/Pye Corner (Figure 2c) survey locations were installed in July 2014.

B.6.4 The numbers and distribution of tubes installed in each survey site depended on the site-specific conditions; however, in woodland or areas of scrub, nest tubes were generally installed in a grid pattern of 20 m squares and along hedgerows at approximately 10-20 m intervals.

B.6.5 Nest tubes were inspected on a monthly basis between May and November 2014 in order to locate any signs that could confirm the presence of dormice, including dormice nests.

B.6.6 Each survey visit was carried out by a licensed surveyor accompanied by an accredited agent or assistant. All evidence of dormice and their activity was recorded and mapped. Where individual dormice were found, the sex of animals was determined and their weights measured where possible. Evidence of other small mammal activity was also recorded where this occurred. During the November check where torpid dormice were found, the sex of the animal was not determined so as to avoid undue disturbance.

2014 survey effort

B.6.7 In accordance with the *Dormouse Conservation Handbook* (Bright *et al*., 2006) the scores for survey effort were as listed below.

- New Park Farm area (Figure 2a): 42 tubes surveyed for three months and 36 tubes surveyed for seven months giving a score of 24.

- Castleton area (Figure 2a): 59 tubes surveyed for seven months and 14 tubes surveyed for four months giving a score of 33.
- Berryhill Farm/Coedkernew (Figure 2a): 106 tubes surveyed for seven months giving a score of 51.
- Gwent Levels: 19 tubes (Pye Corner, Figure 2c) plus 10 tubes (Tata Steelworks, Figure 2d) surveyed between August and November giving a total score of 9 (6 for Pye Corner and 3.2 for Tata Steelworks).
- Magor area (Figure 2e): 67 tubes surveyed for seven months giving a score of 32.

B.6.8 Bright *et al*. (2006) consider 20 to be the minimum acceptable score to confirm sufficient survey effort. Therefore, it is considered that the survey effort for New Park Farm, Castleton and Magor survey locations was sufficient in 2014;, however, the survey effort for the Gwent Levels (Pye Corner and Tata Steelworks) was considered insufficient in 2014.

2014 hazel nut search

B.6.9 In areas of suitable habitat where fruiting hazel was present, searches were undertaken for hazel nuts that had been characteristically opened by dormouse. Areas surveyed included New Park Farm north, the A48(M) verges, Spring Court woodland (Figure 2a/b) and the verge south of M4 J23a services (Figure 2g/h).

B.6.10 Searches were carried out within five 10 m x 10 m quadrats for twenty minutes each, or until 100 nuts (not opened by birds or squirrels) had been collected.

2014 survey limitations

B.6.11 In accordance with Bright el al. (2006), survey effort should be at least 20. Therefore, sufficient survey effort was undertaken at all sites other than the Gwent Levels Pye Corner and Tata Steel sites.

B.6.12 No access was permitted to Gwaunhonsbrown Farm (to the north of the M4, Figure 2a) for the entire survey season. All surrounding areas were surveyed and this limitation did not adversely affect the conclusions of the survey.

B.6.13 At the site to the south of Pen-y-lan Farm (to the north of the M4, Figure 2a), a number of the nest tubes were damaged by cattle. These were replaced once but further damage occurred. Therefore to minimise the risk to dormice the decision was made to remove the affected tubes from the survey. This is not thought to have adversely affected the conclusions of the survey due to the number of tubes placed within the wider connected habitat and the historic presence of dormice within the area.

B.6.14 As the Gwent Levels area was only surveyed for the latter part of the survey period and only achieved a score of 9, results from this area are insufficient to consider a complete survey. Although this area was considered unlikely to support dormice and was only included in the 2014 survey programme to gain additional evidence to support the understanding that dormice are absent from the Levels, the survey in the area was continued into 2015 so as to provide sufficient survey effort (as described below).

2015 survey methods

B.6.15 As in 2014, the 2015 surveys comprised a hazel nut search and nest tube survey. The surveys followed methodologies undertaken in 2014 and set out in the *Dormouse Conservation Handbook* (Bright, *et al.* 2006).

2015 nest tube surveys

B.6.16 Nest tubes were inspected in accordance with best practice guidelines, by ecologists. Any evidence of dormouse activity located in the nest tubes were recorded including the animals themselves, nests or gnawed nuts.

2015 survey effort

B.6.17 In accordance with the *Dormouse Conservation Handbook* (Bright *et al*., 2006) the score for survey effort was as set out below. The survey effort for all survey locations was sufficient to enable a conclusion to be drawn regarding dormouse presence/absence in accordance with Bright *et al*., 2006, as described below.

Minnet's Lane/Haul Road to Ifton Quarry, Figure 2f

B.6.18 The nest tube locations are considered as one survey area due to the proximity of each of the groups of nest tubes and the presence of suitable connecting habitat between them. The total number of nest tubes was 188 surveyed from July to November. Survey effort = 67.68.

Magor (to the north of M4 and east of Junction 23A), Figure 2f

B.6.19 The nest tube locations are considered as one survey area due to their proximity to each other and the presence of suitable connecting habitat. The total number of nest tubes was 135 surveyed from July to November. Survey effort = 48.6.

Gwent Levels – Pye Corner Figure 2c

B.6.20 A total of 9 additional nest tubes were installed due to the loss of the 2014 nest tubes. These were surveyed from August to November. Survey effort = 3.24.

Gwent Levels- Tata Steelworks land Figure 2d

B.6.21 In addition to the 10 remaining 2014 nest tubes, an additional 80 nest tubes were installed on the Tata Steelworks land. Tubes were surveyed from August to November. Survey effort = 28.8.

Castleton and Castleton-Cefn Llogel, Figure 2a

B.6.22 The area can be divided into two separate areas, due to the distance between each survey area and the limited availability of suitable connecting habitat.

B.6.23 The total number of nest tubes in one survey area was 83 surveyed from June to November. Survey effort = 33.2.

B.6.24 There were 42 nest tubes within the second survey area. (28 were surveyed from June to November (Survey effort = 11.2). 14 were surveyed from July to November (Survey effort = 5.04). In addition, the total number of retained 2014 nest tubes was 34 which

were surveyed between May and November (Survey effort = 16.32). Therefore, the total survey effort for the area = 32.56.

New Park Farm to the north of the M4, Figure 2a

B.6.25 The nest tube locations are considered as one survey area due to their proximity to each other and the presence of suitable connecting habitat. The total number of nest tubes was 65 surveyed from July to November. Survey effort = 23.4.

New Park Farm to the south of the M4, Figure 2a

B.6.26 The nest tube locations are considered as one survey area due to their proximity to each other and the presence of suitable connecting habitat. The total number of nest tubes was 95. 29 were surveyed from June to November (Survey effort = 11.6). 66 were surveyed from July to November (Survey effort = 23.76). Therefore, the total survey effort for area = 35.36.

B.6.27 In addition, monitoring of the Arup 2014 nest tubes was continued in the area, where accessible.

2015 hazel nut search

B.6.28 Hazel nut searches were undertaken at several locations along the proposed route between 2nd and 20th November 2015. At each location, due to the fact survey areas did not contain a large number of heavily fruiting hazel, the following method of survey was undertaken: 100 hazel nuts that had been opened by small rodents (avoiding caches and nuts opened by squirrels) were collected. In areas where there was a very small number of hazel plants present, all hazel nuts located were collected. Collected hazel nuts were then inspected off-site, using a magnifying glass/microscope as required in order to determine whether or not they had been opened by dormice.

B.6.29 The locations of the survey areas are shown on Figure 2.

B.6.30 In addition, a hazel nut search of Coed Mawr (Figure 1) was undertaken using the same methodology as described above for the on-site nut searches (Figure 3).

Limitations to the 2015 survey

B.6.31 Access for nest tube installation and checking of tubes previously installed by Arup was available from mid-May 2015.

B.6.32 Access arrangements and subsequent inductions onto Tata Steelworks land (Area N, Figure 2d) were not completed until August 2015 and, therefore, following the discovery of a dormouse nest in a nest tube on the boundary of the Tata Steelworks site, additional nest tubes were not installed on the Tata Steelworks site until September 2015.

B.6.33 In survey areas I and L, Figure 2f, a number of the nest tubes were damaged by cattle during the survey. The tubes were not replaced to minimise the risk to dormice, if present. However, this is not thought to have adversely affected the conclusions of the survey due to the number of tubes placed within the wider connected habitat.

B.6.34 A few other nest tubes elsewhere on site were damaged during the survey period, by horses or other factors, but again it is thought that this did not adversely affect the conclusions drawn from the survey due to the number of unaffected tubes.

B.6.35 In some of the proposed nut search areas there was little or no hazel so minimal or no hazel nuts were collected.

2016 survey methods

2016 nest tube survey

B.6.36 During 2016 the nest tube survey to the east of the River Usk was continued in order to develop a greater understanding of dormouse presence/likely absence across the areas. Additional nest tubes were also installed on the embankments of the M4 and island between the M4 and M48 at the eastern end of the Scheme, where access was not obtained in previous years and some nest tubes that had become damaged or lost were replaced. In addition, a nest tube survey was undertaken in Coed Mawr.

B.6.37 Table 3 below shows the dates and number of dormouse nest tubes installed and the dates when each site was surveyed.

Table 3 Dates of Nest Tube Installation and Survey Visits

	DATE							
Site	**April 2016**	**May 2016**	**June 2016**	**July 2016**	**Aug 2016**	**Sept 2016**	**Oct 2016**	**Nov 2016**
Coed Mawr woodland (Figure 3)	500 tubes Installed		1st - 2nd		1st	30th	1st 31st	1st
TATA Steelworks land (Figure 2d)	50 tubes reinstalled		16th		30th		31st	
Woodview woodland at the northern end of the Magor survey area (Figure 2e/f)	50 tubes installed		30th			29th	31st	
M4 / M48 motorway islands (Figure 2f)	-	-	50 tubes installed			7th		1st
M4 motorway island (Figure 2f)	-	-	50 tubes installed			7th		1st

B.6.38 As in previous years, nest tube surveys were carried out in accordance with the methodology set out in the *Dormouse Conservation Handbook* (Bright, *et al.*, 2006).

2016 survey effort

B.6.39 As described above, in accordance with the method stated in English Nature's Research Report 524 (English Nature, 2003), the survey effort in 2016 was:

Coed Mawr

B.6.40 500 nest tubes were surveyed from May to October. Survey effort = 180.

Tata Steelworks land

B.6.41 50 nest tubes were surveyed from May to October. Survey effort = 22.

Woodview woodland – northeast Magor survey area

B.6.42 50 nest tubes were surveyed from May to October. Survey effort = 22.

M4 / M48 motorway islands

B.6.43 50 nest tubes between the M4/M48, 25 nest tubes on the M4 embankment, surveyed from July to October. Survey effort = 16 + 8 = 24. The areas have been grouped together here as dormice would need to have crossed the main road in order to reach the surveys areas and, therefore it is considered they are likely to be from the same population.

Coed Mawr habitat mapping

B.6.44 Initial habitat mapping and assessment of Coed Mawr was also undertaken in 2016 during the nest tube survey period in order to identify broad habitat types and to assess the potential suitability of the site for dormice.

Limitations to the 2016 survey

B.6.45 At the end of October 2016, nest tubes along North Row, to the south east of Tata Steelworks land were found to have been damaged during hedgerow management. A few other nest tubes elsewhere in the Tata Steelworks survey area were also damaged by horses or other factors. However, the majority of the nest tubes in the survey area remained intact; therefore, the loss of this small number of nest tubes was not considered to significantly affect the overall survey. The survey was additional to the survey in 2014/2015, when in accordance with English Nature 2003, sufficient survey effort was undertaken.

B.6.46 Access to the M4 embankment at the eastern end of the Scheme, where 25 dormouse tubes were installed, was limited due to the density of the vegetation (scrub and trees) and health and safety reasons with regard to the proximity to the M4 carriageway in places. The survey effort achieved did not meet the target score of 20; however, if combined with the survey area between the M4/M48 Island (to the south of the M4), the survey effort was greater than 20. (The area will continued to be surveyed in 2017.)

B.6.47 The initial habitat mapping of Coed Mawr was undertaken during other site visits and comprised a survey of broad habitat types only. A detailed habitat survey and assessment of the existing and potential value of the site will be undertaken in late 2016 - 2017.

B.7 Survey results

2014 survey results

B.7.1 Dormice were confirmed to be present at the western end of the survey area, within the New Park Farm area and the Castleton area (Figure 2a). The survey results provided evidence that dormice are present to the north and south of the M4 and also to the north and south of the A48(M) indicating connectivity of the habitat along the verges to the west, where known populations of dormice exist and possibility to the north and south of these major roads.

B.7.2 No dormice were recorded within the Berryhill Farm/Coedkernew area (Figure 2a) to the south of the A48(M) at the eastern end of the scheme. This may be due to the lack of suitable habitat connections between known populations and these areas and also the limited understorey and sheep grazing having an adverse impact on the food availability in these woodlands.

B.7.3 No dormice were recorded across the Gwent Levels (Figure 2c).

B.7.4 No dormice were recorded within the Magor area (Figure 2e/f) despite having suitable habitat situated north of the M4. This may be due to the lack of habitat linkages such as hedgerows between potentially suitable habitat and known existing populations of dormice.

2015 survey results

2015 nest tube survey results

New Park Farm (Figure 4a)

B.7.5 A single dormouse was recorded to the north of the M4 during the June 2015 visit. Dormouse nests were recorded during further visits in July and September 2015. An old dormouse nest and two dormice were recorded during the November 2015 visit.

B.7.6 Along the M4 road verge at New Park Farm, one dormouse nest was recorded with a dormouse present in July 2015. Five dormice and five dormouse nests were also recorded in September 2015. Thirteen dormouse nests were recorded in November 2015, including one with one adult and one juvenile present.

B.7.7 One dormouse nest was recorded along a hedge off Pen-y-lan Road, at the far west of the survey area, during the survey visit in July 2015. This was recorded again in September 2015 and two different dormouse nests were recorded in the hedge in November 2015.

B.7.8 Between the M4 and A48(M) one dormouse was recorded in a wood mouse nest during the September 2015 visit.

Castleton (Figure 4a/b)

B.7.9 A single dormouse was recorded in June 2015 in the area south of Pen-y-lan Farm and dormouse nests were recorded during further visits undertaken in July, September and November 2015.

B.7.10 No evidence of dormouse was recorded in the Pound Hill area during the June, July and November 2015 survey visits; however, one dormouse and three dormouse nests were recorded during the September 2015 visit.

B.7.11 On Gwaunshonbrown Farm, two dormouse nests were recorded in July 2015; five dormouse nests were recorded each in September and November 2015.

B.7.12 Along the verges of Pound Hill Road, three dormouse nests were recorded in November 2015.

Castleton – Cefn Llogel (Figure 4b)

B.7.13 Four dormouse nests were recorded in July 2015. Five live dormice and nine nests were recorded in September and 17 potential dormouse nests were recorded in November.

Gwent Levels - Pye Corner (Figure 4e)

B.7.14 The tubes around Pye Corner (Figure 2e) were not present/easily found so additional nest tubes were installed in September 2015. No signs of dormouse were recorded during the survey period.

Gwent Levels - Tata Steelworks (Figure 4f/g)

B.7.15 Access to the Tata Steel site was only granted in August 2015 following which a dormouse nest was recorded in a hedgerow to the south of the Tata Steel site. An additional possible nest was later recorded in a hedgerow on site (Figure 2g).

Magor (Figure 4h)

B.7.16 A single dormouse nest was recorded in a hedge along Bencroft Lane during the September 2015 visit and again in November 2015.

B.7.17 A single dormouse nest was recorded in a hedge to the north of a small parcel of broadleaved woodland during the October 2015 visit and again during the November 2015 visit, although a wood mouse was present in the nest in October 2015.

Minnet's Lane/Haul Road to Ifton Quarry (Figure 4i)

B.7.18 Minnett's Lane: A possible nest of old man's beard was located in one nest tube during the November 2015 survey visit. No other evidence of dormouse has been recorded in this area.

B.7.19 No evidence of dormouse was recorded at Roggiett Brake Wood or Quarry Wood.

2015 hazel nut search results

B.7.20 The locations, number of nuts collected and number of nuts that had been opened by dormice are listed in Table 4 below. The survey locations are shown on Figure 2.

Table 4: Hazel Nut Search Areas and Results

Search area ref., Figure 2	Description of search area	Number of collected nuts opened by mammals	Number of nuts opened by hazel dormice
ix	Occasional small hazel on roundabout, occasionally fresh hazelnuts which were mostly uneaten. No hazel in verge to west or east.	20	0
x	Occasional small to mid-hazel trees with fresh, uneaten hazelnuts frequently found.	33	0
xi	Few mid-size hazel trees, hazelnuts mostly old.	115	0
viii	No hazel trees.	0	0
xii	No hazel to the east of St Brides road, small hazel trees to the west with frequent uneaten fresh hazelnuts.	7	0
vii	Occasional/frequent hazel trees to the north, few uneaten or fresh hazelnuts found.	70	0
xiii	Occasional small to mid-size hazel trees, fresh uneaten or squirrel eaten hazelnuts frequent.	25	0
xiv	Not accessed.	0	0

Search area ref., Figure 2	Description of search area	Number of collected nuts opened by mammals	Number of nuts opened by hazel dormice
xv	Occasional mid-size hazel trees, hazelnuts mostly old.	32	0
xvi	Very few mid-size hazel trees, hazelnuts mostly old.	16	0
xvii	Very small few hazel trees, hazelnuts mostly old.	8	0
xviii	Occasional mid-size hazel trees, hazelnuts mostly old.	58	0
i	Abundant small and mid-size hazel trees, few hazelnuts found.	37	0
ii	Small to mid-size hazels abundant/dominant at western end. Hazel trees much sparser further east where woodland has a distinct canopy and sprawling bramble and ivy ground flora.	46	0
iii	Frequent small and mid-size hazel trees, frequent fresh hazelnuts	100	3
iv	No hazel trees.	0	0
v	No hazel trees.	0	0
vi	No hazel trees.	0	0

B.7.21 Dormouse opened hazelnuts were only located at search area reference iii, Figure 4a, to the south of the A48 and west of Pound Hill in Castleton.

B.7.22 Several of the areas had either no hazel or no mammal opened hazelnuts; therefore no nuts were collected during the survey period. Access could not be gained to Location H due to the road layout and barriers that excluded access.

Coed Mawr hazel nut search results

B.7.23 In Area A of the search area (Figure 3), only five hazel plants were located, three of which were young plants located along the eastern edge of the wood, one was a semi-mature plant located in the north-east corner of the area, and one was a young plant located in the centre of the area. Hazelnuts were only located around the semi-mature hazel plants. All nuts were either intact or had been opened by squirrels. No hazelnuts opened by dormice were recorded.

B.7.24 In Area B of the search area (Figure 3), three mature hazel plants were recorded at the north of the search area. Hazelnuts collected were largely still intact; however a small number had been opened by squirrels and wood mice. No hazelnuts had been opened by dormice.

B.7.25 Occasional young hazel plants were recorded adjacent to the footpath in the eastern section of Area C (Figure 3). Most of the hazelnuts collected had been opened by squirrels or were still intact, and only a handful had been opened by wood mice. No hazelnuts had been opened by dormice.

B.7.26 Scattered hazel were recorded throughout Area D of the search area (Figure 3), including young and semi-mature plants. The majority of hazelnuts collected were located beneath a group of semi-mature hazels in the eastern half of Area D. Most had been opened by squirrels and the occasional nut had been opened by wood mouse. No hazelnuts had been opened by dormice.

B.7.27 Three mature hazels were located in the centre of Area E of the search area (Figure 3). Hazelnuts were relatively abundant; however, the majority had been opened by squirrels and the occasional nut had been opened by wood mice. No hazelnuts had been opened by dormice.

2016 survey results

2016 nest tube survey results

B.7.28 During the September 2016 survey visit, one probable dormouse nest was located in Woodview woodland, in the north-east section of the Magor survey area (Figure 4h).

B.7.29 In addition, during the October 2016 survey visit, a dormouse nest was recorded in the motorway island to the south of the M4 (Area Q, Figure 2f).

B.7.30 No other signs of dormouse activity were recorded along the route of the Scheme,

2016 Coed Mawr nest tube survey

B.7.31 With regard to Coed Mawr, one probable dormouse nest was located in a nest tube in November 2016. The nest tube was located amongst naturally regenerating scrub (dominated by birch, gorse and bramble) in the southern tip of the woodland, where conifers had been felled in recent years. No other signs of dormouse presence were recorded during the nest tube survey.

2016 Coed Mawr habitat assessment

B.7.32 Results of the 2016 initial mapping of broad habitat types in Coed Mawr and assessment of potential value to dormice are shown on Figure 5. Results confirm the presence of a diversity of age structures and habitat types across the wood, including habitats of potential value to dormice.

B.8 Interpretation / evaluation of survey results

On-site surveys

Nest tube surveys

B.8.1 Results of the surveys confirm the presence of a considerable population of hazel dormice in woodlands and hedgerows in the New Park Farm and Castleton areas (Figure 4a/b).

B.8.2 Results also confirm the presence of a limited dormouse population on and adjacent to the Tata Steelworks land (Figure 4f/g). Dormice in this area are utilising areas of dense scrub and well developed and connected hedgerows, which are largely confined to the Tata Steelworks survey area. This favourable habitat, in particular areas of dense scrub, is absent from the more open parts of the Gwent Levels to the south. However, areas of dense scrub and woodland are located immediately to the north of the survey location (i.e. to the east and north of the main Tata Steelworks site, along railway lines to the north of the main Tata Steelworks site and in areas of woodland further to the north). Taking this into account, it is considered that the survey area on/around the Tata Steelworks site is likely to be at the southern extent of dormouse habitat in the area.

