Appendix E.1 – Environment (Wales) Act 2016 – Habitats and Species List

Environment (Wales) Act 2016

Section 7 – list of the habitats of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales.

Note: This interim list, which is exactly the same as the previous list under Section 42 of the NERC Act, is under review in consultation with NRW.

Deddf yr Amgylchedd (Cymru) 2016

Adran 7 - rhestr o gynefinnoedd o'r pwysigrwydd pennaf at ddiben cynnal a gwella bioamrywiaeth mewn perthynas â Chymru.

Noder: Mae'r rhestr dros dro, sydd yn union yr un fath a'r rhestr flaenorol o dan Adran 42 o Ddeddf NERC, yn cael ei adolygu mewn ymgynghoriad â CNC.

Habitats	**Cynefin**	**Priority Habitats**	**Cynefin sy'n Flaenoriaeth**
Terrestrial, coastal & freshwater	**Daearol, arfordirol a dŵr croyw**		
Broadleaved, mixed and yew woodland	Coedwig lydanddail, gymysg ac ywen	Traditional orchards	Perllannau traddodiadol
		Wood pasture & parkland	Porfa goediog a pharcdir
		Upland oak woodland	Coedwig dderi yn yr ucheldir
		Lowland beech and yew woodland	Coedwig ffawydd ac ywen ar dir isel
		Upland mixed ash woodland	Coedwig ynn gymysg ar dir uchel
		Wet woodland	Coedwig wlyb
		Lowland mixed deciduous woodland	Coedwig gollddail gymysg ar dir isel
Boundary and linear features	Nodweddion llinellol a therfynau	Hedgerows	Gwrychoedd
Arable and horticultural	Tir âr a garddwriaethol	Arable field margins	Ymylon caeau ŷd
Improved grassland	Glaswelltir wedi ei wella	Coastal and floodplain grazing marsh	Tir pori corslyd ar forfa arfordirol a gorlifdir
Neutral grassland	Glaswelltir niwtral	Lowland meadows	Gweirgloddiau yr iseldir
Calcareous grassland	Glaswelltir calchaidd	Lowland calcareous grassland	Glaswelltir calchaidd yr iseldir
		Upland calcareous grassland	Glaswelltir calchaidd tir uchel
Acid grassland	Glaswelltir asidaidd	Lowland dry acid grassland	Glaswelltir asidaidd sych yr iseldir
Dwarf shrub heath	Gweundir o gorlwyni	Lowland heathland	Gweundir yr iseldir
		Upland heathland	Gweundir yr ucheldir
Fen, marsh and swamp	Ffen, cors a chors siglennaidd	Upland flushes, fens and swamps	Trylifiadau, ffeniau a chorsydd siglennaidd ar dir uchel
		Lowland fens	Ffeniau ar dir isel
		Purple moorgrass and rush pastures	Porfeydd brwyn a glaswellt y gweunydd
		Reedbeds	Gwelyau cyrs
Bogs	Corsydd	Lowland raised bog	Cyforgors ar dir isel
		Blanket bog	Gorgors
Montane Habitats	Cynefinoedd mynyddig	Mountain heaths and willow scrub	Gweundir a phrysgwydd helyg ar dir mynyddig
Rivers and Streams	Afonydd a nentydd	Rivers	Afonydd

Standing open waters and canals	Dŵr llonydd agored a chamlesi	Oligotrophic and dystrophic lakes	Llynoedd oligotroffig a dystroffig
		Ponds	Pyllau dŵr
		Mesotrophic lakes	Llynnoedd mesotroffig

		Eutrophic standing waters	Dyfroedd llonydd ewtroffig
		Aquifer-fed naturally fluctuating water bodies	Dyfroedd a gyflenwir gan ddyfrhaen, ac sy'n arddangos amrywiadau naturiol yn lefel y dŵr
Inland rock	Craig fewndirol	Inland rock outcrop and scree habitats	Cynefinoedd brigiadau craig a sgri mewndirol
		Calaminarian grasslands	Glaswelltiroedd Calaminaraidd
		Open mosaic habitats on previously developed land	Brithwaith o gynefinoedd agored ar dir a oedd cynt wedi ei ddatblygu
		Limestone pavement	Palmentydd calch
Supralittoral rock	Craig uwch-lanw	Maritime cliff and slopes	Clogwyni a llethrau arforol
Supralittoral sediment	Gwaddodion uwch-lanw	Coastal sand dunes	Twyni tywod arfordirol
		Coastal vegetated shingle	Gro arfordirol gyda llystyfiant
Marine	**Morol**		
Littoral Rock	Craig o fewn cylchfa'r llanw	Intertidal boulder communities	Cymunedau ar glogfeini yn y gylchfa rhyng-lanw
		Sabellaria alveolata reefs	Riffiau *Sabellaria alveolata*
		Estuarine rocky habitats	Cynefinoedd creigiog aberol
Littoral sediment	Gwaddodion o fewn cylchfa'r llanw	Coastal saltmarsh	Morfa heli
		Intertidal mudflats	Eangderau llaid yn y gylchfa rhyng-lanw
		Seagrass beds	Gwelyau o wellt-y-gamlas
		Sheltered muddy gravels	Graean lleidiog mewn man cysgodol
		Peat and clay exposures	Amlygiadau o fawn a chlai
Sublittoral rock	Craig is-lanw	Tidal swept channels	Sianelau sy'n cael eu 'sgubo gan y llanw
		Fragile sponge & anthozoan communities on subtidal rocky habitats	Cymunedau bregus o sbyngau ac anthosoaid ar gynefinoedd creigiog is-lanw
		Carbonate reefs	Riffiau carbonad
Sublittoral sediment	Gwaddodion is-lanw	Subtidal sands and gravels	Graean a thywod is-lanw
		Subtidal mixed muddy sediments	Gwaddodion lleidiog cymysg is-lanw
		Mud habitats in deep water	Cynefinoedd lleidiog mewn dŵr dwfn
		Musculus discors beds	Gwelyau o fisglod gwyrdd (*Musculus discors)*
		Blue mussel beds	Gwelyau o fisglod glas
		Horse mussel beds	Gwelyau o farchfisglod
		Maerl beds	Gwely maerl
		Saline lagoons	Lagwnau hallt

Environment (Wales) Act 2016

Section 7 – list of the living organisms of principal importance for the purpose of maintaining and enhancing biodiversity in relation to Wales.

Note: This interim list, which is exactly the same as the previous list under Section 42 of the NERC Act, is under review in consultation with NRW.

Deddf yr Amgylchedd (Cymru) 2016

Adran 7 - rhestr o'r organeddau byw o'r pwysigrwydd pennaf at ddiben cynnal a gwella bioamrywiaeth mewn perthynas â Chymru.

Noder: Mae'r rhestr dros dro, sydd yn union yr un fath a'r rhestr flaenorol o dan Adran 42 o Ddeddf NERC, yn cael ei adolygu mewn ymgynghoriad â CNC.

Ψ Wales only species; † original S74 species
Ψ Rhywogaethau Cymru'n unig; † rhywogaethau Adran 74 gwreiddiol

Mammals / Mamaliad (17 species/rhywogaeth)			**Revisions/Newidiadau**
Arvicola terrestris	Water vole†	Llygoden bengron y dŵr	
Barbastella barbastellus	Barbastelle bat†	Ystlum du	
Erinaceus europaeus	West European hedgehog	Draenog	
Lepus europaeus	Brown hare†	Ysgyfarnog	
Lutra lutra	Otter†	Dyfrgi	
Martes Martes	Pine marten	Bele'r coed	
Micromys minutus	Harvest mouse	Llygoden yr ŷd	
Muscardinus avellanarius	Dormouse†	Pathew	
Mustela putorius	Polecat	Ffwlbart	
Myotis bechsteinii	Bechstein's bat†	Ystlum Bechstein	
Nyctalus noctula	Noctule	Ystlum mawr	
Pipistrellus pipistrellus	Common Pipistrelle†**Ψ**	Ystlum lleiaf	
Pipistrellus pygmaeus	Soprano Pipistrelle†	Ystlum lleiaf meinlais	
Plecotus auritus	Brown long-eared bat	Ystlum hirglust	
Rhinolophus ferrumequinum	Greater horseshoe bat†	Ystlum pedol mwyaf	
Rhinolophus hipposideros	Lesser horseshoe bat†	Ystlum pedol lleiaf	
Sciurus vulgaris	Red squirrel†	Gwiwer goch	

Birds /Adar (51 species/rhywogaeth)			
Acrocephalus paludicola	Aquatic warbler†	Telor y dŵr	
Alauda arvensis subsp. arvensis/scotica	Skylark†	Ehedydd	
Anser albifrons subsp. flavirostris	Greenland greater white-fronted goose	Gŵydd dalcen-wen yr Ynys Las	
Anthus trivialis	Tree pipit	Corhedydd y coed	
Botaurus stellaris	Great bittern†	Aderyn y bwn	
Branta bernicula subsp. bernicula	Dark-bellied brent goose	Gwydd ddu Siberia	
Caprimulgus europaeus	European nightjar†	Troellwr mawr	
Carduelis cabaret	Lesser redpoll	Llinos bengoch fach	
Carduelis cannabina subsp. autochthona/cannabina	Common linnet†	Llinos	
Carduelis flavirostris subsp. bensonorum/pipilans	Twite	Llinos y mynydd	

Charadrius hiaticula	Ringed plover **Ψ**	Cwtiad torchog	
Circus cyaneus	Hen harrier†**Ψ**	Boda tinwyn	
Coccothraustes coccothraustes	Hawfinch	Gylfinbraff	
Crex crex	Corncrake†	Rhegen yr ŷd	
Cuculus canorus	Common cuckoo	Cog	
Cygnus columbianus subsp. Bewickii	Tundra swan = Bewick's swan	Alarch Bewick	
Dendrocopus minor subsp. Comminutus	Lesser spotted woodpecker	Cnocell fraith leiaf	
Emberiza calandra subsp. calandra/clanceyi	Corn bunting†	Bras yr ŷd	
Emberiza citrinella	Yellowhammer†	Bras melyn	
Emberiza schoeniclus	Reed bunting†	Bras y cyrs	
Falco tinnunculus	Kestrel**Ψ**	Cudyll coch	
Ficedula hypoleuca	Pied flycatcher**Ψ**	Gwybedog brith	
Lagopus lagopus subsp. scotica	Red grouse	Grugiar goch	
Lanius collurio	Red-backed shrike	Cigydd cefngoch	
Larus argentatus subsp. argenteus	Herring gull	Gwylan y penwaig	
Larus ridibundus	Black-headed Gull**Ψ**	Gwylan benddu	
Limosa lapponica	Bar-tailed godwit**Ψ**	Rhostog gynffonfraith	
Locustella naevia	Common grasshopper warbler	Troellwr bach	
Lullula arborea	Woodlark	Ehedydd y coed	
Melanitta nigra	Common scoter†	Môr-hwyaden ddu	
Motacilla flava subsp. flavissima	Yellow wagtail	Siglen felen	
Muscicapa striata	Spotted flycatcher†	Gwybedog mannog	
Numenius arquata	Eurasian curlew†	Gylfinir	
Parus montanus subsp. Kleinschimdti	Willow tit	Titw'r helyg	
Parus palustris subsp. palustris/dresseri	Marsh tit	Titw'r wern	
Passer domesticus	House sparrow	Aderyn y to	
Passer montanus	Eurasian tree sparrow†	Golfan y mynydd	
Perdix perdix	Grey partridge†	Petrisen	
Phylloscopus sibilatrix	Wood warbler	Telor y coed	
Pluvialis apricaria	Golden plover†**Ψ**	Cwtiad aur	
Prunella modularis subsp. Occidentalis	Hedge accentor (Dunnock, Hedge sparrow)	Llwyd y gwrych	
Puffinus mauretanicus	Balearic shearwater	Aderyn drycin y Balearig	
Pyrrhocorax pyrrhocorax	Chough†**Ψ**	Brân goesgoch	
Pyrrhula pyrrhula subsp. pileata	Common bullfinch†	Coch y berllan	
Sterna dougallii	Roseate tern†	Môr-wennol wridog	
Stretopelia turtur	European turtle dove†	Turtur	
Sturnus vulgaris subsp. vulgaris	Common starling	Drudwen	
Tetrao tetrix subsp. britannicus	Black grouse†	Grugiar ddu	
Turdus philomelos subsp.clarkei	Song thrush†	Bronfraith	
Turdus torquatus	Ring ouzel	Mwyalchen y mynydd	
Vanellus vanellus	Northern lapwing†	Cornchwiglen	

Fish / Pysgod (10 species/rhywogaeth)			
Alosa alosa	Allis shad†	Herlyn	
Alosa fallax	Twaite shad†	Gwangen	
Anguilla anguilla	European eel	Llysywen	
Coregonus lavaretus	Whitefish (Powan, Gwyniad, or	Gwyniad (Gwyniad	

	Schelly)	Llumonwy, Gwyniad Derwennydd)	
Lampetra fluviatilis	River lamprey	Llysywen bendoll yr afon	
Osmerus eperlanus	Smelt (Sparling)	Brwyniad Conwy	
Petromyzon marinus	Sea lamprey	Llysywen bendoll y môr	
Salmo salar	Atlantic salmon	Eog	
Salmo trutta	Brown / Sea trout	Brithyll / Siwin	
Salvelinus alpinus	Arctic char	Torgoch	

Reptiles and amphibians / Ymlusgiaid ac Amffibiaid (8 species/rhywogaeth)			
Anguis fragilis	Slow-worm	Neidr ddefaid	
Bufo bufo	Common toad	Llyffant dafadennog	
Epidalea calamita	Natterjack toad†	Llyffant y twyni	
Lacerta agilis	Sand lizard†	Madfall y tywod	
Zootoca vivipara	Common lizard	Madfall	
Natrix natrix	Grass snake	Neidr y gwair / neidr y glaswellt	
Triturus cristatus	Great crested newt†	Madfall ddwr gribog	
Vipera berus	Adder	Gwiber	

Invertebrates / Anifeiliaid Di-asgwrn-cefn (188 species/rhywogaeth)			
Acronicta psi	Grey dagger	Bidog llwyd	
Acronicta rumicis	Knot grass	Bidog y tafol	
Adscita statices	The forester	Coediwr	
Agonopterix atomella	A micro-moth	Micro-wyfyn	
Agonum scitulum	A ground beetle	Chwilen ddaear	
Agrochola helvola	Flounced chestnut	Castan Grech	
Agrochola litura	Brown-spot pinion	Castan smotyn brown	
Agrochola lychnidis	Beaded chestnut	Castan leiniog	
Allophyes oxyacanthae	Green Brindled crescent	Cilgant brych	
Amphipoea oculea	Ear moth	Clustwyfyn llygeidiog	
Amphipyra tragopoginis	Mouse moth	Ôl-adain lyglwyd	
Anania funebris	A Pyralid moth	Gwyfyn o deulu'r Pyralidiau	
Andrena tarsata	A mining bee (yn GyrA)	Gwenynen durio	
Apamea anceps	Large nutmeg	Brithyn ocraidd	
Apamea remissa	Dusky brocade	Brithyn llwydolau	
Aporophyla lutulenta	Deep-brown dart	Gwladwr brownddu	
Arctia caja	Garden tiger	Teigr yr ardd	
Argynnis adippe	High brown fritillary†	Britheg frown	
Asilus crabroniformis	Hornet robber fly†	Pryf llofrudd	
Asteroscopus sphinx	The sprawler	Cwcwll bwaog	
Atethmia centrago	Centre-barred sallow	Melyn yr onnen	
Austropotamobius pallipes	White-clawed freshwater crayfish†	Cimwch dŵr croyw	
Bembidion quadripustulatum	A ground beetle	Chwilen ddaear	
Bembidion testaceum	A ground beetle†	Chwilen ddaear	
Bidessus minutissimus	A diving beetle†	Chwilen blymio	
Blepharita adusta	Dark brocade	Pali tywyll	
Boloria euphrosyne	Pearl-bordered fritillary†	Britheg berlog	
Boloria selene	Small pearl-bordered fritillary	Britheg berlog fach	
Bombus humilis	Brown-banded carder-bee†	Cardwenynen lwydfrown	
Bombus muscorum	Moss carder-bee	Cardwenynen y mwsogl	

Bombus ruderarius	Red-shanked carder-bee	Cardwenynen goesgoch	
Bombus ruderatus	Large garden bumblebee	Gwenynen bwm yr ardd	
Bombus sylvarum	Shrill carder-bee†	Cardwenynen feinlais	
Brachylomia viminalis	Minor shoulder-knot	Gwargwlwm bach	
Brachyptera putata	Northern February red†	Coch y mis bach (math o bryf cerrig)	
Calosoma inquisitor	A ground beetle	Chwilen ddaear	
Carabus monilis	A ground beetle	Chwilen ddaear	
Caradrina morpheus	Mottled rustic	Gwladwr brith	
Celaena haworthii	Haworth's minor	Gwyfyn plu'r gweunydd	
Celaena leucostigma	The crescent	Clustwyfyn cilgantog	
Chesias legatella	The streak	Rhesen y banadl	
Chesias rufata	Broom-tip	Rhesen gam	
Chiasmia clathrata	Latticed heath	Seffyr delltog	
Chlaenius tristis	A ground beetle	Chwilen ddaear lwydaidd	
Chrysis fulgida	A ruby-tailed wasp	Cacynen gynffon ruddem	
Cicindela hybrida	A tiger beetle†	Chwilen deigr groesryw	
Cliorismia rustica	A Stiletto-fly†	Pryf pigfain	
Coenagrion mercuriale	Southern damselfly†	Mursen Penfro	
Coenonympha pamphilus	Small heath	Gweirlöyn bach y waun	
Coenonympha tullia	Large heath	Gweirlöyn mawr y waun	
Cosmia diffinis	White-spotted pinion†	Llwyfwyfyn brith	
Cossus cossus	Goat moth	Gwyfyn drewllyd	
Cryptocephalus decemmaculatus	A leaf beetle / Ten spotted beetle	Chwilen ddail ddeg smotyn	
Cupido minimus	Small blue	Glesyn bach	
Cyclophora pendularia	Dingy mocha	Moca tywyll	
Cylindera germanica	A tiger beetle†	Chwilen deigr	
Cymatophorima diluta	Oak lutestring	Tant y derw	
Dasypolia templi	Brindled ochre	Cwcwll melynaidd	
Diarsia rubi	Small square-spot	Smotyn sgwâr bach	
Diloba caeruleocephala	Figure of eight	Crwbach ffigwr wyth	
Dipoena inornata	A Comb-footed spider	Copyn/corryn coes gribog	
Dolomedes plantarius	Fen raft spider†	Corryn rafftio'r ffen	
Donacia aquatica	A reed beetle	Chwilen gyrs	
Donacia bicolora	A reed beetle	Chwilen gyrs	
Ecliptopera silaceata	Small phoenix	Ffenics bach	
Empis limata	A dance fly	Pryf dawnsio	
Ennomos erosaria	September thorn	Carpiog Medi	
Ennomos fuscantaria	Dusky thorn	Carpiog tywyll	
Ennomos quercinaria	August thorn	Carpiog Awst	
Entephria caesiata	Grey mountain carpet	Brychan llwyd y mynydd	
Epirrhoe galiata	Galium carpet	Brychan y friwydd	
Erigone welchi	A money-spider	Copyn lwcus	
Eriopygodes imbecilia	The silurianΨ	Gwyfyn Gwent	
Erynnis tages	Dingy skipper	Y gwibiwr llwyd	
Eucera longicornis	Long-horned Bee	Gwenynen gorniog	
Eugnorisma glareosa	Autumnal rustic	Gwladwr yr hydref	
Eulithis mellinata	The spinach	Brychan cyrens	

Eurodryas aurinia	Marsh fritillary†	Britheg y gor	
Eustroma reticulatum	Netted carpet moth†	Brychan rhwydog	
Euxoa nigricans	Garden dart	Dart y gerddi	
Euxoa tritici	White-line dart	Dart gwynresog	**Added SG6 item 13**
Formicoxenus nitidulus	Shining guest ant	Morgrugyn gwestai gloyw	
Graphiphora augur	Double dart	Dart deunod	
Gryllotalpa gryllotalpa	Mole cricket	Cricsyn y tes	
Hagenella clathrata	A caddis fly (yn gyra)	Pryf gwellt delltog	
Haplodrassus dalmatensis	A spider	Copyn/corryn	
Harpalus melancholicus	A ground beetle	Chwilen ddaear	
Heliophobus reticulata	Bordered gothic†	Rhwyll ymylog	
Hemaris tityus	Narrow-bordered bee hawk-moth†	Gwalchwyfyn gwenynaidd ymyl gul	
Hemistola chrysoprasaria	Small emerald	Emrallt barf yr hen ŵr	
Hepialus humuli	Ghost moth	Chwimwyfyn rhithiol	
Hipparchia semele	Grayling	Gweirlöyn llwyd	
Hoplodrina blanda	The rustic	Llwyd llyfn	
Hydraecia micacea	Rosy rustic	Gwladwr gwridog	
Hydrochara caraboides	Lesser silver water beetle†**Ψ**	Chwilen-blymio ariannaidd leiaf (Gwell: chwilen blymio ariannaidd fach)	
Hydroporus rufifrons	A diving beetle†	Chwilen blymio	
Idea contiguaria	Weaver's wave**Ψ**	Ton Gwynedd	
Idaea dilutaria	Silky wave†	Ton sidan	
Idiocera sexguttata	A cranefly	Pryf teiliwr chwe smotyn	
Isogenus nubecula	A stonefly	Pryf cerrig	
Jodia croceago	Orange upperwing†	Uwchadain oren	
Lampronia capitella	Currant shoot-borer	Tyllwr egin cwrens	
Lasiommata megera	Wall brown	Gweirlöyn y cloddiau	
Leptidea sinapis	Wood white	Gwyn y coed	
Limenitis camilla	White admiral	Mantell wen	
Lipsothrix errans	A cranefly†	Pryf teiliwr crwydrol	
Lipsothrix nervosa	A cranefly†	Pryf teiliwr gïeuog	
Lipsothrix nigristigma	A cranefly	Pryf teiliwr smotyn du	
Lophopus crystallinus	A freshwater bryozoan	Bryosoad dŵr croyw	
Lucanus cervus	Stag beetle†	Chwilen gorniog	
Lycia hirtaria	Brindled beauty	Rhisglyn brith	
Lycia zonaria subsp. britannica	Belted beauty†	Rhisglyn y morfa	
Macaria wauaria	V moth	Seffyr y ffyrch	
Malacosoma neustria	The lackey	Gwaswyfyn	
Margaritifera margaritifera	Freshwater pearl mussel†	Misglen berlog yr afon	
Mecopisthes peusi	A money spider	Corryn lwcus	
Meioneta mollis	A money spider	Corryn lwcus	
Melanchra persicariae	Dot moth	Gwyfyn dotiog	
Melanchra pisi	Broom moth	Gwyfyn y banadl	
Melanthia procellata	Pretty chalk carpet	Brychan hardd y calch	
Meloe proscarabaeus	An oil-beetle	Chwilen olew	
Meloe rugosus	An oil-beetle	Chwilen olew	
Meloe violaceus	An oil-beetle	Chwilen olew	
Meotica anglica	A rove beetle†	Chwilen grwydr	
Mesoligia literosa	Rosy minor	Corrach gwridog	

Minoa murinata	Drab looper	Dolennwr llwydfelyn	
Monocephalus castaneipes	A money spider	Corryn lwcus	
Mythimna comma	Shoulder-striped wainscot	Gwensgod gwar rhesog	
Myxas glutinosa	Glutinous snail†	Malwen ludiog	
Nemapogon picarella	A micro-moth	Micro-wyfyn	
Nematopogon magna	A micro-moth	Micro-wyfyn	
Nigrobaetis niger	Iron blue mayfly	Gwybedyn Mai haearnlas	
Noctua orbona	Lunar yellow underwing†	Isadain felen loerol	
Notioscopus sarcinatus	A money spider	Corryn lwcus	
Ochthebius poweri	A water beetle	Chwilen ddŵr	
Odontomyia hydroleon	A soldier fly†	Pryf soldiwr	
Odynerus melanocephalus	A mason-wasp	Saerbicwnen benddu	
Omphiscola glabra	Mud snail	Malwen y llaid	
Orthonama vittata	Oblique carpet	Brychan lletraws	
Orthosia gracilis	Powdered quaker	Crynwr llychlyd	
Osmia parietina	A mason bee†	Saerwenynen	
Osmia xanthomelana	A mason bee†	Saerwenynen	
Panagaeus cruxmajor	A ground beetle†	Chwilen ddaear	
Pelurga comitata	Dark spinach	Brychan y wermod	
Perizoma albulata subsp. albulata	Grass rivulet	Gwregys y gwair	
Philodromus fallax	A running crab-spider	Cranc-gorryn y tywod	
Phyllonorycter sagitella	A micro-moth	Micro-wyfyn	
Pisidium tenuilineatum	Fine-lined pea mussel†	Misglen rhesi main	
Plebejus argus	Silver-studded blue†	Glesyn serennog	
Polia bombycina	Pale shining brown†	Gwyfyn arennau disglair	
Potamanthus luteus	A mayfly	Gwybedyn Mai	
Pseudanodonta complanata	Depressed river mussel†	Misglen yr afon bantiog	
Pyrausta sanguinalis	A pyralid moth	Perl coch ac aur	
Pyrgus malvae	Grizzled skipper	Gwibiwr brith	
Rhabdomastix japonica	A cranefly	Pryf teiliwr	
Rheumaptera hastata	Argent and sable†	Brychan du a gwyn	
Rhizedra lutosa	Large wainscot	Gwelltwyfyn mawr	**Added SG6 item 13**
Saaristoa firma	A money spider	Corryn lwcus	
Sabra harpagula	Scarce hook tip**Ψ**	Bachadain brin	
Satyrium w-album	White letter hairstreak	Brithribin wen	
Scopula marginepunctata	Mullein wave	Ton arfor	
Scotopteryx bipunctaria	Chalk carpet	Brychan y calch	
Scotopteryx chenopodiata	Shaded broad-bar	Rhesen lydan dywyll	
Sitticus caricis	A jumping spider	Corryn neidio	
Spilosoma lubricipeda	White ermine	Ermin gwyn	
Spilosoma luteum	Buff ermine	Ermin llwydfelyn	
Stilbia anomala	The anomalous	Llwyd gloyw	
Synanthedon scoliaeformis	Welsh clearwing†**Ψ**	Cliradain Gymreig	
Synaptus filiformis	Hairy click beetle†	Chwilen glec flewog	
Thecla betulae	Brown hairstreak†	Brithribin brown	
Thinobius newberyi	A rove beetle†	Chwilen grwydr	
Tholera cespitis	Hedge rustic	Rhwyll y crawcwellt	
Tholera decimalis	Feathered gothic	Rhwyll bluog	
Timandra comae	Blood-vein	Gwyfyn gwythïen goch	
Trichiura crataegi	Pale eggar	Wylun gwelw	
Tyria jacobaeae	The cinnabar	Teigr y benfelen	
Vertigo angustior	Narrow-mouthed whorl snail†	Malwen droellog geg	

		gul	
Vertigo geyeri	Geyer's whorl snail†	Malwen droellog Geyer	
Vertigo moulinsiana	Desmoulin's whorl snail†	Malwen droellog Desmoulin	
Watsonalla binaria	Oak Hook-tip	Bachadain y derw	
Xanthia gilvago	Dusky-lemon sallow	Melyn y llwyf	
Xanthia icteritia	The sallow	Melyn penfelyn	
Xanthorhoe decoloraria	Red carpet	Brychan coch	
Xanthorhoe ferrugata	Dark-barred twin-spot carpet	Brychan deusmotiog tywyll	
Xestia agathina	Heath rustic	Clai'r rhos	
Xestia ashworthii	Ashworth's rustic	Gwladwr Cymreig	
Xestia castanea	Neglected rustic	Clai'r waun	
Xylena exsoleta	Sword-grass†	Cleddwyfyn cyffredin	

Vascular plants / Planhigion fasgwlaidd (77 species and 1 Hieracium sp. Group/ 77 rhywogaeth ac 1 grŵp Hieracium)			
Artemisia campestris subsp. maritima	Field wormwood	Y feidiog ddi-sawr	
Asparagus prostratus	Wild asparagus†	Merllys gorweddol	
Asplenium trichomanes subsp. pachyrachis	A maidenhair spleenwort**Ψ**	Duegredynen gwallt y forwyn	
Blysmus compressus	Flat-sedge	Corsfrwynen arw	
Bupleurum tenuissimum	Slender Hare`s-ear	Paladr trwyddo eiddilddail	
Campanula patula	Spreading bellflower†	Clychlys ymledol	
Carex divisa	Divided sedge	Hesgen ranedig	
Centaurea cyanus	Cornflower	Glas yr ŷd	
Centaurium scilloides	Perennial centaury	Canrhi barhaol	
Cephalanthera longifolia	Narrow-leaved Helleborine	Caldrist gulddail	
Cerastium nigrescens (=*Cerastium arcticum*)	Arctic mouse-ear	Clust-y-llygoden ogleddol	**Taxonomic revision SG13[1]**
Chamaemelum nobile	Chamomile†	Camri	
Cicendia filiformis	Yellow centaury	Canrhi felen eiddil	
Clinopodium acinos	Basil thyme	Brenhinllys y maes	
Cotoneaster cambricus	Wild cotoneaster†	Cotoneaster y Gogarth	
Dactylorhiza purpurella var. cambrensis (=*Dactylorhiza purpurella subsp. cambrensis*)	A Marsh orchid	Tegeirian y gors	**Taxonomic revision SG 13[1]**
Dactylorhiza viridis	Frog orchid	Tegeirian y broga	
Dianthus armeria	Deptford pink†	Penigan y porfeydd	
Euphrasia cambrica	An eyebright†	Effros Cymreig	
Euphrasia officinalis subsp. anglica (=*Euphrasia anglica*)	Glandular eyebright	Effros Lloegr	**Taxonomic revision SG 13[1]**
Euphrasia ostenfeldii	An eyebright	Effros Ostenfeld	
Euphrasia pseudokerneri	Chalk eyebright	Effros y calch	
Euphrasia rivularis	An eyebright†	Effros y nant	
Euphrasia officinalis subsp. monticola (=*Euphrasia rostkoviana subsp. montana*)	An eyebright	Effros	**Taxonomic revision SG 13[1]**
Fumaria purpurea	Purple ramping-fumitory†	Mwg y ddaear glasgoch	
Galeopsis angustifolia	Red hemp-nettle†	Y Benboeth gulddail	
Galeopsis segetum	Downy hemp-nettle**Ψ**	Y Benboeth	
Galeopsis speciosa	Large-flowered hemp-nettle**Ψ**	Y Benboeth amryliw	
Gentianella anglica	Early gentian	Crwynllys cynnar	
Gentianella campestris	Field gentian†	Crwynllys y maes	

Gentianella uliginosa	Dune gentian†	Crwynllys Cymreig	
Gymnadena borealis	Northern fragrant orchid**Ψ**	Tegeirian pêr gogleddol	
Gymnadena conopsea	Fragrant orchid**Ψ**	Tegeirian pêr	
Gymnadena densiflora	Marsh fragrant orchid**Ψ**	Tegeirian pêr y gors	
Hammerbya paludosa	Bog orchid**Ψ**	Tegeirian bach y gors	
Hieracium spp.: *Hieracium angustatiforme* *Hieracium breconicola* *Hieracium reticulum* *Hieracium radyrense* *Hieracium snowdoniense* *Hieracium subminutidens*	6 threatened endemic species**Ψ**	6 rhywogaeth endemig dan fygythiad	
Hordeum marinum	Sea barley	Haidd y morfa	
Hypopitys monotropa (=*Monotropa hypopitys*)	Yellow bird`s-nest	Cytwf	**Taxonomic revision SG 13 G¹**
Hypopitys monotropa subsp hypophegea (=*Monotropa hypopitys subsp hypophegea*)	A bird's-nest	Cytwf	**Taxonomic revision SG 13 G¹**
Hypopitys monotropa subsp monotropa (=*Monotropa hypopitys subsp hypopitys*)	A bird`s-nest	Cytwf	**Taxonomic revision SG 13 G¹**
Juniperus communis	Juniper†	Merywen	
Juniperus communis subsp. hemisphaerica	A juniper**Ψ**	Merywen	
Liparis loeselii	Fen orchid†	Gefell-lys y fignen	
Luronium natans	Floating water plantain†	Dŵr-lyriad nofiadwy	
Lycopodiella inundata	Marsh clubmoss†	Cnwp-fwsogl y gors	
Lycopodium clavatum	Stag's-horn clubmoss**Ψ**	Cnwp-fwsogl corn carw	
Matthiola sinuata	Sea stock	Murwyll arfor	
Melittis melissophyllum	Bastard balm	gwenynog	
Mentha pulegium	Pennyroyal†	Brymlys	
Neotinea ustulata	Burnt orchid	Tegeirian llosg	
Oenanthe fistulosa	Tubular water-dropwort	Cegiden bibellaidd	
Ophrys insectifera	Fly orchid	Tegeirian y clêr	
Pilularia globulifera	Pillwort†	Pelenllys	
Platanthera bifolia	Lesser butterfly-orchid	Tegeirian llydanwyrdd bach	
Poa glauca	Glaucous meadow-grass	Gweunwellt llwydlas	
Polystichum lonchitis	Holly-fern	Rhedynen gelyn	
Potamogeton compressus	Grass-wrack pondweed†	Dyfrllys camleswellt	
Potentilla rupestris	Rock cinquefoil†	Pumnalen y graig	
Pseudorchis albida	Small-white orchid	Tegeirian bach gwyn	
Pulicaria vulgaris	Small fleabane	Cedowydd	
Ranunculus arvensis	Corn buttercup	Blodyn-ymenyn yr ŷd	
Ranunculus tripartitus	Three-lobed water-crowfoot†	Crafanc-y-frân dridarn	
Rumex rupestris	Shore dock†	Tafolen y traeth	
Salsola kali subsp. kali	Prickly saltwort	Helys pigog	
Saxifraga cespitosa	Tufted saxifrage	Tormaen siobynnog	
Scandix pecten-veneris	Shepherd's needle†	Crib Gwener	
Scleranthus annuus	Annual knawel	Dinodd unflwydd	
Scleranthus annuus subsp. annuus	Annual knawel	Dinodd unflwydd	
Silene gallica	Small - flowered catchfly†	Gludlys amryliw	
Sorbus eminens	A whitebeam	Cerddinen Mynwy	
Sorbus leptophylla	A whitebeam	Cerddinen Gymreig	