B.8.3 The population recorded to the north of Magor (Figure 4h) and along Minnet's Lane/the haul road to Ifton Quarry (Figure 4i), is also considered to be limited in size due to the limited availability of significant parcels of woodland in the survey area. It is considered that the main population from which the small number of individuals recorded is likely to inhabit the larger parcels of woodland further to the north.

B.8.4 The dormouse nest recorded in the M4 island at the eastern end of the Scheme (southern section of Area Q, Figure 2f) is considered likely to represent a small number of animals in the motorway embankment. However, results of the 2017 surveys will confirm whether or not dormice have moved into the motorway islands from embankment habitat along the Scheme to the south. Should this be the case, results of the surveys would inform any potential revisions to the estimated population size with regard to this area.

Hazel nut search

B.8.5 All hazel nut search locations primarily overlapped with nest tube survey areas, with the exception of Fox Covert (Area R, Figure 4b). This area would be subject to a nest tube survey in 2017, as described below. Results of the survey would inform the final mitigation strategy and method statement for this area.

Population size estimates

B.8.6 Bright *et al*. (2006) suggested a typical dormouse home range could cover approximately 1-1.5 hectares of woodland or 300 m of hedgerow. Whilst in optimal habitat the mean population density in spring could be up to 10 adults per hectare.

B.8.7 The National Dormouse Monitoring Programme (NDMP) suggested an average population density of between 1.75 and 2.5 adults per hectare of favourable habitat.

B.8.8 The People's Trust for Endangered Species (PTES) suggest the home range of a female dormouse will generally be up to 1 hectare in size and males will have larger home territories that overlap several female home ranges. The PTES also suggest under optimal habitat conditions, the population density could be between 3 and 5 adults per hectare.

B.8.9 Taking the above into account as well as the type of habitat on site, estimates of the number of dormice that could be affected by habitat loss along the M4CaN route are between 36 and 90, as listed in Table 5 below. Estimates of population sizes take into account habitat type, condition and extent.

Table 5: Dormouse Habitat Loss and Population Size Estimates

Location, Figure 4	Vegetation type	Habitat loss (hectares (ha) / metres (m)), as shown on Figure 6	Estimate of population size
Castleton and New Park, Figure 4a	Broadleaved woodland (semi-natural and plantation)	11.52 ha	**11 adults** (based on 1 adult/ha) **– 57 adults** (based on 5 adults/ha (PTES) if considered optimal habitat).
	Mixed plantation	1.72 ha	
	Continuous/dense	0.9 ha	

Location, Figure 4	Vegetation type	Habitat loss (hectares (ha) / metres (m)), as shown on Figure 6	Estimate of population size
	scrub		
	Hedgerow	1,894 m	**6 adults** (based on 1 adult/300 m).
Gwent Levels - Tata Steelworks, Figure 4b	Broadleaved woodland (semi-natural and plantation)	0.24 ha	**3 adult** (based on 1 adult/ha) **– 6 adults** (based on 1.75 adults/ha (NDMP) as not considered optimal habitat due to the fragmented/limited extent).
	Continuous/dense scrub	3.54 ha	
	Hedgerows	2,164 m (389m of which is defunct hedge)	**7 adults** (based on 1 adult/300 m)
Magor, Figure 4c	Broadleaved woodland (semi-natural and plantation)	1.96 ha	**2 adults** (based on 1 adult/ha) **– 5 adults** (based on 2.5 adults/ha as not considered optimal habitat due to the fragmented/limited extent (NDMP)).
	Hedgerows	1,502 m	**5 adults** (based on 1 adult/300 m and presuming dormice are using all hedgerows in survey area)
M4/M48, Figure 4i	Broadleaved plantation	0.6 ha (southern island only)	**1 adult** (based on 1 adult.ha) – **3 adults** (based on 5 adults per hectare if considered optimal habitat)

B.8.10 It is expected that the hedgerow along Minnet's Lane would not be cleared to enable construction.

Off-site survey - Coed Mawr

B.8.11 By comparing the habitat maps produced by the Forestry Commission (now NRW) for Coed Mawr with results of the habitat mapping survey undertaken in 2016 (Figure 5), it is evident that changes have occurred over recent years as a result of conifer clearance.

B.8.12 The natural spread of dormouse populations is a relatively slow process (Chanin, 2014). Therefore, the distance between Coed Mawr and the closest woodland where dormice have been recorded (Figure 1b), as well as the relatively recent nature of changes to the woodland habitat (i.e. felling of sub-optimal conifer plantation), would explain why only one probable dormouse nest has been recorded in the southern-most section of the wood during the 2015-2016 surveys, in an area of young scrub regeneration following the relatively recent felling of conifer in the area.

B.8.13 It is considered that the recent timing of felling works in the wood, along with the distance between Coed Mawr and the nearby woodlands where dormice have been recorded in the past (Figure 1/1b) would explain why considerable number of dormice are not present in Coed Mawr – the natural spread of dormouse populations is typically a slow process (Chanin, 2014).

Winter 2016/2017 surveys

B.8.13 Monitoring of dormouse nest tubes would continue in 2017 so as to develop a greater understanding of the size and extent of the existing dormouse population and inform the NRW licence application.

B.8.14 In addition, taking into account results of the 2016 surveys, the 2017 dormouse nest tube survey area would be increased to cover the following areas:

- M4 embankments to the east and west of the Magor survey area, to confirm whether or not dormice have moved into the embankments. Results would inform the final mitigation strategy.
- M4 embankments between the toll/Caldicot Moor and the M4/M48 survey area (Areas H-L, Figure 4i) in order to determine presence and assess population size and habitat quality. Results would inform the mitigation strategy for the area;
- Hedgerows of high potential value to dormice that connect to the M4 and M48 embankments at the eastern end of the Scheme (Areas H-L, Figure 4i). Results would inform the location of the receptor sites for any dormice from the area.
- Areas of dense scrub to the north of the Tata Steelworks survey area (i.e. to the east of the main Tata Steelworks site and along the railway line to the north of the Steelworks site, Figures 3f/g). The aim would be to determine whether or not dormice are moving southwards towards the Scheme from this habitat and to assess the potential value of this habitat for dormice. Results would inform the receptor site for displaced dormice, or for dormice that may need to be relocated from the Scheme in this area to adjacent habitat.

B.8.15 As a precautionary approach, the following areas would also be included in the 2017 survey:

- Hedgerows of potential value to dormice connected to areas of dense scrub to the south and east of the Tata Steelworks survey area (Figures 3f/g), in order to determine whether or not individual dormice are moving into adjacent hedgerows.
- Fox Covert area of scrub and woodland (Area R, Figure 3b). Although the area is of limited extent and relatively fragmented from significant areas of scrub and woodland, and a nut search in 2015 reported no nuts that were opened by dormice, a nest tube survey has yet to be completed.
- Due to the limited survey coverage in previous years due to various issues including access and health and safety issues, areas of dense scrub and hedgerows of potential value to dormice around the Pye Corner survey area to the west of this (including to the north of Solutia Nature Park) would be surveyed (Figure 3d).

B.8.16 The habitat along the M4 and A48(M) embankments either side of the western end of the Scheme as well as some embankment habitat wither side of the M4 and M48 to at the eastern end of the Scheme is of potential value to dormice. Results of post-construction surveys for the M4 Widening scheme between Junctions 29 and 32 of the

M4 confirm the presence of dormice along this section of the embankments of the M4. Therefore, in order to inform an assessment of the impact on the remaining dormouse population of a translocation of dormice from the works areas in these locations (as described in section D.1 below), a nest tube survey of embankment scrub and woodland either side of the eastern and western ends of the Scheme would also be undertaken in 2017.

B.8.17 During the 2017 survey period, in all survey areas located within the Scheme boundary, nest boxes will also be installed so as to increase the survey effort and provide as much time as possible for dormice to locate the nest boxes that would later be used in any pre-construction trapping and translocation surveys (as described under *Translocation of dormice* below). Where possible, the aim would be to install nest boxes to a density of 30 boxes per hectare of suitable habitat.

B.8.18 All dormouse nest boxes to be used required under this mitigation strategy would be of standard specification as described in section 3.2.5 of the *Dormouse Conservation Handbook* (Bright *et al*., 2006).

Winter 2016/2017 Coed Mawr habitat mapping

B.8.19 Detailed habitat mapping and assessment would be undertaken in Coed Mawr in late 2016 and in 2017 following NRW felling works. The aim of the survey would be to assess the existing value of the woodland as a receptor site for dormice, and if favourable habitat is located, to determine the carrying capacity of the wood, and to identify habitat enhancement and management requirements for the benefit of dormice.

B.8.20 Results of the survey will inform the detailed habitat management plan for the wood that would form part of the NRW licence application to be agreed with NRW.

C Impact Assessment – Potential Impact of Proposed Works in the ***Absence*** of Mitigation/Compensation

C.1 Short-term impacts: disturbance

C.1.1 In the absence of mitigation, in areas where dormice have been recorded (Figure 4), individual animals would be at risk of injury or fatality due to pre-construction habitat clearance and construction works.

C.1.2 Construction works would result in the potential short-term disturbance of dormice in the immediately surrounding area as a result of noise and vibration during construction.

C.1.3 Temporary short-term disturbance of habitats of value to dormice would be expected as a result of run-off of pollutants and dust deposition during construction.

C.2 Long-term impacts: habitat modification

C.2.1 No habitat modification would result from the Scheme.

C.3 Long-term impacts: habitat loss

C.3.1 In order to construct the M4CaN scheme, hedgerows, scrub and woodland of known and potential value to dormice would be cleared, as listed in Table 5 above.

C.4 Long-term Impacts: Fragmentation and Isolation

C.4.1 Taking into account result of surveys as well as the nature and extent of the M4CaN scheme, in the absence of mitigation the new road would result in the fragmentation and isolation of dormice to the north and south of the new road.

C.4.2 Table 5 above summarises habitat loss at each of the locations where dormice have been recorded during the 2014 - 2016 surveys. The habitat losses would result in fragmentation of dormice within remaining habitats.

C.5 Post-development Impacts

C.5.1 The new section of motorway would result in habitat loss and fragmentation of populations as described above.

C.5.2 There would be some potential for injuries or fatalities of dormice on the new road; however, the new road would be expected to present a considerable barrier/deterrent to the movement of the majority of dormice and, therefore, it is considered that the potential impact would not be result in a significant ecological effect.

C.6 Predicted Scale of Impact

C.6.1 Taking into account the results of the 2014/2015 surveys, including the presence of an apparently strong population of dormouse in the New Park Farm/Castleton area (Figure 4a/b), and recognising the European protected status of hazel dormouse and its inclusion in the Newport Local Biodiversity Action Plan, the population of dormice in the area of the M4CaN Scheme is considered to be of county importance.

C.6.2 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.6.3 Taking into account the results of surveys to date, the extent of the working area and habitat loss and fragmentation, and the duration of construction (from July 2018 until late 2021), without mitigation the conservation status of the dormouse population in the area may be affected and the effect of this could be significant at the county level. Therefore, the following mitigation measures are proposed in order to prevent an adverse impact to the favourable conservation status of the dormouse population in the area.

D WORKS TO BE UNDERTAKEN

D.1 The mitigation measures described in this section include those that would be carried out under a hazel dormouse European Protected Species licence issued by NRW where necessary. All licenced works described in this section would be completed by or under the on-site supervision of an NRW dormouse licenced ecologist(s) who would be named on the NRW licence. Works would be undertaken in accordance with the NRW licence method statement.

D.2 Works would be undertaken in accordance with the biosecurity risk assessment and safe system of works. The document would be updated as necessary in response to changing baseline conditions. The document would be signed and adhered to by contractors and surveyors.

D.3 Measures to be undertaken for the benefit of dormice are summarised below.

- In order to help prevent injuries or fatalities during the clearance of small areas of habitat (as defined in this report) that are of value to dormice, measures would be undertaken in order to displace or encourage dormice to move to adjacent areas of retained favourable habitat.
- In order to help prevent injuries or fatalities during the clearance of larger areas of habitat of value to dormice, a trapping survey would be undertaken prior to clearance works and captured dormice would be translocated to an NRW approved receptor site, via a temporary captivity site.
- In order to mitigate the impact of habitat loss, replacement planting of scrub and woodland in areas where dormice have been recorded. Replacement planting would result in a long-term increase in habitat of value to dormice. Where practicable this would include early planting (i.e. during the construction phase).
- In order to help increase the carrying capacity of habitats in areas surrounding the Scheme, dormouse nest boxes would be installed in suitable habitat for use by any dormice that might be displaced into the areas, as well as to help attract dormice away from the works areas.
- Should an off-site translocation be undertaken, in order to enhance the habitat value of the permanent off-site receptor site (i.e. Coed Mawr), habitat management would be undertaken in accordance with a detailed NRW approved habitat management plan. Enhancement measures would include the installation of dormouse nest boxes.
- In order to help minimise the potential impact of population and habitat fragmentation across the Scheme, mammal crossings would be constructed along the new road embankment.
- Population and habitat monitoring would be undertaken throughout construction and post construction in order to inform the ongoing mitigation strategy and habitat management for the benefit of dormice.

D.4 Detailed methods relating to the Scheme are described below.

D.1 Site clearance methods

Displacement of dormice

Locations for displacement methodology

D.1.1 Guidance published in the *Dormouse Conservation Handbook* (Bright *et al*., 2006) states that displacement of dormice, rather than translocation, is appropriate where less than 100 m of hedgerow is to be affected and where no more than 10% of a parcel of woodland or woodland complex would be lost.

D.1.2 Guidelines published by English Nature (2001) suggest small habitat areas are "... *less than 50 square metres of high quality woodland, larger areas of low quality habitat and short lengths of hedge*".

D.1.3 Taking the above into account, as well as survey results and population size estimates (Table 5), a displacement methodology is considered to be the most appropriate mitigation strategy for the following areas.

- The construction of the temporary haul road across areas of potential value to dormice (i.e. this would relate to all habitat of potential value to dormice located within in survey areas where dormice have bene recorded – for survey boundaries see Figure 6). The haul road would be restricted to approximately 12 metres in width.
- The Magor survey area (for previous survey boundaries see Figure 6c) and immediately adjacent favourable habitat along adjacent stretches of the M4 embankment, due to the limited evidence of dormouse activity recorded in the survey area (Table 5) and retention of favourable hedgerows with good connectivity to other hedgerows and woodland in the surrounding area.
- Minnet's Lane (Figure 4i) due to the limited evidence of dormouse activity recorded in the area (Table 5), the fact habitat would largely remain intact with good connectivity to nearby hedgerows and woodland in the surrounding area.

Receptor site preparation

D.1.3 Prior to the commencement of displacement, dormouse nest boxes would be installed in favourable dormouse habitat in adjacent areas. Where practicable, in each displacement location at least 50 boxes would be installed in habitat adjacent to the Scheme. The purpose of the boxes would be to help increase the carrying capacity and value of adjacent habitat into which dormice would be displaced.

D.1.4 Installation of nest boxes outside the Scheme boundary would be on land owned by Welsh Government, SWTRA or NRW. This would include suitable areas of habitat along the M4, A48(M) and M48 embankments immediately adjacent to survey areas.

Vegetation clearance

D.1.5 All clearance of vegetation of value to dormice (as confirmed by the ECoW) would be overseen by an on-site ecologist named on the NRW dormouse licence.

D.1.6 Where the construction schedule requires, the clearance of small areas (as described below) of hedgerow, scrub or woodland located within survey areas where dormice have been recorded (Figure 4/Figure 6), would be undertaken in one stage between May and October/November(depending on local weather conditions) , with a

preference for May or after late September in order to avoid the potential to separate mothers and young.

D.1.7 In 2018, habitat clearance for the construction of the haul road would commence in July. However, on Welsh Government land, vegetation clearance could commence ahead of the start of construction and following the Inspector's Decision and receipt of an NRW dormouse licence, i.e. from May 2018.

D.1.8 Prior to the commencement of clearance of vegetation each day, a detailed visual inspection of the vegetation would be undertaken by an ecologist named on the NRW hazel dormouse licence, in order to determine presence/absence of dormice/dormouse nests.

D.1.9 Any dormouse nests identified during daily inspections or during the clearance works would be left *in situ* for at least two days and the dormouse licenced ecologist would monitor the nest throughout this period. It is expected that clearance activities would likely induce dormice to leave a nest, unless dependent young are present.

D.1.10 Where nests are found by the licenced ecologist to be empty for two consecutive days of clearance activity, they would be carefully carried in a dormouse nest box (as described under Section D.2.3 below) by the licenced ecologist to a suitable location in favourable habitat outside the works area, where they would not be affected by on-going works for re-use as necessary.

D.1.11 Should any dormice, including dependant young be found to be present, a similar approach to this would be undertaken, but additional care in siting the nest box with the nest in would be taken so as to ensure conditions at the new location are as similar as possible to those that the nest was discovered in. Particular care would be taken in mimicking the original aspect, shading and camouflage. Such a nest would be placed in a location sufficiently far to be unlikely to be unduly disturbed by the clearance works, but within approximately 100(-150) metres of its original location, so as to ensure that it remained within the existing home-range of the individual dormice involved.

D.1.12 Once nests have been relocated, or should no nest be located, vegetation clearance would commence (taking into account required *Measures to protect other species during habitat clearance* described below).

D.1.13 Works would be carried out by appropriately experienced contractors using hand-tools only and supervised by a dormouse licensed ecologist named on the NRW licence.

D.1.14 Clearance would be undertaken in phases (i.e. clearing no more than an approximately 5 metre wide strip of habitat in one area per day). Clearance would involve first coppicing vegetation to approximately 15 cm above-ground level. Coppicing would commence at the end furthest from the adjoining retained habitat of value to dormice, so as to help encourage any dormice disturbed in the process to move towards these retained habitat areas.

D.1.15 Once above-ground arisings have been removed from site or chipped on site and stacked for later removal, ecologists named on the NRW dormouse licence would hand search coppiced areas in order to locate any remaining dormice or dormouse nests. Any dormice or dormouse nests located would be transferred to a dormouse nest box and relocated in the box to a suitable secure location in an area of retained favourable scrub or woodland within 100 metres of the site of capture.

D.1.16 Coppiced vegetation would then be uprooted under using low ground pressure mini diggers with wide toothed buckets. An ecologist(s) named on the NRW dormouse licence would be present throughout in order to oversee works and capture and relocate any dormice that might still be present as described above.

Translocation of dormice

D.1.17 As above, all clearance of hedgerows, scrub and woodland in areas where dormice have been recorded would be overseen by an on-site ecologist named on the NRW licence, who would be present to ensure works were carried out in such a way as to help minimise the impact of clearance and in order to handle any dormice that could be disturbed by the works.

Locations and general approaches for translocation

D.1.18 Taking into account guidelines published by English Nature (2001) advising displacement for *small* habitat areas, and considering the amount of dormouse habitat to be cleared during construction (Table 5); the amount of dormouse activity recorded during the 2014 and 2015 surveys in the area; the presence of narrow corridors of favourable habitat on adjacent land where dormice are already present; and the time that it would take for even early planting in the area to become mature enough to support additional dormice, a translocation of dormice would be undertaken from the New Park Farm and Castleton areas (Figure 4a, 4b).

D.1.19 The translocation would be to a site of temporary captivity (as described under *Temporary captivity* below) in order to determine the number of dormice present and ratio of adult females:males. This information would in part determine the release strategy (as described under *Release of captive dormice* below).

D.1.20 In addition, so as to ensure dormice are not isolated from favourable habitat by the new road scheme, a translocation would be undertaken in the following areas prior to habitat clearance. The aim would be to immediately translocate captured dormice to favourable habitat adjacent to the Scheme which has good habitat connections to other areas of favourable habitat.

- Tata Steelworks land (Figures 4g/h): due to the risk that dormice may be displaced to the south of the new road and, therefore, could become separated from considerable areas of scrub and woodland and high value hedgerows to the north of the Scheme, including areas of woodland to the north of the main Tata Steelworks site, dormice would be captured from the Tata Steelworks land and immediately translocated to areas of favourable retained scrub and hedgerows on the Tata Steelworks land to the north of the construction site.
- Hedgerows of high potential value to dormice that connect to habitat of value to dormice in the Tata Steelworks area: as above, dormice would be captured and immediately translocated to areas of favourable habitat on the Tata Steelworks land to the north of the construction site.

D.1.21 Results of the 2017 survey of favourable habitat along the southern embankment of the M4 and between the M4 and M48 at the eastern end of the Scheme (Area H, Figure 4i) would inform the final strategy for this area, which would be included in the final *Hazel Dormouse Method Statement* for the NRW licence application. The strategy would be agreed in advance with NRW. Taking into account the isolated nature of habitat between the M4 and M48 at the eastern end of the Scheme (Area H, Figure 4i); the amount of habitat clearance required in the area; and the time it would take for

replacement woodland planting in the area to mature to favourable condition, it is considered that a translocation of dormice could be the best option for this population.

D.1.22 The translocation would be to a site of temporary captivity (as described under *Temporary captivity* below) in order to determine the number of dormice and ratio of adult females:males captured, which would in part determine the release strategy, as described below and under *Release of captive dormice*.