Sorbus leyana	Ley's whitebeam†	Cerddinen y darren fach	
Sorbus minima	A whitebeam	Cerddinen wen fach	
Stellaria palustris	Marsh stitchwort	Serenllys llwydlas	
Trollius europaeus	Globe-flowerΨ	Cronnell	
Vicia orobus	Wood bitter-vetchΨ	Ffacbysen chwerw	
Viola lactea	Pale dog-violet	Fioled welw	
Woodsia ilvensis	Oblong woodsia†	Cor-redynen hirgul	

Lichens /Cen (67 species and 2 communities)			
Anaptychia ciliaris subsp. ciliaris	A lichen	Prysgwydden y coed	
Arthonia atlantica	A lichen	Cen	
Bacidia circumspecta	A lichen	Cen	
Bacidia incompta	A lichen†	Cen	
Biatoridium monasteriense	A lichen†	Cen	
Blarneya hibernica	A lichen	Cen	
Bryoria smithii	A lichen†	Cen	
Buellia hyperbolica	A lichen	Cen	
Calicium adspersum	A lichen	Cen	
Caloplaca atroflava	A lichen	Cen	
Caloplaca flavorubescens	A lichen	Cen	
Caloplaca herbidella	A lichen	Cen	
Caloplaca lucifuga	A lichen	Cen	
Caloplaca luteoalba	Orange-fruited elm lichen†	Cen llwyfen ffrwythau oren	
Chaenotheca phaeocephala	A lichen†	Cen	
Cladonia peziziformis	A lichen†	Cen	
Collema dichotomum	River-jelly lichen†	Cen gwymonaidd yr afon	
Collema fasciculare	A lichen	Cen	
Collema fragile	A lichen	Cen	
Collema fragrans	A lichen	Cen	
Cryptolechea carneolutea	A lichen	Cen	**Added SG 13 G**
Endocarpon adscendens	A lichen	Cen	
Fulgensia fulgens	A lichen	Wygen y twyni	
Fuscopannaria sampaiana	A lichen	Cen	
Gomphillus calycioides	A lichen	Cen	
Graphina pauciloculata	A lichen†	Cen	
Gyalecta flotowii	A lichenΨ	Cafneddgen Flotow	
Heterodermia leucomela	Ciliate strap-lichen†	Cen rhuban blewog	
Lecania chlorotiza	A lichen	Cen	
Lecanographa amylacea	A lichen	Cen	
Lecanora achariana	Tarn lecanora	Cen llyn mynydd	
Lecanora quercicola	A lichen	Cen	
Lecanora sublivescens	A lichen	Cen	
Leptogium brebissonii	A lichen	Cen	
Leptogium cochleatum	A lichen	Cen	
Lobarion community	A lichen communityΨ	Cymuned o gen (*Lobarion*)	**See Annex 1**
Megalospora tuberculosa	A lichen	Cen	
Melaspilea lentiginosa	A lichenicolous fungus	Un o'r ffyngau cen	
Mine site community	A lichen communityΨ	Cymuned o gen (*safleoedd mwynglawdd*)	**See Annex 1**
Opegrapha prosodea	A lichen	Cen	
Parmelina carporrhizans [=*Parmelina quercina*]	A lichen	Cen	**Taxonomic revision SG 13 G³**
Parmeliella testacea	A lichen	Cen	

Parmelinopsis horrescens	A lichenΨ	Cen	
Parmotrema robustum	A lichen	Cen	
Peltigera venosa	A lichen	Cen	
Pertusaria velata	A lichen	Cen	
Physcia tribacioides	Southern grey physcia	Ffysgia llwyd y de	
Porina effilata	A lichen	Cen	
Porina hibernica	A lichen	Cen	
Pseudocyphellaria intricata	A lichen	Cedennog blawd llwyd	
Pseudocyphellaria lacerata	Ragged pseudocyphellaria	Cen cedennog llarpiog	
Pseudocyphellaria norvegica	A lichen†	Cen	
Pyrenula hibernica	A lichen	Cen	
Pyrenula nitida	A lichen	Cen	
Ramonia chrysophaea	A lichen	Cen	
Ramonia dictyospora	A lichen	Cen	
Rinodina isidioides	A lichen	Cen	
Schismatomma graphidioides	A lichen†	Cen	
Stereocaulon delisei	A lichen	Cen	
Stereocaulon symphycheilum	A lichen	Cen	
Sticta canariensis	A lichen	Pysg-gen glas	
Strangospora microhaema	A lichenΨ	Cen	
Strigula stigmatella var. stigmatella	A lichen	Cen	
Synalissa symphorea	A lichen	Cen	
Teloschistes flavicans	Golden hair-lichen	Cen eurwallt	
Toninia sedifolia	A lichen	Cen	
Usnea articulata	A lichen	Brig-far flodeuog	
Usnea florida	A lichen	Cen	
Wadeana dendrographa	A lichen	Cen	

Mosses and liverworts / Mwsoglau a Llysiau'r Afu (52 species and 1assemblage)			
Anoina rigida	Rigid Aloe-mossΨ		**Added SG 15 H**
Anomodon longifolius	Long-leaved tail-moss†	Cynffon-fwsogl hirddail	
Barbilophozia kunzeana	Bog paw-wort	Pawen-fwsogl y gors	
Bartramia stricta	Rigid apple-moss	Afal-fwsogl anystwyth	
Bryum calophyllum	Matted bryum	Edeufwsogl cedennog	
Bryum gemmiparum	Welsh thread-moss	Edeufwsogl Cymreig	
Bryum intermedium	Many seasoned Thread-mossΨ		**Added SG 15 H**
Bryum knowltonii	Knowlton's thread-moss	Edeufwsogl Knowlton	
Bryum marratii	Baltic bryum	Edeufwsogl y Baltig	
Bryum muehlenbeckii	Muehlenbeck's ThreadmossΨ		**Added SG 15 H**
Bryum warneum	Sea bryum†	Edeufwsogl arfor	
Buxbaumia aphylla	Brown Shield-mossΨ		**Added SG 15 H**
Cephaloziella calyculata	Entire threadwort	Llysiau'r afu edafeddog cyfan	
Cephaloziella nicholsonii	Greater copperwort†	Llysiau'r afu mawr y copr	
Cephaloziella massalongii	Lesser CopperwortΨ		**Added SG 15 H**
Daltonia splachnoides	Irish Daltonia		**Added SG 13 G**
Dendrocryphaea lamyana (=*Cryphaea lamyana*)	Multi-fruited river moss†	Mwsogl afon aml-ffrwythog	**Taxonomic revision SG 13 G²**
Dicranodontium asperulum	Orange Bow-mossΨ		**Added SG 15 H**
Dicranum undulatum	Waved Fork-moss	Crafancfwsogl	**Taxonomic revision**

(=*Dicranum bergeri*)		tonnog	**SG 13 G²**
Didymodon tomaculosus	Sausage beard-moss	Mwsogl barfog cnapiau hirion	
Ditrichum plumbicola	Lead-moss†	Mwsogl plwm	
Ditrichum subulatum	Awl-leaved ditrichum	Crafancfwsogl y mynawyd	
Entosthodon pulchellus (=*Funaria pulchella*)	Pretty cord-moss	Rheffynfwsogl hardd	**Taxonomic revision SG 13 G²**
Fissidens curvatus	Portuguese pocket-moss	Pocedfwsogl Portiwgal	
Fossombronia fimbriata	Fragile Frillwort**Ψ**		**Added SG 15 H**
Fossombronia foveolata	Pitted frillwort	Crychfwsogl tyllog	
Grimmia arenaria	Nodding Donn's Grimmia**Ψ**		**Added SG 15 H**
Habrodon perpusillus	Lesser squirrel-tail moss	Mwsogl cynffon gwiwer fechan	
Leiocolea fitzgeraldiae	Fitzgerald's Notchwort**Ψ**		**Added SG 15 H**
Leptodon smithii	Prince of Wales feather-moss**Ψ**	Mwsogl (pluenfwsogl Smith)	
Meesia uliginosa	Broadnerved Hump-moss**Ψ**		**Added SG 15 H**
Micromitrium tenerum	Milimetre Moss		**Added SG 13 G**
Oceanic Ravine Assemblage	A Bryophyte Assemblage**Ψ**	**See Annex 1**	**Added SG 15 H**
Orthotrichum obtusifolium	Blunt leaved Bristle-moss		**Added SG 13 G**
Orthotrichum pumilum	Dwarf Bristle-moss		**Added SG 15 H**
Pallavicinia lyellii	Veilwort†	Llysiau'r afu gwylaeth y gors	
Paraleptodontium recurvifolium	Drooping leaved Beard-moss**Ψ**		**Added SG 15 H**
Petalophyllum ralfsii	Petalwort†	Llysiau'r afu petalaidd	
Pseudocalliergon lycopodioides	Large Hookmoss**Ψ**		**Added SG 15 H**
Radula voluta	Pale Scalewort**Ψ**		**Added SG 15 H**
Riccia canaliculata	Channelled crystalwort	Llysiau'r afu llabedog rhychog	
Riccia nigrella	Black crystalwort	Llysiau'r afu llabedog du	
Scopelophila cataractae	Tongue-leafed copper-moss	Mwsogl copr dail tafod	
Seligeria oelandica	Irish Rock-bristle		**Added SG 13 G**
Sematophyllum demissum	Prostrate Signal-moss†**Ψ**		**Added SG 15 H**
Sphagnum balticum	Baltic Bog-moss†		**Added SG 13 G**
Tomentypnum nitens	Woolly Feather-moss**Ψ**		**Added SG 15 H**
Tortula canescens	Dog Screw-moss**Ψ**		**Added SG 15 H**
Tortula cuneifolia	Wedge-leaved screw-moss	Mwsogl troellog dail lletem	
Tortula wilsonii	Wilson's pottia	Mwsogl troellog Wilson	
Weissia levieri	Levier's beardless-moss	Mwsogl minfoel Levier	
Weissia multicapsularis	Many-fruited Beardless-moss†		**Added SG 13 G**
Weissia squarrosa	Spreading-leaved beardless-moss	Mwsogl minfoel dail atblyg	

Fungi / Ffyngau (27 species / rhywogaeth)			
Amanita friabilis	Fragile amanita	Amanita brau	
Armillaria ectypa	Agaric marsh honey fungus†	Agarig (ffwng mêl y gors)	
Chrysomyxa pirolata	Wintergreen rust	Rhwd glesyn y gaeaf	
Clavaria zollingeri	A fairy club/violet coral†**Ψ**	Ffwng cwrel dulas	
Cotylidia pannosa	Woolly rosette	Roset manflewog	
Entoloma bloxamii	Big blue pinkgill	Tagell binc las fawr	
Geastrum elegans	Elegant earthstar	Seren ddaear gain	

Geoglossum atropurpureum	Dark-purple earthtongue	Tafod daear dulas	
Hericium erinaceus	Bearded tooth fungus†	Ffwng draenog pigau hirion	
Hohenbuehelia culmicola	Marram oyster	Madarch y moresg	
Hydnellum concrescens	A tooth fungus zoned tooth†	Ffwng draenog	
Hydnellum scrobiculatum	A tooth fungus ridged tooth†	Ffwng draenog	
Hydnellum spongiosipes	Velvet tooth†	Ffwng draenog melfedaidd	
Hygrocybe spadicea	Date-coloured waxcap date waxcap†	Cap cwyrog melynddu	
Hypocreopsis lichenoides	Willow gloves	Menig llwyfain	
Hypocreopsis rhododendri			**Added SG 13 G**
Microglossum olivaceum	Olive earthtongue†	Tafod daear bach melynwyrdd	
Phellodon confluens	A tooth fungus (fused tooth)	Ffwng draenog	
Phellodon melaleucus	A tooth fungus (grey tooth)	Ffwng draenog	
Phellodon tomentosus	A tooth fungus Woolly tooth	Ffwng draenog	
Phylloporus pelletieri	Golden gilled bolete	Boled tagellau aur	
Piptoporus quercinus	Oak polypore	Ysgwydd y derw	
Poronia punctata	Nail fungus†	Ffwng tail ceffyl mannog	
Puccinia scorzonerae	Scorzonera rust	Cawod barf yr afr	
Tremellodendropsis tuberosa	Ashen coral	Cwrel lludlwyd	
Tulostoma melanocyclum	Scaly stalkball	Twlostoma coes gennog	
Urocystis colchici	Colchicum smut	Penddu saffrwm	
Stoneworts / Rhawn yr ebol (5 rhywogaeth/species)			
Chara baltica	Baltic stonewort	Rhawn-yr-ebol y Baltig	
Chara curta	Lesser bearded stonewort†**Ψ**	Rhawn-yr-ebol barfog	
Nitella gracilis	Slender stonewort†	Rhawn-yr-ebol main	
Nitella tenuissima	Dwarf stonewort†	Rhawn-yr-ebol bach	
Nitellopsis obtusa	Starry stonewort	Rhawn-yr-ebol serennog	
Marine/Morol (55 rhywogaeth/species)			
Alkmaria romijni	Tentacled lagoon worm**Ψ**	Llyngyren dentaclog	
Ammodytes marinus	Sand-eel	Llymrïen	
Anotrichium barbatum	Bearded red seaweed†	Gwymon coch barfog	
Arctica islandica	Icelandic cyprine or Ocean quahog**Ψ**	Cocosen fawr	
Atrina fragilis	Fan mussel†	Cragen adain	
Balaenoptera acutorostrata	Minke whale†	Morfil pigfain	
Balaenoptera physalus	Fin whale†	Morfil asgellog llwyd	
Caretta caretta	Loggerhead turtle†	Crwban môr pendew	
Cetorhinus maximus	Basking shark†	Heulgi	
Clupea harengus	Herring†	Pennog	
Cruoria cruoriaeformis	A red seaweed	Gwymon coch	
Delphinus delphis	Common dolphin†	Dolffin cyffredin	
Dermochelys coriacea	Leatherback turtle†	Crwban môr cefn-lledr	
Dermocorynus montagnei	A red seaweed	Gwymon coch	
Dipturus batis	Common skate†	Morgath	
Edwardsia timida	Burrowing anemone	Anenome dyllu	
Eunicella verrucosa	Pink sea-fan†	Môr-wyntyll binc	

Gadus morhua	Cod†	Penfras	
Galeorhinus galeus	Tope shark	Ci glas	
Globicephala melas	Long-finned pilot whale†	Morfil pengrwn	
Grampus griseus	Risso's dolphin†	Dolffin Risso	
Haliclystus auricula	A stalked jellyfish	Slefren goesynnog	
Hippocampus guttulatus	Long snouted seahorse	Morfarch myngog	
Hyperodon ampullatus	Northern bottlenose whale†	Morfil trwyn potel	
Lagenorhynchus acutus	Atlantic white-sided dolphin†	Dolffin ystlyswyn	
Lagenorhynchus albirostris	White-beaked dolphin†	Dolffin pigwyn	
Lamna nasus	Porbeagle shark	Corgi môr	
Lithothamnion corallinoides	Coral maerl	Cramen goch gwrelaidd	
Lophius piscatorius	Sea monkfish†	Cythraul y môr	
Lucernariopsis campanulata	A stalked jellyfish	Sglefren fôr goesynnog	
Megaptera novaeangliae	Humpback whale†	Morfil cefngrwm	
Merlangius merlangus	Whiting†	Gwyniad môr	
Merluccius merluccius	European hake†	Cegddu	
Molva molva	Ling†	Honos	
Orcinus orca	Killer whale†	Lleiddiad, orca	
Ostrea edulis	Native oyster†	Wystrysen	
Padina pavonica	Peacock's tail	Gwymon cynffon paun	
Palinurus elephas	Crayfish, crawfish or spiny lobster	Cimwch coch	
Phocoena phocoena	Harbour porpoise†	Llamhidydd	
Phymatolithon calcareum	Common maerl	Cramen goch	
Pleuronectes platessa	Plaice†	Lleden goch	
Prionace glauca	Blue shark	Morgi glas	
Raja brachyura	Blonde ray**Ψ**	Morgath felen	
Raja clavata	Thornback ray**Ψ**	Morgath styds	
Raja undulata	Undulate ray	Morgath donnog	
Rostroraja alba	White or Bottlenosed skate	Morgath wen	
Scomber scombrus	Mackerel†	Macrell	
Solea solea	Sole†	Lleden chwithig	
Squalus acanthias	Spiny dogfish	Ci pigog	
Squatina squatina	Angel shark	Maelgi	
Stenella coeruleoalba	Striped dolphin†	Dolffin rhesog	
Tenellia adspersa	Lagoon sea slug	Môr-wlithen y morlyn	
Trachurus trachurus	Horse mackerel†	Marchfacrell	
Tursiops truncatus	Bottlenose dolphin†	Dolffin trwyn potel	
Ziphius cavirostris	Cuvier`s beaked whale†	Morfil gylfinog Cuvier	

NB: At present we have standard Welsh names for vertebrates, flowering plants, ferns and conifers. All other names are liable to change as a result of current and ongoing work on Welsh environmental terms and names.

References

[1] Stace, C.A. (2010). New Flora of the British Isles, Third Edition. Cambridge University Press, Cambridge.

[2] Hill, M.O., Blackstock, T.H., Long, D.G. & Rothero, G.P. (2008). A Checklist and Census Catalogue of British and Irish Bryophytes. British Bryological Society, Middlewich.

[3] Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W., and Wolseley,

P.A. (eds.). (2009). The Lichens of Great Britain and Ireland. The British Lichen Society, London.

Annex 1 Section 42 Communities and Assemblages

Lichens /Cen Communities

The Lobarion Community

The following provides some guidance on the identification of the Lobarion lichen community. For fuller details see James, P.W., Hawksworth, D.L., & Rose, F. (1977) *Lichen Communities in the British Isles* pages 322-327 in Seward, M.R.D. (Ed.) (1977) Lichen Ecology, Academic Press, London.

When well-developed this is a spectacular community that can include some of the largest foliose lichens. Unfortunately most of its constituent species are highly sensitive to suphur dioxide, acid rain and excessive ammonia levels and many examples of the Lobarion in Wales are now species poor.

The Lobarion is likely to be present on a tree or shrub or any rock face that supports the following:-

Any species of the genera:

Degelia	*Menegassia*	*Parmeliella* (except *Parmeliella parvula* – see below)
Fuscopannaria	*Nephroma*	*Psuedocyphellaria*
Heterodermia	*Pannaria*	*Sticta*
Lobaria		

Any of the following species (*=species individually listed in Section 42):

Agonimia octospora	*Leptogium brebissonii**	*Phyllopsora rosei*
*Collema fasciculare**	*Leptogium cochleatum**	*Porina coralloidea*
Collema furfuraceum	*Pachyphiale carneola*	*Porina hibernica**
*Gyalecta flotowii**	*Parmotrema crinitum*	*Punctelia reddenda*
Gomphillus calycioides	*Peltigera collina*	*Thelopsis rubella*
Leptogium burgessii		

Any three of the following species:

Acrocordia gemmata	*Leptogium lichenoides*	*Opegrapha sorediifera*
Arthonia vinosa	*Leptogium teretiusculum*	*Parmeliella parvula*
Catinaria atropurpurea	*Loxospora elatina*	*Peltigera horizontalis*
Dimerella lutea	*Mycobilimbia pilularis*	*Pertusaria hemisphaerica*
	Normandina pulchella	*Thelotrema lepadinum*

Mine site community (Metallophytes).

Once Wales probably supported a significant assemblage of lichens associated with natural outcrops of heavy metal-rich rock. Due to the destruction of these outcrops by our mining activities the survival of metallophyte lichens are now almost entirely dependant upon the conservation of old mine sites.

Two special types of lichens are almost completely confined to these sites in Wales:-

1. Obligate metallophytes. Those lichens that appear, in some way, to require heavy metals and only occur on heavy metal-rich substrates.

2. Faculative metallophytes. Those lichens which can tolerate heavy metals, but can be found elsewhere in sites, without such heavy metals. Most of these species are probably poor competitors but can survive extreme conditions. In Wales, they are mostly confined to metal-rich sites but also occur, for example, on exposed peat on the summit ridges of high mountains.

The following species fall into one or other of these two categories in Wales and any threatened site **supporting more than three of these species** should be subject to a detailed assessment:

Acarospora sinopica	*Rhizocarpon oederi*
Baeomyces placophyllus	*Sarcosagium campestre*
Belonia incarnata	*Steinia geophana*
Epilichen scabrosus	*Sterocaulon condensatum*
Gyalidea subscutellaris	*Sterocaulon dactylophyllum*
Lecanora epanora	*Stereocaulon delisei*
Lecanora gisleriana	*Stereocaulon glareosum*
Lecanora handelii	*Stereocaulon leucophaeopsis*
Lecanora subaurea	*Stereocaulon nanodes*
Placopsis lambii	*Sterocaulon pileatum*
Placynthiella hyporhoda	*Stereocaulon symphycheilium*
Polyblastia agraria	*Vezdaea spp.*
Psilolechia lepraria	
Rhizocarpon cinereovirens	
Rhizocarpon furfurosum	

Mosses and liverworts / Mwsoglau a Llysiau'r Afu

The Oceanic Ravine Assemblage of bryophytes is likely to be present if a site supports:-

Any one of the following species; *=species individually listed in Section 42
Aphanolejeunea microscopica
Campylopus setifolius
*Daltonia splachnoides**
Drepanolejeunea hamatifolia
Hageniella micans
Harpalejeunea molleri
Leptoscyphus cuneifolius
Metzgeria leptoneura
*Paraleptodontium recurvifolium**
Plagiochila exigua
Plagiochila heterophylla
*Radula volute**
*Sematophyllum demissum**

Three or more of the following species
Adelanthus decipiens
Andreaea megistospora
Dicranum scottianum
Fissidens polyphyllus
Jubula hutchinsiae
Lepidozia cupressina

Lepidozia pearsonii
Radula aquilegia
Five or more of the following species
Anastrepta orcadensis
Colura calyptrifolia
Douinia ovata
Heterocladium wulfsbergii
Hygrobiella laxifolia
Hygrohypnum eugyrium
Isothecium holtii
Marchesinia mackaii
Plagiochila bifaria
Plagiochila punctata
Platyhypnidium lusitanicum
Porella pinnata
Rhabdoweisia crenulata
Sphenolobopsis pearsonii

Eight or more of the following species
Bazzania trilobata
Fissidens bryoides var. *caespitans*
Hyocomium armoricum
Lejeunea lamacerina
Lejeunea patens
Lophocolea fragrans
Plagiochila spinulosa
Saccogyna viticulosa
Scapania gracilis
Solenostoma paroicum
Sphagnum quinquefarium

Species removed from the Section 42 list.

Lichens /Cen			
Arthothelium dictyosporum	A Lichen	Cen	**Removed SG13 G** – never recorded in Wales
Mosses and liverworts / Mwsoglau a Llysiau'r Afu			
Atrichum angustatum	Lesser smoothcap	Mwsogl penllyfn (*neu* penfoel) bychan	**Removed SG15 H** – presumed extinct
Fissidens serrulatus	Large Atlantic pocket- moss	Pocedfwsogl mawr yr Iwerydd	**Removed SG15 H** – presumed extinct
Grimmia elongata	Brown grimmia	Clustogfwsogl brown	**Removed SG15 H**- Conservation status change
Rhytidiadelphus subpinnatus	Scarce turf-moss	Mwsogl blewog prin	**Removed SG15 H**- Conservation status change

Appendix E.2 - Statement to Inform an Appropriate Assessment (SIAA)

A487 CAERNARFON AND BONTNEWYDD BYPASS

ASSESSMENT OF IMPLICATIONS ON EUROPEAN SITES – STATEMENT TO INFORM AN APPROPRIATE ASSESSMENT

3513874-PB-XX-XX-RP-EN-00011

Final

A487 Caernarfon and Bontnewydd Bypass

Assessment of Implications on European Sites – Statement to Inform an Appropriate Assessment

3513874-PB-XX-XX-RP-EN-00011

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APPENDICES:

Appendix A: Performance Indicators for European Sites
Appendix B: Bat Survey Data
Appendix C: Screening Matrices

LIST OF ABBREVIATIONS/DEFINITIONS

AADT – Average Annual Daily Traffic
AIES – Assessment of Implications on European Sites
ALC – Agricultural Land Classification
Above Ordnance Datum
AQMA – Air Quality Management Area
AQS – The Government's 'Air Quality Strategy'
ASIDOHL – Assessment of the Significance of Impacts of Development on Historic Landscape
BAP – Biodiversity Action Plan
BBS – Breeding Birds Survey
BMV – Best and Most Versatile Agricultural Land
BPM – Best Practicable Means
BGS – British Geological Survey
BS – British Standard
CIEEM – Chartered Institute of Ecology and Environmental Management
CO – Carbon Monoxide
CO_2 – Carbon Dioxide
COMEAP – Committee on Medical Effects of Air Pollution
CRoW Act – Countryside Rights of Way Act 2000
dB – Decibels
DCWW – Dwr Cymru Welsh Water
DMRB – Design Manual for Roads and Bridges
ECI – Early Contractor Involvement (contract under which the scheme is being delivered)
EIA – Environmental Impact Assessment
EPUK – Environmental Protection UK
EQS – Environmental Quality Standard
ES – Environmental Statement
FRA – Flood Risk Assessment
GAT – Gwynedd Archaeological Trust
GC – Gwynedd Council
GCR – Geological Conservation Review
HAWRAT – Highways Agency Water Risk Assessment Tool
HER – Historic Environments Record
HRA – Habitats Regulations Assessment
HIS – Habitats Suitability Index
IAN – Interim Advice Note
IAQM – Institute of Air Quality Management
IEEM – Institute of Ecology and Environmental Management (now CIEEM)
JNCC – Joint Nature Conservation Committee
KS2 – Key Stage 2 (refers to the study of transportation options undertaken in 2009 on behalf of the Welsh Government)
L_{Aeq} – Equivalent Continuous Level (term used in noise assessment)
LAQM – Local Air Quality Management
LBAP – Local Biodiversity Action Plan
JLDP – Joint Local Development Plan
LNR – Local Nature Reserve
MAFF – Ministry of Agriculture, Fisheries and Food
NCN – National Cycle Network
NERC Act – Natural Environment and Rural Communities Act 2006
NMR – National Monuments Record
NMWTRA – North and Mid Wales Trunk Road Agency
NO – Nitric Oxide
NOx – Oxides of Nitrogen
NO_2 – Nitrogen Dioxide

NRW – Natural Resources Wales
PAS – Portable Antiquities Scheme
PM_{10} – Particulate Matter with a small size range (between 1 and 10µm)
RBD – River Basin District
RCAHMW – Royal Commission on the Ancient and Historic Monuments of Wales
RIGS – Regionally Important Geodiversity Sites
RTP – Regional Transport Plan
SAC – Special Area of Conservation
SAM – Scheduled Ancient Monument
SEA – Strategic Environmental Assessment
SIAA – Statement to Inform an Appropriate Assessment
SINC – Site of Importance for Nature Conservation
SPA – Special Protection Area
SPZ – Source Protection Zone
SSSI – Site of Special Scientific Interest
TAN – Technical Advice Note
TPO – Transport Planning Objectives
TREBAP – Trunk Road Estates Biodiversity Action Plan
TR111 – The planned route of a road protected for planning purposes
UDP – Unitary Development Plan
WelTAG –Welsh Transport Planning and Appraisal Guidance
WFD – Water Framework Directive 2000/60/EC
WG – Welsh Government
WHO – World Health Organisation
WHS – World Heritage Site
WOC – Welsh Office Circular
ZTV – Zone of Theoretical Visibility
ZVI – Zone of Visual Influence
µm – Micro Metre (= to $1x10^{-6}$ of a metre)

Potential commuting route – existing habitat features that may be used by Lesser Horseshoe Bats for commuting purposes.
Bat/safe crossing point – those structures included to provide safe passage for Lesser Horseshoe Bats beneath the carriageway.

1 INTRODUCTION

1.1 Purpose of the Report

This report has been prepared to provide information to the Welsh Ministers ("the competent authority") on the implications of the A487 Caernarfon and Bontnewydd Bypass (herein after referred to as 'the Scheme') with regard to the requirements of the Conservation (Natural Habitats &c.) Regulations 2010 (as amended), known as and referred to in this report as 'the Habitats Regulations'. This report comprises both the Stage 1 (Screening) and Stage 2 (Appropriate Assessment) stages of the Assessment of Implications on European Sites (AIES) process.

1.2 Requirements of the Habitats Regulations

The European Community Habitats Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the Habitats Directive) provides legal protection for habitats and species of European importance. The Directive is transposed into UK law by the Conservation (Natural Habitats &c.) Regulations 2010 (as amended) [1].

Before deciding to give consent for a plan or project, the competent authority (in this case, the Welsh Ministers) must consider under the requirements of Regulation 61 whether the plan or project -

(a) is likely to have a significant effect on a European site (either alone or in combination with other plans or projects); and

(b) is not directly connected with or necessary to the management of that site,

and in such cases they must make an 'appropriate assessment 'of the implications for that site in view of its conservation objectives.

In the light of the conclusions of the assessment, the competent authority may agree to the plan or project only after having ascertained that the project will not, alone or in-combination with other plans and projects, adversely affect the integrity of the European site. The only exceptions are where there are no alternatives and there are imperative reasons of overriding public interest (IROPI), in which case compensatory measures must be adopted if the Scheme is to proceed.

The assessment primarily assesses the consideration of the likely significant effects of the proposed Scheme, its reasonable alternatives and the Do Minimum scenario on the European designated sites. In the case of any likely significant effects arising, consideration of effects in relation to the conservation objectives will be assessed.

1.3 Guidance Used in Preparing the Report

This report has been prepared in accordance with Conservation (Natural Habitats &c.) Regulations 2010 (as amended) [1] and DMRB Volume 11, Section 4 HD 44/09 [2]. The document reports the Assessment of Implications on European Sites (AIES) as a Statement to Inform an Appropriate Assessment (SIAA) as outlined in Annex F of HD 44/09.

The AIES process consists of five stages:

- Stage 1: Screening,
- Stage 2: Appropriate Assessment,
- Stage 3: Alternative solutions,
- Stage 4: IROPI,
- Stage 5: Compensatory Measures.

The AIES process can be concluded at the end of Stage 1, Stage 2 or Stage 5 depending on the findings of the study.

1.4 Experience of the Surveyors and Authors of this Report

The authors of this report are Jean Hamilton and Max Burrell The report was reviewed by Samantha Shove, Lee Jones and David Wells. Surveys were carried out by a team of ecologists managed by Samantha Shove.

1.4.1 Jean Hamilton BSc (Hons), MSc, MCIEEM is a consultant ecologist with eight years' professional experience. She has extensive experience in the assessment of impacts of major road schemes on the natural environment, and the design and implementation of mitigation measures to minimise such impacts. She has carried out Habitats Regulations Assessments (HRAs) for numerous developments, mainly in the Republic of Ireland. These include Birrane Quarry in County Mayo and Redmonds Lee in County Galway. Jean worked extensively in the ecological impact assessment and Appropriate Assessment of a number of large projects in the west of Ireland. She carried out the Extended Phase 1 habitat surveys and co-authored the Natura Impact Statement (Stage 2 Appropriate Assessment) for the N59 Westport to Mulranny Road Scheme. She also carried out field surveys and helped to compile information to inform the Natura Impact Statement (SIAA) for the Connemara Greenway, a proposal to develop the dismantled Galway to Clifden railway line into a walking/cycling track (Greenway) between Oughterard and Clifden a distance of over 52.4km.

Max Burrell BSc (Hons), MSc, MIEMA, MCIEEM has over ten years' experience working with projects that can potentially affect Natura 2000 Sites. He has a Natural Resources Wales (NRW) Bat Survey Licence (current licence No. 60826: OTH: CSAB: 2014). Max was the author of the A483/A489 Newtown Bypass SIAA in relation to the Montgomery Canal SAC, which was published in 2014. In 2012 he produced the Supplement to the Statement to Inform an Appropriate Assessment in relation to the Usk Bat Sites SAC and the Supplement to the Appropriate Assessment Screening Report for the Cwm Clydach Woodlands SAC for the A465 Section 3 (Brynmawr to Tredegar) Scheme. Max has also organised and undertaken the monitoring and reporting of mitigation and compensatory measures associated with effects of the A465 Section 1 (Abergavenny to Gilwern) Scheme on the Usk Bat Sites SAC between 2005 and 2013 and the A465 Section 3 Scheme (Brynmawr to Tredegar) between 2012 and the present.

Samantha Shove BSc (Joint Hons) MCIEEM, CEnv has over nine years' experience working with projects that potentially affect Natura 2000 sites and experience of working on all stages of the Appropriate Assessment process. She has contributed to the preparation and reporting of Appropriate Assessments/ Assessment of Implications on European Sites (AIES) including initial AIES screening works for A483/A489 Newtown Transportation Study, A470/A487 Builth Wells Transportation Study (including Appropriate Assessment Screening), A487 Caernarfon to Bontnewydd Transportation Study, grouting works on the A465 River Usk road bridge (relating to the River Usk SAC) and Appropriate Assessment Screening for A465

Heads of the Valleys Section 3 Brynmawr to Tredegar (in relation to the Cwm Clydach Woodlands SAC).

Lee Jones BSc (Hons) DipTP, MRTPI, MLI is the Environmental Coordinator for the Scheme. He has a wealth of experience having been the contractor's environmental coordinator on a number of other highway projects within Wales, which have affected Natura 2000 sites for which Lesser Horseshoe Bats have been a qualifying interest. These have included the A477 Nash to Bangeston, A487 Llanwnda, and the A465 Heads of the Valleys Dualling Sections 1 (2004 to 2013) and 3 (2010 to present). His work has included inputs and review of SIAAs, overseeing survey works and the development of mitigation and compensatory measures. The A465 Section 1 was built under the terms of the IROPI Stage of the AIES process and required stringent mitigation and compensatory measures and careful project management.

David Wells BSc (Hons), MIEEM, CEnv has twenty years' professional experience, including fifteen years working as a consultant. David is a specialist in protected species surveys, impact assessment and mitigation design, particularly for bats and dormice. He has provided technical advice and assistance on bat survey, assessment and mitigation for a number of infrastructure projects including the A483/A487 Newtown Bypass, A487 Porthmadog Bypass, A477 Sageston and Redberth Bypass, A40 Penblewin to Slebech Park and the A470 Cross Foxes to Maes yr Helmau Improvements. David was also involved with the M6 Toll and the A470 Pont yr Afanc to Dolwyddelan Improvements. He was also a member of the Technical Advisory Group for the A465 Heads of the Valleys (Section 2) Improvements. David has also co-authored a number of bat related guidance notes and co-authored and presented papers at Bat Conservation Trust Conferences.

1.5 Why the Scheme is Needed

The A487 forms part of the strategic road network in north west Wales. It links the region of north west Wales into the A55 Corridor on the north Wales coast which provides an important link into Ireland and England. Currently the A487 at Caernarfon and Bontnewydd is a substandard section of this network.

The problems that the Scheme aims to address include:

- Traffic congestion;
- A lack of high quality road infrastructure hindering economic development of the area;
- Community severance and quality of life for settlements along the A487;
- A high risk of collisions in urban areas;
- Vehicles using county roads to bypass the A487; and
- Difficulty in maintaining the trunk road due to high traffic levels and lack of suitable alternative routes.

1.6 History of the Scheme

In the early 1990s Parkman Consulting was commissioned by the Welsh Office Highways Directorate to undertake studies in the Caernarfon area to determine if a bypass of Caernarfon was feasible. A report was published in 1992 confirming that there were potentially feasible routes to bypass Caernarfon.

From 1992 to the present a number of trunk road and major transport infrastructure projects were undertaken in the area; A487 Felinheli Bypass, A487 Point Seiont, A487

Llanllyfni to south of Llanwnda, A487 Porthmadog Bypass together with A499 Llanelhaearn to Aberdesach and A497 Abererch to Llanystumdwy on the Llyn.

Arup was commissioned in February 2007 by WG to undertake a WelTAG Planning Stage and Stage 1 Study to consider transport issues and options in the Llanwnda to Plas Menai corridor using the draft version of WelTAG. A number of options were identified and a combination of these and online measures were recommended for further testing under the WelTAG Stage 1 Appraisal process.

In 2009 the WG commissioned a study to address transport problems on the A487 Fishguard to Bangor Trunk Road through Caernarfon and Bontnewydd. This study utilised the earlier work undertaken separately. The more recent WelTAG Stage 2 study included an initial public consultation that took place between March and May 2010 and a supplementary public consultation that took place between November 2010 and January 2011.

The Scheme, with the objectives to reduce journey times, accidents, and the number of vehicles passing through residential communities and improve network resilience forms part of the WG's main transport policy aims. The A487 trunk road is an important part of the WG's strategic road network and it serves as the major north/south route along the west Wales coast linking Fishguard, Cardigan, Aberystwyth, Machynlleth, Dolgellau, Porthmadog, Caernarfon and Bangor.

The Key Stage 2 Study for the Scheme was carried out by Parsons Brinckerhoff. Following the investigation of route options and two public consultations, a Preferred Route (Purple Route) was recommended. This Preferred Route was announced by the Minister for Local Government and Communities in July 2012.

As a result of budgetary pressures the Minister for Economy, Science and Transport decided to review the options and in May 2013 adopted the Yellow Option as the preferred route.

The Balfour Beatty / Jones Brothers Joint Venture (hereinafter referred to as the JV Team) was commissioned in December 2014 to develop the Scheme and prepare draft Orders and accompanying information during Key Stage 3 (KS3). The JV Team will support the Welsh Government through the Statutory Process in Key Stage 4 (KS4, also known as the detailed design stage) and would proceed to construction in Key Stage 6 (KS6) on the award of a separate contract between the Contractor and the Welsh Government. A summary of the project Key Stages is shown below:



1.7 Scheme Description

1.7.1 General

The Scheme would be 9.7km in length and would comprise of a Wide Single 2+1 Road. (WS2+1) This would provide two lanes in one direction and one lane in the opposite direction throughout the Scheme. The Scheme would provide a total of 4.60km of overtaking length in the northbound direction and 4.57km of overtaking length in the southbound direction. This route would be made up of three sections of WS2+1 standard carriageway separated by new at-grade roundabouts at Meifod and

Cibyn. All the proposed alignment would be offline from the existing A499/A487(T) Goat roundabout to the existing A487(T) Plas Menai roundabout.

For the proposed alignment there would be two significant river crossings over the Afon Gwyrfai, which is designated as an SAC, and the Afon Seiont.

New or diverted Public Rights of Way and Private Means of Access would be provided to replace those affected by the scheme.

Road drainage would be provided through 'over the edge' drainage which would discharge into attenuation ponds along the Scheme (French/filter drains would collect the water in the verges which then connect to a series of ponds through outfalls). The attenuation ponds would be provided for each of the carriageway drainage sub-catchments to mitigate for the increased rates and volume of run-off that would arise post-scheme construction. These ponds would attenuate and treat the collected surface water prior to discharging it into existing watercourses.

The drainage of both the Afon Seiont and Afon Gwyrfai viaducts would be via combined kerb and drainage bridge-deck compatible units. Water on the bridge decks cannot drain 'over the edge' and traditional gullies cannot be constructed on a bridge due to the lack of depth of construction. Therefore, special kerbs are used that have holes in them at the edge of the carriageway to collect water which then runs in a channel built in to the kerb and off the bridge to outfall into ponds as described above.

The majority of the Scheme would be fenced with stock proof fencing. Otter fencing would also be provided at appropriate locations on the Scheme, such as watercourse crossings and culverts.

A detailed description of the Scheme is given in section 2.

1.8 Scheme Objectives

1.8.1 Welsh Government Objectives and Mission Statement

The Welsh Government's objective for the Scheme is to: *'provide an improvement to Caernarfon and Bontnewydd in accordance with the findings of the Key Stage 2 study, and to include the commitments made at the Public Consultation undertaken as part of this study. This is to be carried out through appointment of a design and build Contractor under an Early Contractor Involvement (ECI) contract to be managed following the principles of PRINCE2 project management system and to deliver the works to programme, budget, and with due regard to the Welsh Ministers policies'.*

The Welsh Government's Mission is to:

'Promote the vision and transport strategy described in the Welsh Government's 'One Wales: Connecting the Nation', the Wales Transport Strategy, and the National and Regional Transport Plan'.

1.8.2 Scheme / Planning Objectives

The following five specific Transport Planning Objectives for the Scheme have been developed:

Objective 1

- Reduce journey time (between Llanwnda and Plas Menai) and improve journey time reliability to within +/- 3 minutes of the average journey time throughout the day.

Objective 2

- Reduce journey time (between Llanwnda and Caernarfon) and improve journey time reliability to within +/- 3 minutes of the average journey time throughout the day.

Objective 3

- Reduce the number of vehicles passing through residential communities; including Llanwnda, Dinas, Bontnewydd and Caernarfon.

Objective 4

- Scheme to contribute to the Welsh Government casualty reduction targets:
  - 40% reduction by 2020;
  - 25% reduction in motorcyclists by 2020; and
  - 40% reduction in the number of young children killed or seriously injured by 2020.

Objective 5

- Improve network resilience – Increase the amount and/or capacity of alternative routes to improve the resilience of the network.

1.8.3 General Objectives

To meet all of the above objectives whilst ensuring proper regard for the environment.

1.8.4 Specific Environmental Design Objectives

Key aims are:

- To avoid or to mitigate adverse effects of the Scheme upon designated features, sites and species,
- To reflect the landscape character through which the Scheme passes,
- To allow permeability of the Scheme so that the LHB population is sustained,
- To maintain linkages and provide routes for non-motorised users (NMU).

1.9 Alternatives Considered

WelTAG Approach

The Conceptual Design for the Scheme, and other associated transport measures were developed and appraised through the WelTAG Planning / Stage 1 Study commissioned in 2007 and the WelTAG Stage 2 Appraisal undertaken as part of the Key Stage 2 Study commissioned in 2009.

1.9.1 WelTAG Planning and Stage 1 Appraisal

The WelTAG Planning Stage firstly established Caernarfon and Bontnewydd's transportation problems, constraints and opportunities and the 'Transport Planning Objectives' (TPOs) were developed against which the appraisal of options could be tested. Once these had been established, potential solutions were developed in the form of transportation options.

Following the Planning Stage, the WelTAG Stage 1 Appraisal was undertaken and fourteen transportation options were appraised against the TPOs, criteria relating to the Welsh Impact Areas (taken from the Wales Transport Strategy as detailed within the WelTAG Stage 1 Report [3]) and other criteria relating to public and stakeholder acceptability, feasibility, risk and affordability. The Welsh Impact Areas represent the three elements of sustainability which underline policy in Wales:

- The economy,
- The environment,
- Society.

Five of the fourteen options performed well against the TPOs and Welsh Impact Area criteria and were recommended for further appraisal at WelTAG Stage 2. These were:

- *Option 1 – A new bypass from Llanwnda to Plas Menai,*
- *Option 2 – Local bypasses of Llanwnda, Dinas, Bontnewydd, Pont-rug and Crug,*
- *Option 3 – A conventional rail link either from Bangor to Caernarfon, Caernarfon to Afon-wen or Bangor to Afon-wen,*
- *Option 4 - An online package of measures, which includes; online road capacity improvements, road traffic management, parking, soft measures, accident remedial measures, cycle routes, lanes & priorities, pedestrian areas/crossings, and public transport modes, and*
- *Option 5 – Do nothing.*

The WelTAG Appraisal Summary Table (AST) was completed for each option appraised at WelTAG Stage 1[3].

WelTAG Stage 2 Appraisal

A public consultation exercise was carried out as part of the Stage 2 Appraisal exercise. This resulted in a further seven options being developed, and gave a total of twelve options that were appraised at WelTAG Stage 2 as follows:

Bontnewydd Bypass Options

- Pink Option – 3.4km bypass to the south west of Caernarfon, west of Bontnewydd and Llanwnda
- White Option – 3.75km bypass to the south of Caernarfon, east of Bontnewydd and Llanwnda
- Blue Option – 4km bypass to the south of Caernarfon, east of Bontnewydd, running slightly further east of Llanwnda than the White Option.

Caernarfon Bypass Options

- Purple Option - 11km bypass to the south east of Caernarfon, the Pink Option forms the first part of this route before continuing north east and linking to the A487 at the Felinheli Bypass.
- Yellow Option – this is similar to the Purple Option with the exception of the northern end where it links to the Plas Menai roundabout.
- Brown Option – 10.4km of mixed on and offline improvements/bypass to the south east of Caernarfon, the Pink Option forms the southern section while the northern end follows the Yellow Option.
- Brown Variant Option – as above with the exception of the alignment north of Bontnewydd which would run through Gypsy Wood Park, continue online for 2km before deviating for 1.8km past Felinbach before rejoining at Lon Glai Farm.
- Black Option – this is a variation to the Purple Option totalling 11.8km which uses part of the unclassified roads that tie in to the existing Caeathro roundabout instead of the alignment which runs adjacent to Caernarfon Quarry.
- Orange Option – this is a variation to the Yellow Option totalling 10.4km which uses part of the unclassified roads that tie in to the existing Caeathro roundabout instead of the alignment which runs adjacent to Caernarfon Quarry.
- Red Option – this is a variation to the Black Option between the Meifod roundabout and the unclassified roads around Caeathro totalling 11.8km.
- Cyan Option – this is a variation to the Orange Option between the Meifod roundabout and the unclassified roads around Caeathro totalling 10.5km.
- Online Improvements Option – online improvements on unclassified roads from Plas Menai to Bontnewydd.

The online package of improvements included proposals for traffic calming in Bontnewydd, promotion of park and share schemes, cycling and pedestrian facilities on the A487 and ‘smarter choices’.

The WelTAG ASTs for the above options, including detailed descriptions, are available in the ES Volume 3, Appendix A.4.

The Key Stage 2 Study recommended that the ‘Purple Route’ as the preferred route. The minister’s decision was to reject this route and the ‘Yellow Route’ was adopted as the preferred route. The route was protected for planning purposes through the Welsh Government serving a TR111 notice.

1.10 Previous work

1.10.1 Caernarfon to Bontnewydd Transport Study (Key Stage 2) Appropriate Assessment Screening [4]

An Appropriate Assessment Screening exercise was conducted for Key Stage 2 of the A487 Caernarfon to Bontnewydd Scheme in 2012 in line with HD44/09.

The screening stage assesses the potential effects produced by the proposed development against the interest features of each European site to determine whether there is a Likely Significant Effect (LSE). This is essentially a risk-based process to decide whether a more detailed assessment is required (alone and in-combination).

The screening for LSE involves identifying whether the proposed development might affect any of the interest features of the relevant European sites. If there is such an effect, it is then necessary to identify the potential pathways through which the proposed development could affect the interest features, the lengths of those

pathways and what may reduce or prevent the potential effect. Where there is a source, a pathway and an effect that reaches the interest feature, it is judged that there is a LSE that requires more detailed assessment (i.e. appropriate assessment stage).

When carrying out screening at this LSE stage, account is taken of the avoidance and mitigation measures that have been built into the proposed design. Mitigation measures considered in this assessment are those which are plainly established and uncontroversial.

The screening for LSE identifies those aspects of the proposed development and those interest features of each relevant European site where there is confidence that they are not likely to be significantly affected and which therefore need not be considered further. If it cannot be concluded with confidence that LSEs are unlikely, then under the precautionary principle, it is assumed that the issue requires more detailed consideration.

The Natura 2000 sites considered in this Screening exercise were:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Menai Strait and Conwy Bay SAC
- Glynllifon SAC
- Meirionnydd Oakwoods and Bat Sites SAC
- Gwydir Forest Mines SAC

The Screening Report concluded that, in the absence of mitigation, the Scheme could have impacts on the Afon Gwyrfai a Llyn Cwellyn, Menai Strait and Conwy Bay SAC, Glynllifon SAC and the Meirionnydd Oakwoods and Bat Sites SAC.

This Screening also concluded that, due to its distance from the Scheme (approximately 25km), no impacts were expected on the Gwydir Forest Mines SAC. However, the DMRB Guidelines state that all SACs for bats be considered within a 30km radius of the scheme in question, and so this site will be considered further in this SIAA despite the lack of anticipated impacts as Lesser Horseshoe Bats are a designatory feature of this SAC. This was also discussed and agreed with NRW in an initial telephone conference meeting with NRW at the start of Key Stage 3.

It is important to note that impacts were assessed in the absence of any mitigation measures, such as mitigation by design, or pollution control measures.

Further information of the Screening stage assessment is included within Appendix C.

2 DESCRIPTION OF THE SCHEME

2.1 Detailed Scheme description

Ch.0 – 1650 Goat Roundabout to Dinas Accommodation Underpass (S105)

The Scheme would commence at its southern connection from a new arm on the A499/A487(T) Goat Roundabout and would provide two lanes in the southbound direction and one lane in the northbound direction. The Scheme would be on an embankment of up to 7m high for a short length, passing over Pont Parc Underpass (S101A) before entering a cutting of up to 9m deep, where a minor road would cross on the Ty'n Llan Overbridge (S103).

A treatment/attenuation pond (Pond 1A) would be located to the west of the bypass near to the Goat Outfall and another pond (Pond 1) would be located to the east of the bypass at the Pont Parc Underpass. The existing Lon Eifion cycleway that currently crosses the A449 would be diverted around Goat Roundabout, crossing the proposed de trunked A487. The existing footpaths FP 19 and FP10 would be diverted along the proposed structures, Pont Parc Underpass (S101A) and Ty'n Llan Overbridge (S103) respectively. A dedicated bat/mammal underpass would be provided at CH 1180.(SNRW1)

An additional culvert to increase permeability of the Scheme following discussions with NRW during Key Stage 3 (KS3) of the Scheme development has been included at Ch.1180.

Geufron Culvert (S104) would be located at Ch1400 with two treatment/attenuation ponds (Pond 2 and Pond 3) located to the west of the Scheme.

Dinas Accommodation Underpass (S105) is located at Ch1550.

Ch.1650 – 3460 Dinas Accommodation Underpass (S105) to Meifod Roundabout

The Scheme would provide a non-conflicting changeover after Dinas Accommodation Underpass (S105) to provide two lanes in the northbound direction and one lane in the southbound direction. It would cross the Afon Gwyrfai floodplain on a long viaduct that would be known as the Gwyrfai Viaduct (S106), which would be around 6m above the adjacent landscape. An attenuation pond (Pond 4a) would be located to the east of the Scheme north of the northern abutment of the Gwyrfai Viaduct (S106).

Between Ch2050 and 3000, the Scheme would be on embankment approximately 5m high. The Scheme would cross over the Pont Llydiart Gwyn (S107) box underbridge.at Ch2250 and a layby would be located in the northbound direction at Ch2450. Pont Cefnwerthyd (S108) underbridge would accommodate the crossing over the Welsh Highland Railway. The existing side road would be stopped up to vehicles and equestrians and the Pont Ceriw Non-Motorised User overbridge (S109) would provide access over the Scheme. The bridge would not be suitable for equestrian use. Access for equestrians and vehicles would be maintained through a diversion along existing alternative side roads. A dedicated bat/mammal underpass (SNRW2) would be provided at Ch3420.

A treatment/attenuation pond (Pond 4) would be located to the east of the Scheme adjacent to the section of the Scheme that would connect to the existing A487 via the new Meifod Roundabout.

An additional culvert to increase permeability of the Scheme following discussions with NRW during KS3 of the Scheme development has been included at Ch.3120.

Ch. 3460 – 4950 Meifod Roundabout to Caernarfon Quarry

On leaving the Meifod Roundabout the road would be on embankment approximately 7m high, providing two lanes in the southbound direction and one lane in the northbound direction. At Ch3900 the proposed Penybryn Road crossing would be made by way of an underbridge, Pont Bryn Mafon box underbridge (S111) and at Ch4000 the existing Penybryn Road would be replaced by a box culvert for bats (S111A). A layby would be provided at Ch4200 in the southbound direction. As the Scheme skirts the eastern side of Caernarfon Quarry, it would be on a small

embankment of around 1.5m high. At Ch4800 the road then would enter a cutting approximately 5m deep.

There would be two treatment/attenuation ponds (Pond 5 and Pond 6) located to the north-east of the proposed Meifod Roundabout and east of the existing Penybryn Road.

Ch. 4950 – 6490 Caernarfon Quarry to Cibyn Roundabout

A non-conflicting crossover (where the one lane of traffic switches to two lanes on a 2+1 lane carriageway in the direction of travel on both sides of the carriageway) would be provided at Ch4950 to provide two lanes in the northbound direction and one lane in the southbound direction. An additional culvert to increase permeability of the Scheme following discussions with NRW during KS3 of the Scheme development has been included at Ch.5100.

The Scheme would approach the Afon Seiont floodplain on embankment up to 8m high and cross by means of a large viaduct, the Seiont Viaduct (S112), approximately 20m above the valley floor. A dedicated bat/mammal underpass (SNRW3) would be provided at Ch5100. The road would lie to the north of the Glan Gwna Holiday Park and would be in cutting of up to 2.5m deep until the A4086. This section would then terminate at the proposed Cibyn Roundabout, which connects with the existing A4086.

There would be three attenuation ponds (Pond 7, Pond 8 and Pond 8a) located to the west of the southern embankment of the Seiont Viaduct (S112), north-east of the northern abutment of the Seiont Viaduct (S112) and south of Cibyn Industrial Estate respectively.

Ch. 6490 – 7910 Cibyn Roundabout to Bethel Road

There would be two treatment/attenuation ponds (Pond 9 and Pond 10) located at Cibyn Roundabout. The road would be at grade for a short distance before entering another embankment, which would cross an existing minor road (Bethel Road), which would be diverted to the east of the proposed bypass including a new Bethel Road Roundabout.

Another treatment/attenuation pond (Pond 11) would be located to the south west of Bethel Roundabout and Pond 12 would be located between the proposed Scheme and the proposed diverted Bethel Road Roundabout.

Ch. 7910 – 9710 Bethel Road to Plas Menai Roundabout

A conflicting crossover (where two lanes switch to one lane in the direction of travel on both sides of the carriageway) would be provided at Ch7910 to provide two lanes in the southbound direction and one lane in the northbound direction.

The route then would lower slightly into cutting and the B4366 is accommodated with an overbridge at Ch8420. The existing Bethel Road Roundabout would be relocated to the eastern side of the Scheme. On the approach to the existing A487 there would be a gradient of 6% which would be a cutting. The Afon Cadnant would be diverted around this junction using oversized culverts to encourage use by mammals.

The connection at Crug Lane with Plas Menai Roundabout would maintain a two-way access. The access would be provided by constructing a new section of carriageway between the existing land and would tie in at Crug Farm Nurseries.

Between Ch8900-9600 the Scheme would enter a deep cutting with exposed rock slopes of up to 22.5m on the approach to Plas Menai Roundabout. The existing Outdoor Centre access would be relocated from a direct link to Plas Menai Roundabout to join Caernarfon Road. The existing bus layby on the Caernarfon Road approach would also be relocated approximately 100m away from the new Yacht Club access junction.

[redacted] Lighting, signage, earthworks and structures

The lighting strategy has been developed in liaison with WG, NMWTRA, NRW and Gwynedd Council. The lighting would be restricted to the following:

- Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs.
- At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction
- The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts.
- The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.
- The current provision of lighting at the Goat and Plas Menai roundabouts would be maintained.

2.1.3 Signage and Road Markings

The Signage and Road Markings strategy has been developed in liaison with WG, NMWTRA and Gwynedd Council. Consultations have taken place with the Highway Authorities and their agents on the provision of signs including brown tourist signs. Signs are lit at roundabouts.

Signage will be designed and located to ensure that they will not affect any of the European sites considered within the SIAA or any other Natura 2000 site.

2.1.4 Earthworks

The earthworks for the scheme would reuse material excavated from site and use material excavated from Caernarfon quarry in embankments, false cuttings and re-graded landscaping areas.

Earthworks and associated excavations will be designed and located to ensure that they will not affect any of the European sites considered within the SIAA or any other Natura 2000 site.

2.2 Distance from Natura 2000 Sites

- Afon Gwyrfai a Llyn Cwellyn SAC – 0 km (Scheme crosses the site at approx. Ch. 2+050)
- Glynllifon SAC – approx. 1.2km to the south of Scheme's southern end (Goat Roundabout)
- Menai Strait and Conwy Bay SAC – approx. 0.5km north of the Scheme's northern end (Plas Menai Roundabout), approx. 2.3.km north-west of the Scheme's southern end (Goat Roundabout)

- Meirionnydd Oakwoods and Bat Sites SAC – approx. 14.7km southeast of the Scheme's southern end (Goat Roundabout)
- Gwydir Forest Mines SAC – approx. 25km east of the Scheme (Cibyn Roundabout)

2.3 Physical Land-take of the Project

The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land would be required for temporary works associated with the Scheme. An area of approximately 0.13ha of the Afon Gwyrfai SAC is crossed by the Scheme; this comprises the river bed and banks. The Scheme would not have any land take within any of the other SACs considered in this report.

The habitats within permanent and temporary works areas of the Scheme are set out in Table 2.3.1 below. The areas considered to be of temporary loss are those areas to be used for site compounds, storage and other constructions works and that will be reinstated at the end of the construction works. These areas include all areas that may be subject to habitat disturbance and prevention of use by protected species as well as direct habitat loss. The areas of permanent loss are those that will not be reinstated at the end of the works.

Table 2.3.1 – Permanent and temporary land loss by habitat type

Habitat	Permanent Loss (ha)	Temporary Loss (ha)
Semi-natural broadleaved woodland	1.35	1.61
Broadleaved plantation woodland	0.20	0.34
Plantation Coniferous woodland	0.54	0
Dense scrub	2.06	3.12
Semi-improved neutral grassland	0.48	0.29
Improved grassland	52.84	35.45
Marshy grassland	5.10	2.60
Poor semi-improved grassland	1.36	0.79
Tall ruderal	0.51	0.08
Running water	0.49	0.56
Acid Scree	0.15	0
Arable	0.42	0.74
Amenity grassland	0	0.01
Ephemeral/short perennial	0.19	0
Caravan site	0.01	0.78
Track	5.27	4.19
Bare ground	0	0.54
Other	0.70	0.18
Total Habitat Loss	**71.67**	**51.28**

2.4 Key Stages of the Project

2.4.1 Construction Strategy

Methodology and overview

The start date for the construction phase would depend on a number of factors including the successful completion of the statutory processes in making the Orders to construct the scheme, availability of Welsh Government funding and the formal signing of the contract to construct the works. It is currently anticipated that the construction activities for the scheme would commence in late 2017. It is anticipated to be a 24-month contract, with an anticipated completion date at the end of 2019. The works would be planned to ensure that the construction activities and traffic management would have minimal disruption to road users.

At the start of construction, the site would be fenced and site clearance would commence. Protected species licences would be obtained for bats and any temporary mitigation measures implemented as necessary and as outlined in Chapter 8 Nature Conservation. Temporary and permanent drainage consents and other environmental consents would be obtained where required.

Site compound and delivery routes

It is anticipated the main site office and compound would be located midway along the Scheme. A 2m high chain-link fence or hoarding would be provided as necessary to form a compound area to provide security and noise mitigation. It is anticipated the compound would have one main access from Seiont Mill Lane off the existing roundabout on the A487 with access directly on to the site from the east side of the compound at approximate chainage 4700, thus reducing unnecessary traffic movements on the existing roads. This has not been included in the temporary loss figures in Table 2.3.1 above as it is subject to a separate approval process. However, the compound location is shown on Figure 2.6 in ES Volume 2.

A number of satellite compounds would be required along the length of the scheme and these would predominately be located at the location of major structures, with provisions for small offices, welfare, storage, preparation areas and access to the local road network. Haul roads would be formed around the structures to maintain a route through the site. The land-take required for these have been included in the temporary loss figures in Table 2.3.1 above and can be seen in ES Volume 2 Figure 2.6. All compounds have been located within the Scheme area and will not be located closer to the Natura 2000 sites than those distances given in Section 2.2 above.

Construction of the scheme would be carried out over an anticipated 24 months. The first two months would be predominately site clearance works and the last month would be predominately preparation of landscape plots, planting and finalising the site works. Therefore, the main construction vehicular movements and earth moving works would be undertaken over a period of 10 months with drainage and road construction taking a further 9 months.

Goat Roundabout tie in to Afon Gwyrfai Viaduct (Ch0 – 1800)

The scheme starts from the existing Goat roundabout of Bontnewydd. The tie in off the roundabout would be constructed to minimise disruption to road users. From the roundabout the road heads north towards Afon Gwyrfai.

Three new culverts would be constructed to deal with existing watercourses. These would be reinforced concrete pipes and box sections delivered via the site access at the Goat Roundabout. New underpass bridges would be constructed at Pont Parc and Dinas. These structures would be reinforced cast in situ concrete structures, with materials being delivered from the Goat Roundabout site access. An over bridge would be constructed at Ty'n Llan. This structure would be a three span bridge with the deck sections supported on precast concrete beams on in situ reinforced concrete abutments and piers. The beam deliveries would be anticipated around spring 2018 from the site access at Goat Roundabout. Localised road closures would be implemented to facilitate the construction of these structures. The diversion route would be planned and agreed with Gwynedd Council to ensure road users are informed and diverted with the minimum of disruption.

A traffic controlled plant crossing would be provided where the site haul route crosses over Ty'n Llan. There would be a further plant crossing on the access to Dinas Farm which will be manually controlled. These crossings would be used to bring excavated material through the site for deposition in this area. It is anticipated approximately half of the fill material for this section would be obtained from within the section with the balance hauled from the cutting at Ch.9300 along the site haul routes. There would be an earthworks area at Ty'n Llan that would be removed in the second earthworks season. Three attenuation ponds would be constructed within this section. These would be constructed early to deal with site run off and provide water for dust suppression. Landscaping and planting works would be carried out over two planting seasons providing early establishment of significant sections of the scheme.

Anticipated phasing of the works in this area is shown in Table 2.2.1 below. Phase 1 commences at the start of construction and all durations follow on.

Table 2.2.1: Phasing of the works from Ch0 – Ch1800

Phase	Approximate Duration	Key Activities
1	8 months	Secure site, fencing ecological mitigation as required and site clearance (including vegetation), Statutory Undertakers diversions. Construct temporary haul routes. Construct pre earthworks drainage, Commence earthworks, Construct attenuation ponds 1,2 and 3, Construct stream culvert (S104).
2	6 months	Construct stream culvert (S101), Construct Pont Parc Underpass (S101A), Construct Afon Rhyd Culvert (S102), Culvert NRW1, Construct Dinas Accommodation Underpass (S105), Continue Statutory Undertakers Diversions, Commence Road Drainage, Commence Landscaping and planting.
3	8 months	Complete Statutory Undertakers Diversions, Construct Ty'n Llan Overbridge (S103), Complete

Phase	Approximate Duration	Key Activities
		earthworks/drainage/road construction, Lighting and signage, Complete landscaping and environmental mitigation.

Afon Gwyrfai Viaduct (S106) (Ch1800 – 2100)

The Afon Gwyrfai Viaduct would be an eight span viaduct with the deck formed on steel beams supported on in situ reinforced concrete leaf piers and abutments. The leaf piers are located within the flood plain of the Afon Gwyrfai. Construction of the viaduct would start in late summer of 2017, once the earthworks have significantly progressed. A satellite office and stores area would be erected near the South abutment above the flood plain with access off the Goat Roundabout for light vehicles. Plant and materials would not be stored on the flood plain.

The steel beams would be delivered to site from the site access at the Goat Roundabout and craned into position. The delivery route would be planned with GC to ensure road users are informed and have the minimum disruption. A temporary bailey bridge would be constructed to provide access over the Afon Gwyrfai to maintain the haul route through the site. A crane platform will be constructed around the footprint of the bridge deck in order to accommodate bridge pier access.

Phase 1 works start late summer and all other durations follow on.

Table 2.2.2: Phasing of the works from Ch1800 – Ch2100

Phase	Approximate Duration	Key Activities
1	4 months	Topsoil strip. Construct haul roads and install bailey bridge over the river Gwyrfai. Construct crane platform, then commence Piling to abutments and piers. , Construct abutments and piers
2	10 months	Deliver and install Beams, Construct bridge deck, Construct ballast and wing walls, Structure drainage and earthworks/ backfill, Vehicle Parapet, Finishes to deck

Afon Gwyrfai Viaduct to Meifod Roundabout (Ch2100 – 3500)

This section would continue on embankment from the Afon Gwyrfai Viaduct to the existing A487(T) Pwllheli Road. The material for this section would be hauled through the site from the cuttings at Ch6000 and Ch9300 along site haul roads. Two attenuation ponds would be constructed within this section. These would be constructed early to deal with site run off and provide water for dust suppression.

An in situ reinforced concrete box section Underbridge would be constructed at Pont Llydiart Glyn. This road would be closed for construction of the structure. Where the

new road crosses over the Welsh Highland Railway (WHR) the Pont Cefnwerthyd Underbridge will be constructed for the railway to pass through. The structure would be a single span reinforced earth construction with precast concrete facing panels with piled columns extending through the reinforced earth abutment supporting precast reinforced concrete beams with an in situ concrete deck. The abutments would be positioned either side of the track at a distance to allow construction to be carried out in the safe zone. A detailed method statement and liaison with WHR would ensure safety to the rail infrastructure during construction. A controlled plant crossing would be provided to facilitate site vehicles crossing the WHR and this would be agreed with WHR and constructed to meet current railway standards. It is anticipated that a number of night and weekend closures would be required to construct the bridge deck and these would be confirmed with WHR during the detailed design stage. This structure also includes provision for an access track and a recreation route. The Pont Ceriw NMU Overbridge would be a single span reinforced earth construction with precast concrete facing panels with piles extending through the reinforced earth abutment supporting precast reinforced concrete beams with an in situ concrete deck. Deliveries for these structures would be from the A487(T). The precast beam deliveries would be anticipated November/December 2017. Localised road closures would be implemented to facilitate the construction of these structures. The diversion routes would be planned and agreed with GC to ensure road users are informed and diverted with the minimum of disruption.

Two new culverts would be constructed to deal with existing watercourses. These would be constructed using concrete pipes. These would provide a safe bat crossing point and wildlife crossing points. Landscaping and planting works would be carried out over two planting seasons providing early establishment of significant sections of the scheme.

Phase 1 works start in the summer of 2017 and all durations follow on.

Table 2.2.3: Phasing of the works from Ch2100 – Ch3500

Phase	Approximate Duration	Key Activities
1	8 months	Secure site, fencing, ecological mitigation and site clearance (including vegetation), Statutory Undertakers diversions, Construct pre earthworks drainage, Commence earthworks, Construct attenuation ponds 4 and 4A
2	7 months	Construct Pont Llydiart Gwyn Underbridge (S107), Construct Pont Cefnwerthyd Underbridge (S108), Construct Pont Ceriw NMU Overbridge (S109), Construct Stream Culverts (S109A and S109B), Culvert NRW2, Complete Statutory Undertakers diversions, Commence Road drainage, Commence landscaping and planting, Commence road construction
3	7 months	Complete earthworks/drainage/road construction, Lighting and signage, Complete landscaping and environmental mitigation

Meifod Roundabout to A4085 Waunfawr Road (Ch3500- 5310)

The Meifod roundabout would be constructed mostly off line ensuring minimal disruption to road users on the existing road. A bailey bridge would also be constructed at this location over the A487 to provide a plant crossing. This section is predominately constructed on embankment with a section of cut at Ch4900 which would provide the material for one third of the embankments with the balance coming from the cut at Ch9300 along the site haul routes. Two attenuation ponds would be constructed within this section. These would be constructed early to deal with site run off and provide water for dust suppression. The main site compound would also be located within this section and access would be provided directly to the works at ch4700. It is expected the compound would be erected early in 2017. Two plant crossings would be provided to cross over minor roads and one plant crossing over the busier A4085 Waunfawr Road in this section. These plant crossings would be signal controlled crossings with the highway surface replaced with a durable concrete surface layer at the crossing location.

Pont Bryn Mafon Underbridge would be an in situ reinforced concrete box section structure, with materials deliveries accessing site from the Meifod Roundabout site access. Three new culverts would be constructed to deal with existing watercourses. These would be constructed using concrete pipes delivered to site from the site access at the Meifod Roundabout. A further culvert would be constructed using concrete pipes to provide a safe crossing point.

Table 2.2.4: Phasing of the works from Ch3500 – Ch5310

Phase	Approximate Duration	Key Activities
1	5 months	Fencing, ecological mitigation and site clearance, Statutory Undertakers diversions Construct temporary site access and bailey bridge, Pre earthworks drainage, Commence earthworks, Construct attenuation ponds 5, 6
2	6 months	Construct Pont Bryn Mafon Underbridge (S111), Construct stream culverts (S110, S110A, S111B) Construct Bat Culvert (S111A), Culvert NRW3 Complete Statutory Undertakers diversions, Commence road drainage, Commence landscaping and planting
3	11 months	Complete earthworks/drainage/road construction, Lighting and signage, Complete landscaping and environmental mitigation

Pont Afon Seiont Viaduct (S112) to Cibyn Roundabout (Ch5310 – 6400)

The road through this section is in cutting. The excavated material would be transported through the site haul roads for deposition in the fill areas at Ch3800 and Ch2300. A temporary bailey bridge would be constructed to provide access over the River Seiont to maintain the haul route through the site. One stream culvert and two

attenuation pond would be constructed between ch5600 and ch6000 to manage existing watercourses.