D.1.23 Should favourable habitat be available in the area surrounding the M4/M48 survey area (Area H, Figure 4i) (to be confirmed during 2017 and 2018 pre-construction surveys) animals could be relocated to these areas in nest boxes as soon as practicable after capture. However, should favourable habitat not be available and/or should the population be too large to relocate to adjacent habitat, the population would be translocated to an alternative NRW approved receptor site or bred in captivity (see *Temporary captivity* below) for later translocation to an off-site receptor site (e.g. an appropriate part of Coed Mawr) or to woodland planting proposed for the area (Figure 7), once confirmed to be in favourable condition.

Trapping of dormice prior to vegetation clearance

D.1.25 The clearance of vegetation in areas where a dormouse translocation is required (listed above), would not commence until the completion of a dormouse and translocation survey.

D.1.26 In order to increase the efficiency of a trapping survey, during the 2017 survey period, nest boxes would be installed in translocation areas in order to provide time for dormice to locate the nest boxes (as described in Section B.8.17). The aim would be to install boxes at a density of 30 per hectare. In addition, 30 nest tubes per hectare would be required in order to further increase the survey efficiency. Where necessary, additional and/or replacement nest boxes and/or nest tubes would be installed as soon as practicable in 2018 to achieve the desired density.

D.1.27 In addition, the installation in 2017 of nest boxes and tubes in survey areas adjacent to those to be cleared for construction would help to deter dormice away from the works site.

D.1.28 The installation of nest boxes and nest tubes outside the 2017 survey areas would be on areas owned by Welsh Government, SWTRA and NRW. This would include the M4, A48(M) and M48 embankments where translocations are proposed.

D.1.29 All dormouse nest boxes would be of standard specification as described in section 3.2.5 of the *Dormouse Conservation Handbook* (Bright *et al*., 2006).

D.1.30 Trapping surveys would be undertaken between May and November. The trapping survey prior to construction in 2018 would commence as soon as practicable after the granting of an NRW dormouse licence. Trapping would require grant of a licence. Trapping early in the active season, i.e. May 2018 (depending on local weather conditions), would be on land owned by Welsh Government, SWTRA or NRW, which would include road embankments and islands. Trapping elsewhere would commence in July 2018.

D.1.31 Throughout the trapping period, ecologists named on the NRW dormouse licence would inspect nest boxes and nest tubes in the trapping area twice daily. Any dormice located would be transferred in their nests to laboratory cages provided by the Bristol

Zoological Society. Each laboratory cage would be labelled with the following information:

- number of dormice;
- age group;
- male/female;
- apparent health;
- weight (adults);
- location of capture (site, nest box/tube reference number and GPS location);
- date of capture; and
- weather and temperature on date of capture.

D.1.32 The dormice would be carefully transported in their laboratory cages by road to Bristol Zoo's "Wild Space" temporary captivity site (as described under *Temporary captivity* below). The dormice would be transferred to the zoo during the day of capture, so as to minimise the period of disturbance. Laboratory cages would be stored in transit so as to prevent individual animals from causing harm to themselves or each other through the bars of a cage (i.e. care would be taken so as to ensure cages are stable and a barrier would be positioned between each cage to prevent animals from coming into contact with each other).

D.1.33 Any nest box or nest tube removed during the translocation, i.e. in order to transfer nests and dormice into laboratory cages, would be cleaned out and returned to the same location in the trapping area before the end of that trapping day. All nest boxes and tubes would be brushed clean following the removal of a dormouse nest and/or dormice and regularly so as to help encourage use.

D.1.34 Any nest boxes or tubes damaged during the trapping phase would be replaced as soon as practicable. A record of the location and date of replacement would be maintained by the ECoW.

D.1.35 Trapping would continue until no dormice captures are recorded in an area for a period of time agreed with NRW. Nest box usage typically declines during June and July; therefore, this would be taken into account when determining the completion of a trapping survey. It is considered that the early installation of nest boxes and nest tubes in 2017 and the density of nest boxes (30 per hectare) and nest tubes (30 per hectare) would ensure an efficient capture rate; however, capture rates would be monitored throughout the trapping period and should it be considered necessary to ensure the completion of the trapping survey in time for the commencement of vegetation clearance, additional nest boxes and tubes would be installed.

D.1.36 Habitat clearance in the area would not commence until the ECoW has confirmed to the contractor that NRW has provided approval for the completion of a trapping survey.

D.1.37 Should it not be possible to complete a trapping exercise prior to November 2018, construction works in the area would be delayed until the following April(May) (depending on the weather).

Clearance of vegetation

D.1.38 Due to the presence of dormice in habitat immediately surrounding the Scheme in the New Park Farm and Castleton areas, a 5 metre wide strip of vegetation within the Scheme boundary that connects to favourable habitat outside the Scheme boundary, would be coppiced over a phased period in order to help deter dormice from moving into the trapping area.

D.1.39 As described above, prior to coppicing the 5 metre wide strip of boundary vegetation, an ecologist(s) named on the NRW dormouse licence would visually check the vegetation for dormouse nests and should no nests be located, vegetation would be coppiced over a phased time scale. Areas no greater than 5 metres^2 each day would be coppiced to approximately 15 cm above ground. At the start of the coppicing period, each coppiced area would be separated from another coppiced area by distance of 5 metres. Gaps would then be coppiced during subsequent days of coppicing. The ecologist would supervise the works in order to capture any dormice disturbed by the works.

D.1.40 By coppicing in phases, any dormice that could be present would have time to relocate ahead of the works. The installation of nest boxes in adjacent areas during the 2017 survey period and prior to the commencement of works in 2018 would help to increase the carrying capacity of surrounding habitat.

D.1.41 The contractor would not commence the clearance of remaining areas of vegetation in translocation sites until the ECoW has confirmed that sufficient trapping effort has been completed with agreement from NRW, and that NRW approval to commence vegetation clearance has been received.

D.1.42 Where practicable, clearance of larger areas of vegetation would be undertaken over two phases after the completion of the trapping survey. The two phase process would involve coppicing vegetation during the winter (November – March, to avoid the bird nesting season) and uprooting of coppiced plants after the end of the dormouse hibernation period in April/May depending on local weather conditions. By leaving the coppiced area undisturbed, any dormice that may still be present would have the opportunity to relocate to adjacent retained habitat after the hibernation period and prior to uprooting and final clearance works.

D.1.43 However, due to the construction schedule, which requires habitat clearance and construction to commence in July 2018 and works to be completed within approximately 42 months, it is expected that the above two phase methodology would not be practicable in most areas. It is expected that the haul road would need to be constructed from July 2018 and main construction would commence in late 2018. Therefore, coppicing and uprooting would need to be undertaken immediately after the completion of the trapping and translocation and prior to the commencement of the dormouse hibernation period (November/December, depending on local weather conditions) in 2018.

D.1.44 Vegetation clearance would be undertaken between May and November (depending on local weather conditions) in order to prevent disturbance to hibernating dormice. Both methods of vegetation clearance, following the trapping survey, would be undertaken as described below.

D.1.45 Vegetation clearance would commence with coppicing by hand, e.g. using brushcutters or chainsaws. Coppicing would be to approximately 15 cm above ground-level, so as to

minimise the potential to harm dormice or other species that might be present. Coppicing would be undertaken from the centre of the clearance area out towards adjacent areas of retained favourable habitat so as to enable dormice to relocate ahead of the works to areas of favourable habitat.

D.1.46 Should a dormouse be disturbed during the clearance works, the on-site ecologist named on the NRW licence would capture the dormouse for transfer to temporary captivity.

D.1.47 Following coppicing, ecologists would hand search areas in order to locate any remaining dormice or dormouse nests. Should any dormouse nests be located by the ecologist prior to the coppicing of an area, the nest would be relocated to adjacent retained favourable habitat in a dormouse nest box as described above.

D.1.48 Once coppicing has been completed, plants would be uprooted prior to the commencement of the dormouse hibernation season (i.e. prior to the end of November, depending on local weather conditions). Uprooting would be carried out under the guidance and on-site supervision of the NRW licenced ecologist who would be present in order to capture and relocate any dormice that could be disturbed by the works.

D.1.49 Uprooting works would be undertaken in the same direction as the coppicing works so as to enable any remaining dormice to relocate ahead of the works to surrounding favourable habitat.

D.1.50 Arisings, timber and root balls would be carefully removed from site. Removal works would be undertaken sensitively as described below in order to minimise the likelihood for injury to animals and damage to soils:

- material would be lifted by hand or machine (e.g. long-reach mechanical grab) out of clearance areas;
- haul routes/drag lines would be limited in number and size as far as is practicable; and/or
- directional felling.

D.1.51 Arising timber and root balls would be dealt with at a suitable processing site in accordance with latest best practice guidance with biosecurity advice. Where practicable, uprooted coppiced stumps would be translocated to areas of early planting or Coed Mawr where appropriate for early establishment of new habitat, as described under Section D,2 below.

Measures to protect other species during habitat clearance

Breeding birds

D.1.52 Where vegetation of potential value to nesting birds is to be cleared during the bird breeding season (mid-February/March – August inclusive), immediately prior to clearance an ecologist should check the vegetation for nesting birds. Should it not be possible to confirm presence/absence of active bird nests through a visual inspection of the habitat (e.g. should the vegetation be too dense), the vegetation would be surveyed from a distance over a period of at least two hours during the late afternoon/early evening or early morning prior to each day of clearance in order to identify any potential nesting behaviour from returning birds, such as birds returning to site carrying nesting material or food.

D.1.53 Should an active nest be located, the ecologist would instruct the contractors on site as to the measures required to prevent damage to the nest until the ecologist has confirmed any young have fully fledged and left the nest. No habitat containing an active nest would be removed.

D.1.54 All arisings would be removed from site and processed in accordance with best practice guidelines and latest biosecurity advice, as soon as practicable during the bird breeding season in order to prevent breeding birds from nesting in piles of cut or chipped vegetation.

Bats

D.1.55 Should any trees that need to be felled be covered by the Scheme's NRW bat roost licence, clearance works would be undertaken in accordance with the requirements of the NRW bat licence, which is likely to include the requirement to soft fell under a licenced watching brief between late March/April and/or October (depending on local weather conditions).

D.1.56 In addition, the ECoW would assess the potential value to roosting bats of any semi-mature to mature trees that would require felling and uprooting. The ECoW would advise the contractor as to whether further survey work would be required in order to confirm the presence/absence of bat roosts and should this be necessary, the survey work would be undertaken prior to the commencement of felling and uprooting. Should a roost be located, felling works would be undertaken in accordance with the requirements of the NRW bat licence.

Great crested newts

D.1.57 Works within all areas covered by the Scheme's NRW great crested newt licence (GCN) would be undertaken in accordance with the requirements of the licence.

D.1.58 Works in GCN licenced areas would also be supervised by ecologists named on the NRW GCN licence where advised necessary by the ECoW and/or licenced ecologist so as to ensure GCN licence requirements are met.

Reptiles

D.1.59 Wood chip piles would be removed as soon as practicable so as to ensure reptiles do not utilise them for egg laying or as hibernation sites.

Temporary captivity

Paignton Zoo and PTES

D.1.61 On behalf of Welsh Government, on the 1 February 2016 RPS contacted Neil Bemment, Co-ordinator of the dormouse captive breeding programme at Paignton Zoo that supports the Natural England Dormouse Reintroduction Programme. Consultation is ongoing with Neil Bemment with regard to the provision of technical advice and expertise for any temporary captivity programme that may be required, as well as the potential to provide temporary holding sites for captive dormice.

D.1.62 In addition, RPS are communicating with the People's Trust for Endangered Species (PTES), who are also involved in managing and undertaking the Natural England's Dormouse Reintroduction Programme, in order to further inform the detailed method statement for any potential programme of temporary captivity.

D.1.63 It is expected that information provided by Paignton Zoo and the PTES would be incorporated into the detailed method statement for the temporary captivity.

Bristol Zoo

D.1.64 On behalf of Welsh Government, RPS met with Bristol Zoo on the 12 September 2016, in order to discuss the potential for Bristol Zoo to assist the Scheme with a temporary captivity programme, should it be required.

D.1.65 Bristol Zoo, which holds a holds a BALAI Approval licence, is particularly suited to a temporary captive programme due to:

- its history of involvement in successful captive breeding programmes, including captive breeding of species native to the UK;
- its relative proximity to the Scheme, enabling any transfer from site to the zoo to be completed during the day of capture;
- the facilities and resources available at the zoo. The proposed site for temporary captivity would be the zoo's "Wild Space", which is located to the north of Bristol and therefore, is more readily accessible from the M4. The site is an area of farmland with ample "undeveloped" woodland in which a population of captive dormice could be housed in temporary holding areas away from visitors. In addition, Bristol Zoo has a team of on-site veterinarians who would be available to monitor the health of dormice whilst held in captivity.

D.1.66 During the meeting on the 12 September 2016, Bristol Zoo confirmed their ability to assist the Scheme during the meeting. Consultation with the zoo is ongoing in order to develop a detailed method statement, which would be included in the final *Hazel Dormouse Mitigation Strategy* and NRW licence application.

Bristol Zoo - health screening

D.1.68 On arrival, dormice would be held in quarantine for a minimum period of 30 days. would require a dedicated building with strict biosecurity procedures set in place. Animals would be housed in their captured groups, or individually within laboratory cages provided by Bristol Zoological Society.

D.1.69 Bristol Zoo's "Wild Space" has a team of on-site veterinarians who would be available to monitor the health of dormice whilst held in captivity.

D.1.70 Should dormice be retained in captivity for captive breeding until later return to receptor sites, a health check would be undertaken in accordance with the Natural England Dormouse Reintroduction Programme, so as to ensure any population relocated to the receptor site is in good health.

D.1.71 Basic veterinary checks would include the following as considered necessary.

- X-rays
- Blood tests
- Faecal samples
- Six monthly health checks

D.1.72 In addition, all dormice would be internally chipped with Passive Integrated Transponders (PIT) tags for later monitoring.

Bristol Zoo – captive breeding

D.1.73 Animals held in temporary captivity would be cared for in accordance with a detailed captive breeding method statement, which would be agreed in advance with NRW and Natural England. The method statement would be submitted to NRW in support of the NRW dormouse licence application. The method statement would be development in consultation with NRW, Bristol Zoo, Paignton Zoo and PTES and would take into account IUCN guidelines and the requirements of the Natural England Dormouse Reintroduction Programme.

D.1.74 Dormice from the M4CaN Scheme would not be mixed with other populations of dormice in captivity, so as to protect the local genetic provenance. In particular, dormice would not be bred with English origin dormice. If necessary, in order to minimise the potential for genetic inbreeding and ensure a sufficiently large and robust population for translocation to a receptor site(s), dormice captured from more than one location along the Scheme may be bred together in accordance with the detailed captive breeding method statement.

Bristol Zoo - captive enclosures

D.1.75 Dormice would be transferred from site directly into purpose built enclosures at Bristol Zoo's "Wild Space". Two types of enclosures would be provided where necessary:

- For holding individual males, groups of adult females and groups of juveniles long-term enclosures would be a minimum of 1 metre x 1 metre x 1 metre and would have roof protection from the weather.
- For holding breeding groups together as the dormice may be held relatively long-term and therefore will need to breed during that time to ensure that a healthy, recruiting population can be added to the new site, enclosures would be 3 metres x 2 metres x 1 metre with roof protection.

D.1.76 Fencing would be constructed around the area of woodland where enclosures would be constructed, so as to prevent human interference and unnecessary disturbance.

D.1.77 Dormice would be kept at Bristol Zoo under a Natural England hazel dormouse licence. Keepers responsible for overseeing daily care and breeding in the zoo would be approved under the Natural England licence.

D.1.78 Animals held in temporary captivity would be cared for in accordance with the captive breeding method statement.

Release of captive dormice

D.1.79 Works described below relating to the release of dormice would be undertaken by ecologists named on the NRW dormouse licence.

D.1.80 The release of dormice would be undertaken in accordance with the NRW approved captive breeding method statement, which would form part of the NRW dormouse licence application.

D.1.81 With regard to translocations, Bright *et al*. (2006) suggest that a population comprising less than 20 adults would be too small to be considered a viable independent population and, therefore, would not be suitable for a translocation. Chanin (2014) suggests the ideal minimum to reduce the risk of adversely depleting genetic diversity would be 30 individuals with a good ratio of adult females:male.

D.1.82 Taking the above into account, in order to ensure the captured population from the New Park and Castleton areas (Figure 4a/b) is of a suitable size to translocate as an independent population, individuals caught would be temporarily transferred to an NRW approved captive breeding site (i.e. Bristol Zoo's "Wild Space") until the capture process has been completed and the total captive population can be assessed.

D.1.83 Should five or less dormice, dormice pairs, or groups of mother and young be trapped from the trapping sites to north of the M4 , between the M4 and A48(M), or to the south of the M4 in the New Park Farm and Castleton areas, these dormice would be returned to adjoining areas of motorway embankment scrub or woodland. Animals would be placed into dormouse nest boxes that would be installed in favourable locations in adjacent receptor areas. The installation of dormouse nest boxes in the area would help to increase the carrying capacity and value of the receptor habitat (as described under Section D.2.3 below). Due to the significance of the existing M4 as a barrier to the movement of dormice, this would mean five or less individuals/groups captured from the area to the north of the existing M4, and the same number captured from the area to the south of the M4.

D.1.84 However, should more than five but less than 20 dormice be captured during the trapping survey in the Castleton and New Park Farm areas, an assessment of numbers of animals captured and ratio of females:males and adults:young, would be made with regard to whether or not this captured population could put too great a pressure on surrounding habitat to be returned to these areas. In agreement with NRW, if it is considered that the population could put too great a demand on resources available in adjacent habitat, the population would be retained in temporary captivity (i.e. Bristol Zoo's "Wild Space") for captive breeding. Captive breeding would aim to achieve a population of a suitable size and ratio of adult females:males to survive as an independent population at an alternative receptor site (i.e. Coed Mawr or new woodland planting along the Scheme, Figure 7).

D.1.85 Should a dormouse population of over 20 adults be captured from the Castleton and New Park areas, with a good proportion (e.g. at least a half) of these being females of breeding age and in good condition, a translocation to a favourable off-site receptor site could be undertaken. However, in order to help maximise chances of success, dormice could be held in captivity for a longer period in order to breed the population up to a size of at least approximately 40-50 individuals with an appropriate ratio of adult females:males. This would ensure there would be an appropriate number of animals to survive as an individual population and an group of animals that could be retained in the captive breeding programme for later 'topping up' of the translocated population, should this be considered necessary to ensure its success, or to return to the Scheme once woodland planting has matured to favourable condition.

D.1.86 The final approach to release of captive bred dormice would in part be informed by the results of dormice population and habitat monitoring surveys of receptor sites, areas of early planting, and favourable habitat adjacent to the Scheme (as described in section D.3 below). Should monitoring indicate that dormice numbers in areas immediately adjacent to the Scheme are declining, it may be considered necessary for captive dormice to be relocated to these adjacent habitat areas or to be bred in captivity until they could be returned to areas of woodland planting close to where they were captured (Figure 7), once it can be confirmed that planting has reached favourable condition, in order to top up the local population.

D.1.87 Any dormouse showing signs of ill health or young weighing less than 15 g in late October would be not be released into a receptor site, instead they would be retained

in captivity until in good condition, with regard to underweight young they would be held in captivity until at least the following May when they would then be released at the receptor site once they have achieved favourable weight.

Timing of release

D.1.88 So as to enable young to fatten before the winter, captured dormice would be released into cages during the active season, i.e. between April (depending on the weather) and early July. Animals would be kept in pre-release cages for at least 10 days to become accustomed to their new surroundings before then being released into the receptor site.

D.1.89 Releases would be made during fine weather (i.e. avoiding cold or wet weather conditions when dormice activity becomes reduced/dormice can enter torpor).

Method of release

D.1.90 Bright *el al*. (2006) advises that the majority of dormice released directly into receptor sites tend to disperse and/or starve to death within a few days. Therefore, captured dormice would first be held in pre-release cages at the receptor site so as to provide time for them to become accustomed to the site before release.

D.1.91 Pre-release cages would be made from welded mesh attached to a suitable tree or shrub, such as a mature hazel on site. Three nest boxes and plenty of fresh branches, such as hazel branches, would be put in each cage.

D.1.92 Each pre-release cage will house the following:

- a male and female established pair;
- one male and two females;
- a single dormouse; or
- a mother and young.

D.1.93 Release cages containing adult males would be located at least 100 metres apart and cages containing females only would be located between cages with lone males.

D.1.94 Fresh food would be provided to the dormice on a daily basis for a period of at least two weeks. Food would include food resourced from the receptor site, including hazel nuts if available, as well as wax worms, fresh fruit (e.g. apple), biscuits, peanuts and sunflower seeds. After two weeks, and once the natural fruit and nut crop is ripe (e.g. late August) the artificial food supply would be slowly withdrawn. If food is not eaten, the cage would be opened and the health of the animals checked.

D.1.95 A small opening would be made in each cage roof (about 3 cm and no greater than 5cm to exclude squirrels and birds) in order permit dormice to leave the cages and return should they wish.

D.1.96 By late August, when the animals would be expected to be independent, the cages would be removed from site and nest boxes would be left *in situ*.

D.2 Dormice habitat

D.2.1 In-situ retention of habitat

D.2.1.1 No habitat of value to dormice would be retained on the construction site.