The Pont Afon Seiont Viaduct would be a four span viaduct with the deck formed on steel beams supported on in situ reinforced concrete columns and abutments. The columns are located on the valley floor near to, but not within, the Afon Seiont. Construction of the viaduct would start in summer of 2017, once the earthworks on both sides of the viaduct have significantly progressed and consideration given to settlements periods, particularly on the southern end. A satellite office and stores area would be erected near the southern abutment with access off A4085 Waunfawr Road.

The large construction vehicles would access the bridge site from within the scheme boundary gaining access to the southern and northern abutments from the south off A4085 Waunfawr Road. The steel beams would be delivered early 2018 to via the A487 and would access site compound and lay down area from the A4085 Waunfawr Road from where they would be craned into position. The delivery route would be planned with GC to ensure road users are informed and have the minimum disruption.

Where the structure crosses over the A4085 Waunfawr Road the construction will be in situ reinforced concrete deck supported on precast concrete beams supported on in situ reinforced concrete abutments on piled bases. Lane closures using traffic signal control would be required for the construction of the abutments. The signals would be controlled manually at peak times to reduce disruption to road users. Some night time or weekend road closures would be required for the beam installation. Arrangements for lane/road closures would be agreed with GC to minimise the impact on road users.

Table 2.2.5: Phasing of the works from Ch5310 – Ch6400

Phase	Approximate Duration	Key Activities
1	6months	Secure site, fencing, ecological mitigation and site clearance (including vegetation), Statutory Undertakers diversions, Pre earthworks drainage, Commence earthworks
2	6 months	Topsoil strip, Piling to abutments and piers, Construct abutments and piers, Construct Stream Culvert (S112C), Construct A4085 span of the Viaduct (S112E)
3	10 months	(S112) Deliver and install Beams, Construct bridge deck, Construct ballast and wing walls, Structure drainage and backfill, Construct attenuation ponds 7 and 8, Vehicle parapet, Finishes to deck Complete earthworks/drainage/road construction, Complete statutory Undertakers diversions, Lighting and signage, Complete landscaping and environmental mitigation

Cibyn Roundabout to Bethel Road South (Ch6400 – 7900)

Cibyn Roundabout would be constructed mostly off line with disruption to road users limited to the tie in works. Two stream culverts and an attenuation pond would be constructed at the roundabout to manage existing watercourses. The phasing of the tie works would be agreed with GC to minimise the impact on road users. From the roundabout the road proceeds north through a mostly shallow cut with some low embankments towards Bethel Road. The majority of excavated material from this cutting would be transported along the site haul road to the fill area at Ch5100, with the balance remaining within the section. A traffic controlled plant crossing would be provided where the haul route crosses over the A4086 Llanberis Road. One further attenuation pond would be constructed within this section. This would be constructed early to deal with site run off and provide water for dust suppression.

A precast concrete box culvert would be constructed to divert Footpath 36 and an existing watercourse at ch7160. In situ reinforced concrete wingwalls would be constructed at each end of the structure. The units for the structure would be delivered to site through the site access at Cibyn Roundabout and offloaded by crane.

Table 2.2.7: Phasing of the works from Ch6400 – Ch7900

Phase	Approximate Duration	Key Activities
1	6 months	Secure site, fencing, ecological mitigation and site clearance (including vegetation), Statutory Undertakers diversions, Pre earthworks drainage, Commence earthworks, Construct FP36 Underbridge (S113A), Construct Stream Culverts (S112A, S112B,), Construct attenuation ponds 9, 10 and 14
2	3 months	Complete Statutory Undertakers diversions, Commence road drainage,
3	6 months	Complete earthworks/drainage/road construction, Lighting and signage, Complete landscaping and environmental mitigation

Bethel Road South to Plas Menai Roundabout (Ch7900 – 9700)

The road continues north through this section into a deeper cutting where it crosses over Bethell Road, then into the rock cutting as it approaches the end of the scheme at Plas Menai Roundabout. The majority of the excavated fill material is transported to the fill areas at Ch300, Ch1500, Ch2300 and Ch5300 through the site haul routes. It will also be used in Cement Bound Material. A high proportion of the material to be excavated in this area will be rock and therefore it is envisaged that there will be need for controlled blasting in order to remove the rock and achieve the designed profile. The rock excavated from within the cutting would be processed to the side of the cutting area for use on site as capping, sub base and drainage stone.

A controlled plant crossing would be provided at Bethel Road with a temporary concrete crossing in order to ensure safe crossing of plant. The balance of the fill material would be retained within the section to provide the fill for the diverted side

road. Three attenuation ponds would be constructed within this section. These would be constructed early to deal with site run off and provide water for dust suppression. Five culverts would be constructed to deal with existing watercourses. These would be constructed from concrete pipes which would also provide safe crossing points for bats.

A precast concrete box culvert would be constructed to divert the Afon Cadnant watercourse and provide a cattle creep. In situ reinforced concrete wingwalls would be constructed at each end of the structure. The units for the structure would be delivered to site through the site access at Plas Menai Roundabout and offloaded by crane. Bethel Road Overbridge would be constructed offline from the existing Bethel Road. The structure would be precast concrete reinforced abutments and wing walls. The in situ reinforced concrete bridge deck would be cast on piled precast concrete beams supported on in situ reinforced concrete piles passing through the reinforced earth abutment. Deliveries for this structure would be received through the site access at Plas Menai Roundabout. The precast concrete beams would be delivered through this access early in 2018.

Table 2.2.8: Phasing of the works from Ch7900 – Ch9700

Phase	Approximate Duration	Key Activities
1	7 months	Secure site, fencing, ecological mitigation and site clearance (including vegetation), Pre earthworks drainage, Commence earthworks, Commence rock cutting and processing, Construct Afon Cadnant Cattle Creep Underbridge (S114), Construct Stream Culverts (S114A, S115A, S115B, S116, S118), Construct attenuation ponds 11, 12 and 13
2	9 months	Construct Bethel Road Overbridge (S115), Commence road drainage, Commence landscaping and planting, Complete earthworks/drainage/road construction to side road
3	5 months	Complete earthworks/drainage/road construction, Lighting and signage, Complete landscaping and environmental mitigation

Night-time Works

It is anticipated that night working (considered to be works between dusk and dawn) would be required at the following locations:

- Plas Menai Roundabout works
- Llanberis Road Roundabout works
- A4085 Caethro Road – bridge construction
- Meifod Roundabout works
- Welsh Highland Railway structure 109 construction
- Goat Roundabout works

The exact locations and times of the works will be determined during the detailed design stage.

2.4.2 Operation

The duration of operation cannot be accurately stated but the design life of the carriageway pavement is 40 years, surface course is 15 years and earthworks and structures are 120 years. There would be ongoing maintenance during the operational use as follows:

On completion of the construction phase the JV Team would continue to maintain the highway for 12 months and monitor and maintain the environmental mitigation, especially the landscape and ecological works, for five years. The environmental requirements for this period are set out in an Environmental Landscape and Ecology Aftercare Management Plan (ELEAMP), which would be produced and managed by the JV Team environmental specialists. During the post construction period, the JV Team would review the effectiveness of the environmental mitigation against their intended function as identified within the ES and would provide any remedial actions if required.

At the completion of this five-year period, the management of the soft estate and environmental mitigation measures would be transferred to the North and Mid Wales Trunk Road Agent (NMWTRA). The JV Team would prepare a ten-year Maintenance Environmental Management Plan (MEMP), which would set out on-going management and monitoring actions.

2.5 Resources Required throughout the Lifetime of the Project

Types of materials required to construct the Scheme are listed below:

- Surfacing material i.e. Blacktop
- Fill material, including topsoil and rock fill;
- Concrete;
- Structural steelwork
- Other materials including pipework, concrete manhole rings and geo-grid and geo-textiles

None of the resources required will be sourced from Natura 2000 sites. Table 2.4.1 summarises the approximate quantity of materials required to construct the Scheme, material won on site and material to be imported to the scheme.

Table 2.4.1: Quantity of material and likely HGV movements to import material onto the scheme

Type of Material	Approximate Quantity Required	Approximate Quantity Won*	Approximate Quantity Imported	Number of HGV movements required
Topsoil (m^3)	136,130	136,130	0	0
Fill material (m^3)	739,200	665,180	74,020	6,660
Aggregates (m^3)**	212,210	212,210	0	0
Concrete (Imported) (m^3)	15,000	0	15,000	2,500
Surfacing Material (tonnes)	77,820	0	77,820	3,890

Type of Material	Approximate Quantity Required	Approximate Quantity Won*	Approximate Quantity Imported	Number of HGV movements required
Drainage pipes and ducting (linear metres)	15,000	0	15,000	400
Concrete manhole rings and other products (units)	750	0	750	
Geo-grid and geotextile rolls (m^2)	150,000	0	150,000	
Structural steelwork (Tonnes)	980	0	980	33

* Site won materials include materials excavated as part of constructing the scheme.

** Including aggregate for use in Cement Bound Material

The Scheme would be constructed via a combination of cut and fill earthworks using site won and imported material. The contractor is aiming to achieve a cut/fill balance but it is dependent on the quantity and quality of the rock excavated from the Plas Menai (and other) cutting. If there is a shortfall, suitable material may have to be imported (locations to be identified but will be outside Natura 2000 sites). Embankments would be formed using approximately 739,200m³ of general fill, of which approximately 665,180m³ would be site won in the cuttings. A total of 74,020m³ of fill material would be imported and sourced locally where practicable generating approximately 6,600 lorry movements over a period of 10 months when the main construction vehicular movements and earth moving works would be undertaken. This is the equivalent of 33 lorry movements per day assuming 20 working days per month.

Total material excavated from the route of the Scheme would be approximately 1,173,530m^3 including topsoil and rock fill. Most of this material (877,390m³) would be used by the scheme as fill and aggregates for roads and structures. The remaining 296,140m^3 would include topsoil and unsuitable material (i.e. material that cannot be used as base materials for highway construction, structures, embankments or other built elements, but can be used for general fill and landscape areas). The topsoil (136,130m^3) would be used for reinstating the side slopes and remaining 160,010m^3 of unsuitable material would be taken off site and placed in a local tip requiring approximately 14,400 lorry movements over a period of 19 months. This includes the main construction vehicular movements and earth moving works (10 months) and drainage and road construction including landscaping and environmental mitigation (9 months). This is the equivalent of 38 lorry movements per day assuming 20 working days per month.

The unsuitable material volume at present is based on assumptions and results of findings of the latest ground investigation work and this therefore may change if on site excavation works reveal differing conditions. During the planning and construction phase it is envisaged that more work would be done to reduce the unsuitable volumes by using a combination of ground improvement techniques and provision of additional landscaping areas where materials can be placed. This should in turn reduce the amount of material taken off site.

The material sourced on site would be hauled in dump trucks to the appropriate area via the haul route which runs along the length of the scheme trace. A material processing area would be located at the northern end of the Scheme which would process (where required) the site won material into the required specification.

Materials would be stored in areas away from sensitive receptors including watercourses and visual receptors. The sensitivity of the receptors as a result of storage and treatment is considered to be low, and the potential magnitude of impacts associated with storage and treatment during the works would be minor. The overall significance of effect has been consequently assessed to be neutral.

Approximately 77,820 tonnes of surfacing material would be required for the scheme which would be delivered via 3,890 lorry movements over a period of 9 months when the road construction works would take place. This is the equivalent of 22 lorry movements per day assuming 20 working days per month. Surfacing material is likely to be sourced locally where practicable e.g. Penmaenmawr, Bangor or via quarries at Minffordd. Surfacing material from these sources would access the scheme from any of the 5 Site Access points.

There is a possibility that a concrete batching plant would be set up for the project at the Main Site Compound to make the 15,000m^3 of concrete required for the scheme. This option is still being considered, and until the quality of the aggregate source can be confirmed on site by material testing, this possibility cannot be confirmed at this time. Approximately 18,000 tonnes of aggregate required for the concrete could be sourced from the works. As part of the site concrete batching option approximately 6,000 tonnes of cement (200 lorry movements) and approximately 9,000 tonnes of sand (300 lorry movements) would be required to be delivered to the concrete batching plant thus saving 2,000 lorry movements on the local highway network when compared with the option of importing concrete (total of 2,500 lorry movements over a period of 7 months which is the equivalent of 18 lorry movements per day assuming 20 working days per month).

Other materials items (drainage pipes and ducting, concrete manhole rings and geo-grid and geotextile rolls) would likely be sourced through national builder merchants and would be delivered direct from suppliers due to the quantities needed. The deliveries would generate approximately 400 lorry movements and would access the scheme from any of the 5 Site Access points. Materials would be stored at various compound locations located throughout the Scheme.

Cement Bound Material (CBM) would be used to construct the Scheme using approximately 27,000m^3 of site won aggregate (included in the 212,210m^3 volume quoted in Table 2.4.1) to form the bottom pavement layers. This would remove the importation of approximately 60,000m^3 of fill material which would have been required in addition to the 74,020m^3 of fill material being imported.

As described above construction materials is required to be imported for the Scheme in order to construct the carriageway and proposed structures. Materials would be imported from local suppliers. Given that the Scheme has been developed to achieve a balance of cut and fill and so minimise the export of site-won materials from the works areas, import of materials would be minimised.

Standard highway operation and maintenance procedures would be carried out during the lifetime of the bypass. Typical activities include:

- Winter maintenance, such as de-icing/gritting;
- Painting (line and bridge);
- Resurfacing;
- Repairs to damage;
- Maintenance of the highway drainage network;

- Management and maintenance of roadside grass areas and vegetation trimming to comply with the environmental objectives;
- Management of nature conservation (habitat and protected species) measures.

2.6 Waste Products arising during Construction and Operation

The majority of the waste generated during construction of the Scheme is likely to be excess fill material from earthworks and construction site waste from the Contractor Compounds (for example packaging and residual materials). The waste streams anticipated during construction of the Scheme and their corresponding classifications are listed in Table 2.5.1.

Table 2.5.1: Anticipated Waste Streams during Construction

Waste Stream	Waste classification
Excess excavated material unsuitable for engineered fill	Inert waste
Structures waste – rubble and building materials	Inert waste / non-hazardous waste
General non-putrescible waste	Non-hazardous waste
General putrescible waste	Non-hazardous waste
Contaminated soil from spills of fuels, oils and lubricants	Hazardous waste
Waste oil and lubricants	Hazardous waste
Green waste from vegetation removal and construction timber	Non-hazardous waste
Solid and liquid waste from temporary ablution facilities	Non-hazardous waste

The majority of the waste generated during construction of the Scheme is likely to be construction site waste from the Contractor Compounds (for example packaging and residual materials). Through the implementation of the CEMP, construction waste would be recycled where feasible. Non-recyclable general waste from the site (from the contractor's facilities) would be disposed of at a licenced landfill site.

2.7 Emissions

The potential magnitude of dust emissions is large for all construction activities except demolition, primarily due to the overall size of the Scheme. The magnitude of dust emissions from demolition is small due to the limited requirements for removal of existing road surfaces/street furniture at junctions but no requirements for demolition of properties. The large magnitude of dust emission from earthworks is due to the large total site area (>10,000m2), a generally clayey soil and large amounts of materials movement. In addition, to the northern end of the Scheme, there is a significant requirement for blasting and cutting of rock. Similarly, the large site area is the primary contributor to the large magnitude dust emission potential from construction activities, together with the requirement for piling and concrete batching activities. The potential for dust emissions from track-out is also considered large due to the high numbers of potential HDV movements and the presence of lengths of unpaved roads on site and road crossing points.

It should be noted that dust risk levels do not remain constant at all times. Actual risks on any given day will depend on the activities being undertaken, the meteorological conditions and the proximity of receptors to activities with high dust generating potential. This variability is particularly relevant to the Scheme which will not have construction activities across the whole site for the whole construction period. The

assessment is therefore conservative and indicative of the maximum potential impact of construction related dust at any given time.

The CEMP will include a Dust Management Plan, which will reflect best practice and will be implemented across the site for the duration of works. Additional measures will also be provided where construction activities (earthworks/construction/track-out) occur with 50m of sensitive receptors such as residential properties.

With the Scheme in operation, predicted concentrations of annual mean nitrogen dioxide in 2018 are well below the annual mean objective at all receptors, with a corresponding negligible risk of exceedence of the hourly mean air quality objective.

The largest magnitude impacts relate to the decrease in traffic on the A487, from south of Bontnewydd (where daily traffic decreases from around 22,000 to 6,000) to the Plas Menai roundabout in the north (where daily traffic decreases from around 19,000 to 11,000). These traffic decreases result in large decreases in nitrogen dioxide concentrations, of up to 17µg/m3. The modelled increase in concentration along the Scheme is up to 4.5µg/m3. The traffic flow on the bypass is of the order of 18,000 vehicles per day, but the closest properties are over 10m from the roadside which mitigates the impacts.

In general, traffic flows (and pollutant concentrations) on arterial routes into Caernarfon and on minor roads between these arterial routes also decrease with the Scheme as drivers opt to use the bypass. However, as noted in the methodology, there is some potential for increases in traffic on the A487 and A499 as drivers opt to use these roads in conjunction with the bypass rather than other minor roads. These impacts would generally be lower in magnitude than those within the detailed study area.

2.8 Excavation Requirements

Excavations would be required at a number of points along the length of the proposals, as outlined in Section 2.4 above. There would be no excavation within any Natura 2000 site.

2.9 Transportation Requirements

The numbers of HGV movements required to transport materials to site for construction is outlined in Table 2.1. The Scheme requires approximately 75,000 tonnes of surfacing material which would be delivered via 3,750 lorry movements. Transporting cement and sand, required for the on-site production of concrete, would require a further 750 HGV movements. Other materials required for the construction of the Scheme, such as drainage pipes, concrete manhole rings, geogrid and geotextile rolls, would require a further 400 HGV movements.

2.10 Structures

Structures on the Scheme would be defined by BD2/12 Technical Approval of Highway Structures Clause 3.3. They have been grouped by form/function as listed in Table 2.10.1 below.

2.10.1 Structures

Structures on the Scheme would be defined by BD2/12 Technical Approval of Highway Structures Clause 3.3. They have been grouped by form/function as listed in Table 2.10.1 below. Figure 1.0 shows the locations of these structures.

Table 2.10.1 – Summary of Scheme structures

Structure Group	Structure	WG Structure Name	Function	Associated SAC
	S100	Goat Outfall		Afon Gwyrfai a Llyn Cwellyn
Watercourse crossings - minor	S101	Ty Hên Culvert	Crossings of ordinary watercourses, small main river crossings, and provision for minor field ditches. All culverts are specified to allow crossings for mammals and bats.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S104	Geufron Culvert		Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S109A	Pen Y Bryn Culvert 3		Afon Gwyrfai a Llyn Cwellyn
	S109B	Pen y Bryn Culvert 4		Afon Gwyrfai a Llyn Cwellyn
	S110A	Pen Y Bryn Culvert 2		Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines

Structure Group	Structure	WG Structure Name	Function	Associated SAC
	S110	Pen y Bryn Culvert 1		Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S111B	Bryn Mafon Culvert 2		N/A
	S112A	Bodrual Culvert 2		Afon Gwyrfai a Llyn Cwellyn
	S112B	Bodrual Culvert 1		Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S112C	Cibyn Culvert 1		
	S112D	Cibyn Culvert 2		
	S116	Parciau Culvert		N/A
	S116A	Parciau Mammal Culvert		Afon Gwyrfai a Llyn Cwellyn
	S118A	Crug Lane Mammal Culvert		Afon Gwyrfai a Llyn Cwellyn
Watercourse crossings – Afon Rhyd and Afon Cadnant	S102	Afon Rhyd Culvert	River Rhyd continuity	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S114	Afon Cadnant Cattle Creep / Culvert	River Cadnant continuity – but combined with	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a

Structure Group	Structure	WG Structure Name	Function	Associated SAC
			cattle creep. See Underbridges.	Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S114A	Lon Glai Culvert	River Cadnant continuity	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S115A	Bethel Road Culvert 1	River Cadnant tributary continuity	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S115B	Crug Lane Culvert 1	River Cadnant tributary continuity	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S115C	Bethel Road Culvert 2	River Cadnant tributary continuity	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir /

Structure Group	Structure	WG Structure Name	Function	Associated SAC
				Gwydyr Forest Mines
Large Box Underbridges	S101A	Pont Parc Underpass	Side road.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S105	Dinas Accommodation Underpass	Accommodation track.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S107	Pont Llydiart Gwyn	Side road.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S111	Pont Bryn Mafon	Side road.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S113A	FP 36	Footpath and watercourse.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd

Structure Group	Structure	WG Structure Name	Function	Associated SAC
				Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S114	Afon Cadnant Cattle Creep / Culvert	Cattle creep and water course.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
Overbridges	S103	Ty'n Llan Overbridge	Side Road.	N/A
	S109	Pont Ceriw NMU Overbridge	NMU bridge.	N/A
	S115	Bethel Road Overbridge	Side Road.	N/A
Underbridge	S108	Pont Cefnwerthyd	Crosses WHR.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	S112E	Waunfawr Road Underbridge	Side Road	
Afon Gwyrfai Viaduct	S106	Afon Gwyrfai Viaduct	Crosses Afon Gwyrfai flood plain.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
Afon Seiont Viaduct	S112	Pont Afon Seiont Newydd	Crosses Afon Seiont flood plain.	Afon Gwyrfai a Llyn Cwellyn, Glynllifon, Coedydd Derw a

Structure Group	Structure	WG Structure Name	Function	Associated SAC
				Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
Ecological mitigation – LHB specific	S111A	Bryn Mafon Culvert 1	Ecological mitigation	Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
Ecological mitigation - general	S102A	Afon Rhyd Mammal Culvert 1	Ecological mitigation	Afon Gwyrfai a Llyn Cwellyn
	S102B	Afon Rhyd Mammal Culvert 2	Ecological mitigation	Afon Gwyrfai a Llyn Cwellyn
	NRW 1	Wildlife Crossing 1	Ecological mitigation	Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines
	NRW 2	Wildlife Crossing 2	Ecological mitigation	Afon Gwyrfai a Llyn Cwellyn
	NRW 3	Wildlife Crossing 3	Ecological mitigation	Glynllifon, Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites, Mwyngloddiau Fforest Gwydir / Gwydyr Forest Mines

The containment barriers along the length of bridges (bridge parapets) would be to normal containment level. The requirements for lengths of vehicle barriers on the approaches to bridge would be determined from the Road Restraint Risk Assessment Process (RRRP). Typically, vehicle barrier on the approach to the bridge would be connected to the ends of bridge parapets to form a continuous safety barrier.

All parapets would meet the minimum required heights for road restraint system and proposed parapets would be typically 1000mm high. Pedestrian restraint systems (i.e. handrails) would be provided to the tops of all pedestrian facing walls.

Street furniture, such as signs and street lighting, would be typically located away from structures to avoid direct or indirect impacts on the use of structures by protected species.

2.11 Any Other Services

[redacted] Lighting, signage, earthworks and structures

The lighting strategy has been developed in liaison with WG, NMWTRA, NRW and Gwynedd Council. The lighting would be restricted to the following:

- Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs.
- At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction
- The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts.
- The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.
- The current provision of lighting at the Goat and Plas Menai roundabouts would be maintained.

2.11.2 Signage

The Signage and Road Markings strategy has been developed in liaison with WG, NMWTRA and Gwynedd Council. Consultations have taken place with the Highway Authorities and their agents on the provision of signs including brown tourist signs. Signs are lit at roundabouts.

Signage will be designed and located to ensure that they will not affect any of the European sites considered within the SIAA or any other Natura 2000 site.

2.11.3 Utilities

At a number of locations along the route, the alignment is affected by utilities including Dwr Cymru Welsh Water, BT Openreach (overhead and underground), Scottish Power Energy Networks (overhead and underground), Wales and West Utilities and Fiberspeed. The design has taken into account the utilities and sought to minimise the need for permanent diversions of apparatus.

With respect to utilities, a range of protection and below ground diversion works would be required during the construction phase. In addition, a number of permanent above ground works would be required, including diversion of existing 33kV and 11kV power lines at various points along the new carriageway.

The diversion/modification of these existing utilities will not affect any of the European sites considered within the SIAA or any other Natura 2000 site.

3 DESCRIPTION OF EUROPEAN SITES POTENTIALLY AFFECTED BY THE SCHEME

The location of the designated sites affected by the Scheme are shown on Figure 1.1

3.1 Afon Gwyrfai a Llyn Cwellyn SAC

3.1.1 Site Location and Distance from the Scheme

The Afon Gwyrfai a Llyn Cwellyn SAC is located in north-west Wales, comprising the Afon Gwyrfai, which flows out of Llyn y Gader near Rhyd Ddu and passes through Llyn Cwellyn on its way to the sea at Y Foryd, Caernarfon Bay.

The Scheme crosses the Natura 2000 site towards its southern end, on a viaduct (Gwyrfai Viaduct) at approx. Ch. 2+050).

3.1.2 Physical area of the site

The Afon Gwyrfai a Llyn Cwellyn covers an area of 114.29ha.

3.1.3 Site Description

The Countryside Council for Wales (CCW), (now Natural Resources Wales (NRW)) Core Management Plan for this site (CCW, 2008a) [5] provides the following overall description of the SAC:

'This site comprises the Afon Gwyrfai and Llyn Cwellyn. The Gwyrfai flows out of Llyn y Gader near Rhyd Ddu and passes through Llyn Cwellyn on its way to the sea at Y Foryd, Caernarfon Bay. It also includes a tributary of the Gwyrfai, the Afon Treweunydd, and the small lake it flows from on the slopes of Snowdon. Sporadically throughout its course, the SAC is abutted by semi-natural wetland riparian habitat much of which is within the SSSI.

Llyn Cwellyn has long been recognised for its conservation importance and is an excellent example of a deep (maximum depth of 37m, average depth of 23m) oligotrophic lake formed during the last Ice Age. Its nutrient–poor waters support a range of typical macrophytes, and one of the best populations of floating water plantain in the UK.

The whole of the Gwyrfai river system is of outstanding ecological quality. The river is particularly noted for its excellent Salmon population, for which it is considered to be one of the best supporting rivers in the United Kingdom. It is also notable for its otter population which occur here in good numbers because of the relative naturalness of its riparian habitats and the abundance of undisturbed dense cover. In addition to the lake, the river supports a discrete community of floating water plantain, and water-crowfoot Ranunculus spp, with other associated vegetation including bryophyte assemblages occurring in various sectors of the river.'

3.1.4 Qualifying interests of the site [6]

The Annex I habitats that are a primary reason for selection of the site are:

- *Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea,*

- *Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation.*

The Annex II species that are a primary reason for selection of this site are:

- Atlantic Salmon *(Salmo salar),*
- Floating water-plantain *(Luronium natans).*

The Annex II species present as a qualifying feature, but not a primary reason for site selection is:

- Otter *(Lutra lutra).*

According to the Core Management Plan for the site [5], the '*Oligotrophic to mesotrophic standing waters …'* only occurs within Llyn Cwellyn, which lies within Management Unit 3 of the site and *'Floating water plantain'* is restricted to Management Units 5 & 7. As all of these areas are upstream of the Scheme, they will not be affected by the proposed works and so are not considered further in this SIAA.

3.1.5 Conservation objectives of the site

Conservation objectives for the Natura 2000 site have been taken from the Core Management Plan for the Afon Gwyrfai a Llyn Cwellyn SAC [5]. Each conservation objective is a composite statement representing a site-specific description of what is considered to be the favourable conservation status (FCS) of the feature.

There is one conservation objective for each feature and each conservation objective consists of two elements:

- Vision for the feature,
- Performance Indicators.

The performance indicators are aspects of the conservation objectives that are measureable, and are thus part of, not a substitute for, the conservation objectives.

The visions for qualifying features likely to be affected by the proposals (i.e. those which occur in the vicinity of, or downstream of, the Scheme crossing) are set out below; performance indicators are provided in Appendix A.

'Conservation objective for the watercourse. The ecological status of the water course is a major determinant of FCS for all features. The required conservation objective for the water course is defined below.

The capacity of the habitats in the SAC to support each feature at near-natural population levels, as determined by predominantly unmodified ecological and hydromorphological processes and characteristics, should be maintained as far as possible, or restored where necessary.

The ecological status of the water environment should be sufficient to maintain a stable or increasing population of each feature. This will include elements of water quantity and quality, physical habitat and community composition and structure. It is anticipated that these limits will concur with the relevant standards agreed between CCW and the Environment Agency through the Review of Consents process.

Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC.

All known breeding, spawning and nursery sites of species features should be maintained as suitable habitat as far as possible, except where natural processes cause them to change.

Flows, water quality, substrate quality and quantity at fish spawning sites and nursery areas will not be depleted by abstraction, discharges, engineering or gravel extraction activities or other impacts to the extent that these sites are damaged or destroyed.

The river plan-form and profile should be predominantly unmodified. Physical modifications having an adverse effect on the integrity of the SAC, including, but not limited to, revetments on active alluvial river banks using stone, concrete or waste materials, unsustainable extraction of gravel, addition or release of excessive quantities of fine sediment, will be avoided.

River habitat SSSI features should be in favourable condition.

Artificial factors impacting on the capability of each species feature to occupy the full extent of its natural range should be modified where necessary to allow passage, e.g. weirs, bridge sills, acoustic barriers.

Natural factors such as waterfalls, which may limit the natural range of a species feature or dispersal between naturally isolated populations, should not be modified.

Flows during the normal migration periods of each migratory fish species feature will not be depleted by abstraction to the extent that passage upstream to spawning sites is hindered.

Levels of nutrients, in particular phosphate, will be agreed between the EA and CCW in the Water Framework Directive water body in the Afon Gwyrfai a Llyn Cwellyn SAC, and measures taken to maintain nutrients below these levels. It is anticipated that these limits will concur with the standards to be agreed between CCW and Environment Agency Wales used by the Review of Consents process.

Levels of water quality parameters that are known to affect the distribution and abundance of SAC features will be agreed between EA and CCW for the Water Framework Directive water body in the Afon Gwyrfai a Llyn Cwellyn SAC and measures taken to maintain pollution below these levels. It is anticipated that these limits will concur with the standards to be agreed between CCW and Environment Agency Wales used by the Review of Consents process.

Potential sources of pollution not addressed in the Review of Consents, such as contaminated land, forestry operations and improvement of riparian habitat, will be considered in assessing plans and projects.

Levels of suspended solids will be agreed between EA and CCW for the Water Framework Directive water body in the Afon Gwyrfai a Llyn Cwellyn SAC. Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels.

Measures including, but not limited to, the control of suspended sediment generated by agriculture, forestry and engineering works, will be taken to maintain suspended solids below these levels.

Conservation Objective for Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

Vision:

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

i. *The conservation objective for the water course as defined above must be met.*
ii. *The extent of this feature within its potential range in this SAC should be stable or increasing.*
iii. *The extent of the sub-communities that are represented within this feature should be stable or increasing.*
iv. *The conservation status of the feature's typical species should be favourable.*
v. *All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).*

Conservation objectives for Atlantic Salmon (Salmo salar):

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

i. *The conservation objective for the water course must be met.*
ii. *The population of the feature in the SAC is stable or increasing over the long term.*
iii. *The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions. Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future. Natural factors such as waterfalls may limit the natural range of individual species. Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be assessed.*
iv. *The Gwyrfai will continue to be a sufficiently large habitat to maintain the feature's population in the SAC on a long-term basis.*

Conservation Objectives for European Otter (Lutra lutra):

i. *The vision for these features is for it to be in a favourable conservation status, where all of the following conditions are satisfied:*
ii. *The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behavior.*
iii. *The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory*

and/or provide routes between breeding territories. The size of breeding territories may vary depending on prey abundance.

iv. *The population size should not be limited by the availability of suitable undisturbed breeding sites. Where these are insufficient they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site is subject to a level of disturbance that could have an adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance are managed.*

v. *The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing etc. at road bridges and other artificial barriers.*

vi. *All factors affecting the achievement of these conditions are under control.*

3.2 Menai Strait and Conwy Bay SAC

3.2.1 Site Location and Distance from the Scheme

The Menai Strait and Conwy Bay SAC is situated in north-west Wales and includes the whole of the Menai Strait, from its south-western entrance at Abermenai Point through to Red Wharf Bay and Conwy Bay to the north.

The site is located approx. 0.5km north of the Scheme's northern end (Plas Menai Roundabout) and approx. 2.3.km north-west of the Scheme's southern end (Goat Roundabout).

3.2.2 Physical area of the site

The Menai Strait and Conwy Bay SAC covers an area of 26482.67ha.

3.2.3 Site Description

The following description is taken from the document '*Advice provided by the Countryside Council for Wales in fulfilment of Regulation 33 of the Conservation (Natural Habitats, &c.) Regulations 1994 for Y Fenai a Bae Conwy / Menai Strait and Conwy Bay European Marine Site, Issue 2'* (CCW, 2009) [7].*:*

'The unique physiographic conditions experienced within the Menai Strait and Conwy Bay SAC make this an unusual site, which has long been recognised as important for marine wildlife. The variation in physical and environmental conditions throughout the site, including rock and sediment type, aspect, water clarity and exposure to tidal currents and wave action result in a wide range of habitats and associated marine communities. Many of these community types are unusual in Wales. Of particular interest is the continuum of environmental and physical conditions and associated marine communities from the tide-swept, wave-sheltered narrows of the Menai Strait to the more open, less tide-swept waters of Conwy Bay and the moderately wave-exposed Great and Little Ormes.'

3.2.4 Qualifying interests of the site [6]

The Annex I habitats that are a primary reason for selection of the site are:

- Sand banks which are slightly covered by sea water all the time
- Mudflats and sandflats not covered by seawater at low tide
- Reefs

The Annex I habitats that are present as qualifying features, but which are not a primary reason for selection of the site are:

- Large shallow inlets and bays
- Submerged or partly submerged sea caves

There are no Annex II species that are primary reasons for selection of the site or which are present as a qualifying feature.

3.2.5 Conservation objectives of the site

The following conservation objectives have been taken from the publication 'Menai Strait and Conwy Bay Special Area of Conservation European Marine Site – Advice Provided by the Countryside Council for Wales in Fulfilment of Regulation 33 of the Conservation (Natural Habitats, &c.) Regulations 1994, Issue 2 (CCW, 2009) [7].

'To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

RANGE

The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.

*For the **intertidal mudflats and sandflats** feature these include;*

- *Muddy gravel communities*
- *Dwarf eelgrass, Zostera noltei beds*
- *Sediment communities at Traeth Lafan*

*For the **reef** feature these include;*

- *Reef communities in high energy wave-sheltered, tide-swept conditions*
- *Under-boulder, overhang and crevice communities*
- *Limestone reef communities*
- *Clay outcrop reef communities*

*For the **large shallow bay** feature these include;*

- *Organically enriched muddy sediment areas*

Structure and function

The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Important elements include;

- *geology,*
- *sedimentology,*
- *geomorphology,*
- *hydrography and meteorology*
- *water and sediment chemistry*
- *biological interactions*

This includes a need for nutrient levels in the water column and sediments to be:

- *at or below existing statutory guideline concentrations*
- *within ranges that are not potentially detrimental to the long term maintenance of the features species populations, their abundance and range.*

Contaminant levels in the water column and sediments derived from human activity to be:

- *at or below existing statutory guideline concentrations*
- *below levels that would potentially result in increase in contaminant concentrations within*
- *sediments or biota*
- *below levels potentially detrimental to the long-term maintenance of the features species*
- *populations, their abundance or range.*

Restoration and recovery

*This includes the need for restoration of some reef features such as underboulder, overhang and crevice communities, and of some **mudflat and sandflat** features such as the muddy gravel habitats and sheltered muddy habitats. All of these habitats are also part of the **large inlets and bays** feature.*

Typical species

The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. Important elements include:

- *species richness,*
- *population structure and dynamics,*
- *physiological heath,*
- *reproductive capacity*
- *recruitment,*
- *mobility*
- *range*

As part of this objective it should be noted that:

- *Populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term.*
- *the management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term.'*

3.3 Glynllifon SAC

3.3.1 Site Location and Distance from the Scheme

This site is located in north-west wales, situated in the former Glynllifon Estate. The site is located approx. 1.2km south of the southernmost point of the Scheme (Goat Roundabout).

3.3.2 Physical area of the site

The Glynllifon SAC covers an area of 189.27ha.

3.3.3 Site Description

This single site in north Wales is both a maternity and hibernation site for a large population of Lesser Horseshoe Bat *Rhinolophus hipposideros*, comprising about 6% of the UK population.

The Glynllifon SAC site covers most of the same area as the SSSI of the same name, and is designated for the same feature (Lesser Horseshoe Bat). The following description has been taken from the Glynllifon SSSI citation:

'The site includes three summer roost sites and two hibernation sites for the Lesser Horseshoe Bat. The main maternity roost is situated in the cellars of the Glynllifon mansion house, built during the 1830s. The site also contains areas of woodland which is used by the bats as foraging areas as well as hedgerows and other linear features used as flight routes. The colony of bats at Glynllifon was first reported in the early 1960's.

Since the roost at the mansion house has been monitored, the number of bats using the site has increased. The cellars in the mansion house are used throughout the year by the bats, both during the summer when the adults give birth and suckle their young and during the winter when the bats hibernate. The number of bats using the cellars in the summer regularly exceeds 600 adults. The numbers then increase to over 800 when the young start flying in August. In addition to the cellars, the bats are using a number of other roosts. Two additional summer roosts, Melin-y-Cim and Pen-y-Bont, are situated in the Llyfni valley near to Pontllyfni. These two roosts support a small number of bats (around 30-40 bats in each roost) and are less than 0.5km away from each other and have been shown to be linked to each other and Glynllifon.

The bats from these roosts use several important feeding areas in and around the Glynllifon Estate. Within the estate, bats from the mansion forage in areas of plantation woodland along the Afon Llifon and on the southern side of the estate near to Plas Newydd. These areas also act as flight routes for bats going to other feeding areas outside the estate boundaries. A number of other bat species are found within the Glynllifon Estate. These include whiskered bat Myotis mystacinus, Natterer's bat M. nattererii, Daubenton's bat M daubentonii, common pipistrelle Pipistrellus pipistrellus, soprano P. pygmaeus, noctule bat, Nyctalus noctula and the brown long-eared bat Plecotus auritus.

The site includes hibernacula situated in the old mine workings at Simdde-Dylluan Copper mine near to Drws y Coed in the Nantlle valley. Mining at Simdde-Dylluan dates back from at least the 18th century and continued through until 1920 when the mine finally closed. Most of the mine workings are no longer visible except for a number of horizontal passageways running into the hillsides above the valley floor. These tunnels are used throughout the year by Lesser Horseshoe Bats, but only a small number of bats are present during the summer. Several other species of bat are found in the vicinity of the mines including common pipistrelle, and Myotis species. Otter Lutra lutra and water voles Arvicola terrestris have been recorded on both the Afon Llifon.'

3.3.4 Qualifying interests of the site [8]

There are no Annex I habitats that are a primary reason for selection of the site or which are present as qualifying features.

The Annex II species that is the primary reason for selection of this site is:

- Lesser Horseshoe Bat *(Rhinolophus hipposideros)*

3.3.5 Conservation objectives of the site

Conservation objectives for the Natura 2000 site have been taken from the Core Management Plan for the Glynllifon SAC [8]. Each conservation objective is a composite statement representing a site-specific description of what is considered to be the favourable conservation status (FCS) of the feature.

3.3.6 Vision

There is an overall "vision" which describes what needs to be achieved for the conservation of the species, this is as follows:

i. The natural range of Lesser Horseshoe Bats will not be reduced, nor be likely to be reduced for the foreseeable future.

ii. There is, and will continue to be, sufficient habitat to maintain the Lesser Horseshoe Bat population on a long-term basis.

iii. The three maternity roosts will continue to be occupied annually by Lesser Horseshoe Bats and their babies
- *Glynllifon Mansion (Unit 16).*
- *Melin y Cim (Unit 32).*
- *Pen y Bont (Unit 36).*

iv. There will be a sufficiently large area of suitable habitat surrounding these roosts to support the bat population, including continuous networks of sheltered, broadleaved and coniferous woodland, tree lines and hedgerows connecting the various types of roosts with areas of insect-rich grassland and open water.

v. *All factors affecting the achievement of these conditions are under control.*

3.4 Meirionnydd Oakwoods and Bat Sites SAC

3.4.1 Site Location and Distance from the Scheme

The Meirionnydd Oakwoods and Bat Sites SAC comprises a number of scattered sites, lying between 14km and 30km of the Scheme. The closest of these sites occurs at Beddgelert, 14.7km southeast of the most southerly point on the Scheme at Llanwnda.

3.4.2 Physical area of the site

The Meirionnydd Oakwoods and Bat Sites covers an area of 2813.7ha.

3.4.3 Site Description

This site comprises the centre of distribution for Lesser Horseshoe Bats in Wales.

The following is taken from the Core Management Plan for the Meirionnydd Oakwoods and Bat Sites SAC [CCW, 2008] [9]:

'The Meirionnydd Oakwoods and Bat Sites SAC is made up of a series of woodlands, stretching from Dolgellau in the south to Eryri in the north.

The majority of the SAC is classified as the woodland type known as "Old sessile oak woods with Ilex and Blechnum in the British Isles", which covers approximately 84% of the SAC and is the dominant woodland type at most of the sites. A key feature of European importance is the rich Atlantic bryophyte communities that are often well developed within this Annex I type. These include numerous rare species, such as Campylopus setifolius, Sematophyllum demissum, Adelanthus decipiens, Leptocyphus cuneifolius and Plagiochila atlantica. Another key feature of the Meirionnydd Oakwoods and Bat Sites SAC is the lichen flora which is exceptionally rich and includes numerous rare species such as, Micarea xanthonica, Parmelinopsis horrescens, Phyllopsora rosei, Micarea stipitata and Tyothallia biformigera. Frequently the oak woodland occurs as part of a mosaic of woodland types including other Annex I Habitats, "Bog woodland", "Alluvial forests with Alnus glutinosa and Fraxinus excelsior" and "Tilio-Acerion forests of slopes, screes and ravines" which occur in small areas and are only significant at a few of the component SSSI/units. The transitions between these different woodland types are important in terms of maintaining the structure and function of the habitat type and vary across the U.K.

The heath is characterised by abundant Calluna vulgaris, Ulex gallii and Erica cinerea growing on thin, poor acidic soils. There are many small areas of dry heath interspersed amongst the woodland, which have not been measured, but the three largest areas of dry heath, together comprise 1% of the area of the SAC.

The feature "Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation" occurs within the Afon Glaslyn, within the Glaslyn SSSI and currently outside the SAC but within a proposed extension to the SAC.

Lesser Horseshoe Bats have over 20 known roosts within the SAC and forage widely within the SAC's woodlands, associated habitats and the surrounding countryside. The SAC includes maternity roost sites in various types of buildings and structures, and winter hibernation sites, especially in mines. There are other types of roost such as night, transitional, leks and swarming sites, about which very little is known.'

3.4.4 Qualifying interests of the site [6]

The Annex I habitats that are a primary reason for selection of the site are:

- Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Alluvial forests with *Alnus glutinosa* and *Fraxinus* excelsior (*Alno-Padion, Alnion incanae, Salicion albae*)

The Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site are:

- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- North Atlantic wet heaths with *Erica tetralix*
- European dry heaths
- *Tilio-Acerion* forests of slopes, screes and ravines
- Bog woodland

The Annex II species that is the primary reason for selection of this site is:

- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

3.4.5 Conservation objectives

The vision for the Woodland SAC feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

i. The total extent of the woodland area, including woodland canopy and scrub, woodland glades and associated dry heath, bracken and grassland shall be maintained as indicated on maps, see Annex 2, some 1826 ha in total.

ii. The location of the different woodland SAC features, as listed in the title above, will be as shown in Annex 2. The distribution of these woodland communities is largely a reflection of the topography, soils, geology and aspect and is unlikely to change.

iii. The tree canopy percentage cover within the woodland area for the whole SAC (see maps in Annex 2) shall be no less than 80%, 87% being the current canopy cover (excepting natural catastrophic events). Some units will have a lower canopy cover which is acceptable provided this is compatible with safeguard of the habitat, features and special interest.

iv. The canopy and shrub layer comprises locally native species, see Table 2 for the relevant species for each woodland SAC feature.

v. There shall be sufficient natural regeneration of locally native trees and shrubs to maintain the woodland canopy and shrub layer, by filling gaps and allowing the recruitment of young trees, and encouraging a varied age structure.

vi. The typical ground layer species of each woodland SAC feature will be common, see Table 2. It is important for most of the woodland SAC that the vegetation does not becomes rank and overgrown with a height above 40cm and/or dominated by species such as bramble, ivy and young holly. Limits may be set on a unit or compartment basis.

vii. The abundance and distribution of common and typical (Atlantic, sub-Atlantic, western, oceanic) mosses and liverworts, lichens (and slime moulds), will be maintained or increased. Refer to indicative lists in Tables 3 and 4.

viii. The abundance and distribution of uncommon mosses and liverworts, lichens and slime moulds, will be maintained or increased. Refer to indicative lists in Tables 5 & 6 in Annex 3.

ix. There will be a scattering of 5 mature trees per hectare within the existing tree canopy or parkland, that is trees of c60cm diameter plus for oak and ash and/or with signs of decay, holes etc. In the longer-term, by 2060 there should be 1 veteran trees per hectare that is trees of c100cm diameter plus for oak and ash and 75cms birch.

x. The volume of dead wood will exceed 30 cubic metres per hectare throughout and consist of a mixture of fallen trees (minimum 1 per hectare), broken branches, dead branches on live trees, and standing dead trees (minimum 1 per hectare). Volumes of deadwood are currently at relatively low levels because the woodlands, in general, have an even-age structure and lack mature trees and any quantity of deadwood because of past silvicultural management. Some lower plants are dead wood specialists but these woodlands tend to lack the rare dead wood invertebrate assemblage found in other parts of the UK.

xi. Invasive non-native species such as rhododendron, Japanese knotweed and Himalayan balsam will not be present.

xii. 12. All factors affecting the achievement of these conditions are under control.

3.5 Gwydir Forest Mines SAC

3.5.1 Site Location and Distance from the Scheme

The Gwydir Forest Mines SAC comprises a number of scattered sites, the closest being 24.9km to the east of the Scheme.

3.5.2 Physical area of the site

The Gwydir Forest Mines SAC covers an area of 39.75ha

3.5.3 Qualifying interests of the site [6]

The Annex I habitats that are a primary reason for selection of the site are:

- *Calaminiarian* grasslands of the *Violetalia calaminariae*

There are no Annex I habitats, which are present as qualifying features.

There are no Annex II species which are primary reasons for selection of the site.

The Annex II species which is present as a qualifying feature, but not a primary reason for site selection is:

- Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

3.5.4 Conservation objectives

The conservation objectives are taken from the Countryside Council for Wales' (now NRW) Core Management Plan for the area [10]. The objectives are broken down in to features for which there is a vision and performance indicators, and are as follows:

Feature 1 - Calaminarian grasslands of the *Violetalia calaminariae* (EU Habitat Code: 6130)

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

i. *The area of calaminarian grassland must be stable (based on the extent at the time of SAC notification), or increasing in the long term, and will occur in all management units.*
ii. *The remainder of the management units not highlighted for calaminarian grassland will be maintained in a favourable condition for Lesser Horseshoe Bat.*
iii. *The calaminarian grassland can be described as either "calaminarian grassland with Ditrichum plumbicola" or "calaminarian grassland (metal spoil) without Ditrichum plumbicola".*
iv. *Calaminarian grassland with D. plumbicola will be defined as a characteristically sparse and species poor vegetation type. The substrate varies from fine scree, through fine clay to fine silt like spoil. The substrate is rich in heavy metals (notably lead and zinc) resulting in a paucity of taxa within the habitat. Mosses and liverwort (e.g. Polytrichum piliferum, Jungermanniana gracillima, Weissia controversa, Dicranella heteromalla, Pholia nutans and Cephaloziella spp.) are often the only taxa found in association with D. plumbicola.*
v. *Calaminarian grassland (metal spoil) without D. plumbicola is characterised by lichen encrusted (often Stereocaulon species), heavy metal rich, mine*

spoil. Between the blocks of spoil where humus accumulates, lower and higher plants with some degree of heavy metal toxicity tolerance grow. Mosses and liverworts often dominate the vegetation, however, in areas with greater depths of humus, pteridophytes and angiosperms can dominate. The metallophytes Asplenium septentrionale (Forked Spleenwort), Silene uniflora (Sea Campion) and Thlaspi caerulescens (Alpine Penny-cress) are often found in association with other higher plants on the mine spoil.

vi. *Broadleaf, coniferous, exotic and scrub species should be absent from the calaminarian grassland stands, because the above plants will shade out the slower growing moss and lichen species, and in time will smother the lower plants with litter material.*
vii. *A 10m buffer, clear of coniferous vegetation, will be maintained around the stands of calaminarian grassland with D. plumbicola.*
viii. *Disturbance through human impact and recreation will be absent from the calaminarian grassland.*
ix. *All factors affecting the achievement of these conditions are under control.*

Feature 2 – Lesser Horseshoe Bat *Rhinolophus hipposideros* (EU Habitat Code 1303)

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

i. *The site will support a sustainable population of Lesser Horseshoe Bats in the Gwydyr Forest area.*
ii. *The population will be viable in the long term, acknowledging the population fluctuations of the species.*
iii. *The natural range of Lesser Horseshoe Bats is neither being reduced nor is likely to be reduced for the foreseeable future.*
iv. *Mines on the site will be in optimal condition to support the populations.*
v. *Sufficient foraging habitat is available, in which factors such as disturbance, interruption to flight lines, and mortality from predation or vehicle collision, changes in habitat management that would reduce the available food source are not at levels which could cause any decline in population size or range.*
vi. *There is a sufficiently large area of suitable habitat surrounding the roosts to support the bat population, including continuous networks of sheltered broadleaved and coniferous woodland, and tree lines, connecting the various roosts with areas of insect rich grassland and open water.*
vii. *Management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure there is likely to be no reduction in population size or range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat.*
viii. *All factors affecting the achievement of the foregoing conditions are under control.*

4 ASSESSMENT METHODS AND ASSUMPTIONS

4.1 Assessment Methods

4.1.1 The nature of potential impacts on Natura 2000 sites has been assessed using the guidance presented in DMRB Vol 11 Section 4: HD44/09 [2].

Each Natura 2000 site potentially affected by the Scheme has been assessed at the Screening Stage (see Section 6) using the Screening Matrix template given in Annex

C of Section 4: HD44/09. These screening matrices are included as Appendix C to this SIAA.

In accordance with HD44/09, the nature of the impacts is defined and described in terms of the following:

- *Where the impact directly or indirectly affects the site.*
- *Loss of Area of European Site.*
- *Change in species population numbers of qualifying interests.*
- *Disturbance to species within European Site.*
- *Effects of fragmentation caused by the project.*
- *The reversibility of the impacts.*
- *The duration (i.e. long- or short-term).*

4.1.2 The 'Integrity of Site Checklist' (taken from Annex F of HD44/09) has also been used to assess the impacts on Natura 2000 sites. The checklist questions are as follows:

Conservation objectives

Does the project have the potential to:

- *Cause delays in progress towards achieving the conservation objectives of the site?*
- *Interrupt progress towards achieving the conservation objectives of the site?*
- *Disrupt those factors that help to maintain the favourable conditions of the site?*
- *Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?*

Other indicators

Does the project have the potential to:

- *Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?*
- *Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?*
- *Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?*
- *Reduce the area of key habitats?*
- *Reduce the population of key species?*
- *Change the balance between key species?*
- *Reduce the diversity of the site?*
- *Result in disturbance that could affect population size or density of the balance between key species?*
- *Result in fragmentation?*
- *Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc)?*

4.1.3 Valuation of Qualifying Features of European Sites.

All of the qualifying features of the European Sites in question are considered to be of International Importance under the Chartered Institute for Ecology and Environmental Management (CIEEM) Guidelines [10A].

4.1.4 Plainly Established and Uncontroversial (PEU) Mitigation Measures

The significance of the potential effects is assessed taking in to account plainly established uncontroversial (PEU) mitigation measures, such as standard pollution control measures and standard measures in accordance with DMRB guidelines. If impacts require detailed, site specific mitigation measures, it is concluded at the Screening Stage (Stage 1) that the Scheme will have 'Likely Significant Effects' (LSEs) on the Natura 2000 site in question. The affected site and associated qualifying interest will progress to the Appropriate Assessment Stage (Stage 2), where detailed mitigation measures will be outlined. If the impact in question may not be adequately addressed through site-specific mitigation, or if there is still sufficient uncertainty, further stages in the AIES process (i.e. alternative solutions, IROPI and compensatory measures) may need to be pursued.

The impact significance calculated using the CIEEM criteria [10A] can then be assessed against the conservation objectives of the site to ascertain whether any of the potential significant impacts will affect any of the conservation objectives and therefore affect he integrity of the site.

A summary of the PEU mitigation measures incorporated into the Scheme design is provided in Section 6 below.

4.1.5 Use of Professional Judgement

Professional judgement was used in the carrying out of this work where specific guidance was not available and in the interpretation of results. Where there was insufficient information regarding the likelihood of qualifying interests being present or of the risk of impacts the assessment used the precautionary principle to inform judgement. The precautionary principle has been applied to ensure that any assessments errs on the side of caution without being overly cautious. This principle means that the conservation objectives should prevail where there is uncertainty or that harmful effects will be assumed in the absence of evidence to the contrary.

4.1.6 Precautionary Principle

In assessing impacts and designing mitigation, the "precautionary principle" as described in the HD 44/09 [2] has been adopted which is as follows:

"It is important to recognise that in undertaking assessment of the implications of plans and projects, there is a need to apply the "precautionary principle", that is "… the conservation objectives … should prevail where there is uncertainty" or that harmful effects will be assumed in the absence of evidence to the contrary. The basis of this is the 'Communication from the Commission on the precautionary principle' which indicates that the Treaty does not define this term but that it "… prescribes it only once" in that its purpose is "– to protect the environment." This communication goes further in providing detailed advice on when recourse to this principle is relevant, recourse to this principle should occur when there is":

- "identification of potentially negative effects resulting from a phenomenon, product or procedure;

- a scientific evaluation of risks which, because of the insufficiency of the data, their inconclusive or imprecise nature, makes it impossible to determine with sufficient certainty the risk in question".

It follows from the above that when assessing the likelihood of impacts, it is assumed if there is sufficient uncertainty of whether there is an impact then there is the potential for an impact.

4.1.7 The precautionary principle has been applied to ensure that any assessment errs on the side of caution, without being overly cautious. This principle means that the conservation objectives should prevail where there is uncertainty or that harmful effects will be assumed in the absence of evidence to the contrary. A high standard of proof is required at all stages of the assessment. Objective evidence is required to justify the assessment. It will be important to provide sufficient evidence to support conclusions "beyond any reasonable scientific doubt".

5 SOURCES OF INFORMATION USED IN THE ASSESSMENT

The following sources of information have been used in the preparation of this report:

- The Core Management Plans for the European sites, produced by NRW (formerly CCW).
- Highways Agency (2009). Assessment of implications (of highways and/or roads projects) on European Sites (including appropriate assessment). DMRB Volume 11, Section 4, Part 1, HD 44/09.
- A487 Caernarfon to Bontnewydd Transportation Study DMRB Stage 2 Environmental Impact Assessment Report (Parsons Brinkerhoff, 2012)
- Results from bat surveys undertaken in 2009 to inform the A487 Caernarfon to Bontnewydd Transportation Study (Parsons Brinkerhoff, 2012)
- A487 Caernarfon to Bontnewydd Transportation Study Appropriate Assessment Screening Report (TACP, 2012)
- Bing aerial photography via MapInfo GIS Software
- Records from the North Wales Environmental Information Service (Cofnod), obtained in February 2015.
- Records from the Bat Conservation Trust (BCT)'s Roost Count Surveys (dataset key GA000616), accessed through the National Biodiversity Network (NBN) Gateway in March 2016, under permission from BCT.
- Results from bat surveys conducted in 2014 by the Employer's Agent (EA) for the A487 Caernarfon to Bontnewydd Scheme (Ramboll, 2014).
- Results from bat surveys undertaken in 2015 to inform the A487 Caernarfon to Bontnewydd Bypass Environmental Statement (Parsons Brinkerhoff, ES Volume 3 Appendix E.5)
- Results from bat surveys undertaken in 2016 (Parsons Brinkerhoff, unpublished survey summaries)
- Predictive model for the likely presence of Lesser Horseshoe Bats, developed by NRW.
- Results and mitigation details from the A40 Penblewin to Slebech Park Improvement Statement to Inform an Appropriate Assessment (Cresswell Associates October 2006)

- Results and analysis from the A40 Penblewin to Slebech Park Improvement Final Environmental Design Performance Report (draft) May 2016 (Arcadis 2016)
- Results and analysis from the TRA477 Nash Fingerpost to Bangeston Improvement Environmental Monitoring 2010 Final Report (TACP December 2010)
- A477 Nash Fingerpost to Bangeston Farm Improvement: Crossing of road by bats: Rationale and Development of the Proposals (unpublished note)
- Results and analysis from the A465(T) Heads of the Valleys Dualling Section 1: Abergavenny to Gilwern Usk Bat Sites SAC Monitoring of Lesser Horseshoe Bats Summary Report 2013 Surveys (TACP 2013)

In summary, the following information has been obtained with regard to Lesser Horseshoe Bats: the biological records search showed that no Lesser Horseshoe Bat roosts have been recorded within the areas directly affected by the Scheme (i.e. within the area of permanent or temporary land-take).

Records were reviewed for Lesser Horseshoe Bat roosts within SACs within a 30km radius of the Scheme. Tables 5.1.1 and 5.2.1 provide maximum and latest roost count data from BCT's Roost Count surveys for sites within the Glynllifon SAC and Meiryonnydd Oakwoods and Bat Sites SAC.

5.1 Glynllifon SAC

Table 5.1.1 – Glynllifon SAC Lesser Horseshoe Bat roost counts

Site	Management Unit	Distance from Scheme (km)	Date	No. of adults
Glynllifon Mansion	16	2.8	June 2003	612 (max. count)
			June 2015	234 (latest count)
Melin-y-cim	32	6.29	June 2002	24 (latest count)
			June 2002	33 (max count)
Pen-y-bont	36	6.23	June 2003	97 (max count)
			June 2011	53 (latest count)

5.2 Meiryonnydd Oakwoods and Bat Sites SAC

Meiryonnydd Oakwoods and Bat Sites SAC is a large composite site which includes most of the known Lesser Horseshoe Bat maternity roosts in Meiryonnydd and some hibernacula. The largest maternity roost within this site is Hafod Garegog.

Table 5.2.1 Meiryonnydd Oakwoods and Bat Sites SAC Lesser Horseshoe Bat roost counts

Site	Distance from Scheme (m)	Date	No. of adults
Hafod Garegog	18.13	June 2014	545 (max. count)
		June 2014	545 (latest. count)
Hen Dolfriog	18.38	June 1999	384 (max. count)
		June 2014	286 latest count)
Hendre Henydd	22.29	June 2015	309 (max count)
		June 2015	309 (latest count)
Aberundant Hall	19.03	2006	172
		June 2013	120
Hendy	19.71	2000	182
		June 2014	143

5.3 Records for Lesser Horseshoe Bats outside designated sites

Cofnod records for Lesser Horseshoe Bats were also reviewed for areas outside designated sites. There are over 2,400 records for Lesser Horseshoe Bat within a 30km radius of the Scheme, though many of these are records for the same roost. These records are too numerous to describe, and so for roosts outside designated sites, a 2.5km radius from the Scheme was considered.

It has been suggested that conservation efforts should focus on a 2.5km radius of a nursery roost (Bontadina *et al*., 2002 [11]), and so this buffer was deemed appropriate for the study of impacts in the immediate vicinity of the Scheme, such as impacts from construction activities (generation of noise, airborne pollutants, etc.). A total of 13 Lesser Horseshoe Bat roosts have been recorded in non-designated areas within a 2.5km radius of the Scheme (see Table 5.3.1 below).

Table 5.3.1: Cofnod records for Lesser Horseshoe Bat roosts outside designated sites, within a 2.5km radius of the Scheme

Site Name	Distance from Scheme (m)	Notes	Max / Latest Count
Glan Morfa	390	Emerged from cottage	31 (06/06/2012)
Glangwna Hall, Caerthro	430	Roost in cellar – day counts and emergence counts	50 observed roosting during day count (01/09/1993)
Caernarfon Brickworks	440	Observed in basement and emerging from building.	23 adult (27/09/2001) Latest record from 2004 (7 adults)
Bontnewydd derelict barn	530	-	1 adult (01/07/1986)
Outbuilding, Felin Bach, Caeathro, Caernarfon	660	Dropping pile (stringed and sized as LHB) in outbuilding (brick, corrugated iron). Possible night roost (2014)	Droppings
Capel Saron	790	-	6 adult (June 2012)
Bronant	950	Droppings only (occasional night roost)	Droppings
Cae-Cipris	1100	Observed in roof	4 (04/08/2011)
Plas Brereton	1640	-	1 (08/09/2014)
Coach House West	1640	-	1 (11/09/2014)
Seiont Manor	1670	Confirmed hibernation roost, possible maternity roost (no data for this)	2
Plas ty Coch	1750	-	1 (11/09/2014)
Fourteenth Peak, Palace Street, Caernarfon	2075	In small cavity of cellar roof. Bats have used this site in the past.	1 adult (25/02/1987)

5.4 Bat surveys conducted for the Scheme

Surveys conducted in 2009 to inform the Key Stage 2 Study confirmed the presence of Lesser Horseshoe Bat along the length of the Scheme, recorded at ten of the fourteen transects surveyed, but with a slight southern bias.

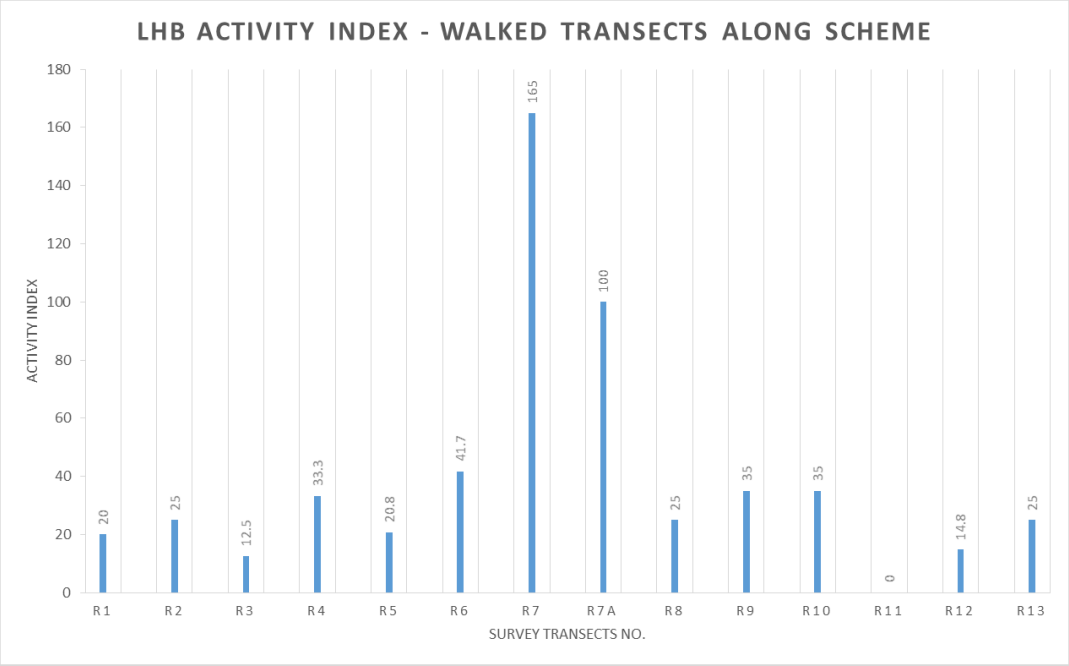
Surveys carried out by Ramboll in August/September 2014 recorded Lesser Horseshoe Bats at nine of the thirteen transects surveyed. Survey locations are shown in Figure 2.0.

During the activity surveys conducted in May, July and September 2015, Lesser Horseshoe Bats were recorded at eleven of the thirteen transects, with a peak in activity at Transect R7, towards the middle of the Scheme. As a higher level of activity was recorded at R7, it was considered useful to study the nearby area in more detail; therefore, an additional transect (Transect R7a) was surveyed during September 2015, following discussions with the Welsh Government. This was located approximately 1km south-west of transect 7 along a mature hedgerow that was severed by the Scheme.

No obvious commuting routes or commuting behaviour (where LHB are seen to fly in a definite direction at dusk, returning from the opposite direction at dawn) were identified/observed during the surveys with activity spread throughout the survey routes. However, a higher level of activity was noted in survey area 7 and 7A, which may be associated with the presence of a known Lesser Horseshoe Bat roosts within the quarry area and/or that located at Glan Morfa.

Raw data for Lesser Horseshoe Bat recordings from all surveys carried out between 2009 and 2015 are included as Appendix B, and the data is summarised into an activity index; see Graph 1 below. The activity Index (ai) is calculated by: number of bats events/passes (be) divided by the length of time in hours of the survey (hs) and then multiplied by 100, expressed as follows:

$$ai = (be / hs) \times 100$$

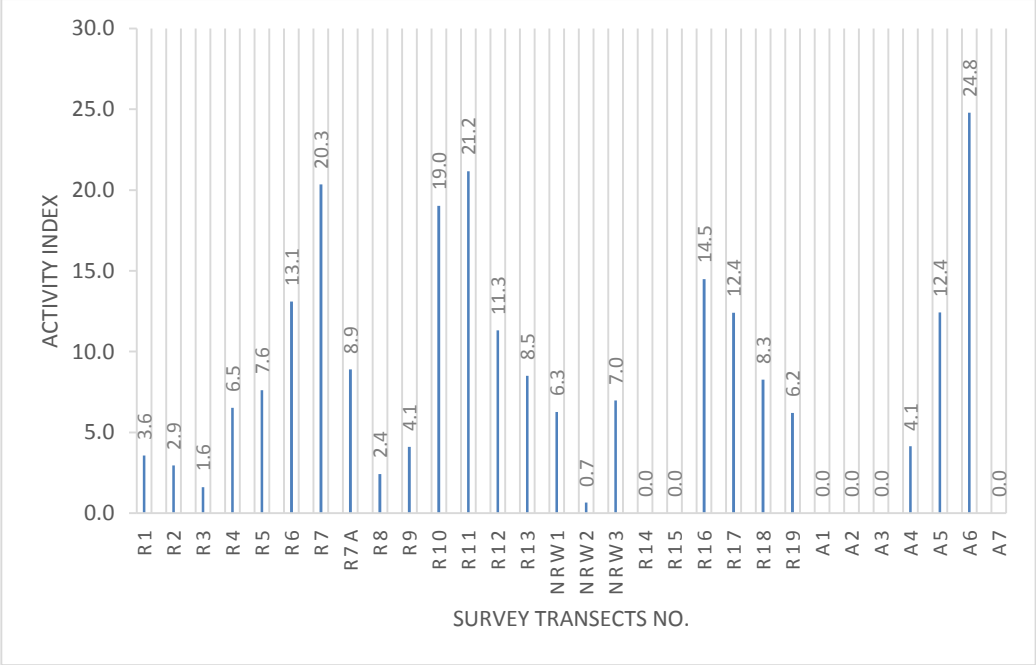


Graph 1: Lesser Horseshoe Bat Activity Index, using results from all walked surveys conducted between 2009 and 2015[1]

[1] Note that survey effort at Transect R7a is lower than at other transects. This transect was surveyed during September 2015 only, following a request from the Welsh Government

The activity index shows relatively consistent levels of Lesser Horseshoe Bat activity throughout the Scheme, with a peak at Transect R7, located to the south-west of the Seiont Brick Works and Quarry, where there is a known Lesser Horseshoe Bat roost (see Graph 1 above). The Lesser Horseshoe Bat activity index is almost four times higher than the second highest activity index recorded at site R7a.

Surveys undertaken in May and June 2016 (also shown in Figure 2.0) showed Lesser Horseshoe Bats were recorded at 21 of the 23 survey transects and 3 of the 7 scoping transects. Once again no obvious commuting routes or commuting behaviour were identified/observed during the surveys with activity spread throughout the survey routes, as per the updated LHB activity index shown in Graph 2 below:



Graph 2: Lesser Horseshoe Bat Activity Index for all surveys conducted between 2009 and June 2016 – includes both surveyor and static detector data

The 2016 surveys undertaken to date have has indicated that there may be activity peaks elsewhere along the Scheme particularly in the vicinity of the Afon Gwyrfai and to the south of the quarry where the peaks at R7 and R7A have been recorded previously. This change may be at least partially due to the increase in survey coverage given the use of static detectors for 5 consecutive nights, particularly as the observations made during the walked surveys remains consistent with those of previous years. It should also be noted that transects A1 to A7 have only been surveyed for a single night in June 2016 to date. Further monthly surveys are programmed for 2016.