D.2.2 Modification of existing habitat

Coed Mawr - potential receptor site for translocated dormice

D.2.2.1 Should Coed Mawr be confirmed as a suitable dormouse receptor site, measures to enhance the woodland would be undertaken for the benefit of dormice in advance of any translocation to the wood. These habitat enhancement measures would be detailed in the *Hazel Dormouse Method Statement* that would be submitted to NRW in support of the NRW dormouse licence application. The measures of enhancement would be developed in full in consultation with NRW – Forestry and would be informed by detailed habitat mapping prior to and post NRW felling over the winter 2016/2017. Measures would include those listed below:

- Clear felling of low value stands of larch across the woodland. NRW objectives for the woodland include the clear felling of approximately 40% of the woodland over the next five years. This would include felling 28 hectares of larch planting during the winter 2016/2017 and 19.3 hectares of young larch planting during the following five years.
- Felling in order to create wide rides to open up the canopy and encourage the development of more robust understorey scrub cover.
- Thinning of select standards in order to open up the canopy and allow more light through to the understorey, thereby encouraging the development of more robust understorey scrub cover.
- Selective thinning of Western Hemlock, which is typically a pioneering species that can tolerate shade and spread prolifically, and once established can cast dense shade across a wood.
- Rotational coppicing of understorey scrub in order to improve structure and productivity, which would include reinstatement of a hazel coppice rotation with the aim of creating connecting parcels of hazel across the woodland that produce a good crop of hazel nuts each year.
- Rotational coppicing of scrub around the boundaries of woodland parcels and either side of woodland rides in order to develop wide thick edge habitats with good structural diversity, productivity and ground cover .
- Planting of understorey and edge scrub where necessary to introduce and develop a good scrub habitat of value to dormice. Planting may be undertaken in clear fell areas in order to introduce a greater diversity of species of value to dormice amongst naturally regenerating scrub. Planting would also help to minimise the dominance of more prolific early establishing species such as silver birch, and would help to ensure habitat of value to dormice is available as soon as practicable.
- Where necessary, management of naturally regenerating scrub in areas of clear fell – e.g. management of silver birch seedlings where they begin to dominate.

D.2.3 New habitat creation

Hazel dormouse nest boxes

D.2.3.1 As reported by Bright *et al*. (2006), dormouse nest boxes can potentially double the carrying capacity of an area if other conditions including food availability are favourable. Therefore, in order to enhance receptor sites for displaced and translocated

dormice, and to help encourage dormice to nest in areas away from the works site, as early as practicable and prior to habitat clearance works (described above), dormouse nest boxes would be installed in areas of favourable habitat immediately adjacent to the Scheme.

D.2.3.2 Nest box installation in areas outside the Scheme boundary would on land owned by the Welsh Government/SWTRA and/or NRW, which would include road embankments either side of the M4, A48(M) and M48 where dormice have been recorded to date. Where possible, nest boxes would be installed at a density of at least 50 nest boxes per habitat area (i.e. with regard to road embankments, one habitat area would be an area of favourable habitat separated from another area of favourable habitat by a main road).

D.2.3.3 Should Coed Mawr be confirmed as a suitable receptor site for translcoated dormice, up to 100 nest tubes would be installed in each favourable habitat parcel throughout the wood. GPS locations of each nest box would be recorded and mapped for inclusion in the long-term management plan for Coed Mawr, which would form part of the Hazel Dormouse Method Statement supporting the NRW licence application.

D.2.3.4 Nest boxes would also be installed in translocation cages, as described under *Temporary captivity above*.

D.2.3.5 All dormouse nest boxes to be used would be of standard specification as described in section 3.2.5 of the *Dormouse Conservation Handbook* (Bright *et al*., 2006).

Landscaping

D.2.3.6 Landscape proposals for the Scheme are detailed in the Environment Master Plan (EMP) (Appendix 2.3 of the ES) and revised *EMP* (Figure R2.6 of the ES Supplement [Document 2.4.4]). Planting proposals for areas located adjacent or close to those sites where dormice were recorded during 2014-2016 surveys are shown on Figure 7. The planting would create substantial woodland parcels connected to surrounding areas of scrub or woodland and hedgerows. Therefore, dormice in the surrounding areas would be able to move into planting areas as they mature.

D.2.3.7 Planting mixes would comprise native species typical of the area and species of value to dormice. Suitable native species of potential value to dormice and typical of the area include: hazel, hawthorn, honeysuckle, holly, blackthorn, dog rose and field rose. English/sessile oak, guelder rose, wayfaring tree, wild cherry, wild service tree should also be considered. Native trees (e.g. English/sessile oad, wayfaring tree and wild service tree) would also be planted scattered along the hedgerows.

D.2.3.8 Where practicable (i.e. where it is possible to translocate plants immediately after uprooting to clear an area for construction), planting mixes would include uprooted scrub and trees taken from the Scheme, in order to help provide mature habitat of value to dormice as soon as possible.

D.2.3.9 Planting mixes would be listed in the *Environmental, Landscape and Ecology Aftercare Plan (ELEAP)* (which would be included in the commitments register for the Scheme) and NRW dormouse licence application. The management plan would include measures for the benefit of dormice.

Planting schedule

D.2.3.10 Where practicable and where on-going construction would not present a risk to plants, hedgerow and scrub planting would be undertaken during the construction phase. Elsewhere, planting would be undertaken as soon as practicable after the completion of construction in an area.

D.2.3.11 It is expected that early planting (i.e. planting during the construction phase) would include planting in areas to the north of the borrow pits at the western end of the Scheme (to the north of Castleton and the existing M4). Due to the amount of habitat to be cleared in the area and the linear nature of the habitat, early planting would be undertaken in this area so as to provide replacement habitat as early as practicable and to provide replacement corridors for the movement of dormice between areas of scrub and woodland along adjacent road embankments and hedgerows on adjacent farmland.

D.2.3.12 In addition, early planting could include woodland planting to the west of the existing M4 shown on Figure 7c.

D.2.3.13 Where practicable, i.e. where land for planting is available at the time of vegetation clearance, early planting would include the planting of translocated coppiced scrub and trees, which would be uprooted with their root balls from nearby clearance areas (i.e. areas along the motorway embankments and Berryhill farm). Nearby sites would be selected so as to make transport of the plants more practicable. Coppiced plants would be translocated and planted as soon as practicable after uprooting.

D.2.3.14 As necessary, early planting would be protected from potential damage during construction with construction fencing (e.g. Heras fencing).

D.2.3.15 In addition, enhancement planting and management of Coed Mawr could commence in 2017 in accordance with an NRW approved management plan. Where practicable planting in the wood could also include uprooted scrub taken from the Scheme.

Access to new habitat

D.2.3.16 In order to minimise the potential impact of habitat severance of the new road and to enable potential interactions between populations either side of the new road, thereby helping to reduce potential adverse genetic impacts of population severance, dry mammal culverts would be constructed along the M4CaN route as potential safe crossing points for dormice, as well as other species. The locations of mammal crossings are shown on Figure 7.

D.2.4 Habitat losses and gains

D.2.4.1 Habitat loss calculations below include all habitat to be cleared from each survey area where dormice have been recorded (as shown on Figure 6), rather than restricting measurements to just those hedgerows or sections of scrub or woodland where dormice have been recorded. The purpose of this would be to ensure habitat of known and potential value to dormice in each area is considered in the calculations.

D.2.4.2 Planting proposals include 46.35 hectares of woodland planting to the north and south of the existing M4 around the New Park, Castleton and Berryhill Farm areas (Figure 7a). This would replace 14.14 hectares of scrub and woodland of value in the New Park Farm and Castleton areas (Table 5, Figure 6a). Therefore, a long-term increase of

32.21 hectares of habitat of potential value to dormice in the area would be expected (an increase of 327.80%).

D.2.4.3 With regard to the areas of known dormouse habitat associated with the M4 and M48(M) around Castleton and New Park Farm areas (Figures 6a and 7a), planting would comprise:

- 10.42 hectares to the north of the existing M4 to replace 8.5 hectares of scrub/woodland
- 5.89 hectares between the M4 and the A48(M) to replace 2.6 hectares of scrub/woodland
- 3.90 hectares to the south of the A48(M) to replace 3.32 hectares of scrub/woodland

D.2.4.4 Berryhill Farm planting would include 8.12 hectares to the west of the new road and 18.02 hectares to the east of the new road.

D.2.4.5 In addition, planting proposals would include:

- 2.27 hectares of woodland planting in the eastern half of the Tata Steelworks land (Figure 7b). This would be in place of 3.54 hectares of scrub and 0.24 hectares of woodland of value to dormice in the eastern half of the Tata Steelworks survey area (Figure 6b).
- 13.35 hectares of woodland planting at the eastern end of the Scheme (Figure 7c). This would replace the 1.96 hectares of scrub and woodland and 1,502 metres of hedgerow around the Magor survey area and approximately 6.25 hectares of scrub/woodland along the M4/M48 islands and road embankments to the south of the M48 (Figure 6c/d), including the 0.6 hectares of scrub on the M4 island where a dormouse nest was recorded in 2016.

D.2.4.6 Therefore, landscape proposals would result in a long-term increase in habitat of potential value to dormice in the immediately surrounding areas.

D.2.4.7 To note: proposals include 4.1 km of hedgerow planting. This would replace over 35.8 km of hedgerows of which 27.6 km are species-poor and/or defunct. Additional hedgerow planting is not included in proposals due to the fact that NRW considers hedgerow planting to be inappropriate to the Gwent Levels SSSI, due to landscape requirements and the potential for hedgerows to over-shade watercourses and, therefore, adversely affect aquatic macrophytes and invertebrates, the important features of the SSSIs.

D.2.5 Scaled maps/drawings

D.2.5.1 The following plans/drawings are included with this Draft Mitigation Strategy:

- Figure 1: Desk Study
- Figure 2, Survey Areas
- Figure 3: Coed Mawr Survey Areas
- Figure 4: Survey Results
- Figure 5: Coed Mawr Habitat Map
- Figure 6: Habitat Loss

- Figure 7: Long-term Mitigation

D.3 Mechanisms for ensuring delivery of mitigation and compensation measures

Commitments register

D.3.1 The commitments register for the M4CaN Scheme includes the requirement for a Hazel Dormouse Mitigation Strategy and NRW hazel dormouse licence for all licensable works.

Responsibilities

D.3.2 The contractor would be responsible for ensuring the commissioning of:

- an appropriately qualified and experienced ECoW to manage and co-ordinate ecology works during the pre-construction and construction phases; and
- ecologists named on the NRW hazel dormouse licence in order to oversee and/or undertake works as described in the NRW licence and associated method statement.

D.3.3 The Welsh Government would be responsible for the commissioning of an appropriately experienced ecologist to carry out an independent compliance audit of works to be carried out under the NRW hazel dormouse (see *Independent compliance audit* below).

D.3.4 The contractor would be responsible for ensuring the establishment of planting during the five year post-construction after care period.

D.3.5 Post-development works described in this draft mitigation strategy would be instructed and/or supervised as necessary by an ecologist named on the NRW hazel dormouse licence and reported on by the ECoW or principal licenced ecologist.

D.3.6 The Welsh Government through SWTRA would be responsible for ensuring post-development management of habitats within the operational boundaries of the new road and on land obtained for mitigation. is undertaken by appropriately qualified and experienced professionals in accordance with the NRW licence method statemen, the *Environmental, Landscape and Ecology Aftercare Plan* (*ELEAP)* and any Handover Management Plan.

D.3.7 With regard to Coed Mawr, the Welsh Government would be responsible for ensuring that a detailed habitat management plan is pre-approved by NRW and measures detailed in the plan are undertaken by NRW Forestry Officers or NRW approved contractors.

Monitoring

D.3.8 Population and habitat monitoring would be undertaken as described in Section E.2.

D.3.9 Should habitat management measures recommended by the monitoring ecologist as a result of results of monitoring surveys be significantly different to those described in the final licence method statement, NRW would be consulted and their agreement sought prior to undertaking them.

Independent ecological compliance audit

D.3.10 The compliance auditing ecologist would undertake auditing site visits as considered necessary to monitor compliance with the final method statement. The content of the audit would be agreed with NRW in advance of the commencement of licenced works.

D.3.11 Auditing site visits would be carried out unannounced or at short notice where notice is required e.g. for health and safety reasons.

D.3.12 The compliance auditing ecologist would report the findings of the audit to the Welsh Government, the contractor and NRW. Reports would be provided on a fortnightly basis, or as otherwise requested or required, and within 24 hours of any potential major non-compliance.

Reporting

D.3.13 A daily record of all works undertaken as described in the final method statement would be maintained by the on-site ecologist(s) named on the NRW licence and these records would be collated by the principal licenced ecologist and included in the site diary (daily record of works carried out on site).

D.3.14 Regular progress updates would be provided by the ECoW to the contractor, Welsh Government and NRW. Regular meetings would be held between the contractor and NRW throughout the pre-construction and construction phases, or as otherwise requested by NRW. The ECoW (and principal ecologist named on the NRW licence where applicable) would be available to attend these meetings as required or requested. Works undertaken as part of the requirements of the final method statement could be discussed at these meetings.

D.3.15 The ECoW would be responsible for ensuring an end of works report for areas covered by the final method statement and NRW licence is completed and submitted to NRW.

D.3.16 Licenced ecologists would report the results of their works to NRW as required under their personal species licences

D.3.17 Results of population and habitat monitoring surveys would inform ongoing habitat management requirements, which would be reported by the ECoW or surveying ecologist to the Welsh Government, the contractor and to NRW.

D.3.18 It is envisaged that a review of habitat management requirements would be confirmed on an annual basis during the 5 year establishment period, after which management requirements for land managed by Welsh Government though SWTRA could be confirmed on a two year rotation, or should adverse factors such as invasive species be recorded, annual management review would be reinstated until adverse factors have been removed or are no longer a significant concern.

D.3.19 Should any results of monitoring surveys and habitat management reviews result in the requirement for significant amendments to the management plans, approval would be sought from NRW prior to commencement.

D.4 Mitigation contingencies

D.4.1 A series of measures would be implemented in order to help minimise the potential for unforeseen or unintentional events that do not adhere to the requirements of the final method statement. These measures would include:

- Site inductions, toolbox talks and site instructions to include the requirements of the NRW hazel dormouse licence and associated method statement (that would be based on this Draft Method Statement).
- Supervision and instruction of ecology works described in the final method statement to be provided by licenced ecologists named on the NRW hazel dormouse licence.
- All ecologist(s) named on the licence and contractor would be responsible for adhering to the requirements of the final method statement and NRW licence.
- If additional or alternative dormouse licenced ecologists are required, a change of ecologist form (available at: http://naturalresourceswales.gov.uk/apply-buy-report/apply-buy-grid/protected-species-licensing/european-protected-species-licensing/dormouse-licensing/?lang=en) would be submitted to NRW as required.
- Pre-construction surveys of dormice populations and receptor site habitats.
- Enhancement of receptor site habitats in order to improve the favourability and/or carrying capacity of receptor sites, including the installation of nest boxes. To be informed by results of pre-works surveys.
- Habitat clearance under an ecological supervision.
- Displacement of dormice where practicable and translocation to temporary captive breeding sites and/or nearby favourable (pre-prepared) habitat where necessary.
- Captive breeding of dormice until receptor sites are in favourable condition as necessary.
- Pre-release health risk assessments and screening for translocated dormice.
- Phased translocations to ensure dormice are fit and accustomed to their receptor site prior to full release.
- Post displacement and translocation dormouse population and habitat monitoring.
- A detailed management plan for Coed Mawr.
- A landscape management plan for the long-term management of planting along the Scheme.
- An independent ecological compliance audit to be completed and reported on regularly.
- A flexible final method statement so as to enable amendments to be made in agreement with NRW e.g. should baseline conditions change or mitigation strategies not prove effective. Results of monitoring and auditing surveys would inform any amendments required to be made to the method statement.

D.5.1 Works would be undertaken in accordance with the Scheme's biosecurity risk assessment and safe system of works, which would be agreed with NRW in advance.

E POST-DEVELOPMENT SITE SAFEGUARD

E.1 Habitat/site management and maintenance

Measures to ensure compliance

E.1.1 The final method statement would include post-development habitat management measures described in this draft mitigation strategy.

E.1.2 The Welsh Government and contractor would be responsible for ensuring no works described in the final *Hazel Dormouse Method Statement* would be undertaken until an NRW licence is obtained.

E.1.3 The Welsh Government and contractor would be responsible for commissioning the appropriately qualified and experienced dormouse licenced ecologist(s) to undertake post-development works as detailed in the NRW licence and associated method statement.

E.1.4 Where stated in the licence method statement, post-development habitat management would be advised and/or supervised by an ecologist named on the NRW dormouse licence.

E.1.5 All contractors would be informed of the content of the NRW dormouse licence when undertaking post-development works.

E.1.6 Responsibilities for site management and maintenance are detailed under section D.3 above.

E.2 Population and habitat monitoring

Dormouse population monitoring

E.2.1 Dormouse population monitoring would cover the following areas:

- habitat located adjacent to the Scheme that is known to support dormice (including habitat areas where dormice have been displaced to); and
- permanent receptor sites for translocated dormice.

E.2.2 Dormouse population monitoring would be based on the inspection of dormouse nest boxes and/or nest tubes. All monitoring surveys would be undertaken by NRW dormouse licenced ecologists.

E.2.3 Dormouse nest boxes would be installed at the permanent receptor site as described in this report. With regard to areas of habitat adjacent to the Scheme, at least 50 nest boxes or nest tubes would be installed in each habitat area to be monitored. Boxes would be numbered and GPS locations would be recorded so as to enable them to be located during monitoring visits and so that any signs of activity recorded during monitoring visits could be associated within a management area of the wood. Results of monitoring would inform ongoing management.

E.2.4 With regard to population monitoring in existing habitat adjacent to the Scheme, dormouse monitoring visits would be undertaken in May and September for each year of the construction phase and for a period of up to ten years thereafter or as otherwise agreed with NRW.

E.2.5 With regard to areas of woodland planting located adjacent to areas of known dormouse populations (i.e. as shown on Figure 7), monitoring visits would be undertaken in May and September for each year following the establishment phase, or as otherwise agreed with NRW, in order to identify signs that would confirm dormice are moving into planting areas.

E.2.6 With regard to dormice held in temporary captivity and later translocated to a permanent site (e.g. Coed Mawr or areas of woodland planting along the Scheme), the population would be monitored at the receptor site for a period of at least fifteen years following release into the site, or as otherwise agreed with NRW. Monitoring would be undertaken as described below:

- During the first year of release, nest boxes would be monitored in September/early October (depending on local weather conditions).
- During subsequent years, nest boxes would be inspected on a bi-monthly basis during May, July and September.

E.2.7 During each monitoring visit, the NRW dormouse licenced ecologist(s) would inspect nest boxes and nest tubes for signs that could confirm the presence of dormice (as described in Bright *et al*., 2006). Records of age group, numbers and apparent health condition would be recorded, and any adults would be weighed. When monitoring areas containing dormice that have been chipped at Bristol Zoo, dormice located would be scanned to identify them. Analysis of blood and faecal samples could be carried out for dormice translocated from Bristol Zoo to the permanent receptor sites.

E.2.8 Dormouse monitoring results would be reported on an annual basis to the Welsh Government and NRW (or as otherwise requested). Reports would include dates of survey visits, results of each box inspection (i.e. numbers, age, sex and condition – weight, apparent health of dormice recorded).

Habitat monitoring

E.2.9 Habitat monitoring would be carried out annually for the 5-year establishment period. During annual survey visits, planting success and establishment would be monitored. Records would be made of the approximate number of planting failures, general condition of plants and, if necessary, any recommendations for additional measures to ensure successful establishment and prevent the development of any significant gaps in the planting canopy would be reported by the ECoW or surveying ecologist to the Welsh Government and SWTRA.

Criteria of success

E.2.10 With regard to any captive bred population, monitoring would be undertaken during captivity in order to confirm the following criteria for success have been achieved:

- no signs of poor condition or health issues (on-going throughout captivity);
- good survival rates (adults and young) over winter months so as to prevent declines in the captive population;
- successful breeding so as to ensure an increase in the population size each year of captivity;
- an appropriate population size and ratio of adult females:males to be considered suitable to translocate as an independent population.

E.2.11 With regard to receptor sites located immediately adjacent to the Scheme (i.e. receptor sites for displaced dormice or those captured and translocated to immediately adjacent retained habitat), population monitoring would be undertaken in order to determine whether or not the following criteria for success have been achieved:

- animals continue to be recorded in the area at a similar density to that recorded during the 2014-2016 surveys;
- evidence of continued breeding – young recorded; and
- evidence dormice are moving into planting areas.

E.2.12 Results of the above surveys would inform the need to enhance receptor areas (e.g. to install additional nest boxes and carry out planting) and any release strategy in the area to ensure populations do not fail.

E.2.13 With regard to the translocated population, in accordance with Bright *et al*. (2006) monitoring surveys would be undertaken in order to determine whether or not the following criteria for success have been achieved:

- evidence of breeding – young recorded on site, preferably by September of the year of release;
- animals recorded on site in May of the second year;
- evidence of breeding in each subsequent monitoring year;
- a greater number of adults present on site in years three onwards;
- evidence of dispersal across the wood; and
- evidence of dispersal beyond the wood.

E.2.14 Results of the above translocated population surveys would inform on-going management of the site and any on-going release strategy (as described under *Release of captive dormice* Release of captive dormice above).

E.3 Post-development mitigation contingencies

E.3.1 Management measures relating to the establishment and long-term management of new, enhanced or reinstated habitats under the management control of Welsh Government through SWTRA or NRW (i.e. Coed Mawr), would be detailed in the final *Hazel Dormouse Method Statement* associated with the NRW licence application and the *ELEAP.* These documents would be flexible in order to permit adaptations to potential changes in baseline conditions and to ensure objectives of this draft mitigation strategy and the final *Hazel Dormouse Method Statement* are met.

E.3.2 The ELEAP and *Hazel Dormouse Method Statement* would include the need to take into account the results of population and habitat monitoring surveys (described above) when determining the annual management requirements for new, enhanced or reinstated habitats under the management control of Welsh Government through SWTRA or NRW .

E.3.3 Should habitat management measures recommended by the ecologist in response to monitoring surveys be significantly different to those described in the final licence method statement and/or *ELEAP*, NRW would be consulted and their agreement sought prior to undertaking them.

E.3.4 It is envisaged that habitat management would be confirmed on an annual basis during the 5 year establishment period, after which management requirements for land managed by Welsh Government though SWTRA and NRW could be confirmed on a two year rotation, or should adverse factors such as invasive species be recorded, annual management review would be reinstated until adverse factors have been removed or are no longer a significant concern. Should any adverse factors require significant amendments to the management plans, NRW would be invited to review the amended management plans in advance of use.

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

E.4.1 The requirement for a hazel dormouse method statement and NRW licence application would be included in the commitments register for the Scheme. Post-development measures described in this draft strategy would be included in both documents.

E.4.2 The contractor would be responsible for the establishment of planting areas for the five year period post-construction.

E.4.3 Responsibilities for the long-term management of habitat of value to dormice within the operational boundary of the Scheme and on land obtained for mitigation would be that of Welsh Government or SWTRA, or with regard to Coed Mawr, NRW.

E.4.4 Long-term management requirements for woodland planting of potential value to dormice (i.e. as shown on Figure 7) would be carried out as detailed in the *ELEAP*. The plan would include measures for the benefit of dormice.

E.4.5 Long-term management of Coed Mawr would be detailed in a site-specific management plan that would be developed in consultation with NRW – Forestry and would be submitted to NRW in support of the NRW dormouse licence application.

E.4.6 Both the *ELEAP* and the NRW licence application, with associated management plan, are included in the commitments register to the Scheme.

E.4.7 Funding for all measures in this strategy, the NRW licence application and the *ELEAP* would be secured by Welsh Government.

G TIMETABLE OF PRIMARY WORKS

Table 6 Timetable of Primary Works

Works	Timing	Summary of works
	Pre-construction phase	
Dormouse nest tube/nest box surveys	April – November 2017	Continuation and expansion of previous surveys to inform the final mitigation strategy and NRW licence application.
Installation of additional dormouse nest boxes/nest tubes	Start of 2017 survey period	Installation of additional dormouse nest boxes and tubes in survey areas.
	Construction phase – all works to be carried out by or under the on-site supervision of an ecologist named on the NRW dormouse licence	
Installation of additional dormouse nest boxes/nest tubes	Start of 2018 survey period	Installation of additional dormouse nest boxes and tubes in survey areas (i.e. 30 per hectare in translocation areas, 50 per area in adjacent habitat, up 10 100 in habitat areas in Coed Mawr, as detailed in final method statement).
Carry out initial visual inspection of habitat areas to ensure no dormouse nests present.	From July 2018	Locate nests. In displacement areas leave for 2 days. Relocate to appropriate locations outside the boundary of the Scheme in a dormouse nest box.
Carry out incremental clearance of vegetation in displacement areas and around the boundary of translocation areas.	Prior to habitat clearance from July 2018	Carry out hand clearance of vegetation in hedgerows on an incremental basis, clearing a maximum of 5m of hedgerow/5m^2 of scrub per day as described in the final method statement.
Commencement of trapping and translocation survey	From May 2018 (on Welsh Government land) (following grant of NRW licence, or from July 2018 (other land).	Trapping of dormice for translocation to surrounding retained favourable habitat or temporary captivity site at Bristol Zoo's "Wild Space".
Coppicing of vegetation	Following completion of displacement or trapping in an area in 2018 and prior to hibernation (November 2018)	Coppicing of vegetation under the supervision of an ecologist named on the NRW dormouse licence. Careful removal of arisings or timber.
Uprooting of coppiced vegetation	Following coppicing and prior to hibernation (November 2018)	Following a hand search of the area by licenced ecologists to capture and relocate any remaining dormice,. uprooting of coppiced vegetation. Where practicable, translocation of coppiced plants with root balls to

		early planting areas, in particular areas of woodland edge planting around borrow pits at the western end of the Scheme and woodland planting areas to the west of the M4, east of Junction 23.
Transfer to temporary captivity	During the trapping survey in 2018	To transfer trapped dormice requiring translocation to areas other than immediately adjacent habitat on the Tata Steelworks site. To transfer dormice immediately after trapping. To be held and if necessary, bred in captivity as detailed in a captive management plan to be agreed with NRW and Natural England and which would form part of the NRW dormouse licence application.
	During or post-construction	
Translocation of captive dormice to receptor sites	Once receptor sites have been confirmed to be in favourable condition.	To translocate captive dormice to approved receptor sites once confirmed to be in favourable condition.
	Post-construction phase	
Annual monitoring of populations and habitats	Following translocation or displacement	Dormouse nest boxes and nest tubes to be monitored between May and November as detailed in the final method statement. Habitat to be monitored as detailed in the final method statement. Captive populations to be monitored as detailed in the final method statement and captive breeding method statement.
Habitat management	Following planting or displacement/translocation of dormice to receptor sites	Habitat management in accordance with the final Method Statement and licence application, the *Environmental, Landscape and Ecology Aftercare Plan (ELEAP)* and the Coed Mawr Management Plan

H LAND OWNERSHIP – MITIGATION SITE / COMPENSATION SITE

H.1 Mitigation site/compensation site ownership - construction

H.1.1 The Welsh Government would own the freehold of the footprint of the M4CaN Scheme and all land acquired for mitigation works, including the potential Coed Mawr off-site receptor site (through NRW) or existing M4 embankments (through SWTRA), other than the temporary captive breeding sites at Bristol Zoo or Paignton Zoo.

Temporary captivity

Bristol Zoo

H.1.2 On behalf of Welsh Government, RPS met with Bristol Zoo on the 12 September 2016, in order to discuss the potential for Bristol Zoo to assist the Scheme with a temporary captivity programme, should it be required.

H.1.3 Bristol Zoo are particularly suited to a temporary captive programme due to their experience of captive breeding programmes, including species native to the UK and their relative proximity to the Scheme, enabling any transfer from site to the zoo to be completed during the date of capture on site. The proposed site for temporary captivity would be the zoo's "Wild Space", which is located to the north of Bristol and therefore, is more readily accessible from the M4. The site is an area of farmland with ample "undeveloped" woodland in which a population of captive dormice could be housed in temporary holding areas away from visitors.

H.1.4 During the meeting on the 12 September 2016, Bristol Zoo confirmed their ability to assist the Scheme during the meeting. Consultation with the zoo is ongoing in order to develop a detailed method statement, which would be included in the final *Hazel Dormouse Mitigation Strategy* and NRW licence application.

Paignton Zoo and PTES

H.1.5 In addition, on behalf of Welsh Government, on the 1 February 2016 RPS contacted Neil Bemment, Co-ordinator of the dormouse captive breeding programme at Paignton Zoo that supports the Natural England Dormouse Reintroduction Programme. Consultation is ongoing with Neil Bemment with regard to the provision of technical advice and expertise for any temporary captivity programme that may be required, as well as the potential to provide temporary holding sites for captive dormice.

H.1.6 In addition, RPS are communicating with the People's Trust for Endangered Species (PTES), who are also involved in managing and undertaking the Natural England's Dormouse Reintroduction Programme, in order to further inform the detailed method statement for any potential programme of temporary captivity.

H.1.7 It is expected that information provided by Paignton Zoo and the PTES would be incorporated into the detailed method statement produced with Bristol Zoo and the NRW licence application.

H.2 Mitigation site/compensation site ownership - post-construction

H.2.1 Throughout the operational phase, the Welsh Government would own the freehold of the footprint of the M4CaN Scheme, including the footprint of the new road and any land obtained for mitigation. NRW is the owner of Coed Mawr.

H.2.2 Bristol zoo are the owners of the land at “Wild Space” on which dormice would be temporarily held in captivity.

I REFERENCES

Bright, P., Morris, P. and Mitchell-Jones, T. (2006) *The dormouse conservation handbook, 2nd Edition*. English Nature (now Natural England).

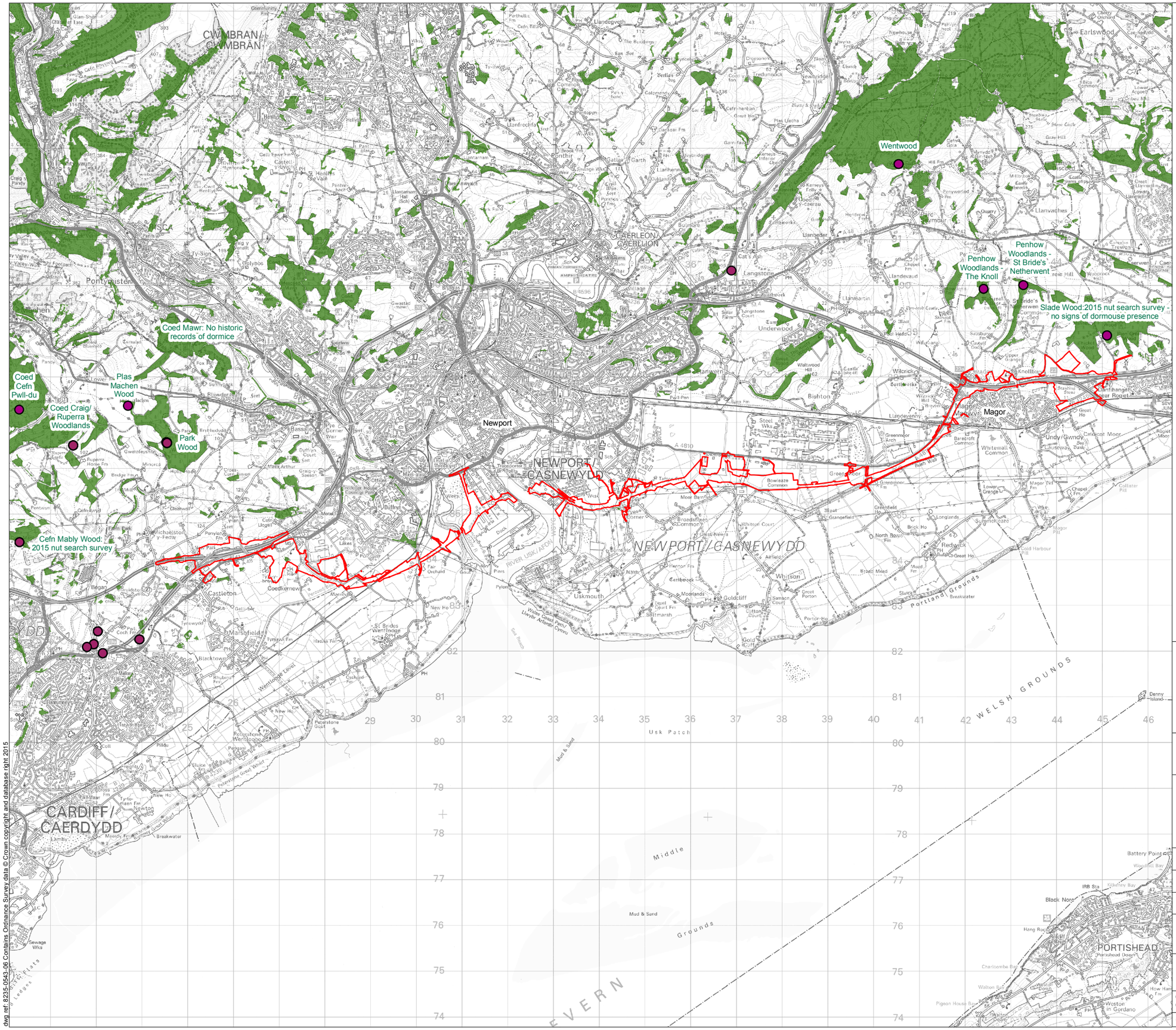
Chanin, P. (2014) *The Dormouse Reintroduction Programme: A review. Natural England Commissioned Report NECR144.* Natural England.

Highways Agency (2001). *DMRB Volume 10 Section 4 Part 6 (HA 97/01): Nature Conservation Management in Relation to Dormice*.

J ANNEXES

J.1 There are no annexes attached to this draft mitigation strategy; however the final strategy would include management plans for new and enhanced habitat of value to dormice, a biosecurity risk assessment and safe system of works, and a captive breeding programme, all of which would be agreed with NRW and would be submitted to NRW in support of the NRW hazel dormouse licence application.

Figure 1: Desk Study



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Hazel Dormouse Record
- Ancient Woodland

Llywodraeth Cymru
Welsh Government

Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Historic Records of Dormice in Surrounding Area

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

Scale: A3 @ 1:80,000
0 2,000 4,000 m

N

dwg ref: 8235-0543-06

Legend

- Coed Mawr woodland
- Woodland
- Identified as hedgerow on aerial photo
- 2km Buffer
- 5km Buffer
- Hazel Dormouse Record

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

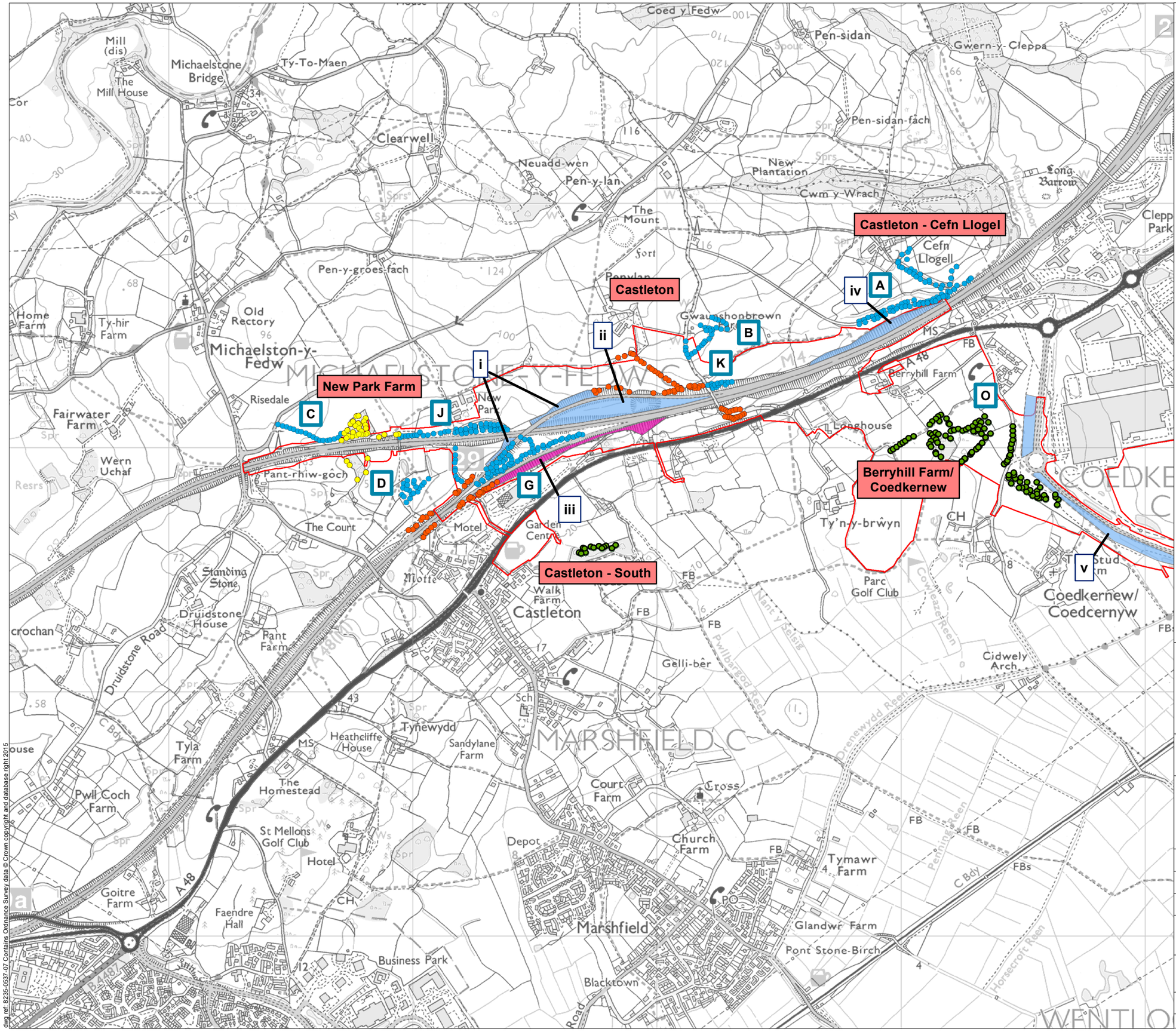
Coed Mawr- Location Map

Figure: 1b	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

Scale: A3 @ 1:45,000
0 700 1,400 m
N

dwg ref: 8235-0602-03

Figure 2 : Survey Areas



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

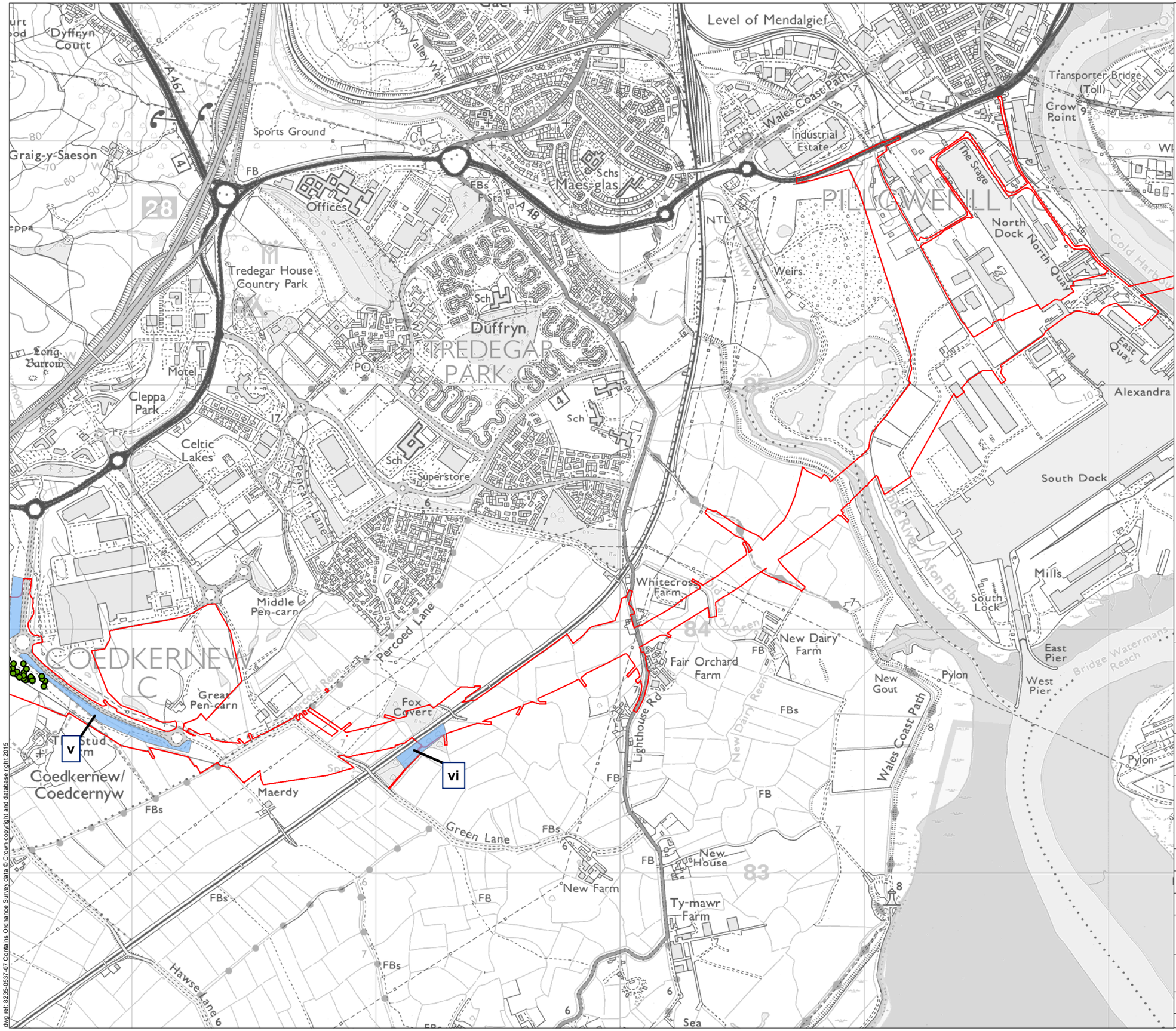
Survey Areas

Figure: 2a	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07



dwg ref: 8235-0537-07 Contains Ordnance Survey data © Crown copyright and database right 2015