5.5 Consideration of other plans and projects

A requirement of the Habitats Regulations (2010) is to also examine the potential for a plan or project to have a significant effect either alone or in combination with other plans and projects. These include those with spatial and/or temporal overlap with the Scheme (based on DMRB HD44/09), namely:

- Trunk road and motorway plans or projects which have been confirmed;
- Developments and other projects which are currently under construction;
- Proposed developments which are currently under consideration with the local planning authority or other determining bodies;
- Local Plan commitments and indicative timescale for implementation.

Other plans that have been considered in the assessment are as follows:

- Draft North Wales Joint Local Transport Plan 2015 – 2020
- Gwynedd Unitary Development Plan (2001 – 2016)
- Joint Local Development Plan Anglesey & Gwynedd (2011 – 2026) – Deposit Plan (2015)

Many of the current planning applications in the vicinity of the Scheme and Gwynedd as a whole refer to relatively small scale works i.e. extensions/conversions to private properties. These would not have any significant impact on any of the SAC's. No nature conservation initiatives that will have an effect on the sites or their qualifying features have been identified during the project searches or during the consultation process.

Other potentially significant projects that have been considered in the assessment are as follows:

Seiont Brick Works and Quarry –

Change of use of land for the siting of three temporary buildings, parking areas and two storage containers together with security fencing in relation to constructing the Bypass. This is located approximately 273.3m to the north west of the Scheme, within the Caernarfon Brickworks. This project is currently undertaking Environmental Impact Assessment and as such information is limited with regard to its potential impacts on the SACs. This project has now been put on hold.

Glyn Rhonwy Pumped Storage –

This involves the conversion of two disused slate quarries into a Pumped Storage Battery with a capacity of up to 99.9MW and is located approximately 8km to the east of the Scheme. An Environmental Impact Assessment (EIA) and Report on the Implications for European Sites (RIES) (including for the Afon Gwyrfai, Menai Strait and Conwy Bay, Glynllifon and Meirionnydd Oakwoods SACs) have been undertaken for this scheme and these have been used to inform the in-combination assessment included within this document. These documents concluded that the scheme would have no impact on Natura 2000 sites given the mitigation measures implemented, either in isolation or in-combination with other plans and projects.

6 STAGE: 1 SCREENING

6.1 Initial Assessment of Impacts on European Sites

A detailed assessment of the potential effects of the Scheme on European Sites is outlined in the screening matrices included as Appendix C to this report. Impacts have been considered in relation to the conservation objectives and associated performance indicators for each of the qualifying features within the sites.

The particular elements of the Scheme likely to give rise to impacts are:

- Generation of airborne and waterborne pollution, that may affect the habitats and species present in the Natura 2000 sites in the area.
- Disturbance of key species such as otter, Atlantic Salmon and Lesser Horseshoe Bat during the construction phase of the Scheme (through noise, vibration and lighting).
- Disruption of the movements and mortality of key species during the construction and operational phases of the Scheme – e.g. Otter, a key species of the Afon Gwyrfai SAC which is crossed by the Scheme, and Lesser Horseshoe Bats, which are particularly sensitive to fragmentation of potential commuting routes such as hedgerows and treelines, a number of which would be lost to the Scheme.

Most of the impacts listed above would be avoided or minimised through the implementation of PEU mitigation measures as outlined below. However, impacts on Lesser Horseshoe Bats would require detailed and site-specific mitigation measures.

6.2 Summary of PEU Mitigation Measures

6.2.1 Mitigation by Design

The Scheme has been subject to an iterative design process, whereby impacts on sites of nature conservation value have been minimised and avoided where possible through appropriate Scheme design. For example, the Afon Gwyrfai a Llyn Cwellyn SAC/Afon Gwyrfai and Llyn Cwellyn SAC will be crossed by a clear-span structure, thus avoiding direct impacts to the SAC.

Culverts have been oversized as far as possible to allow passage of wildlife and will be designed so that they should never be in full spate, wherever possible (detailed within Section 7.2.4 below). This includes the three additional culverts added to increase the general permeability of the Scheme following discussions with NRW during the consultation process; and the clear span structures at the Afon Seiont and the Afon Gwyrfai.

6.2.2 Pollution control measures

The Environmental Statement (ES) Volume 1, Section 14 (Road Drainage and the Water Environment) has undertaken an assessment of potential impacts to surface and ground water during the construction phase. As part of this assessment a number of measures have been proposed in order to avoid / mitigate potential impacts on surface and ground water.

Construction activities will be undertaken in accordance with the Pollution Prevention Guidelines (PPG) published by the EA, including:

- PPG1 - General guide to the prevention of water pollution;
- PPG2 - Above ground oil storage tanks;
- PPG 5 - Works in, near or liable to affect watercourses; and
- PPG 6 - Working at construction and demolition sites,

Other control and prevention measures as detailed within ES Volume 1, Section 14.5 will also be adhered to.

The ES Volume 1, Section 14.5 also provides details of the operation mitigation measures that have been incorporated into the Scheme design. In summary, these include the provision of SUD techniques, whereby highway drainage would be filtered

through a system of grass lined rills and then stones. It would then be piped to one of fourteen attenuation ponds. These ponds will be created throughout the construction programme as the earthworks and drainage in each location is completed (refer to Section 2.4.1 for construction phasing and duration).

Measures to prevent the creation of air borne dust during construction are provided in the ES Volume 1, Section 5.5. In summary these include the implementation of a dust management plan based on the Institute of Air Quality Management's (IAQM) Dust Guidance.

Mitigation for Atlantic Salmon

Direct impacts to Atlantic Salmon will be avoided through the clear span crossing of the Afon Gwyrfai. Indirect impacts in the form of pollution events will be avoided through the pollution control measures described above.

Construction of the pier bases of the viaduct would be restricted during spawning periods (17th October to 15th May in the Afon Gwyrfai (NRW comments)) to prevent disturbance to this species. NRW would be contacted prior to the commencement of piling works, to advice on appropriate timing of works (for example, adult or smolt migration periods, although these are often taken to be in spring and early summer) which are somewhat more variable than spawning season. Further restrictions will be in place during the summer months in relation to the lamprey spawning period.

Mitigation for Otters

The bank seats of the viaduct crossing the Afon Gwyrfai would be set back at a minimum distance of 5.8m from the SAC on both sides of the river, allowing sufficient room for otters to continue using the bank as a dispersal corridor. The flood consequences assessments show that the north bank will remain clear during flood events and there are only minimal changes in flood depth on the south bank (which is existing flood plain).

Dispersal routes outside the SAC boundary are maintained through the use of wide-span bridges and oversized culverts are to be used through much of the Scheme including two additional safe crossings, one at the southern end of the Scheme and one at the northern end. A dry pipe of at least 600mm has also been included either side of the Afon Rhyd (S102) to ensure continued safe passage beneath the carriageway during flood events. Another 600mm dry pipe has been included adjacent to the culvert structures at S116/118 given the risk of these structures flooding during 1 in 100-year flood events. This has been located a short distance to the south of structure 116 to ensure that it remains dry and to straighten the structure increasing the likelihood that it would be used. Mammal ledges have also been proposed for culverts, wherever possible (as noted in Table 2.11.1 above), and will be tied into the adjacent banks using ramps and/or landscaping as appropriate (to be confirmed during the detailed design process in Key Stage 4). The culvert along Pen-y-Bryn Lane and the two of the additional culverts included following consultation with NRW would also provide additional crossing opportunities for Otters. Guidance fencing would be installed either side of these structures to Otters are able to locate them as detailed below.

During construction, no obstructions would be left within a 5m buffer of the river or other watercourses overnight.

Efforts would be made to minimise disturbance of otters during the construction phase along the length of the Scheme, for example by limiting night-time works and controlling light spill onto the river at night-time through the use of directional lighting and/or light shields, as per the guidance provided in the DMRB, Vol. 10 Section 4 Part 4, HA 81/99 [12].

Otter-resistant fencing has been included for 100m each way at all structure points including around the embankments associated with the wide-span bridges at the Afon Gwyrfai and the Afon Seiont and beyond proposed ponds as shown on the Environmental Masterplans. The specification for Otter fencing proposed is, as shown in DMRB (Vol. 10 Section 4 Part 4, HA 81/99 [12]), Badger fencing with the addition of an overhanging crank on the outer face of the fencing where specific Otter mitigation is required (1500mm with a 300mm crank above ground and 500mm section below ground with an additional 300mm underground return). However, this will be reviewed during the detailed design process in Key Stage 4 and Key Stage 6 and discussed with the Statutory Bodies to ensure the most suitable design is used as other schemes in the area have not used the crank design (e.g. Porthmadog and Maes yr Helmau). This fencing and associated landscape planting will be tied in to the structures and/or banks to ensure the animals are directed to these crossings.

All of the watercourse crossings along the Scheme have been designed to ensure continued use by Otters, including the installation of mammal ledges within culverts (as detailed above), and additional routes have been provided around structures 116/118, through the bat culvert to the south of the quarry (S111A) and the three additional culverts included following consultation with NRW (provision for Otter passage will be made through the grille within NRW3). The length of culverts and dry pipes have also been minimised as far as possible given the other constraints on the Scheme design. However, it is acknowledged that there are some sections of the Scheme that do not have crossing provisions as there is a lack of opportunities to do so due to the carriageway being in cut rather than on embankment.

6.2.3 Effectiveness of Mitigation

The mitigation measures described above are based on industry best practice guidance such as the Environment Agency's Pollution Prevention Guidelines (PPGs) and measures outlined in the Design Manual for Roads and Bridges. Therefore, measures are standard best practices which have been developed by statutory environmental bodies.

The effectiveness is largely driven by the mechanisms by which these measures are delivered and how they are put into practice. In relation to the Scheme, there are stringent delivery mechanisms, which the Joint Venture (JV) Team are contractually obliged to follow.

6.2.4 Mechanisms for Delivery

The mitigation measures that require land have been included within the Compulsory Purchase Orders for the Scheme to ensure that the measures can be implemented and maintained as necessary.

Under the terms of the contract, the JV Team are required to operate an Environmental Management System (EMS) in compliance with ISO:14001, ISO:14004 and the requirements of DMRB Volume 10 [13].

As part of the JV's EMS, they are also contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this is the Register of Commitments (ROC), which lists the obligations made in the Environmental Statement and within this document, such as the mitigation and avoidance measures described above. The ROC also lists commitments made under relevant licences and consents. The JV's Environmental Coordinator and Environmental Clerk of Works will be responsible for the implementation and monitoring of the CEMP. This will be produced and management in consultation with NRW and other relevant bodies.

A series of other specific Environmental Action Plans (EAPs) will be produced as part of the CEMP and will detail measures required to reduce the potential impacts on sensitive environmental features and will provide control procedures to all staff on dealing with environmental issues during the construction phase. These include the following:

- Site Waste and Materials Management Plan
- Pollution Control and Contingency Plan: This relates to mitigating potential spills and other environmental incidents during works near the Afon Gwyrfai a Llyn Cwellyn SAC.
- Environmental Landscape and Ecology Aftercare and Management Plan
- Cultural Heritage Management Plan
- Noise and Vibration Management Plan: This would include the avoidance of work such as piling in the vicinity of the Afon Gwyrfai during the Salmon spawning season.
- Maintenance Environmental Management Plan (MEMP)
- Sediment Erosion Management Plan

The JV would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP shall contain procedures for checking, auditing and corrective action. These shall include regular meetings, internal and external audits to review the operation and effectiveness of the CEMP. The results shall be reported to the Project Manager by the Environmental Co-ordinator at the monthly progress meetings. This monitoring is linked into that required for the ES and SIAA.

In the event of any non-compliance the JV shall immediately, on its detection, inform the Project Manager of the occurrence and his proposals for corrective action. The JV shall review and amend their procedures to minimise the risk of further non compliances and re-submit them to the Project Manager and others as required prior to carrying out any further affected works.

At the beginning of the maintenance period or before completion and handover for use, the JV should confirm with the Employer that all commitments listed in the ROC, other than those relating to maintenance, have been actioned or, if not, reasons submitted with a proposal for implementation for approval by the Employer.

6.3 Possible in-combination effects from other plans and projects

An EIA Scoping Report produced for the proposed change of use of the Seiont Brickworks concluded that the development is likely to have effects on bats, including Lesser Horseshoe Bats. This development therefore has the potential to have in-combination effects with the Scheme. The plans for this site are however, currently on hold limiting the scope of possible in-combination impact assessment.

The EIA and RIES undertaken for the Glyn Rhonwy Pumped Storage Scheme highlighted potential pre-mitigation impacts on both bats and otters, although post mitigation no impacts either in isolation or in-combination were anticipated. This scheme and associated documents have been used to inform the in-combination assessment included within this document.

6.4 Outcome of Screening Assessment for each of the Natura 2000 Sites

The Screening exercise determined that, with PEU mitigation measures, likely significant effects are expected on the following sites:

- Glynllifon SAC, 1.2km to the south of the Scheme at its closest point,
- Meirionnydd Oakwoods and Bat Sites SAC, 14.7km southeast of the Scheme at its closest point,
- Gwydir Forest Mines SAC, 24.9km to the southeast of the Scheme at its closest point.

The above sites will be subject to impacts on Lesser Horseshoe Bats, which are a qualifying feature of all three sites. None of the other qualifying features of the sites will be affected by the Scheme (refer to Screening Matrix – Appendix C). Detailed mitigation is required in order to minimise the impacts of the Scheme on this species, and so these sites will require assessment at Stage 2, the 'Appropriate Assessment Stage'.

The 'Screening Stage' Assessment (refer to Screening Matrix – Appendix C) determined that, with PEU mitigation measures, no likely significant effects are expected on the following sites:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Menai Strait and Conwy Bay SAC

Therefore, these sites are not being considered at Stage 2, the 'Appropriate Assessment Stage'.

6.5 Likely Significant Effects on European Sites

The likely significant effects on Lesser Horseshoe Bats identified during the Screening Stage were:

- Habitat loss – loss of foraging habitat; there would be no loss of habitat within the SACs, but the Scheme would result in the loss of woodland, grassland and wetland habitats that may be used as foraging habitat by Lesser Horseshoe Bats from roosts within the SACs;
- Disturbance to species – lighting during construction;
- Disturbance to species – noise and vibration during construction;
- Habitat fragmentation – severance of potential commuting routes (e.g. hedgerows and treelines) may lead to fragmentation of foraging areas, or reduced/severed connectivity to alternate night/day roosts and broad scale changes in the dispersal of Lesser Horseshoe Bats within the SACs in the area;
- Disturbance to species – lighting during operation;
- Disturbance to species – noise during operation;
- Disruption of species –severance of potential commuting routes leading to permanent changes in foraging behaviour.

- Reduction in species density – incidental killing during operation;

7 STAGE 2: APPROPRIATE ASSESSMENT

7.1 Introduction

The outcome of Stage 1 (Screening) was that, with design proposals and PEU mitigation measures incorporated into the proposals, the Scheme is unlikely to have an effect on the Afon Gwyrfai a Llyn Cwellyn SAC or the Menai Strait and Conwy Bay SAC, but there would be Likely Significant Effects (LSEs) on the following sites:

- Glynllifon SAC
- Meirionnydd Oakwoods and Bat Sites SAC
- Gwydir Forest Mines SAC

The LSEs relate only to Lesser Horseshoe Bats, which are a qualifying feature of all three Natura 2000 sites in question; impacts are therefore considered for this species as a whole.

Impacts have been described and assessed in accordance with DMRB Volume 11 and the CIEEM Guidelines (2006).

7.2 Construction Effects

7.2.1 Loss of Lesser Horseshoe Bat roosts

No confirmed LHB roosts have been identified along the line of the Scheme and the 2015 surveys did not identify any buildings along the line or within proximity of the Scheme with roosting potential for Lesser Horseshoe or any other bat species; as such, no direct impacts to roosting bats is anticipated.

7.2.2 Indirect impacts to retained roosts

According to Cofnod data, there are records for 13 Lesser Horseshoe Bat roosts within 2.5km of the Scheme. Whilst these will not be directly affected, there is potential for indirect impacts, in the form of disturbance, disruption of potential commuting routes and potential incidental killing of individuals during the operational phase of the Scheme. These are discussed below.

7.2.3 Habitat loss – loss of foraging habitat

Lesser Horseshoe Bats are known to forage primarily in mature broadleaved woodland and along field boundaries such as tree belts and mature hedgerows (Schofield, 1996 [14] and Bontadina *et al*., 2002 [11]), but will also use other habitats such as pasture, scrub and open water.

The conservation objectives for Glynllifon SAC state the following:

'*There will be a sufficiently large area of suitable habitat surrounding these roosts to support the bat population, including continuous networks of sheltered, broadleaved and coniferous woodland, tree lines and hedgerows connecting the various types of roosts with areas of insect-rich grassland and open water.'*

Performance indicators for Glynllifon SAC relate only to habitat within the SAC itself, which the Scheme does not directly affect. There are no specific recommendations for habitat outside the SAC.

The Scheme would result in the permanent loss of 1.35ha of broadleaved woodland, 2.06ha of scrub and approximately 4,111.2m of hedgerow, habitats which are favoured for foraging by Lesser Horseshoe Bats. Their loss would result in a reduction of potential foraging habitat for Lesser Horseshoe Bats associated with the SACs, within 30km of the Scheme. The Scheme will also result in the loss of improved grassland (52.84ha), semi-improved neutral grassland (0.48ha) and marshy grassland (5.10ha), which may be used by Lesser Horseshoe Bats in the area particularly where such areas are associated with adjacent woodland edge and hedgerows and where management is less intensive. There would also be further loss of 1.61ha of broadleaved woodland, 3.12ha of scrub and 2,911.33m hedgerow habitats in the temporary works areas associated with the Scheme, as well as improved grassland (35.45ha), semi-improved neutral grassland (0.29ha) and marshy grassland (2.6ha) (see Table 2.3.1 above for full details).

Whilst the areas of potential Lesser Horseshoe Bat habitat lost to the Scheme are quite small in comparison to the total available resource, their loss could have an impact on bat populations within the SACs designated for Lesser Horseshoe Bats within a 30km radius. Therefore, habitats should be reinstated as part of landscaping proposals for the Scheme, with efforts focussed on the creation of woodland, hedgerow and treeline habitats, which are favoured by Lesser Horseshoe Bats. This will be located within the Scheme boundary to provide connectivity along the Scheme and with the wider area but it will be located away from the carriageway to avoid the risk of encouraging bat casualties. Details of landscaping proposals are provided in Section 8 below.

As the loss of areas of bat foraging habitat will be mitigated for through the creation of bat foraging habitat (woodland and hedgerows), this impact is considered to be temporary with foraging habitats replaced in the medium to long term (neutral within 15 years of planting). As there are large areas of foraging habitat in the vicinity of the known roosts, this constitutes a small proportion of the available foraging habitat and as such mitigation is not considered to be required in the short-term

7.2.4 Habitat fragmentation - disruption of potential commuting routes

The construction phase of the Scheme would involve the removal of sections of hedgerows which may be used as commuting routes by Lesser Horseshoe Bats. The surveys conducted for the Scheme between 2009 and 2015 (which were focussed on areas identified as having the best potential as Lesser Horseshoe Bat foraging/commuting areas within the Scheme area) recorded low numbers of bats throughout the Scheme.

No particular commuting route was discovered during surveys with activity recorded considered to be foraging related, but taking a precautionary approach, it is assumed that Lesser Horseshoe Bats could use any and all of the field boundaries throughout the Scheme for some sort of commuting route as well as for foraging activity. Therefore, it is assumed that the removal of hedges, treelines and field boundaries during the site clearance phase of the Scheme may cause disruption of Lesser Horseshoe Bat potential commuting activity and foraging activity. This assumption will be continued throughout the remainder of this assessment.

The conservation objective as stated above for foraging habitat loss requires '*…continuous networks of sheltered, broadleaved and coniferous woodland, tree lines and hedgerows connecting the various types of roosts…'*; the loss of hedgerows and treelines, in particular, could be in contravention with this conservation objective.

In order to make the operational Scheme as permeable as possible to Lesser Horseshoe Bats (and other wildlife), all culverts have been oversized as far as possible to allow bats to pass through them and culverts will be designed so that they should never be in full spate, wherever possible. Table 7.2.1 below lists the structures (including culverts) that have been incorporated into the Scheme design as Plainly Established and Uncontroversial Mitigation (PEU), and their associated functions with regard to wildlife mitigation. This includes the three additional culverts added to increase the general permeability of the Scheme following discussions with NRW during the consultation process. and the clear span structures at the Afon Seiont and the Afon Gwyrfai mentioned in the Screening Stage assessment, which would easily accommodate bats underneath them.

These are shown on the Figure 1.0 Location of Structures.

34 of the 38 structures are located on vegetated watercourses, roads, hedgerows and other linear features that could be used by LHB as potential commuting routes as noted in the table below.

Structure 111 is located 108m to the south of the Pen-y-bryn Lane, which means that it is not on the line of a nearby potential commuting route. However, the potential bat commuting route is maintained through the inclusion of Structure 111A, which has been included to retain this route.

Structure 102 is located on the new alignment of the Afon Rhyd, which on its original alignment was a potential bat commuting route. It is 35.5m to the south of the original watercourse

Structure 110A is located 50m to the west of the original culvert beneath the existing A487 again due to the realignment of the watercourse. The original watercourse was not on a potential commuting route.

Structure 115A is located 34m to the south west of the original alignment of the tributary to the Afon Cadnant, which has not been confirmed as a potential bat commuting route.

Table 7.2.1: Summary of Scheme Structures and Associated Wildlife Mitigation - including where usable by Lesser Horseshoe Bats

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
S100	0.6m pipe	33		Non-LHB foraging and safe crossing	Watercourse crossing

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
				point, mammal ledge	
S101	1.8m pipe	57.2	1.11	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S101A	7.2 x 5.8m box underbridge	23.7	N/A	LHB foraging and safe crossing point, wildlife crossing	Road crossing
S102A	0.6m pipe	52.2	N/A	Dry pipe provided for mammal passage	Ecological mitigation only
S102	3.2m x 2.4m box culvert	54.9	0.71	LHB foraging and safe crossing point, wildlife crossing, dry pipes also provided	Stream diversion
S102B	0.6m pipe	52.2	N/A	Dry pipe provided for mammal passage	Ecological mitigation only
S103	Overbridge	N/A	50.9	Non-LHB foraging and safe crossing point	Road crossing
NRW1	1.8m pipe	25.5	N/A	LHB foraging and safe crossing point, wildlife crossing	Ecological mitigation only
S104	1.8m pipe	35.2	1.10	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
S105	4.5 x 4.5 box underbridge	23.6	N/A	LHB foraging and safe crossing point, wildlife crossing	Farm access
S106	Afon Gwyrfai Viaduct	260	N/A	LHB foraging and safe crossing point, wildlife crossing	Watercourse crossing
S107	7.2 x 6.1m box underbridge	24.6	N/A	LHB foraging and safe crossing point, wildlife crossing	Road crossing
S108	19.5 underbridge	17	N/A	LHB foraging and safe crossing point, wildlife crossing	Rail crossing
S109	Overbridge	24.7	N/A	Non-LHB foraging and safe crossing point, wildlife crossing	Road crossing
S109A	1.8m pipe	36.4	0.89	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S109B	0.6m pipe	23.6	0.36	Non-LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
NRW2	0.9m pipe	28.0	N/A	Non-LHB foraging and safe crossing point, wildlife crossing	Ecological mitigation only

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
S110	1.8m pipe	30.2	1.16	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S110A	1.8m pipe	23.2	1.09	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S111A	1.8m box culvert	29.6	N/A	LHB foraging and safe crossing point, wildlife crossing	Ecological mitigation only
S111B	1.5m pipe	14.2	0.66	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
NRW3	1.8m pipe	28.5	N/A	LHB foraging and safe crossing point, wildlife crossing	Ecological mitigation only
S112	Afon Seoint Viaduct	148	N/A	LHB foraging and safe crossing point, wildlife crossing	Watercourse crossing
S112A	1.5m pipe	15	0.85	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S112B	1.5m pipe	32.2	0.81	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S112C	0.6m pipe	32.7	0.34	Non-LHB foraging and safe crossing	Watercourse crossing

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
				point, mammal ledge	
S112D	0.6m pipe	118		Non-LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S112E	18.7m box underbridge	9.7	N/A	LHB foraging and safe crossing point, wildlife crossing	Road crossing
S113A	2.3m x 3.0m box culvert	23.0	2.3	LHB foraging and safe crossing point, wildlife crossing	Watercourse crossing
S114	3.4m x 3.4m box culvert	22	1.77	LHB foraging and safe crossing point, wildlife crossing	Watercourse crossing and cattle creep
S114A	1.8m pipe	29.4	0.60	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S115	Overbridge	23.5m	N/A	Non-LHB foraging and safe crossing point, wildlife crossing	Road crossing
S115A	2.1m pipe	55.5	0.79	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S115B	2.1m pipe	53.5	0.78	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing

Ref	Structure	Length	Headroom when in spate (1 in 100yr)	Description of species-related mitigation	Other Function
	Size /Type	(m)	(m)		
S115C	2.1m pipe	21	0.72	LHB foraging and safe crossing point, mammal ledge	Watercourse crossing
S116	0.6m pipe	35	0 (surcharged ~ 2m)	Not suitable for wildlife passage, dry pipes provided (S116A and S118A)	Watercourse crossing
S116A	0.6m pipe	46	0	Dry pipe provided for mammal passage (NB: Otter pipe surcharged by about 1.3m for 100CC event.)	Ecological mitigation only
S118A	0.6m pipe	24	0	Dry pipe provided for mammal passage (NB: Otter pipe surcharged by about 1.3m for 100CC event.)	Ecological mitigation only

In the absence of additional mitigation, the structures detailed above may not be used by bats, especially if vegetation removal for the Scheme severs hedgerows, treelines and other potential commuting and connectivity features.

If potential commuting routes are disturbed, this could increase flight times between roosts and foraging areas, increasing the energy expenditure required for foraging and thereby reducing fitness. Another possibility is that disruption of potential commuting routes could encourage bats to attempt to cross the road above ground as they try to continue using the original line of the potential commuting route, which could result in incidental killing of bats.

In the absence of mitigation above and beyond the structures above, this impact would be probably, negative, long-term and irreversible.

Additional mitigation is therefore required to minimise this impact; details of that additional mitigation proposed for this impact are outlined in Section 8, along with an assessment of residual effects.

7.2.5 Disturbance during construction - lighting

The construction phase of the Scheme may result in an increased level of lighting in the area, if night time working is required.

Lighting can have a deterrent effect on Lesser Horseshoe Bats (Stone *et al*. 2009 [15]) and therefore increases in lighting during the construction phase of the Scheme may disrupt potential commuting routes and could displace foraging activity. It is envisaged that night time working will be required at the following locations:

- Plas Menai roundabout works
- Llanberis road roundabout works
- A4085 – Caeathro Road in order to construct bridge
- Meifod roundabout works
- WHR structure 109 crossing the railway
- Goat roundabout works.

This impact is considered to be likely, negative, would affect only the Lesser Horseshoe Bat populations that currently forage in or commute through the area, would be temporary and reversible.

7.2.6 Disturbance during construction – noise and vibration

Noise and vibration have the potential to cause disturbance to Lesser Horseshoe Bats in roosts close to the Scheme during the construction phase of the Scheme, particularly from loud construction activities such as piling. As the closest known roost to the Scheme is 390m away beyond the 60m within which noise disturbance may occur (Siemers B M & Schaub A, 2010 [15A]), this impact is considered unlikely, negative, temporary and reversible.

The blasting works are limited to the northern end of the Scheme where the nearest LHB roost is 1.5km to the south west at Plas Bereton, which is considered to be sufficient distance for impacts to be negligible.

7.3 Operational Effects

7.3.1 Disturbance to species – disruption of potential commuting routes and potential mortalities during operation.

As stated above, the fragmentation of features such as hedgerows and treelines as a result of the Scheme could disrupt potential Lesser Horseshoe Bat commuting routes. If potential commuting routes are permanently broken, this could increase flight times between roosts and foraging areas, increasing the energy expenditure required for foraging and thereby reducing fitness. Another possibility is that disruption of potential commuting routes could encourage bats to attempt to cross the road above ground as they try to continue using the original line of the potential commuting route, which could result in incidental killing of bats.

The provision of potential crossing points, in the form of clear-span structures and oversized culverts, has been incorporated into the design of the Scheme (see Table 8.1 above). However, in the absence of additional mitigation, these culverts may not

be used by bats, especially if hedge and treeline removal disrupts potential commuting routes.

In the absence of mitigation above and beyond the structures above, this impact would be probably, negative, long-term and irreversible.

Additional mitigation is therefore required to minimise this impact; details of mitigation proposed for this impact are outlined in Section 8, along with an assessment of residual effects.

7.3.2 Disturbance to species – lighting during operation

Lighting can have a deterrent effect on Lesser Horseshoe Bats (Stone (ed.) 2014 [15]) and therefore increases in lighting during the operational phase of the Scheme may permanently sever commuting/foraging routes and could displace foraging activity.

Lighting for the Scheme would be restricted to the following:

- Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs.
- At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction
- The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts.
- The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.
- The current provision of lighting at the Goat and Plas Menai roundabouts would be maintained.

This impact is considered to be certain, negative and permanent but the effect would be limited to Lesser Horseshoe Bat populations that currently forage in or commute through the affected areas.

7.3.3 Disturbance to species – noise during operation

The Scheme has been designed to reduce operational noise and vibration through the use of low-noise surfacing and suitable consideration of sensitive receptors in designing the Scheme alignment. As the closest known roost to the Scheme is 390m away, this impact is considered unlikely, negative and temporary.

7.3.4 Assessment of in-combination effects

There is potential for a cumulative effect with the Scheme in relation to Lesser Horseshoe Bats and the proposed change of use for part of the Seiont brickworks as there is a known roost within this area. The magnitude and significance of this impact cannot be determined at present with the information provided, primarily as the Environmental Impact Assessment is yet to be produced.

The EIA and RIES undertaken for the Glyn Rhonwy Pumped Storage Scheme highlighted potential pre-mitigation impacts on both bats and otters, although post mitigation no impacts either in isolation or in-combination were anticipated. This scheme and associated documents have been used to inform the in-combination assessment included within this document.

7.4 Summary of effects without mitigation detailed above

As established in the above sections, in the absence of mitigation, the Scheme could have a significant impact on Lesser Horseshoe Bats through:

- Loss of foraging habitat during construction (Section 7.2.3)
- Disruption of potential commuting route (Section 7.2.4)
- Disturbance during construction due to lighting (Section 7.2.5)
- Disturbance during construction due to noise and vibration (Section 7.2.6)
- Disruption of potential commuting routes and potential mortalities during operation (Section 7.3.1)

8 MITIGATION AND ASSESSMENT OF RESIDUAL EFFECTS

8.1 Introduction

As the only feature of all of the Natura 2000 sites which would be potentially affected by the Scheme is Lesser Horseshoe Bat, mitigation is considered in relation to this species as a whole, rather than considering individual SAC sites. Mitigation is outlined for the Construction and Operation Phases of the Scheme is described in Sections 8.2 and 8.3. The landscape-scale approach that has been taken in relation to mitigation is described in 8.1.1 below.

8.1.1 Landscape-scale approach

Surveys undertaken in 2009, 2014, 2015 and 2016 (see Section 5) have indicated that Lesser Horseshoe Bats are present across the majority of the Scheme (recorded along all but one of the survey transects) in relatively low numbers. These surveys have also shown that there are no significant or frequently used commuting routes and that the behaviour, where observed, has been that of foraging and feeding. This type of behaviour is more difficult to design mitigation for than areas where there is distinct commuting behaviour. While no commuting routes are present, the activity recorded demonstrates that in the absence of mitigation LHB could be excluded from foraging areas on the far side of the Scheme from their roosts and have the effects recorded in Section 7 above.

As such the general approach taken to mitigate the impact of habitat fragmentation, which has the potential to cause fatalities to Lesser Horseshoe Bats, has been to adopt a landscape scale approach. This used GIS and survey information (Section 5) to understand bat behaviour in the area and how they use the features in the landscape. This approach is based on the principle that there needs to be permeability through the Scheme and habitat connectivity around the Scheme. In this situation this has involved maximising the number of safe and suitable crossing points available across the Scheme by providing clear-span structures and oversized pipes and culverts (refer to Table 7.2.1 above). These are located on vegetated watercourses, roads, hedgerows and other features, which have high potential for use by bats as potential commuting routes. The use of over-sized culverts to permit safe LHB passage is an accepted mitigation method and is part of both DMRB Volume 10 [13] (minimum of 1.0m diameter) and IAN 116/08(W) [16] (LHB known to use 1.2m diameter culverts but recommends using the largest practical size) guidelines. They have also been shown to work on a number of other highways schemes as shown in the Highways Agency review [17] on such measures published in September 2011; and further examples based on experience are given below.

In addition to these crossing points additional mitigation is required (see Section 7 above). Crossing points would be connected along the length of the Scheme and to the wider landscape by temporary fencing during construction; and by dense hedgerow and woodland planting as described in Section 8.3.1.

The use of planting to guide bats, particularly LHB, to such structures is based on the principles detailed within the Lesser Horseshoe Bat Conservation Handbook (The Vincent Wildlife Trust 2008 [18]) and the findings of the Highways Agency review [15] and the Leeds University research into mitigation for bats crossing linear transport features (Berthinussen and Altringham, 2015 [19]).

The project team also has experience in the successful use of this approach on similar schemes in Wales, as detailed in the example boxes below. Information on the wider context on the schemes is also included:

Example 1 – A477 Nash Bangeston Improvement, Pembrokeshire:

This scheme involved the online improvement of 3.2km of single carriageway affecting both Lesser and Greater Horseshoe Bats (GHB) including diversions from their habitual flight lines to safe crossings.

Mitigation for both of these species was provided in the form of:

- Wide culverts and guide fencing in order to encourage both of these low-flying species to cross under the carriageway. Culverts were located at Slade Cross to the western end of the scheme and at the Old Rectory to the eastern end.
- Planting at the southern access to the Slade Cross culvert was a low scrub mix in order to guide bats into the culvert.
- Bat fencing was installed along sections of the carriageway known to be used as bat crossing points around the Old Rectory area to prevent bats crossing the carriageway and to direct them to the culvert. The fencing would also force bats to cross at vehicle height should they try and fly over the carriageway.
- Planting along the bat fence was also incorporated to screen the fence and to reinforce the barrier.
- A services easement behind the northern bat fence through the woodland and hedge planting coincided with the creation of a bat flight corridor to the Old Rectory culvert. This was reinforced by the planting to the south of the bat fence and the woodland block north of the corridor.
- Planting blocks were designed to provide funnelling effects both north and south of the carriageway, particularly on the southern side along the stream to the western boundary of the Old Rectory.