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

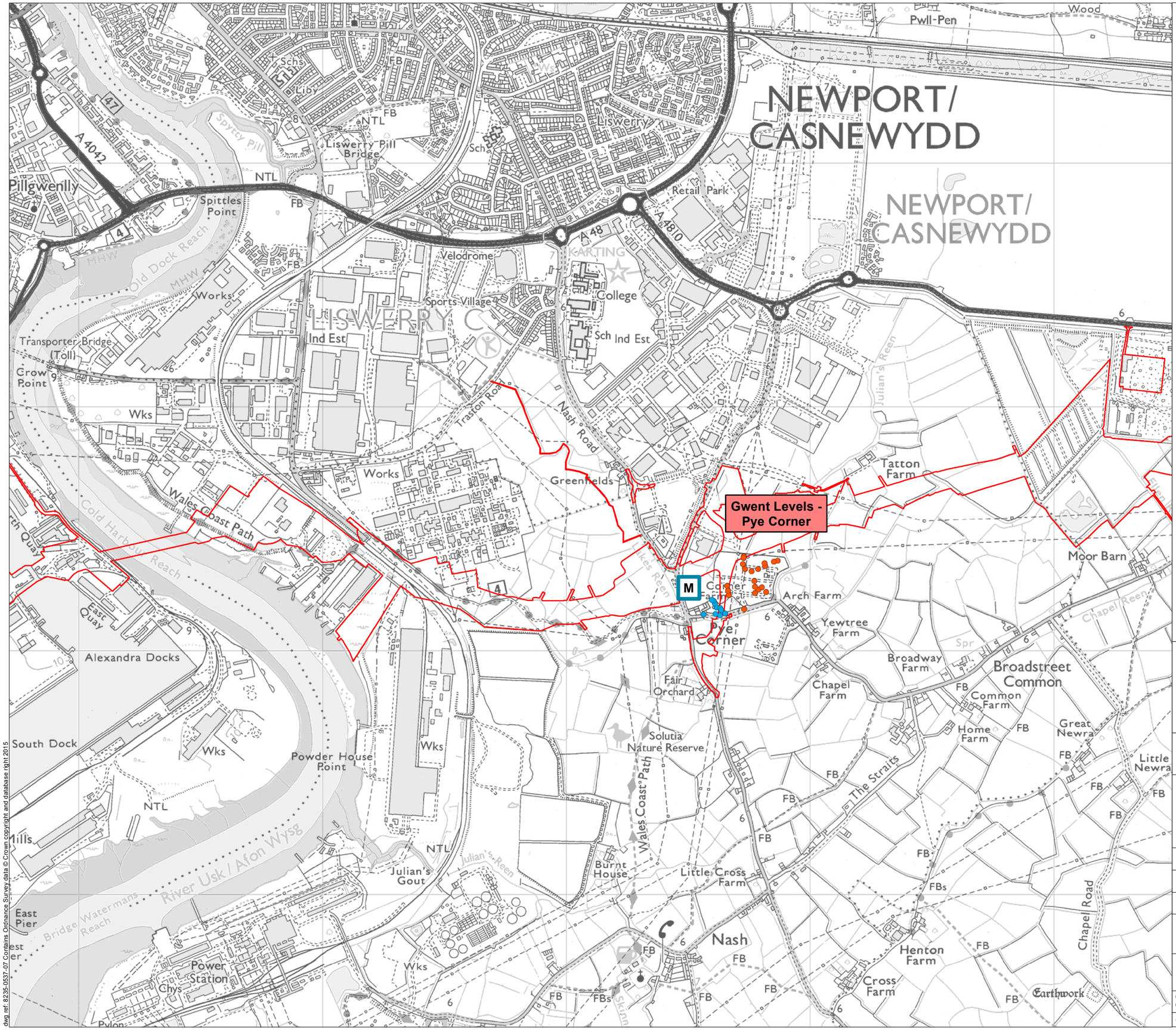
Survey Areas

Figure: 2b	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

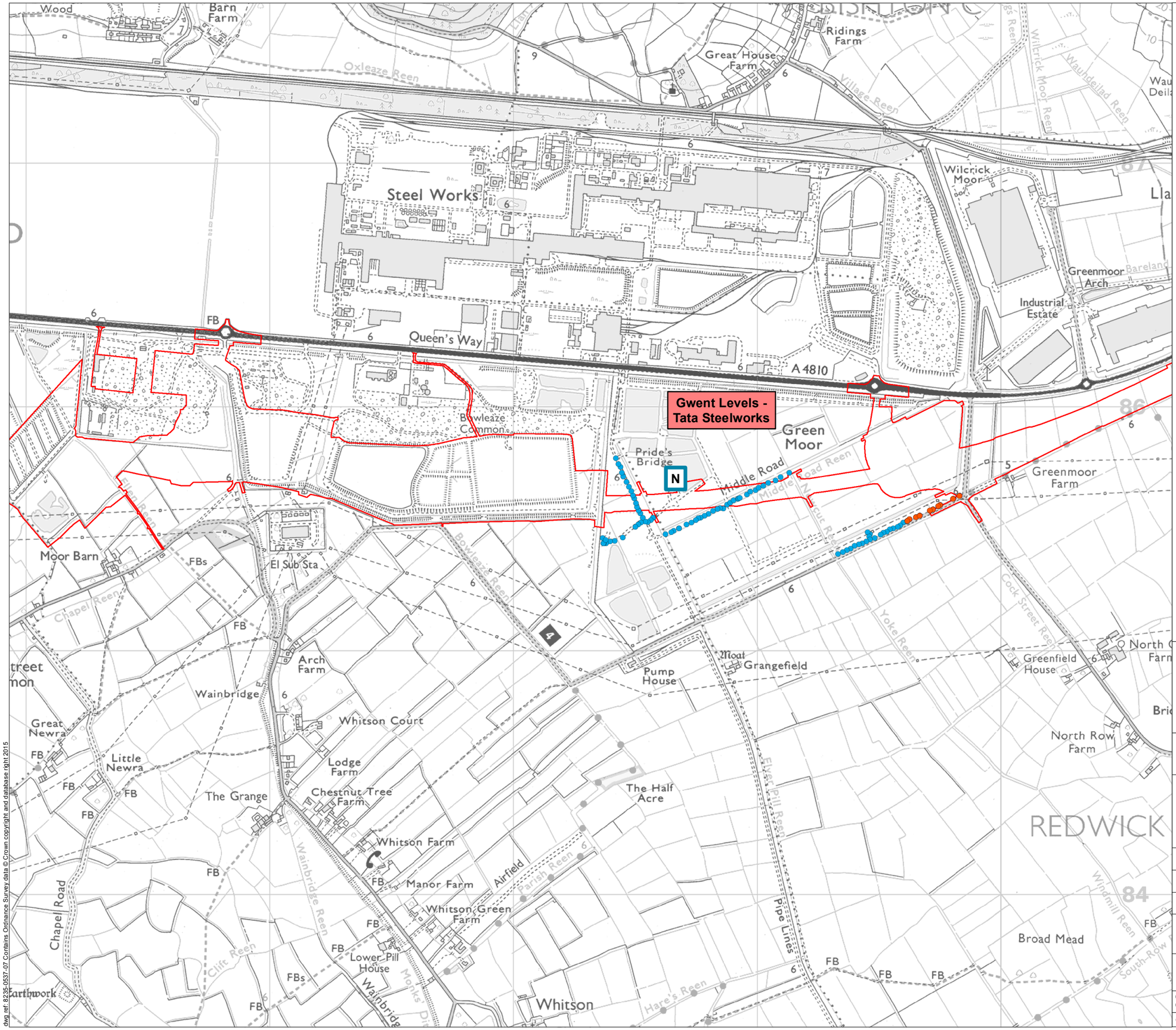
Survey Areas

Figure: 2c	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

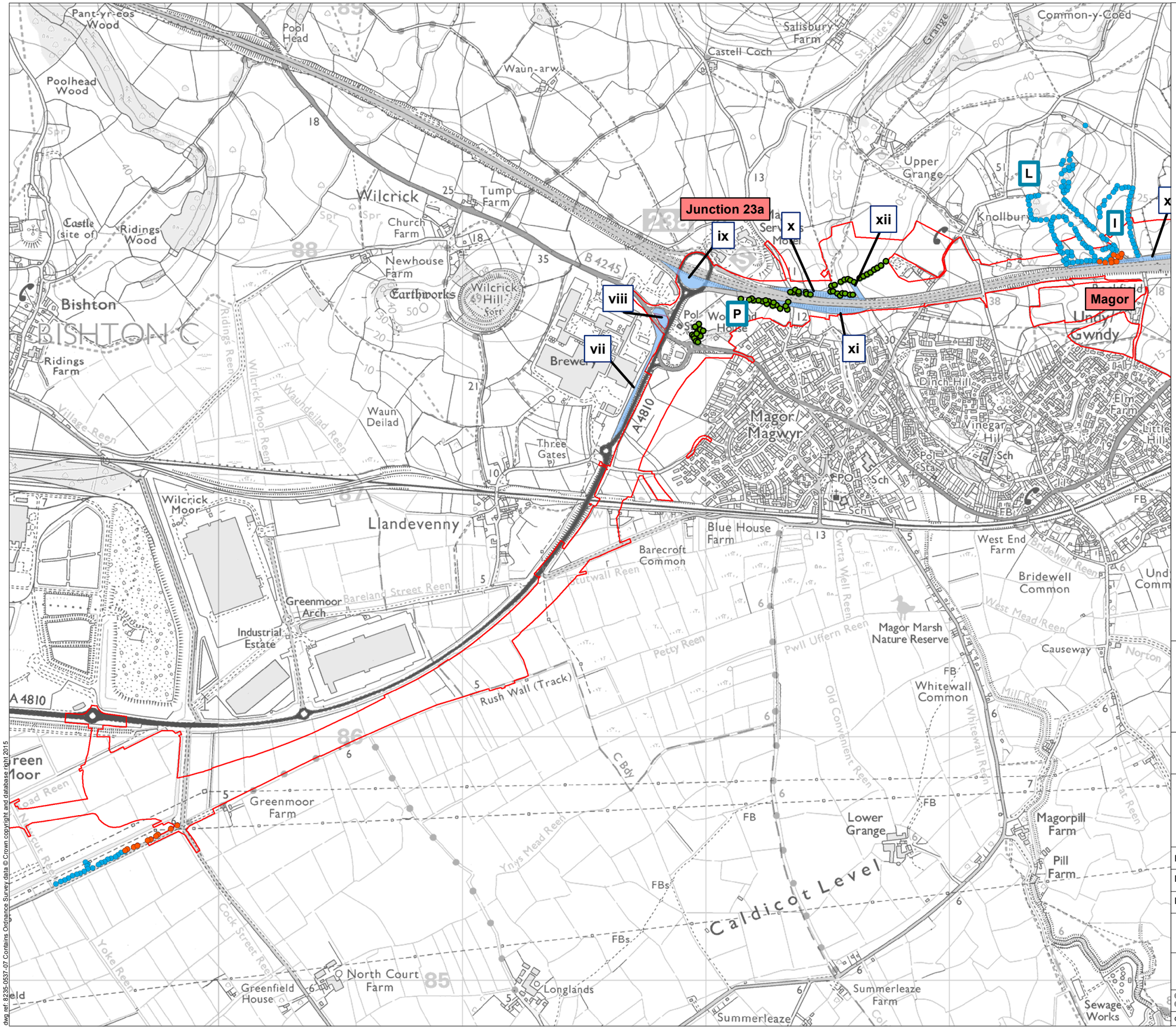
Survey Areas

Figure: 2d	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

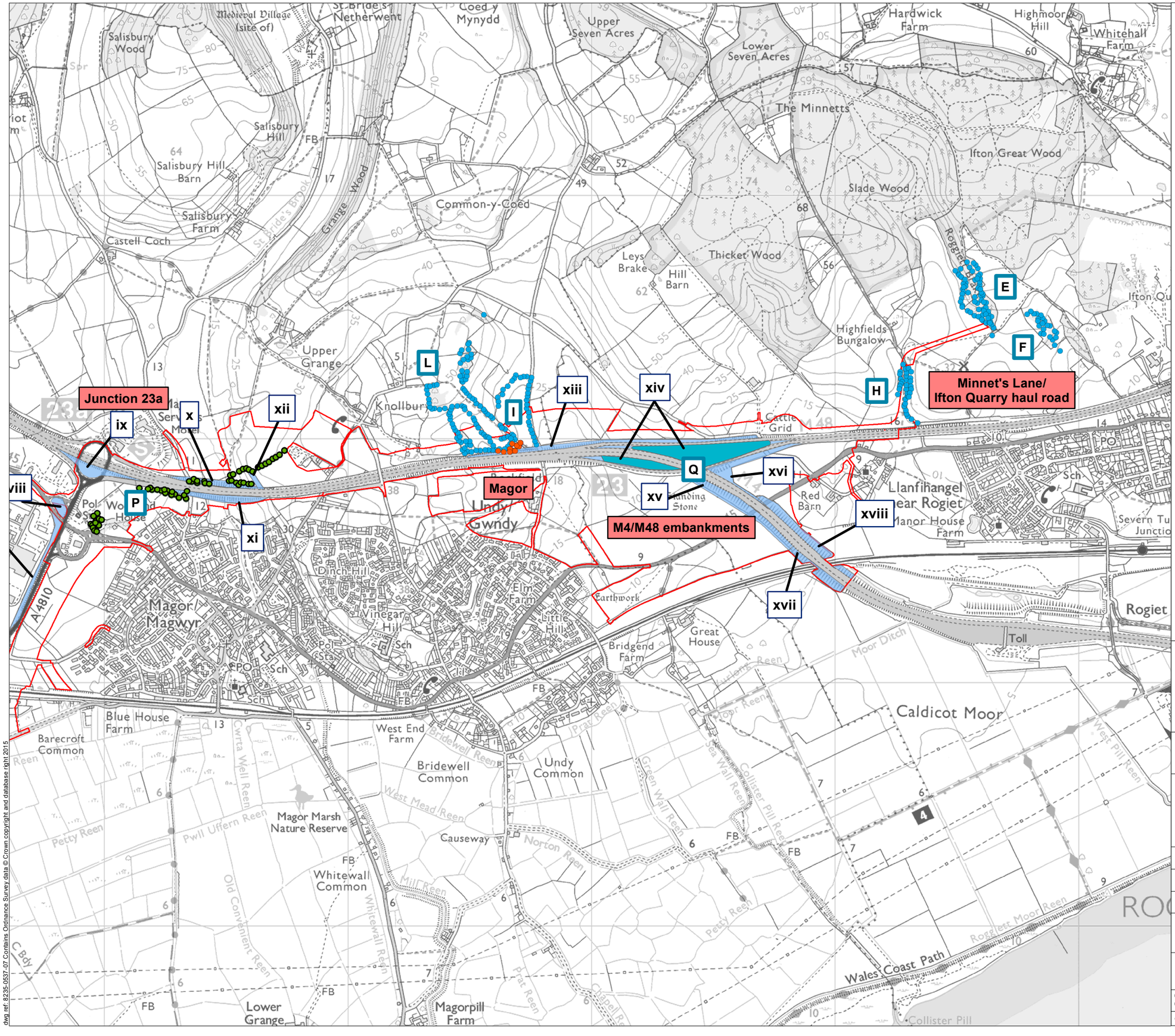
Survey Areas

Figure: 2e	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Arup (2014) Dormouse nest tube survey completed
- Arup (2014) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- RPS (2015 -) Dormouse nest tube survey ongoing
- Atkins Dormouse box survey ongoing
- x Nest tube survey areas

Hazlenut Survey Results

- Hazel dormouse presence unconfirmed
- Hazel dormouse presence confirmed
- i Hazel nut search areas

The scheme shown reflects the design at time of survey

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Survey Areas

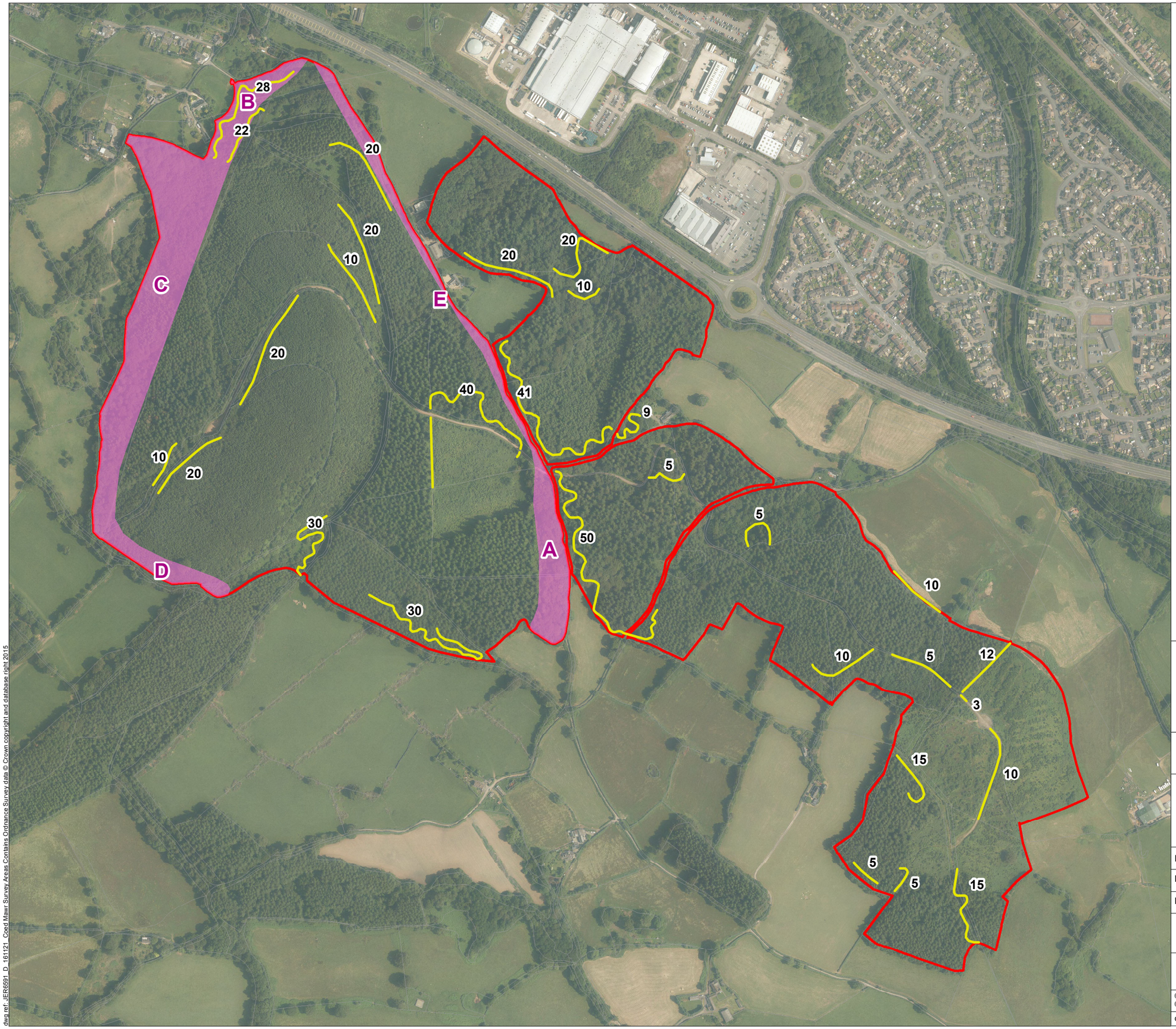
Figure: 2f	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS/CR	Checked: EW

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

N

dwg ref: 8235-0537-07

Figure 3: Coed Mawr Survey Areas



Legend

- Dormouse Tubes Installation Transect
- Hazel Nut Search Areas
- Survey Boundary
- A — Survey Reference
- 20 — Number of Traps

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Coed Mawr Survey Areas

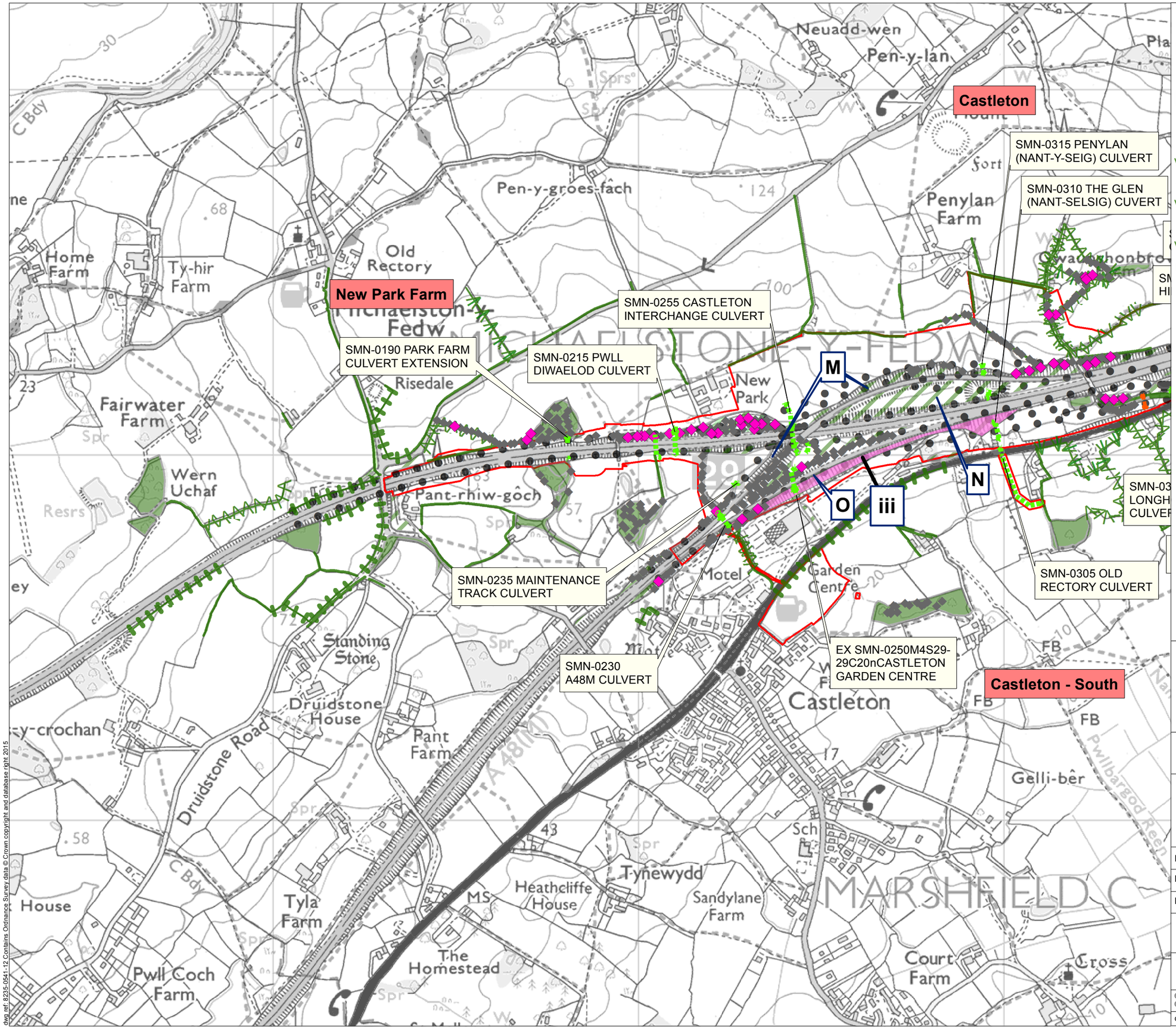
Figure: 3	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: JGB	Checked: EW

Scale: A3 @ 1:6,000
0 100 200 m

N

dwg ref: JER6591_D_161121_Coed Mawr Survey Areas

Figure 4: Survey Results



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazelnut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

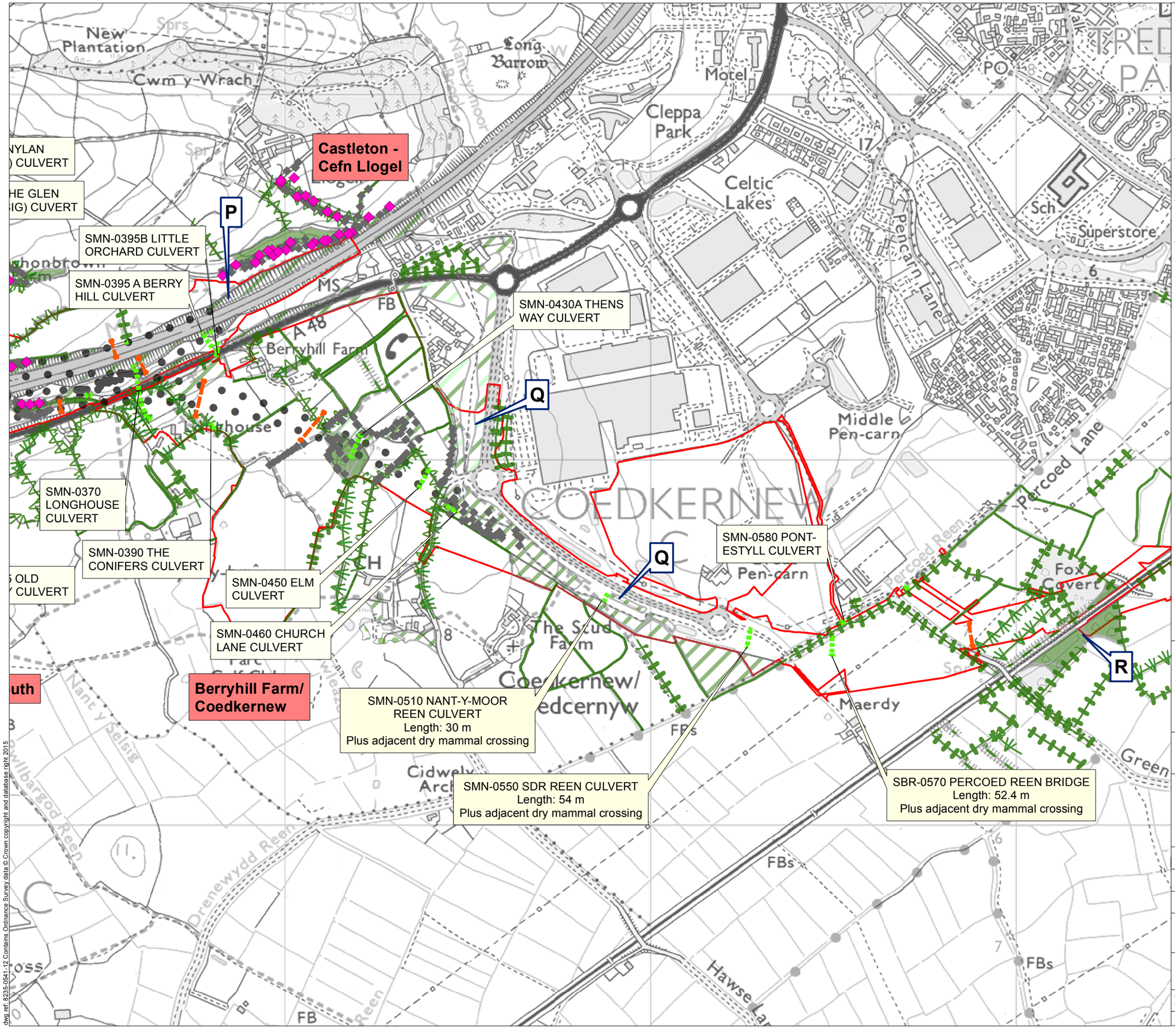
Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazelnut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12

SMN-0905 MAES GLAS PILL CULVERT

SMN-0805 PONT-Y-CWCW
COMPENSATORY REEN CULVERT
Length: 52 m
Plus adjacent dry mammal crossing

SMN-0800 PONT-Y-CWCW
REEN CULVERT
Length: 59 m
Plus adjacent dry mammal crossing

SMN-0775 OLD DAIRY
REEN CULVERT
Length: 62 m
Plus adjacent dry mammal crossing

SBR-0835 SEA WALLREEN BRIDGE
Length: 93.6 m
Plus adjacent dry mammal crossing

SMN-0810 NEW DAIRY
FARM CULVERT

SMN-0770 OLD DAIRY REEN
FIELD ACCESS CULVERT
Length: 10 m
Plus adjacent dry mammal crossing

SMN-0730 RAILWAY
COTTAGE CULVERT

SMN-0680 MORFA
GRONW REEN CULVERT
Length: 72 m
Plus adjacent dry mammal crossing

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazelnut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazlenut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

SMN-1180 PICKED LANE CULVERT Length: 74 m

SMN-1230 LAKE'S REEN CULVERT Length: 56 m Plus adjacent dry mammal crossing

LLREEN BRIDGE 93.6 m mammal crossing

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

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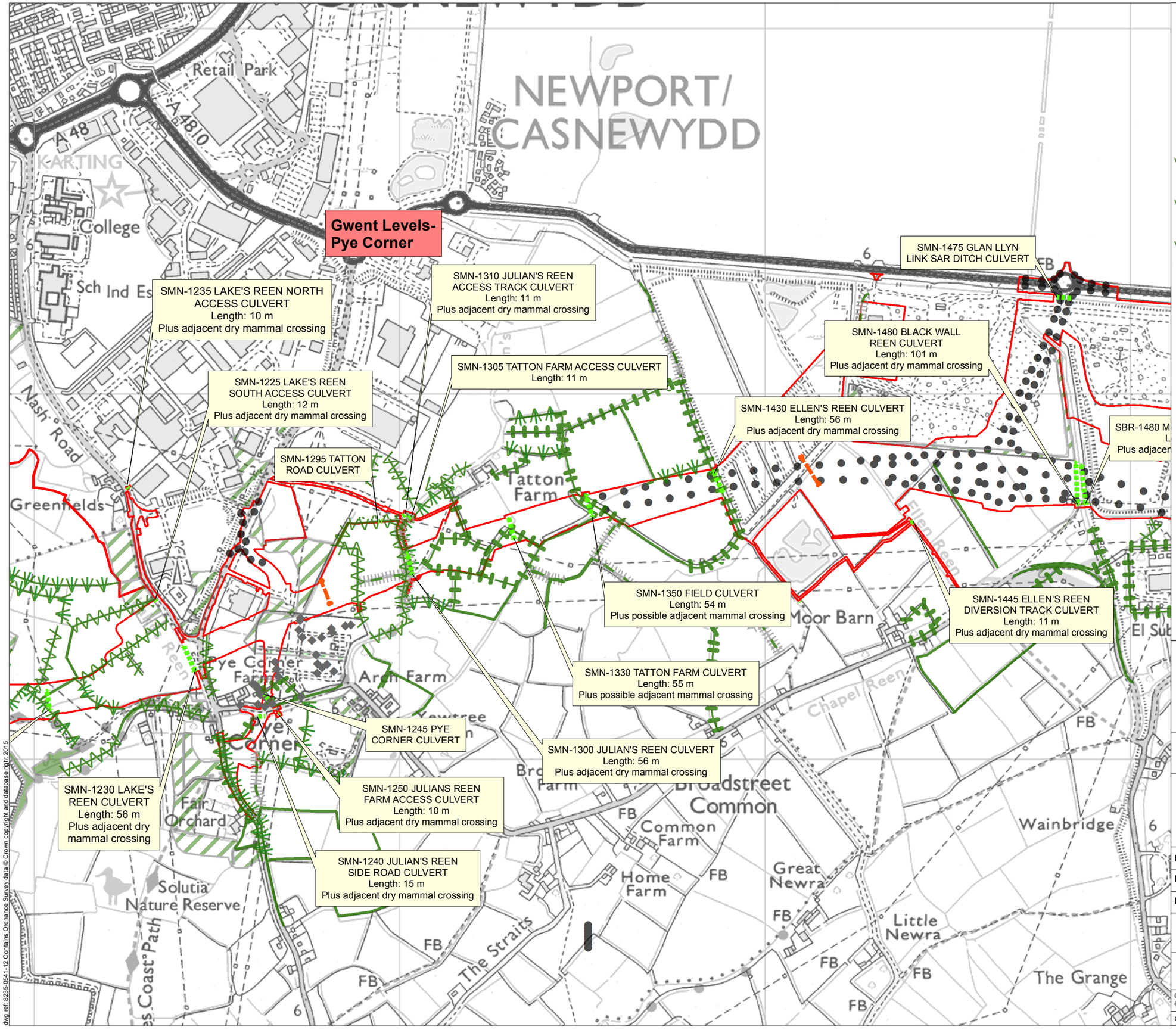
dwg ref: 8235-0541-12



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazlenut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12

SMN-1445 ELLEN'S REEN
DIVERSION TRACK CULVERT
Length: 11 m
Plus adjacent dry mammal crossing

SBR-1480 MONK'S DITCH BRIDGE
Length: 95 m
Plus adjacent dry mammal crossing

SBR-1640 STEELWORKS
DEDICATED REEN BRIDGE
Length: 54 m
Plus adjacent dry mammal crossing

SMN-1655 ELVER PILL
REEN CULVERT
Length: 61 m
Plus adjacent dry mammal crossing

SBR-1755 MIDDLE ROW
REEN BRIDGE
Length: 18 m
Plus adjacent dry mammal crossing

SMN-1720 NEW CUT REEN
Length: 60 m
Plus adjacent dry mammal crossing

SMN-1750 NORTH
ROW SAR CULVERT

SBR-1780 MIDDLE ROA
REEN DIVERSION M4 BRI
Length: 56 m
Plus adjacent dry mammal cr

Gwent Levels-
Tata Steelworks

Steel Works
Queen's Way
A 4810
Pride's
Bridge
Middle Road
Green
Moor
Common
El Sub Sta
FB
Arch
Farm
Wainbridge
Whitson Court
Lodge
Farm
Chestnut Tree
Farm
The Grange
Pump
House
Moat
Grangefield
The Half
Acre
Boulston Reen
Yoke Reen
Elver Pill Reen

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazlenut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

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

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12

SMN-2087 NEWPOR

SMN-2088 WOODLAND

SMN-2085 BREWERY HO

SMN-2010 SOUTH WALES MAINLINE CULVERT

SMN-1970 BARELAND STREET EAST NORTH CULVERT
Length: 25 m
Plus adjacent dry mammal crossing

SMN-2010 SOUTH WALES MAINLINE CULVERT

SMN-1980 BARELAND STREET EAST SOUTH CULVERT
Length: 37 m

SMN-1925 PETTY REEN CULVERT
Length: 60 m
Plus adjacent dry mammal crossing

SBR-1780 MIDDLE ROAD REEN DIVERSION M4 BRIDGE
Length: 56 m
Plus adjacent dry mammal crossing

SMN-1940 Rush Wall Reen Culvert
Length: 12 m
Plus possible adjacent mammal crossing

SMN-1850 COCK STREET REEN CULVERT
Length: 60 m
Plus adjacent dry mammal crossing

SBR-1770 NORTH ROW MIDDLE ROAD DIVERSION REEN BRIDGE
Length: 25 m
Plus adjacent dry mammal crossing

SMN-1790 NORTH ROW DRAIN CULVERT

Gwent Levels- Tata Steelworks

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazlenut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

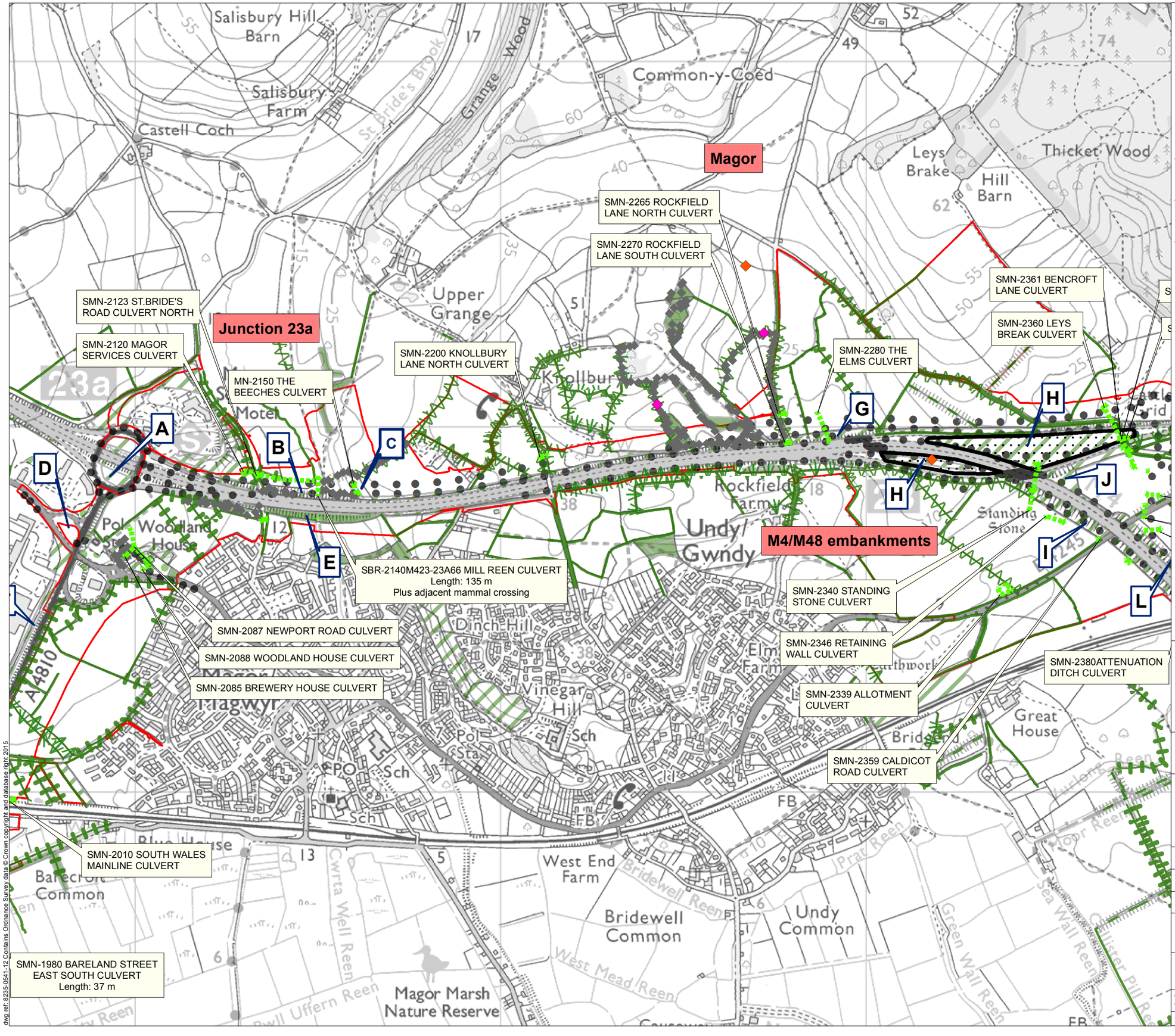
Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

Figure: 4g	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazelnut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

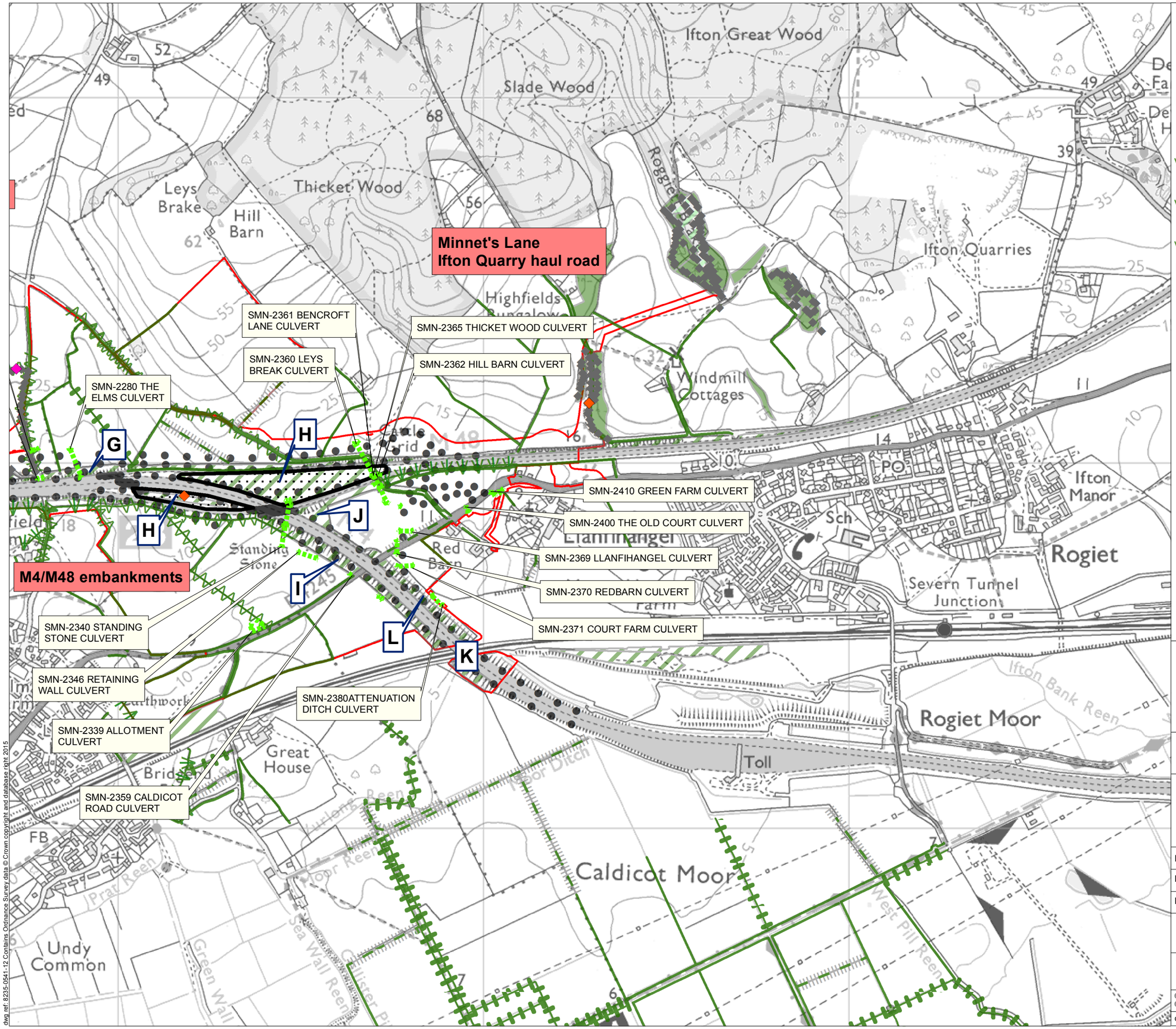
Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

Figure: 4h	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- Survey location
- Survey area
- Possible Dormouse Presence
- Dormouse Presence
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Broadleaved plantation woodland
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

Hazlenut Survey Results

- Hazel dormouse presence confirmed
- i Hazel nut search areas

*culverts without lengths- measurements to be confirmed

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Survey Results (2014, 2015), Mammal Crossings and Operational Lighting