This scheme altered the routes of existing flight lines and as part of the mitigation design, a rationale was provided, which acknowledged that it was not possible to place a culvert on the alignment of the Lesser Horseshoe flight line of about 425-450m. However, it also notes that '*the Lesser Horseshoes could probably also be expected to adopt the new culvert crossing, provided a means could be found to*

persuade them to adopt a new route down the western side of the Old Rectory plot rather than along the rear of the property.'

Previous knowledge and experience of the behaviour of horseshoe bats, coupled with evidence from other sites at the time suggested that it should be possible to affect a change in the Lesser Horseshoe Bats' flightway route by a combination of making the western route as attractive as possible whilst discouraging use of the eastern route. The former would include grading out the stream on either side of the new, enlarged culvert to provide an unobstructed route into it, and modification of the hedge canopy to provide a clear and obvious single route to the culvert. Discouragement from the old route would include the use of high fences ('baffles') to make access onto the old route more difficult or undesirable and to highlight the comparative accessibility of the western route. Similar measures to 'funnel' the bats to the culvert would also be implemented north of the road to accommodate any 'two-way' use of the route. High fences have been used on other schemes to successfully deter bats from following a particular route.

Initially, the proposed mitigation included the provision of high baffles extending all of the way across the field to the rear of the Old Rectory to maximise the funnelling effect of the mitigation. These proposals were subsequently modified to a much more modest baffle in order to accommodate objections to the loss of visual and landscape amenity from the property owner, even though this was considered likely to have some risk of reducing its effectiveness. Similarly, the possible use of high intensity lighting to the rear of the Old Rectory to further deter bats from crossing to the east were abandoned, as were proposals for additional planting and the possible use of subsidiary baffles within the property.

The final monitoring report in 2010 concluded that:

- The bat survey results indicate greater levels of LHB activity in and around the Old Rectory culvert compared with the 2006 to 2009 surveys. However, these are still lower than those recorded in 1998 and 2005.

- Only a single LHB was recorded using the culvert at Slade Cross during these surveys and none recorded utilising the surrounding area. This is lower than earlier survey results although LHB numbers have been consistently low in this area, especially utilising the culvert. This could be due to the general decline in LHB numbers or because the route is only used intermittently.

- None of the static bat detectors recorded any bats crossing the road at either the Old Rectory or Slade Cross or crossing to the east of the fencing at the Old Rectory.

- No LHB or GHB were recorded flying along the carriageway during the walkover surveys.

The 2010 monitoring results show the mitigation measures to be successful with both species frequently using the Old Rectory culvert and frequent GHB use of the Slade Cross culvert. LHB use of this culvert has been recorded in the past but a change in the levels of use of the Upton Roost and in the wider area has reduced this. The generally lower levels of bat activity along the roadside is not surprising given the loss of trees and hedgerows although as the mitigation planting becomes more established bat numbers and activity will increase.

The report noted that to ensure continued use of both culverts appropriate vegetation management will be required to maintain the guiding function of the planting areas.

Example 2 - A465 Heads of the Valleys Dualling – Abergavenny to Gilwern:

This scheme involved the widening of a single carriageway to a dual carriageway in close proximity to the Usk Bat Sites SAC, which contains one of the UK's largest Lesser Horseshoe Bat maternity roosts, several hibernacula sites and around 5% of the total UK LHB population. The majority of bats that may be affected by the Section 1 Dualling scheme reside at a maternity roost in Llanwenarth House, which is within five hundred metres of the A465.

Roost emergence counts carried out by the CCW, which have been supplemented with counts carried out by TACP since 2005, suggest the population is approximately 100 individuals. Approximately a third of bats at the roost use the road underpass at Hopyard Farm each night to cross the A465. Some are also known to use other crossing points further east at Cwm-Shenkin culvert and Evesham Nurseries underpass. The bats were also known to infrequently cross the road along access bridges at Pen-y-Worlod and Cadfor Farm and an occasionally used crossing point was noted through the Monmouthshire Canal under-bridge.

Mitigation measures for this scheme included:

- The construction of two temporary bat bridges to replace the existing farm access bridges at Cadfor and Pen-y-Worlod Farms. Tree planting was undertaken at either ends of the bat bridges to encourage usage.
- New road over-bridge between Cadfor and Pen-y-Worlod Farms to replace the two over-bridges lost and associated tree planting to encourage and guide bats.
- The extension of the existing Hopyard Farm Underpass including grille installation and re-design over three survey seasons and pre-construction vegetation clearance. Temporary debris netting was used during construction and while the landscape planting established to maintain connectivity between the culvert and the wider area. Landscape planting was used to permanently replace the connectivity lost during the clearance and construction works.
- The extension of the existing underpass at Evesham Nurseries including lighting system design and subsequent removal and pre-construction vegetation clearance. Temporary debris netting was used during construction and while the landscape planting established to maintain connectivity between the culvert and the wider area. Landscape planting was used to replace the connectivity lost during the clearance and construction works.
- The works at Evesham Nurseries also resulted in the loss of vegetation between the underpass and an area of substantial vegetation (a disused railway) to the west. A fence line was erected in place of the hedgerow that led to this underpass.
- The construction of culverts over Baiden Brook and Cwm Shenkin.

- Construction of a new road over-bridge for the Monmouth and Brecon Canal.

The pre, during and post construction monitoring for the scheme, which ended in 2013 concluded the following:

- The major crossing points at Hopyard Farm, Evesham Nurseries and Cwm Shenkin Culvert are still being utilised by numbers of LHB comparable with the 2004 baseline.

- The numbers of individual bats using the Hopyard Farm Underpass to cross appear to have stayed more consistent pre and post construction. This shows the underpass is continuing to be used but the habits of the bats appear to have changed.

- The results of the surveys carried out at Cwm Shenkin in 2013 are encouraging and show that numbers have recovered from the reduction in usage observed during construction and are in line with pre-construction results. This is clear evidence that an established LHB crossing point can be extended and still be used by the same number of bats post-construction.

- LHB were recorded on each occasion surveys took place at Evesham Nurseries in 2013. The results demonstrate a recovery in the usage of the underpass to levels recorded prior to the installation of lighting. The replacement fence line erected to maintain connectivity between the culvert and vegetation to the west was also shown to be regularly used by LHB.

- Surveys were not undertaken at Pen-Y-Worlod and Cadfor Farm Bat Bridges during 2013. These temporary Bridges had served their purposes as mitigation for the scheme and were removed in December 2013.

- Although there has been no conclusive evidence that LHB have adopted the New Bridge as a means of crossing the A465, there has been an increasing trend since 2011 of a small number of bats recorded at the bridge. The monitoring demonstrated that the location is being visited and so has the potential of being used as a crossing point in the future, if it is not already being used.

- No bat events were recorded at the Canal Underbridge, however, this was only ever used very occasionally. The lighting currently along the tow-path side of the underbridge discourages LHB from using it. It was confirmed in August 2013 that WG would seek to remove this lighting in future. This is welcomed and would provide a further opportunity for LHB to cross the road safely.

- Results from the roost exit counts at Llanwenarth House appear to show a slight downturn in the last two years, which is reflected in counts undertaken at some other maternity roost within the Usk Valley. Counts at Llanwenarth House are variable but do not show obvious continuing increasing or declining trends despite an increasing regional trend in southeast Wales. This is considered to be a reflection of the quality of the roost at Llanwenarth House when compared with other better managed roosts such as Buckland House, rather than the impact of the road.

Details of this scheme and the mitigation measures incorporated for LHB was reported in The Environmentalist, the Journal of the Institute of Environmental Management and Assessment, in February 2008 (Karran 2008 [19A]).

The scheme was also subject to a review by the University of Leeds where surveys undertaken on the Hopyard Farm and Evesham Nurseries underpasses in 2013 showed that 100% of the LHB recorded went through the structures (Berthinussen 2013 [19B]).

Example 3 - A479 Talgarth Relief Road & Bronllys Bypass [17]:

The road, constructed in 2007/2008, severed a hedgerow and watercourse used regularly by around 10 lesser horseshoe bats. Pendre Culvert, a 2.3m high elliptical arch with a span/length of 25m, was put in place to carry the watercourse beneath the carriageway and provide safe passage for LHB. The culvert is perpendicular to the road, whereas the original severed hedgerow was at a more acute angle, so the flightpath has been diverted.

Diversion of the watercourse, hurdle fencing and shrub planting has been used to connect the culvert with the original hedgerow on the western side. The eastern entrance to the culvert lies on the original flightline.

The surveys identified preferential use by lesser horseshoe bats of the culvert rather than the road. The level of activity increased when compared with the baseline surveys. Observations of 'light-sampling' suggest that lesser horseshoe bats may have been hesitant to leave the western portal of the culvert before connecting vegetation had become suitably established.

As part of this approach the use of lighting along the Scheme will also be minimised and other measures put in place to ensure that the use of foraging areas and potential commuting routes are not disrupted by light pollution (as detailed in Section 2.1.2).

Specific over carriageway measures such as bat gantries have not been proposed on the Scheme cuttings or at grade sections, due to recent research indicating they are of limited value for bats (Berthinussen and Altringham, 2012 [20] and 2015 [19]).

The remaining part of this Section brings together the mitigation described in Section 7 and the landscape approach above in the context of the effects of the scheme for both Construction and Operational periods.

8.2 Construction Phase Mitigation for Lesser Horseshoe Bat in Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC

8.2.1 Habitat fragmentation - disruption of potential commuting routes

Safe crossing points would either be maintained (e.g. Afon Gwyrfai and Afon Seoint) or reinstated during the construction period (e.g. through the reinstatement of hedgerow connectivity as soon as possible and the use of temporary measures in the interim period) at those potential commuting route locations where there are associated safe crossing structures proposed.

It is noted that the potential route in the area of peak activity for the Scheme (south of the quarry area R7) will be maintained through the retention of the Plas-y-Bryn Lane

through the inclusion of an oversized box culvert beneath the carriageway. The 2016 bat activity peaks at R10 and R11 (on the Afon Gwyrfai) will be maintained as this area is being crossed by a widespan structure. Two of the three additional culverts (NRW1 and NRW3) included following consultation with NRW would also provide safe crossing locations beneath the carriageway. The third culvert (NRW2) is not considered as LHB mitigation as it is only 900mm in diameter, which cannot be increased further due to engineering constraints. The use of culverts for providing safe passage beneath carriageways has been shown successful by the five examples given above and has also been used for other schemes.

Where there is significant vegetation disruption as a result of the construction works, namely around the Afon Seoint where the haul road placement requires the removal of broadleaved woodland and scrub, temporary measures will be used to maintain woodland edges. These measures would take the form of a temporary pipe of approximately 600mm diameter beneath the haul route where there is sufficient material or debris netting (as used on the Hopyard Farm and Evesham Nurseries underpasses detailed in Example 2 above) or brash windrows/hurdle fencing, which utilise the same principles as debris netting, that can be removed and replaced on a daily basis and will be included within the CEMP. The principles of using fencing and planting as guidance features have also been shown effective with the success of the hedgerow planting as a replacement fence line on the Evesham Nurseries underpass and planting connectivity at Hopyard Farm (Example 2 detailed above) and the use of permanent guidance fencing used at the Old Rectory (Example 1 detailed above). Hurdle fencing was used during and post construction to reconnect severed hedgerow vegetation on the realigned commuting route at Pendre Culvert (Example 3) prior to the establishment of the replacement planting.

There is evidence that vegetation can be used for moving Greater Horseshoe Bats from flight lines, a species with similar behaviour as Lesser Horseshoe Bats, from the A40 Penblewin to Slebech Improvement.

If vegetation is to be cleared during the bat active season, such measures will be installed immediately after vegetation clearance. If clearance is to be carried out in the winter, temporary bat mitigation measures as above will be installed prior to the commencement of the bat active season (April to September, weather-dependant). This approach would also be used to maintain connectivity as far as possible at each safe crossing point location along the Scheme to ensure that bats can continue to use these features during construction.

An example arrangement of this approach has been detailed for the Afon Rhyd (refer to Figures 3.1 to 3.4), which shows the different temporary fencing arrangements required at different points during the construction process. Similar arrangements will be drafted for each of the structure locations with the input of NRW and other statutory bodies once the construction programme has been finalised as this has an impact on the arrangement required. These arrangements will need to be sensitive to whether the existing potential commuting route is being maintained (as it is for a majority of locations) or realigned as with Structures 102, 110A and 115A.

8.2.2 Habitat loss – loss of foraging habitat

It is not possible to mitigate the effects of loss of foraging habitat in hedgerows, woodland and grassland in the short term during the construction period. However, less than 1.5ha of high potential bat foraging habitat (woodland and hedgerow) and further areas of lower potential bat foraging habitat such as improved grassland (54ha), scrub (2ha) and species rich grassland (6.9ha) will be affected. As there are

large areas of foraging habitat in the vicinity of the known roosts, this constitutes a small proportion of the available foraging habitat and as such mitigation is not considered to be required in the short-term.

The permanent loss of approximately 1.35ha of broadleaved woodland and 2.06ha of scrub (3.41ha total) would be mitigated by planting 13.02ha of native tree and shrub areas and 144 individual trees, in accordance with the landscape design proposals for the Scheme. The temporary loss of 1.61ha of woodland and scrub habitat affected by temporary works will be mitigated through habitat reinstatement works within the affected areas. These habitats will become established within 10 – 15 years of planting, although there will be foraging potential within a few years.

Road safety requirements dictate that mature woodland should not be established in close proximity to the Scheme carriageway. However, the establishment of woodland in suitable locations at the base of embankment slopes and at a suitable distance from the Scheme carriageway is considered sufficient to mitigate the identified adverse impact of foraging habitat loss in the long term. This planting has been included adjacent to existing woodland and scrub habitats along the length of the Scheme to reflect the current distribution of these habitats.

Grassland seeding would also be undertaken along the length of the Scheme, particularly in areas of cut, which will provide 29.61ha of mitigation for the 6.94ha of grassland habitats and 53.26ha agricultural grassland habitats lost. This seeding would be species rich unless safety requirements dictate the need for amenity mixes to be used to preserve sight lines etc. These grassland areas will be created in a variety of conditions with different drainage regimes and different floral mixes to encourage the establishment of different grassland types, including species rich marshy grassland, particularly to the north and south of the Bethel Roundabout. If possible the topsoil from the existing marshy grassland will be retained and reused to maintain the seedbank already established. Translocation of topsoil from other grassland areas, particularly those affected within the Wildlife Sites, will also be used if it is appropriate to do so as identified during the detailed design process in Key Stage 4 in consultation with NRW and other statutory bodies.

Such floral and habitat diversity provides food sources for a greater variety and number of invertebrates which in turn provides a greater variety and quantity of food for bat populations in the area. These habitats will establish within a year of seeding.

New hedgerows would be created within the Scheme boundary, in accordance with the landscape design proposals for the Scheme. Approximately 22,954m of hedgerow planting would be provided by the Scheme compared with the approximate loss of 4,111.2m of hedgerow removed during construction of the Scheme (and a further 2,911.33m that may be affected in temporary works areas), thus providing a significant foraging resource for bats in the area, once established (within approximately 5 years). Hedgerow planting will provide connectivity between retained woodlands and proposed planting areas as described above and discussed in the examples given in Section 8.1.1.

Hedgerows would be created in two ways: where sections of hedgerow that require removal during construction support well-established coppice stools of hazel or other shrubs, these would be coppiced and translocated to the alignment of proposed new hedgerows. Translocated coppice stools establish sooner than newly planted shrubs and therefore start providing structural and foraging habitat for a range of species more quickly following construction. Ideally, coppice stools would be translocated direct from donor to receptor sites nearby, though earthworks or drainage

requirements may mean that a limited number of stools have to be translocated twice, first into a temporary 'holding' area within which they should still be replanted with all roots covered by soil until it is possible to move them into their final destination. This ensures retention of existing floral diversity and more rapid establishment of mitigation habitats, which supports the invertebrate populations on which bat populations feed.

The remainder of new hedgerow and all woodland and scrub areas would be planted using a range of locally native tree and shrub species. Care whould be taken to use plants of UK and ideally Welsh stock rather than sourced from overseas, which can have slightly different genetic and ecological characteristics with potential implications for other wildlife. The use of locally sourced plant will also reduce the risk of bringing in plant diseases such as Chalara (ash dieback). This will ensure the successful establishment of planting and provision of mitigation habitats for bats.

In addition to the areas of new planting, key areas of vegetation have been included within the Scheme to ensure their retention. This includes the dense mature hedgerow adjacent to the Scheme between Structures 104 and 105, which surveys have shown is a relatively well used foraging area. The wooded stream that runs along the eastern side of the Scheme from Pen-y-Bryn Lane northwards past the quarry area has also been included and the mature trees and scrub vegetation retained. The woodland areas around Structures 111 and 111a have also been included given the peak of bat activity and the connectivity this provides between the structures and to the adjacent stream. The woodland block to the western side of the carriageway at the Plas Menai roundabout has also been included within the CPO of the Scheme.

8.2.3 Disturbance to species - lighting

Impacts to the known Lesser Horseshoe Bat roosts in the area would be minimised by limiting construction site lighting to specific locations where it is absolutely necessary for public safety or security and by minimising light spill by directing lighting downwards onto rather than across areas requiring illumination. Care would be taken to avoid positioning site compounds or welfare units, generators for traffic management etc. in close proximity to retained roosts.

8.2.4 Disturbance to species – noise and vibration

Rock drilling and blasting works are required in relation to the Plas Menai rock cut to the northern end of the Scheme, however such works will be limited as far as possible and the blasting will be low intensity and only occur once a week during daylight hours. No Lesser Horseshoe Bat roosts have been identified in this area.

8.3 Operation Phase Mitigation for Lesser Horseshoe Bat in Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC

8.3.1 Disturbance to species – disruption of potential commuting routes and mortalities during operation

Fragmentation impacts on bats during operation of the Scheme would largely be avoided through the use of wide-span bridges across the Afon Gwyrfai and Afon Seoint, the provision of oversized culverts along the length of the Scheme as well as the retention of the Pen-y-Bryn Lane as a specific bat underpass. Culverts will not be fitted with grilles or screens so they are fully accessible for use by bats, unless required for public safety reasons.

Culverts and other crossing structures would be linked to the wider landscape through the retention of existing woodland, scrub and hedgerows and through the use of new planting to reconnect fragmented hedgerows as shown within the Environmental Master Plans and within the detailed example shown within Figure 4.0, which shows the landscape planting associated with the Pen-y-Bryn Lane structure. The final extent and design of this planting will be established in consultation with NRW as part of the Key Stage 4 detailed design process.

This approach will utilise the principles and experience of previous schemes as detailed within the example boxes above to ensure that bats are guided to the safe crossing structures. Guidance planting was used in conjunction with permanent bat fencing around the Old Rectory (Example 1) where an existing Greater Horseshoe commuting route was maintained and a LHB commuting route was realigned by approximately 425-450m westwards. Subsequent monitoring showed this to be successful with neither LHB or GHB recorded flying through the culvert rather than over the carriageway. The major commuting routes at Hopyard Farm and Evesham Nurseries and the minor route at Cwm Shenkin Brook culvert (Example 2) also used a combination of culvert/underpasses, fencing and planting connectivity to ensure safe passage of bats beneath the carriageway. A similar approach was applied on the Pendre Culvert (Example 3) where an existing commuting route associated with a hedgeline and watercourse was realigned and reconnected to the severed habitat features using planting, hurdle fencing and the route of the diverted watercourse.

Hedgerows and woodland blocks would also be planted along the length of the Scheme to ensure that bats are guided to safe crossing locations and are discouraged from crossing the carriageway itself as used on previous schemes such as the A477 Nash Bangeston Improvement (Example 1) and the A465 Heads of the Valleys – Abergavenny to Gilwern (Example 2) (refer to the Environmental Master Plans and the example landscape planting shown in Figure 4.0).

Temporary guidance fencing will be used until this planting is established using the principles established within Figures 3.1 to 3.4 as used on the A465 Section 1 (Example 2). The intention is that the planted hedgerows would link together the retained ends of hedgerows severed by the Scheme as used on pervious schemes such as the A40 Penblewin to Slebech, A477 Nash Bangeston Improvement and the A465 Heads of the Valleys – Abergavenny to Gilwern. This will facilitate the colonisation of new hedgerows by a wide range of plant and invertebrate species present in the local hedgerow network. The woodland planting along the Scheme embankments would be designed to discourage bats from crossing the carriageway by guiding them to safe crossing locations as well as providing replacement foraging habitat.

There is evidence that vegetation can be used for moving Greater Horseshoe Bats from flight lines, a species with similar behaviour as Lesser Horseshoe Bats, from the A40 Penblewin to Slebech Improvement.

It is acknowledged that there is less connectivity across the carriageway to the northern end of the Scheme due to the long deep cut required to bring the carriageway to the Plas Menai roundabout. The cutting slopes will be seeded as species rich grassland with the area of rock cut adjacent to the roundabout to be soiled to allow natural regeneration. Woodland, scrub and hedgerow planting has been pulled back to the top of the cutting to discourage bats from crossing the carriageway and to reconnect the woodland blocks and other vegetation severed by the Scheme (as shown on the Environmental Masterplans).

No crossing structures have been provided in this area due to the topography and the road alignment and the low numbers of LHB passes recorded (2016 peak counts of 1 at Transect 1 and of 1 at Transect 2) and lack of confirmed commuting activity. Gantry type over-bridges have been shown to be largely ineffective as mitigation and more substantial structures are not considered appropriate given the low numbers of LHB present in this area and the lack of confirmed commuting routes on which such a structure could be placed. Crossing structures are provided around the Bethel roundabout to permit LHB to cross the carriageway safely and these are connected to the wider area, including the Plas Menai area through the landscape planting. It is not anticipated that the limited connectivity in this area will have an impact on the stability of LHB populations in the area and thus would not impact the conservation objectives of the SACs.

In conjunction with the above there is the potential for the Scheme to provide south-north habitat connectivity both along the length of the Scheme and between different sections as detailed below. This connectivity has the potential to benefit LHB populations in the wider area as well as those in the Scheme area. This is not part of the mitigation strategy for the Scheme and as such has not been considered as part of this assessment.

Goat Roundabout to Dinas Accommodation Underpass

The Scheme has the potential to provide habitat connectivity between the Goat Roundabout and the Afon Rhyd, particularly along the western side where there is notable woodland planting proposed in addition to the hedge planting. The embankment and box culvert at the Afon Rhyd (S102) permits LHB to pass safely beneath the road or continue northwards along the woodland edges. Connectivity beyond the point is limited to the hedgerow planting along the top of the Scheme cutting until the Scheme is raised onto an embankment again within the vicinity of Dinas Farm. Here woodland planting provides connectivity along both sides of the road and three culverts (NRW1, S104 and S105) permit safe passage beneath the road.

Dinas Accommodation Underpass to Meifod Roundabout

The woodland planting continues in places on both sides of the road between the Dinas Accommodation Underpass (S105) and the wide-span viaduct over the Afon Gwyrfai (S106) and northwards along both the east and west road embankments to the Meifod Roundabout. A number of culverts along this section (S107, S108 and S109a) permit LHB passage beneath the carriageway and the side road associated with S109 (overbridge) and S109a. The small watercourse that runs parallel to the road between S109 and the Meifod Roundabout has been acquired to ensure the retention of this feature and associated vegetation. This in conjunction with the proposed woodland and hedgerow planting leads to the culverts at S110 and S110a through which LHB will be able to pass the Meifod Roundabout and existing A487. Lighting around the Meifod Roundabout has been limited to the roundabout itself and will use directional lighting to ensure that there is no light spill across adjacent habitats.

Meifod Roundabout to Caernarfon Quarry

North of the Meifod Roundabout the watercourse has again been acquired to ensure the retention of this feature and associated vegetation. This in conjunction with the proposed woodland and hedgerow planting provides connectivity along both sides of the carriageway between Meifod and the crossing structures at Pen-y-bryn Lane

(S111 and S111a). The planting and structures in this area ensures that the connectivity with the quarry area, where there is a known LHB roost, is maintained both across and along the Scheme. Connectivity between S111a northwards past the quarry is largely limited to retained vegetation and hedgerow planting either side of the Scheme. Some woodland planting has been provided along the small embankment on the east side of the Scheme. However, such planting has not been possible along the west side as this is in a slight cut. The hedgerow connectivity has been maintained with the inclusion of hedge planting along the top of this cutting.

Caernarfon Quarry to Cibyn Roundabout

Immediately north of the quarry the carriageway remains in cut for a short distance where connectivity is limited to the hedgerow planting along the top of the cut. This still ensures some connectivity with the habitats within the quarry area. The Scheme is then raised onto embankment where safe passage beneath the carriageway has been provided by the culvert at NRW3. Woodland planting has been proposed along both side of this embankment up to the viaduct that crosses the Afon Seiont (S112). North of the Seiont the potential for woodland planting is limited, although connectivity has been created through the hedgerow planting and inclusion of woodland areas where possible. The Seiont itself also provides some south-north connectivity to and beyond the Cibyn Roundabout. Passage beyond the Cibyn Roundabout has been maintained through the inclusion of two culverts (S112a and S112b) beneath the carriageway and the limitation of lighting to the roundabout and westwards along the A4086 into Caernarfon only. This lighting will be directional to limit light spill into adjacent habitat areas.

Cibyn Roundabout to Bethel Road

Connectivity between Cibyn Roundabout and Bethel Road consists of the hedgerow planting along both sides of the carriageway which reinstates connectivity between the existing hedgerows and along the Scheme itself. The box culvert along the footpath between the Seiont Nurseries and Tyddyn Bistle provides safe passage beneath the road and connectivity to features leading to and from the Afon Seiont to the east. Connectivity increases to the south side of the Bethel Road Roundabout with areas of woodland proposed, particularly around the cattle creep (S114) and culvert (S114a) on the Afon Cadnant and within the area between the roundabout and the main carriageway. The tributary to the Cadnant is to diverted in an open channel which will provide a feature for LHB to follow and the oversized culverts at S115a and S115c permits safe passage beneath the carriageway.

Bethel Road to Plas Menai Roundabout

North of the Bethel Roundabout a section of the tributary to the Cadnant is diverted in an open channel with an oversized culvert (S115b) provided beneath the carriageway to ensure continued and safe passage. Woodland planting in this area provides further connectivity to the wider area. Beyond this point the Scheme is in a deep cutting reducing the opportunity for woodland planting, particularly in the vicinity of Plas Menai where a large area of rock cut is anticipated. However, hedgerow planting is proposed along the top of the cutting and some woodland areas have been provided to reconnect the severed woodland blocks at Bryn Covet beside the Plas Menai Roundabout. Woodland planting has been proposed within the cutting to the south of Crug Farm Nurseries, which may provide canopy connectivity over the carriageway in the long term.

8.4 Summary of assessment of residual effects

Provided the mitigation measures as outlined above are implemented fully, no residual effects on Lesser Horseshoe Bats or any of the other qualifying interests of the Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC are expected.

Given the above it is considered that there would be no in combination effects with regard to the change of use within part of the Seiont brickworks or the Glyn Rhonwy Pumped Storage Scheme.

9 PROPOSALS FOR MONITORING AND REPORTING

9.1 Pre-construction monitoring

Monitoring of bat activity has been carried out at various stages in the development of the Scheme, as follows:

- Bat surveys to inform the Transportation Study, conducted by TACP in 2009.
- Surveys were conducted on 13 transects along the Scheme alignment by the employer's agent, Ramboll, in 2014.
- The same 13 transects were surveyed by TACP in May, July and September 2015 with the addition of a 14th transect during the September surveys.
- Survey of the 14 transect by TACP in May and June 2016 with the additional of 3 other transects and static detectors placed in 13 additional areas.

As part of the consultation process it has been agreed that the same transects, including the additional transects, will be surveyed in 2016, prior to commencement of works on site. Surveys will continue to be conducted every month at dusk between July and October, which would complement the 2015 surveys which were carried out in May, July and September and bring the surveys in line with the Bat Conservation Trust Bat Survey Guidelines revised in February 2016 [21]. The September survey will again comprise a dusk and dawn survey. The surveys will be carried out using the same methods as used in previous surveys with addition of two static detectors left in situ for 5 consecutive nights at each of the survey transects.

Static only surveys will continue to be undertaken at 6 other locations along the Scheme where structures are to be constructed that are not covered by one of the survey transects detailed above. These will be undertaken each month between July and October with the detectors left in situ for 5 consecutive nights.

These surveys will be continued in 2017 with all surveys undertaken from April onwards and including an additional dusk and dawn survey in April as well as September.

Building and tree inspections will also be carried out in 2016 with follow up activity surveys or additional inspections depending on the survey results. Both the inspections and follow up surveys will be undertaken in accordance with the BCT Bat Survey Guidelines [21] and in agreement with NRW. Any roosts identified will be surveyed further in 2017. Roost counts will also be undertaken at Caernarfon Brickworks, Glan Morfa and Glangwna Hall in 2016 and 2017 in accordance with the National Bat Monitoring Programme.

In addition to the activity surveys above, surveys will be undertaken in the area to the south of the quarry and the area north of Tyddyn Bistle. These surveys will use static

detectors only undertaken each month between July and October with the detectors left in situ on each feature for a three nights.

9.2 Monitoring during construction

Monitoring at the 17 transects and the additional areas would be carried out during the construction phase of the Scheme, each month, using the same methods as used in pre-construction surveys. As the structures are constructed, the surveys will convert from walked transect surveys to crossing point surveys where the surveyors remain stationary where they are able to survey the structure entrances, the temporary mitigation measures and the carriageway itself. The static detectors will also be relocated to within the structures. This will provide more accurate information with regard to the level of use of the structures and of any potential connectivity issues.

Bat behaviour in association with mitigation measures such as guide fencing and crossing structures will also be monitored and recorded as part of the monthly surveys. This will be analysed to determine the effectiveness of these measures and to inform modifications if required.

Roost counts will continue at Caernarfon Brickworks, Glan Morfa and Glangwna Hall and at any other building roosts identified during the pre-construction surveys detailed above.

9.3 Post-construction monitoring

Monitoring of the mitigation measures detailed within this document provided for Lesser Horseshoe Bats will continue to be undertaken on a monthly basis for 5 years post construction as per the methodology established during the 2016 and construction surveys. Surveys will be modified to fixed point rather than transect (as per the methodology changes detailed within Section 9.2 above), with the surveyors monitoring the carriageway and static detectors placed within the culverts.

Both sides of the entire Scheme would also be walked and checked for bat corpses, at least twice annually. These would take place during the months of peak activity in June/July and August/September.

Biannual monitoring of landscape and habitat planting, including those provided to mitigate impacts on Lesser Horseshoe Bats would be undertaken. This would highlight any remedial action required, such as the provision of replacement planting for any plants that may have failed.

As part of the monitoring strategy, bat roost counts for the Glynllifon SAC, the Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC will be obtained on a yearly basis from NRW. Roost counts will also continue at Caernarfon Brickworks, Glan Morfa and Glangwna Hall and at any other building roosts identified during the pre-construction surveys detailed above.

9.4 Criteria for success

Mitigation for Lesser Horseshoe Bats would be considered successful if the monitoring programme determines the following:

- Lesser Horseshoe Bats cross the Scheme using the crossing structures provided, particularly Structure 111A which is near Transect R7/R7a. However, due to the low numbers of bats recorded throughout the Scheme, it

would not be possible to conduct statistically-significant numerical analysis of the numbers of bats using the crossing structures. Based the recent Leeds University study [19], a target of 90% of recorded bats crossing safely across the Scheme as a whole could be applied as an objective measure of success.

- The numbers of Lesser Horseshoe Bats in the Glynllifon SAC, the Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC show no significant decline over the five-year post-construction period that can be directly attributed to the Scheme. This should also be considered in relation to the regional or national trend in Lesser Horseshoe Bat numbers, and assumes that the Lesser Horseshoe Bat populations in the three SACs are not subject to significant effects from non-road related sources; potential impacts from other sources will be taken into account in the consideration of results.
- Lesser Horseshoe Bat activity in the vicinity of Transect R7/R7a remains at similar levels to that recorded prior to the Scheme.
- No Lesser Horseshoe Bat fatalities/injuries which may be attributable to the Scheme are discovered during monitoring.

9.5 Reporting

The during construction survey results will be reported annually and discussed with NRW and WG. Any issues that are identified as part of these surveys will be discussed and addressed as and when they arise. The roost data will be used to provide context to the results obtained from the structure surveys to ensure that any external changes to LHB populations are identified to prevent unnecessary changes to the Scheme mitigation, which could have negative effects on the levels of use of the mitigation measures (i.e. to determine whether a lack of activity at a particular culvert is directly related to the culvert or due to a more general decline in populations in the area).

The results and detailed analysis from the post construction monitoring will be reported biannually and discussed with NRW and WG (as per clause 4.2.3 of the Works Information, Volume 2a) and once success has been determined the survey effort will be revised to ensure that resources are focused where it is needed (i.e. areas where success is yet to be determined or there are connectivity issues that may be reducing the suitability of the mitigation measures).

The results from the during and post construction monitoring will also be summarised and discussed in Environmental Liaison Group (ELG) meetings, which will be held on a quarterly basis. The outcomes of these meetings and any resulting actions will be included within the biannual report.

In addition, *ad hoc* meetings will be held with NRW as required to respond to specific issues where monitoring results suggest that adaptive measures may be required for mitigation. The results of such discussions and any actions taken will be included within the biannual report.

The above monitoring and reporting approach has been used on previous schemes including the A465 Heads of the Valleys Dualling – Abergavenny to Gilwern and proved successful in identifying mitigation related issues as and when they arose. For example, following the installation of a grille at either end of the Hopyard Farm Underpass, the main commuting route for LHB on the Scheme, the monitoring surveys identified that this was interfering with LHB commuting activity. This was reported to CCW (now NRW) following which modifications were made to the grille design and additional monitoring undertaken to determine the success of this. On-going

discussions were had for the season during which the grille design was modified to a point where no change was seen from the baseline activity levels.

10 CONSULTATIONS

Regulation 61(3) of the Habitats Regulations requires the competent authority, before deciding to undertake, or give any consent, permission or other authorisation for, a plan or project which requires appropriate assessment to: 6.1.2 "…for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specify."

As noted in Section 6.2.1 above, the Scheme has been developed through an iterative process, and has been subject to assessment of impacts on European sites prior to the appointment of the Contractor. An Appropriate Assessment Screening Report was prepared for the transportation study (DMRB Key Stage 2) for the Scheme; the screening exercise involved a detailed assessment of the potential impacts of various route options for the Scheme on European sites, and several options were ruled out due to their potential for significant impacts on European sites. This screening exercise involved consultations with the then Countryside Council for Wales (CCW).

Since the appointment of the contractor, regular meetings and informal discussions and communications have been held with various stakeholders, including the Welsh Government and Statutory Environmental Bodies (SEB) including Natural Resources Wales (NRW) and Gwynedd Council, to discuss the development of the Scheme design and the progress of surveys and assessment of effects.