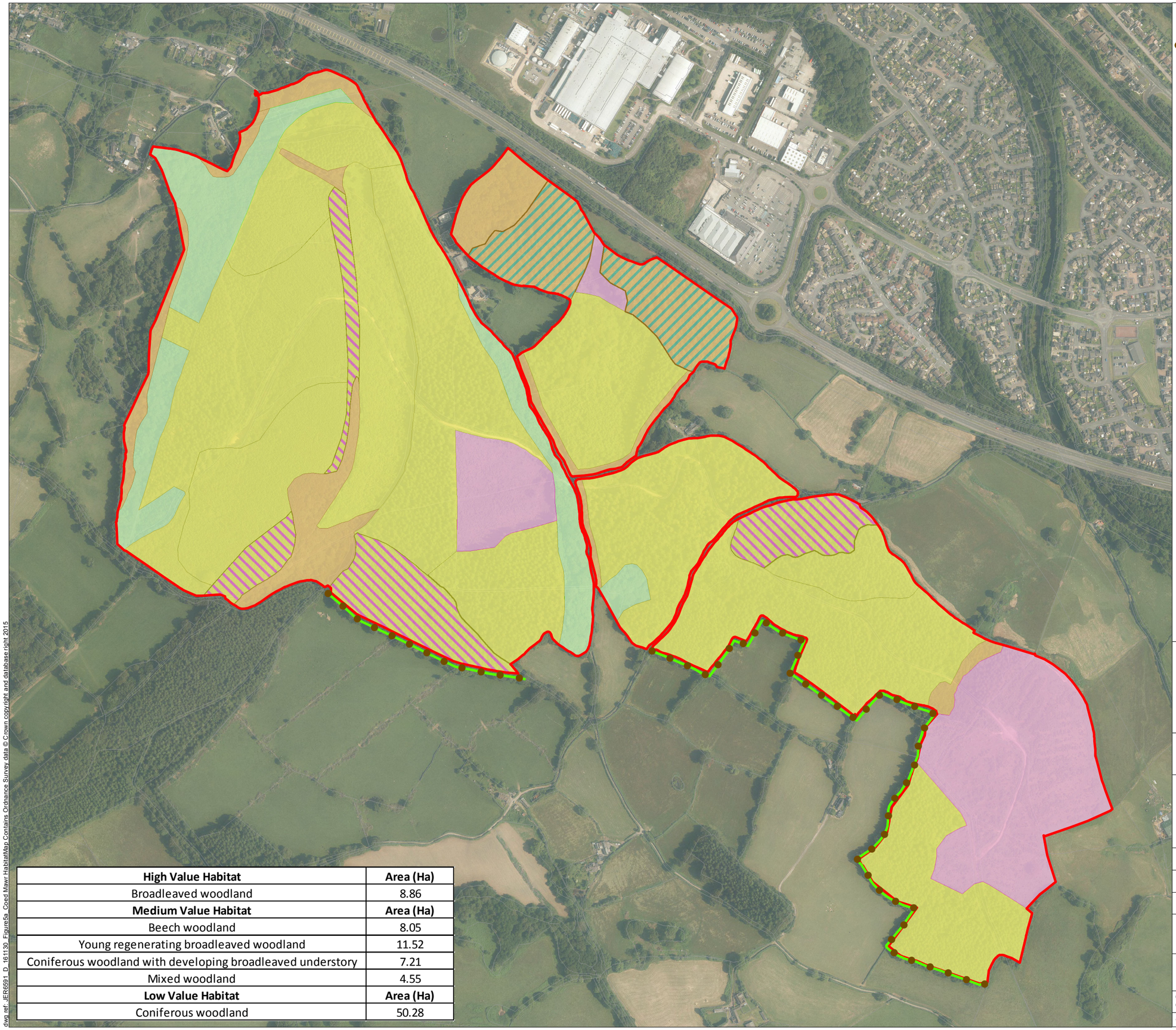
Figure: 4i	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:10,000
0 165 330 m

N

dwg ref: 8235-0541-12

Figure 5: Coed Mawr Habitat Map



Legend

- Mature Oak Trees
- Survey Boundary

High Value Habitat

- Broadleaved woodland including hazel coppice, dense bramble and rowan (coppice)

Medium Value Habitat

- Beech woodland with hazel and willow woodland edge
- Young naturally regenerating broadleaved woodland with silver birch, willow, bramble and gorse
- Coniferous woodland with naturally regenerating broadleaved understorey shrub layer, including hazel and hornbeam
- Mixed woodland

Low Value Habitat

- Coniferous woodland

High Value Habitat	Area (Ha)
Broadleaved woodland	8.86
Medium Value Habitat	**Area (Ha)**
Beech woodland	8.05
Young regenerating broadleaved woodland	11.52
Coniferous woodland with developing broadleaved understory	7.21
Mixed woodland	4.55
Low Value Habitat	**Area (Ha)**
Coniferous woodland	50.28

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Coed Mawr – Habitat Map

Figure: 5	Revision: a
Date: December 2016	Status: AT ISSUE
Drawn: RJ	Checked: EW

Scale: A3 @ 1:6,000

0 100 200 m

N

dwg ref: JER6591_D_161130_Figure5a_Coed Mawr HabitatMap

Figure 6: Habitat Loss

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Ecological mitigation
- Limit of Permanent and Temporary Works for New Section of Motorway
- Proposed Dormouse Nest Tube Survey Areas
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous

Nest Tube Surveys 2014, 2015

- Dormouse Presence
- Possible Dormouse Presence

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Habitat Loss

Figure: 6a	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

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

N

dwg ref: 8235-0603-05

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Ecological mitigation
- Limit of Permanent and Temporary Works for New Section of Motorway
- Proposed Dormouse Nest Tube Survey Areas
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous

Nest Tube Surveys 2014, 2015

- Dormouse Presence
- Possible Dormouse Presence

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

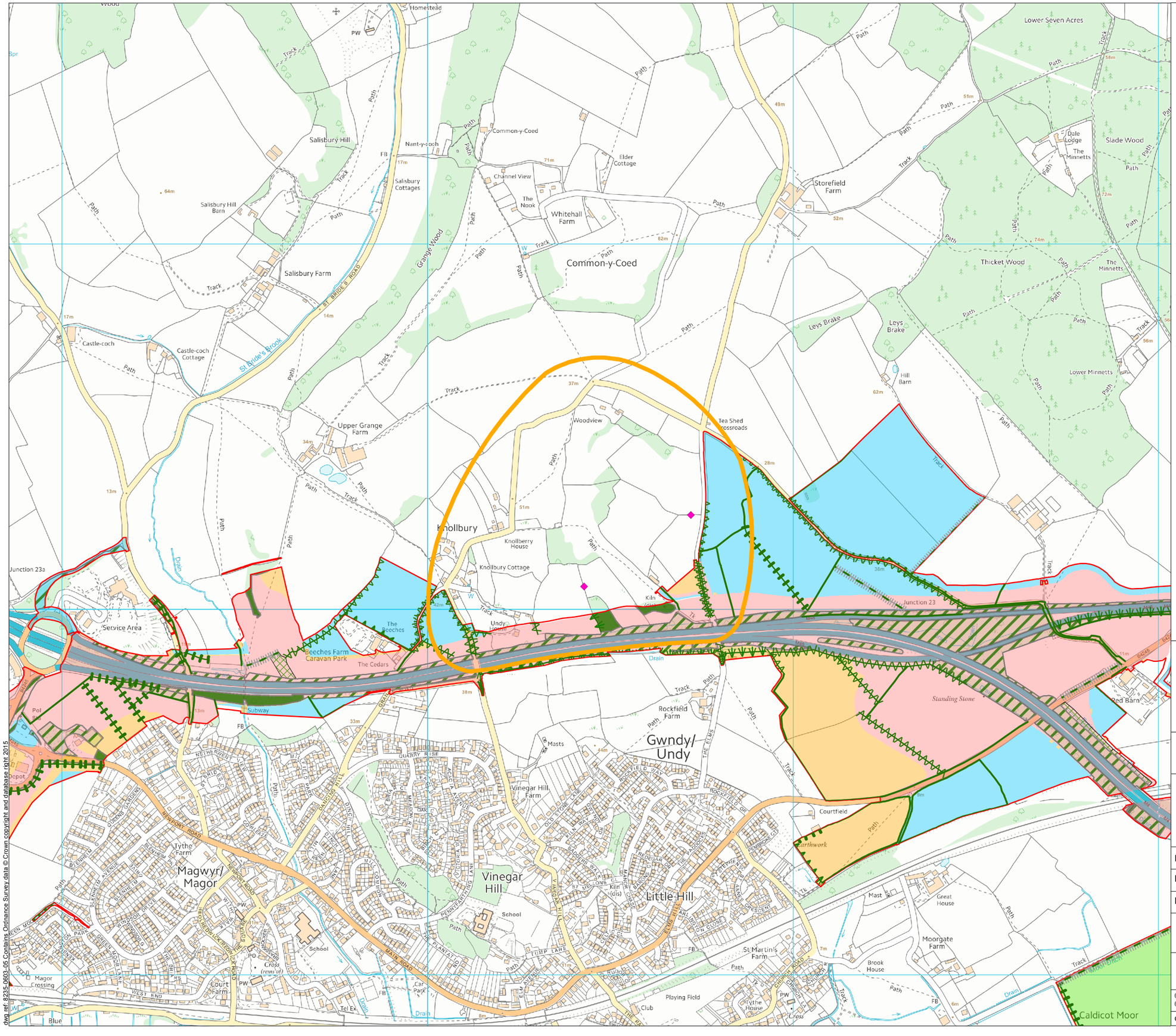
Hazel Dormouse Habitat Loss

Figure: 6b	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

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

N

dwg ref: 8235-0603-05



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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Habitat Loss

Figure: 6c	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

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

N

dwg ref: 8235-0603-05

Legend

- Permanent highway land within fenceline, including water treatment areas
- Other permanent land take e.g. mitigation planting.
- Temporary construction land
- Ecological mitigation
- Limit of Permanent and Temporary Works for New Section of Motorway
- Proposed Dormouse Nest Tube Survey Areas
- 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
- Broad leaved semi-natural Woodland
- Broad leaved plantation Woodland
- Coniferous plantation woodland
- Mixed semi-natural Woodland
- Mixed plantation Woodland
- Scrub dense continuous

Nest Tube Surveys 2014, 2015

- Dormouse Presence
- Possible Dormouse Presence

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Hazel Dormouse Habitat Loss

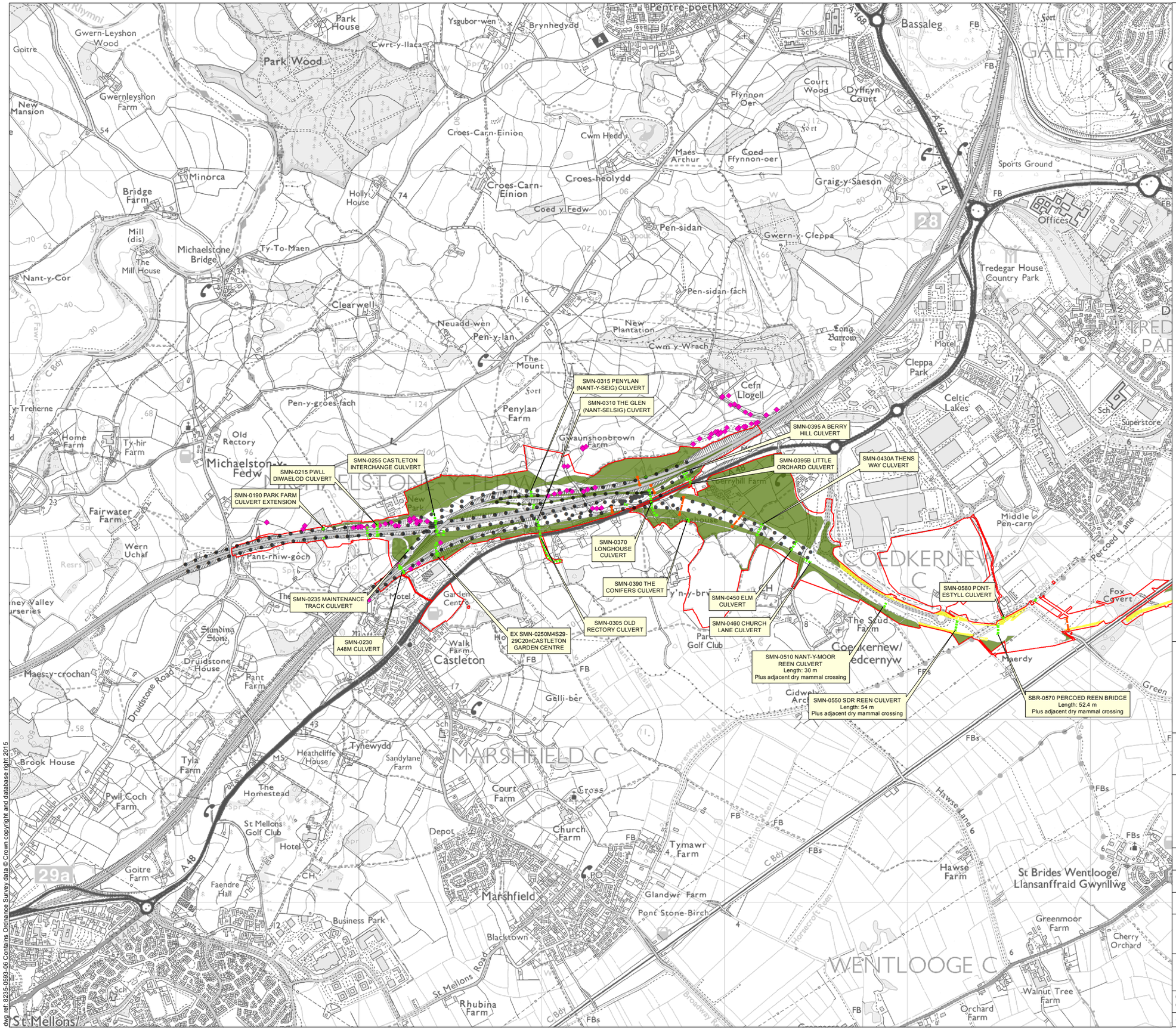
Figure: 6d	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: MS	Checked: JW

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

N

dwg ref: 8235-0603-05

Figure 7: Long-term Mitigation



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- L905_H_LE2.1 Woodland
- L905_H_LE2.4 Linear Belts of Shrubs and Trees
- Dormouse Presence
- Possible Dormouse Presence
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

*culverts without lengths- measurements to be confirmed

Appendix SS10.4 Hazel Dormouse Mitigation Strategy

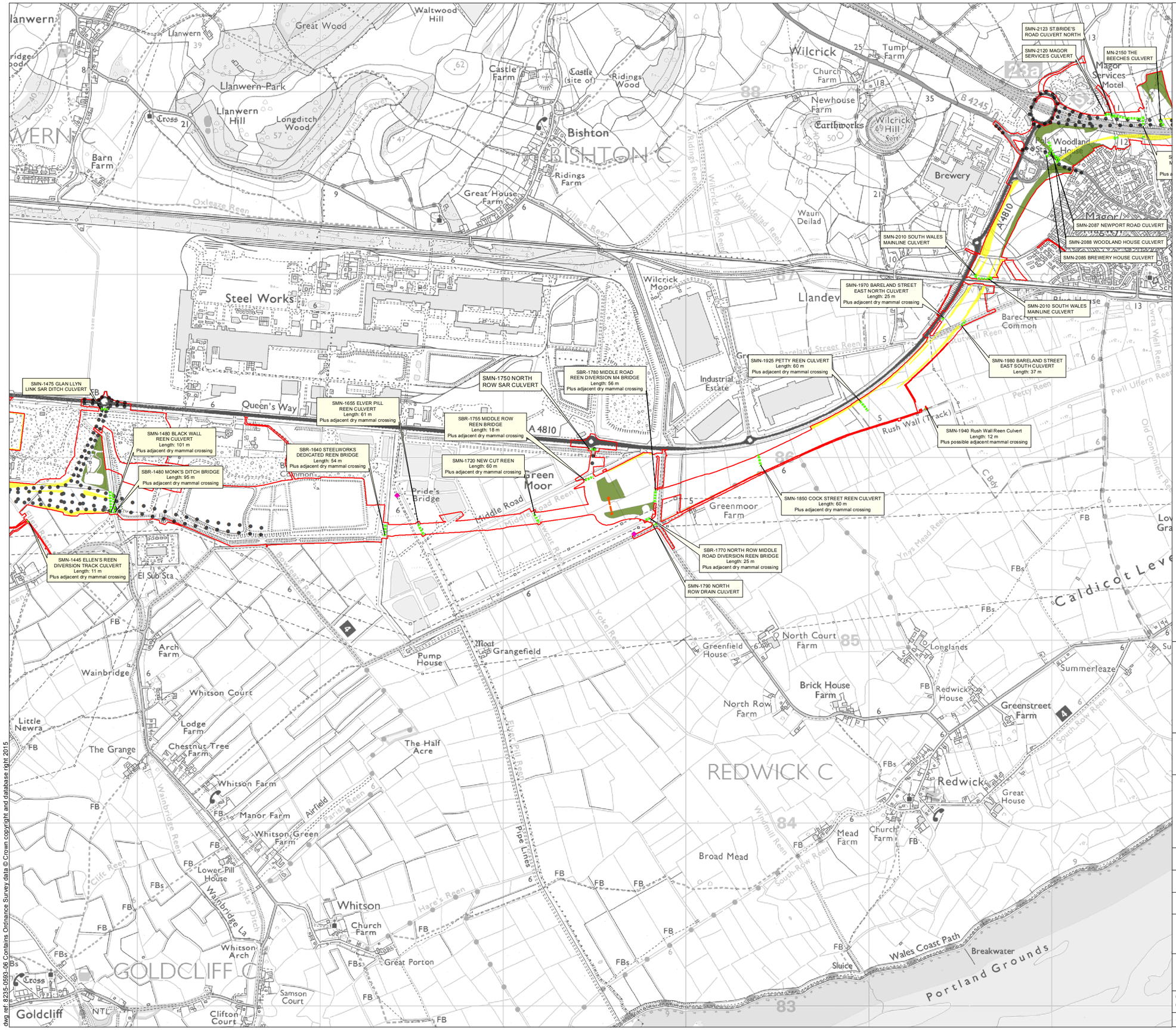
Long Term Mitigation - Woodland and Scrub Planting and Mammal Crossings in Areas of Value to Hazel Dormice

Figure: 7a	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:20,000
0 330 660m

N

dwg ref: 8235-0593-06



Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- L905_H_LE2.1 Woodland
- L905_H_LE2.4 Linear Belts of Shrubs and Trees
- Dormouse Presence
- Possible Dormouse Presence
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

*culverts without lengths- measurements to be confirmed

Llywodraeth Cymru
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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Long Term Mitigation - Woodland and Scrub Planting and Mammal Crossings in Areas of Value to Hazel Dormice

Figure: 7b	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:20,000
0 330 660m

N

dwg ref: 8235-0593-06

Legend

- Limit of Permanent and Temporary Works for New Section of Motorway
- L905_H_LE2.1 Woodland
- L905_H_LE2.4 Linear Belts of Shrubs and Trees
- Dormouse Presence
- Possible Dormouse Presence
- Culvert
- Indicative location of mammal crossing: 900 mm diameter pipes
- Operational lighting

*culverts without lengths- measurements to be confirmed

SMN-2123 ST.BRIDE'S ROAD CULVERT NORTH
SMN-2120 MAGOR SERVICES CULVERT
MN-2150 THE BEECHES CULVERT
SMN-2200 KNOLLBURY LANE NORTH CULVERT
SMN-2265 ROCKFIELD LANE NORTH CULVERT
SMN-2270 ROCKFIELD LANE SOUTH CULVERT
SMN-2361 BENCROFT LANE CULVERT
SMN-2360 LEYS BREAK CULVERT
SMN-2280 THE ELMS CULVERT
SMN-2365 THICKET WOOD CULVERT
SMN-2362 HILL BARN CULVERT
SMN-2410 GREEN FARM CULVERT
SMN-2400 THE OLD COURT CULVERT
SMN-2369 LLANFIHANGEL CULVERT
SMN-2370 REDBARN CULVERT
SMN-2371 COURT FARM CULVERT
SMN-2380ATTENUATION DITCH CULVERT
SBR-2140M423-23A66 MILL REEN CULVERT Length: 135 m Plus adjacent mammal crossing
SMN-2340 STANDING STONE CULVERT
SMN-2346 RETAINING WALL CULVERT
SMN-2339 ALLOTMENT CULVERT
SMN-2359 CALDICOT ROAD CULVERT
SMN-2087 NEWPORT ROAD CULVERT
SMN-2088 WOODLAND HOUSE CULVERT
SMN-2085 BREWERY HOUSE CULVERT
SMN-2010 SOUTH WALES MAINLINE CULVERT
SMN-2010 SOUTH WALES MAINLINE CULVERT
SMN-1980 BARELAND STREET EAST SOUTH CULVERT Length: 37 m
SMN-1940 Rush Wall Reen Culvert Length: 12 m Plus possible adjacent mammal crossing

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Appendix SS10.4 Hazel Dormouse Mitigation Strategy

Long Term Mitigation - Woodland and Scrub Planting and Mammal Crossings in Areas of Value to Hazel Dormice

Figure: 7c	Revision: -
Date: December 2016	Status: AT ISSUE
Drawn: CR	Checked: JW

Scale: A3 @ 1:20,000
0 330 660m

N

dwg ref: 8235-0593-06