This SIAA report has also been submitted to NRW and the Local Planning Authority for consultation as part of the overall public consultation on the Environmental Statement.

11 CONCLUSIONS

HD44/09 recommends that clear answers to the following four questions (a to d) should be provided (based on the information presented) when concluding a SIAA. These are addressed in turn here, in relation to the three sites that were considered in the Stage 2 Appropriate Assessment (Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC and Gwydir Forest Mines SAC).

11.1 a) Is the proposal directly connected with or necessary to site management for nature conservation?

The proposals relate to a new road scheme and are neither connected with nor necessary to the management of the Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC or the Gwydir Forest Mines SAC.

11.2 b) Is the proposal likely to have a significant effect on the features of the site of European Importance, alone or in combination with other plans and projects?

The screening exercise identified that the proposal was likely to have a significant effect on Lesser Horseshoe Bats, which are a qualifying feature of the Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC and the Gwydir Forest Mines SAC. The likely significant effects of the Scheme are listed in Section 6.5 and are discussed in detail in Section 7.

11.3 What are the implications of the effects of the proposal on the sites' conservation objectives and will it delay or interrupt progress towards achieving the objectives?

It has been concluded that, assuming the implementation of the various mitigation measures outlined in Section 8 of this document, the Scheme proposals would not affect progress towards the achievement of any of the objectives for qualifying features of the Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC or the Gwydir Forest Mines SAC, or any other European Sites.

11.4 Can it be ascertained that the proposal will not adversely affect the integrity of the sites beyond reasonable scientific doubt?

Whether the Scheme would have an adverse effect on the integrity of the sites has been determined by assessing whether, following the implementation of the mitigation measures outlined in this report, the Scheme would affect the achievement of one or more conservation objectives set for the three European Sites considered in the Stage 2 Appropriate Assessment. The assessment concluded that the residual effects of the Scheme would not affect the achievement of any of the conservation objectives set for the Glynllifon SAC, Meirionnydd Oakwoods and Bat Sites SAC or the Gwydir Forest Mines SAC.

The 'Integrity of Site Checklist' provided in Annex F of HD44/09 was used to ascertain whether the Scheme would not adversely affect the integrity of any of the sites considered in the Stage 2 Appropriate Assessment – see Table 11.1 below. Best professional judgement was used to answer these questions, supported by the information outlined in this SIAA. As the answer to all of these questions is 'no', it is considered that the Scheme would not adversely affect the integrity of any of the sites.

Table 11.1: Integrity of Site Checklist

Designated Site:	***Glynllifon SAC***	***Gwydir Forest Mines SAC***	***Meiryonydd Oakwoods and Bat Sites SAC***
Conservation Objectives – Does the project have the potential to:			
Cause delays in progress towards achieving the conservation objectives of the site?	No	No	No
Interrupt progress towards achieving the conservation objectives of the site?	No	No	No
Disrupt those factors that help to maintain the favourable conditions of the site?	No	No	No
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No	No	No
Other Indicators			
Cause changes to the vital defining aspects (e.g. nutrient balance) that	No	No	No

Designated Site:	***Glynllifon SAC***	***Gwydir Forest Mines SAC***	***Meiryonydd Oakwoods and Bat Sites SAC***
Conservation Objectives – Does the project have the potential to:			
determine how the site functions as a habitat or ecosystem?			
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No	No	No
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	No	No
Reduce the area of key habitats?	No	No	No
Reduce the population of key species?	No	No	No
Change the balance between key species?	No	No	No
Reduce the diversity of the site?	No	No	No
Result in disturbance that could affect population size or density of the balance between key species?	No	No	No
Result in fragmentation?	No	No	No
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc)?	No	No	No

Therefore, for the purposes of Regulation 61 of the Conservation (Natural Habitats &c.) Regulations 2010 (as amended), it is concluded that there would not be an adverse effect on the integrity of the European Sites considered in this AIES.

12 REFERENCES

[1] Conservation (Natural Habitats &c.) Regulations 2010 (as amended)

[2] Highways Agency (2009). *HD 44/09 Assessment of Implications (of Highway and /or Road Projects) on European Sites (Including Appropriate Assessment). Design Manual for Roads and Bridges, Volume 11 – Environmental Assessment, Section 4 – Assessment of Implications on European Sites, Part 1*

[3] Welsh Assembly Government (2008) A487 WelTAG Study: WelTAG Stage 1 Technical Report Feb 2008

[4] Caernarfon to Bontnewydd Transport Study (Key Stage 2) Appropriate Assessment Screening

[5] Countryside Council for Wales. *Core Management Plan for Afon Gwyrfai a Llyn Cwellyn SAC* [Version 1] 2008

[6] Joint Nature Conservation Committee (JNCC), *SAC selection.* Available: http://jncc.defra.gov.uk/ProtectedSites/SACselection/SAC_list.asp?Country=W Accessed 20 August 2015

[7] Countryside Council for Wales (2009). *Advice provided by the Countryside Council for Wales in fulfilment of Regulation 33 of the Conservation (Natural Habitats, &c.) Regulations 1994 for Y Fenai a Bae Conwy / Menai Strait and Conwy Bay European Marine Site, Issue 2*

[8] Countryside Council for Wales. *Core Management Plan for Glynllifon SAC* [Version 1] 2008

[9] Countryside Council for Wales. *Core Management Plan for Meirionnydd Oakwoods and Bat Sites* [Version 1] 2008

[10] Countryside Council for Wales, *Core Management Plan for Gwydyr Forest Mines SAC* [Version 1] 2008

[10A] Chartered Institute for Ecology and Environmental Management (2006) *Guidelines for Ecological Impact Assessment in the UK and Ireland*

[11] Bontadina, F., Schofield, H. & Naef-Daenzer, B. (2002). *Radio-tracking reveals that Lesser Horseshoe Bats forage in woodland*. J. Zool.,Lond. 258: 281-290.

[12] Highways Agency (2009) *HA81/99 Nature Conservation Advice in Relation to Otters. Design Manual for Roads and Bridges, Volume 10 – Environmental Design and Management, Section 4 – Nature Conservation, Part 4*

[13] Highways Agency (2009) *Design Manual for Roads and Bridges, Volume 10 – Environmental Design and Management*

[14] Schofield, H. W. (1996) *The ecology and conservation biology of Rhinolophus hipposideros, the lesser horseshoe bat.* PhD thesis, University of Aberdeen (referenced in Bontadina et al 2002)

[15] Stone, E. L (ed.) (2014) *Bats and Lighting: Overview of Current Evidence and Mitigation* University of Bristol

[15A] Siemers B M & Schaub A, (2010) *Hunting at the Highway: Traffic Noise Reduces Foraging Efficiency in Acoustic Predators* Proceedings of the Royal Society published online 2010, downloaded from http://rspb.royalsocietypublishing.org/ on 27 July 2016

[16] Welsh Government (2009) *Interim Advice Note 116/08(W) Nature Conservation Advice in Relation to Bats*

[17] Highways Agency (2011) *A Review of Bat Mitigation in Relation to Highway Severance Version 0.6*

[18] The Vincent Wildlife Trust *Lesser Horseshoe Bat Conservation Handbook* October 2008

[19] Berthinussen A. & Altringham J. (2015) *WC1060 Development of a Cost-effective Method for Monitoring the Effectiveness of Mitigation for Bats Crossing Linear Transport Infrastructure* University of Leeds

[19A] Karran A (2008) *Road schemes and protecting Lesser Horseshoe Bats* Institute of Environmental Management and Assessment Issue Number 54 February 2008

[19B] Berthinussen A. (2013) *A465 Heads of the Valley Dualling Section 1 surveys 2013: Summary of methods and results* University of Leeds

[20] Berthinussen A. & Altringham J. (2012) *Do Bat Gantries and Underpasses Help Bats Cross Roads Safely* University of Leeds

[21] Bat Conservation Trust *Bat Surveys for Professional Ecologists: Good Practice Guidelines* February 2016

FIGURE 1 – LOCATION OF STRUCTURES



BBJV Ref.	Chainage	WG Asset No.	WG Name	Type	Width	Height/ Diameter	Length
S100	0+010		Goat Roundabout Outfall OF7(A)	Pipe Culvert		0.6	33
S101	0+120	A487 550 C68	Ty Hen Culvert	Pipe Culvert		1.8	64
S101A	0+420	A487 561	Pont Parc Underpass	Box Underbridge	7.2	5.8	23.7
S102	0+500	A487 565	Afon Rhyd Culvert	Box Culvert	3.2	2.4	52.6
S103	0+850	A487 571	Ty'n Llan Overbridge	Overbridge	8.5	n/a	50.9
NRW1	1+170	TBC	Wildlife Crossing 1	Pipe Culvert	1.8		34
S104	1+400	A487 571 C80	Geufron Culvert	Pipe Culvert		1.8	38
S105	1+540	A487 575	Dinas Accommodation Underpass	Box Underbridge	4.5	4.5	23.6
S106	1+920	A487 581	Afon Gwyrfai Viaduct	Viaduct	15.7	n/a	260
S107	2+280	A487 585	Pont Llydiart Gwyn	Box Underbridge	7.2	6.1	24.6
S108	2+710	A487 591	Pont Cefnwerthyd	Underbridge	19.5	n/a	17
S109	2+920	A487 601	Pont Ceriw NMU Overbridge	Overbridge	3.8	n/a	24.7
S109A	2+940 (SR)	A487 601 C01	Pen Y Bryn Culvert 3	Pipe Culvert		1.8	37
S109B	3+160		Pen Y Bryn Culvert 4	Pipe Culvert		0.6	37
NRW2	3+420		Wildlife Crossing 2	Pipe Culvert		0.9	33
S110	3+680	A487 601 C73	Pen Y Bryn Culvert 1	Pipe Culvert		1.8	35
S110A	3+560 (SR)	A487 601 C58	Pen Y Bryn Culvert 2	Pipe Culvert		1.8	51
S111	3+940	A487 611	Pont Bryn Mafon	Box Underbridge	7.2	5.8	24.5
S111A	4+040	A487 611 C08	Bryn Mafon Wildlife Underpass	Box Culvert	1.8	1.8	25
S111B	4+070 (SR)	A487 611 C09	Bryn Mafon Culvert 2	Pipe Culvert		1.05	14
NRW3	5+100	TBC	Wildlife Crossing 3	Pipe Culvert		1.8	38
S112	5+530	A487 621	Pont Afon Seiont Newydd	Viaduct	18.7	n/a	148
S112A	6+510 (SR)	A487 621 C61	Bodrual Culvert 2	Pipe Culvert		1.5	17
S112B	6+440	A487 621 C59	Bodrual Culvert 1	Pipe Culvert		1.5	41
S112C	5+850		Cibyn Culvert 1	Pipe Culvert		0.6	27
S112D	5+920		Cibyn Culvert 2	Pipe Culvert		0.6	118
S112E	5+330	A487 617	Waunfawr Road Underbridge	Underbridge	18.7	n/a	9.7
S113A	7+180	A487 625	FP 36 Underbridge	Box Underbridge	2.6	3	23
S114	8+160	A487 631	Afon Cadnant Cattle Creep/ Culvert	Box Culvert	3.4	3.4	25.5
S114A	8+180 (SR)	A487 631 C08	Lon Glai Culvert	Pipe Culvert		1.8	30
S115	8+430	A487 635	Bethel Road Overbridge	Overbridge	10.3	n/a	23.5
S115A	8+430 (SR)	A487 635 C01	Bethel Road Culvert 1	Pipe Culvert		1.8	50
S115B	8+520 (SR)	A487 635 C03	Crug Lane Culvert 1	Pipe Culvert		1.8	36
S115C	8+370 (SR)	TBC	Bethel Road Culvert 2	Pipe Culvert		1.8	21
S116	8+880		Parciau Culvert	Pipe Culvert		0.6	56
S116A	8+870		Parciau Mammal Culvert	Pipe Culvert		0.6	46
S118A	8+850 (SR)		Crug Lane Mammal Culvert	Pipe Culvert		0.6	24

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FIGURE 1.1 – LOCATION OF DESIGNATED SITES

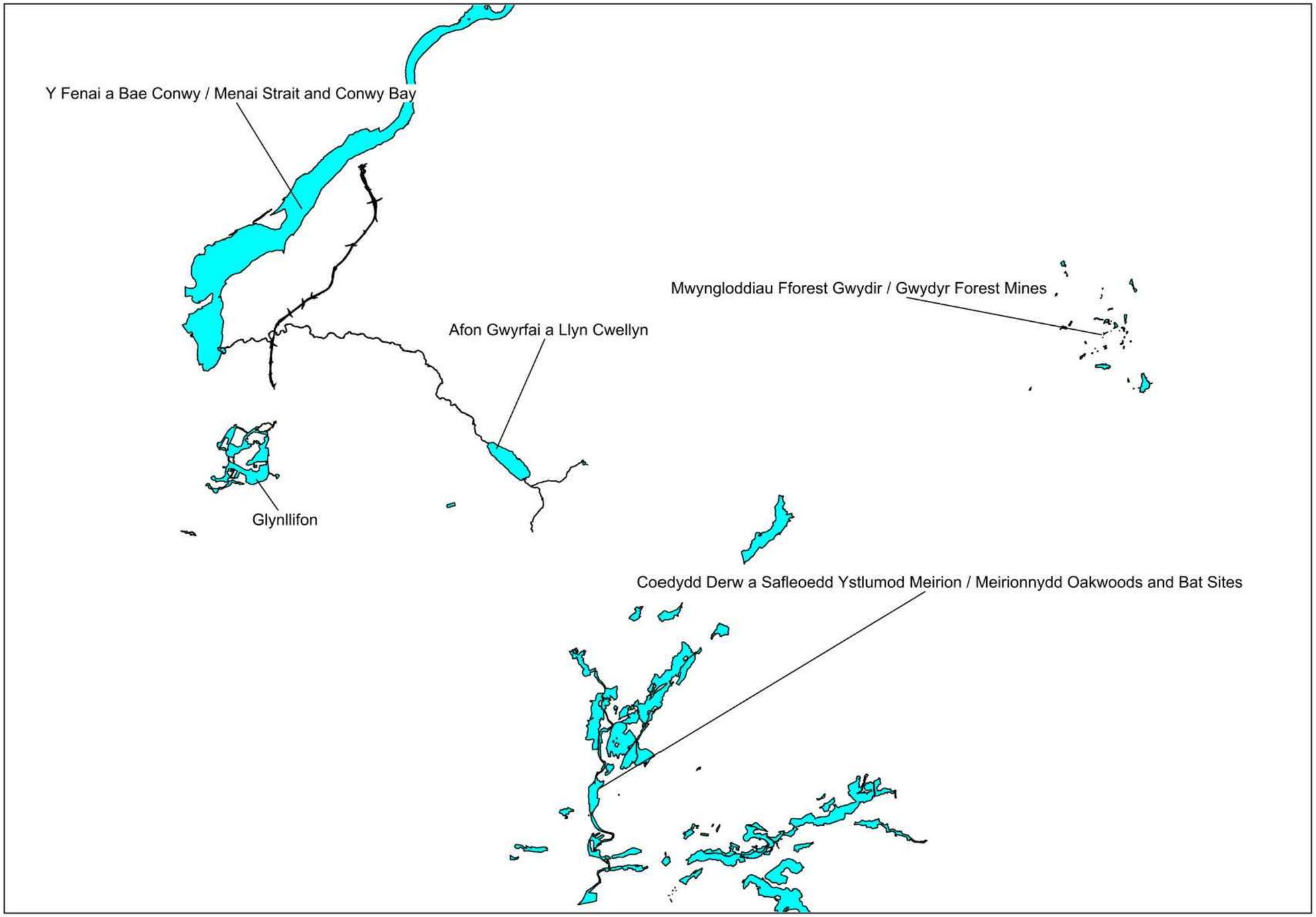

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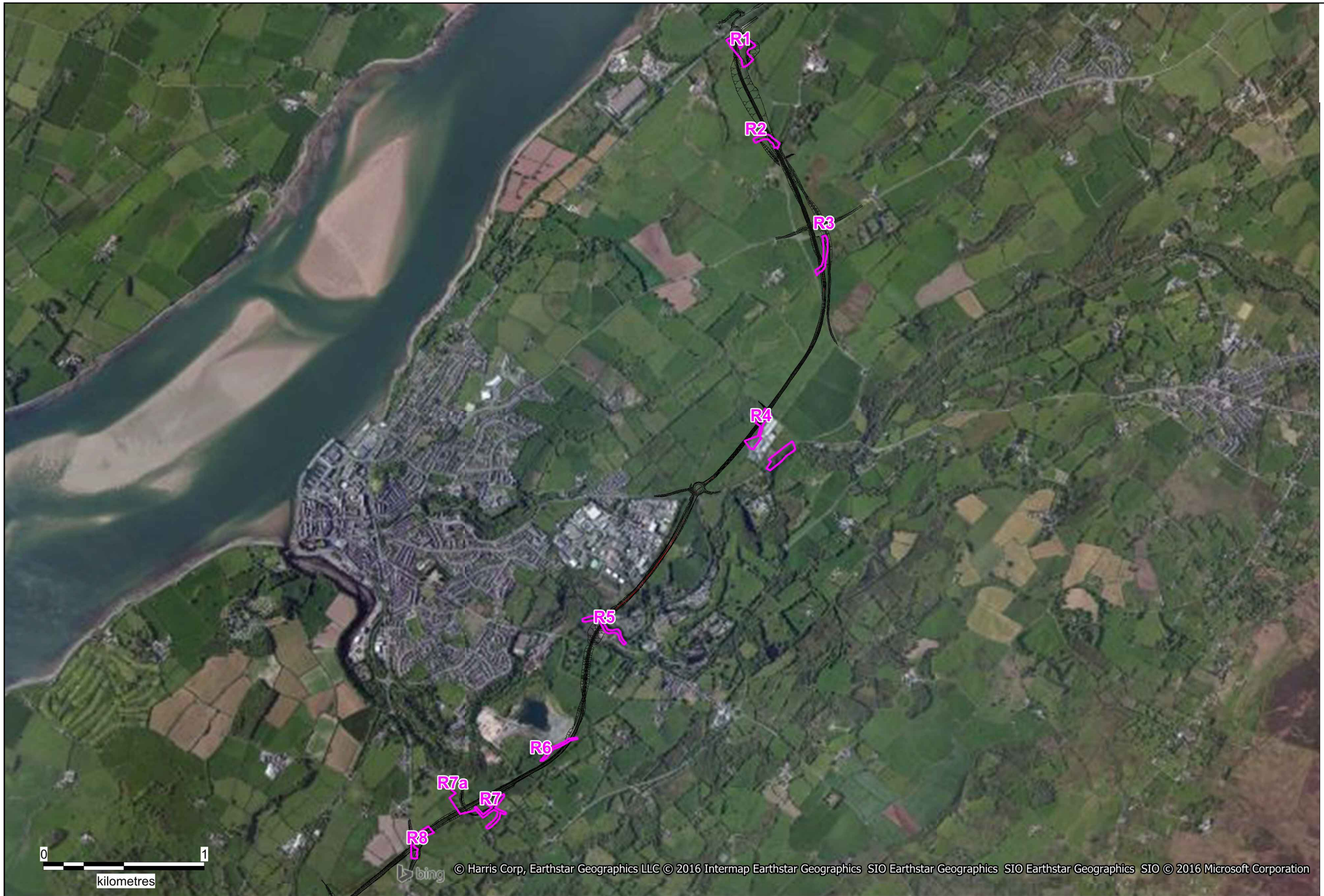
FIGURE 2 – LOCATION OF SURVEY TRANSECTS 2015 AND 2016



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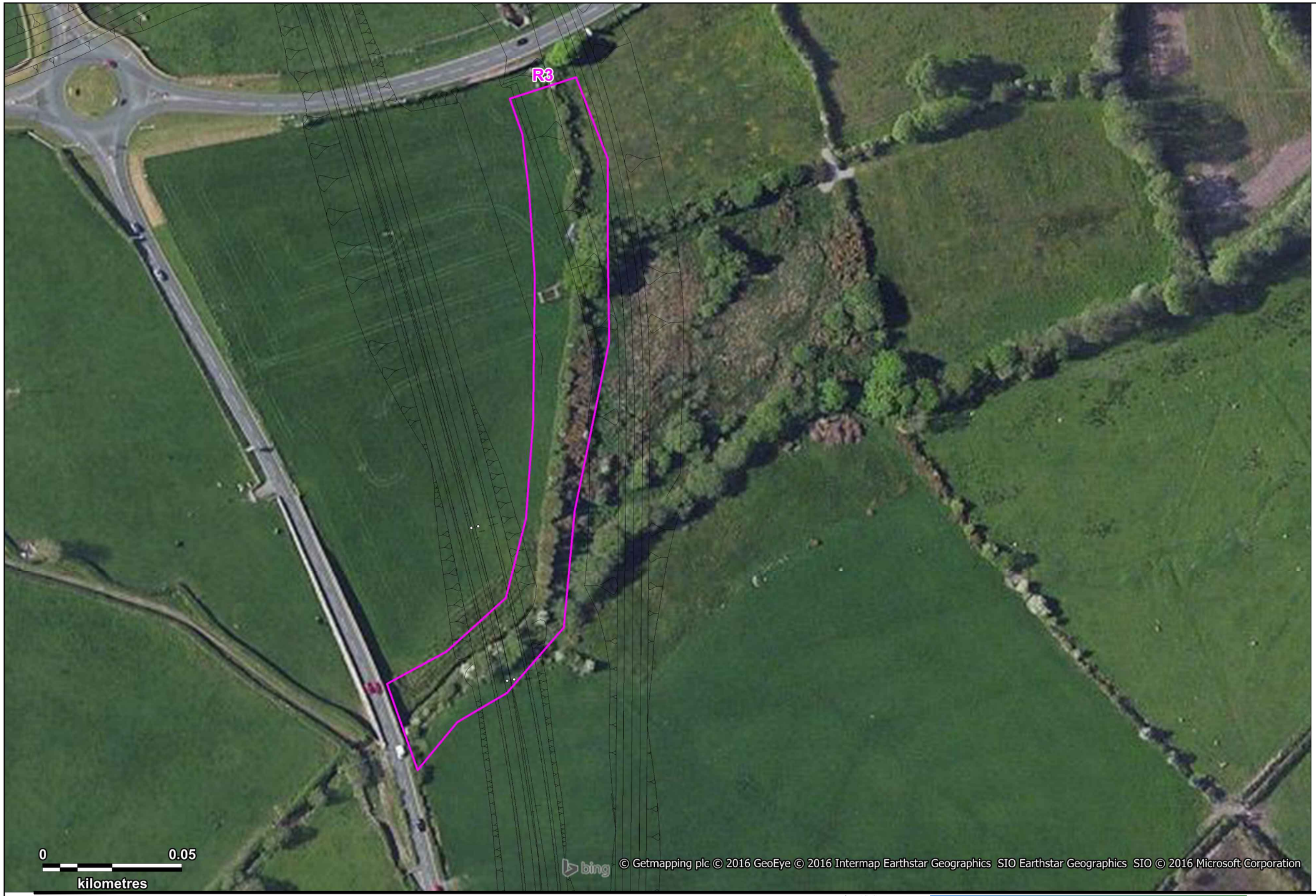

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Bat Survey Transect 2015

Scheme Alignment

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Bat Transect R9

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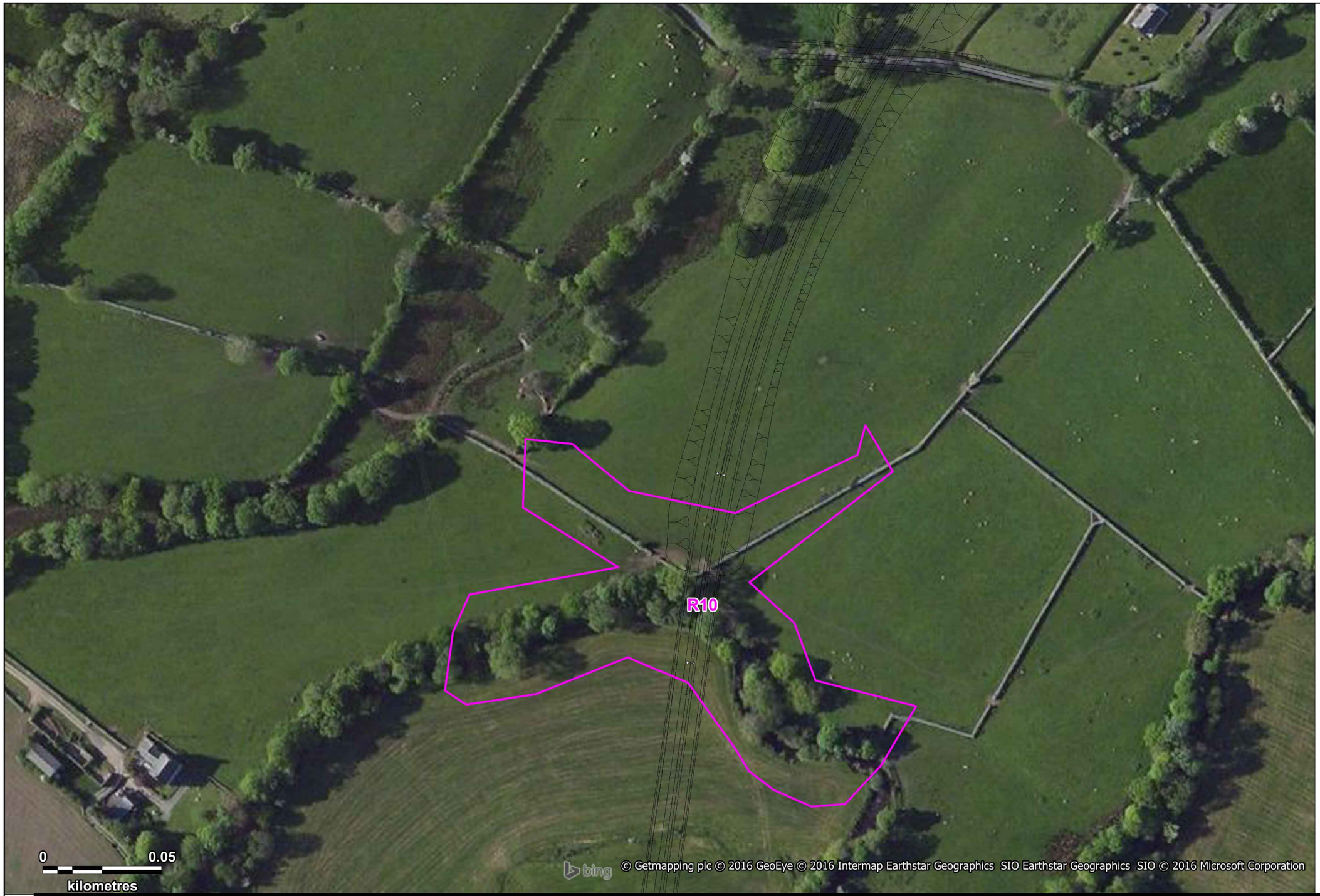

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Bat Transect A1-A3

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Bat Transect R4

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Bat Transect NRW3

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Bat Transect R7&7A

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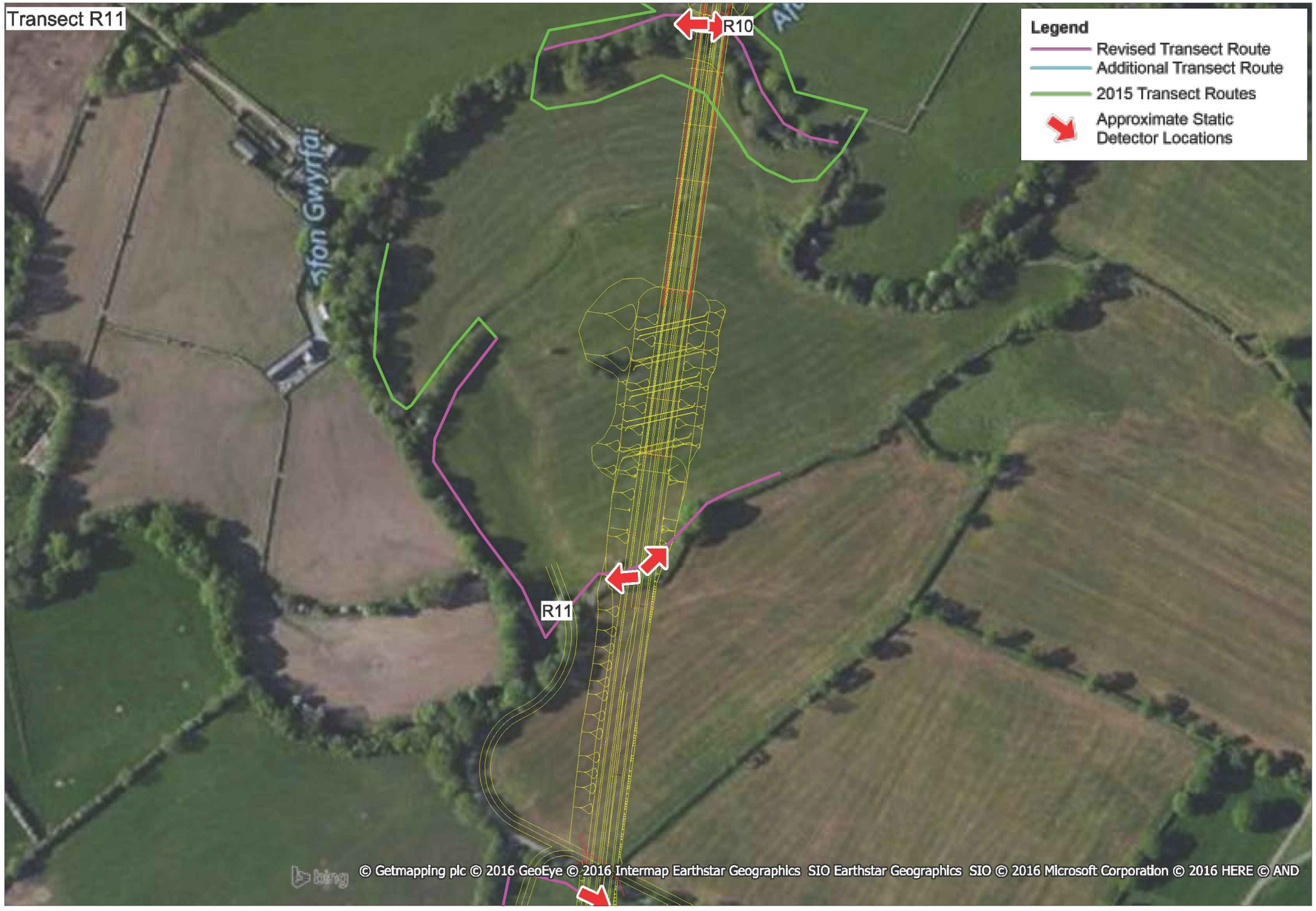

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Bat Transect R11

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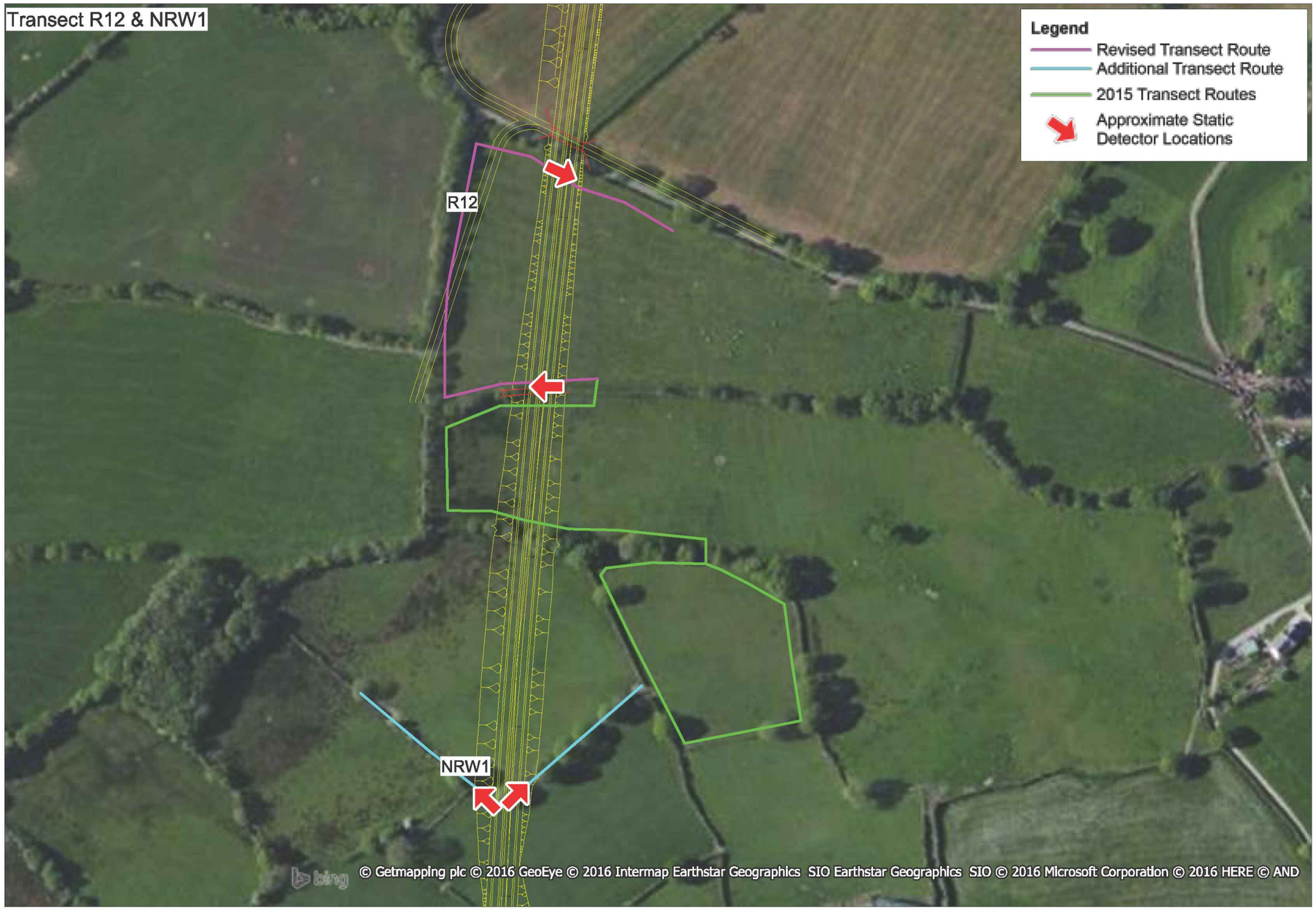

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Bat Transect R12 & NRW1

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Bat Transect R18 & R19

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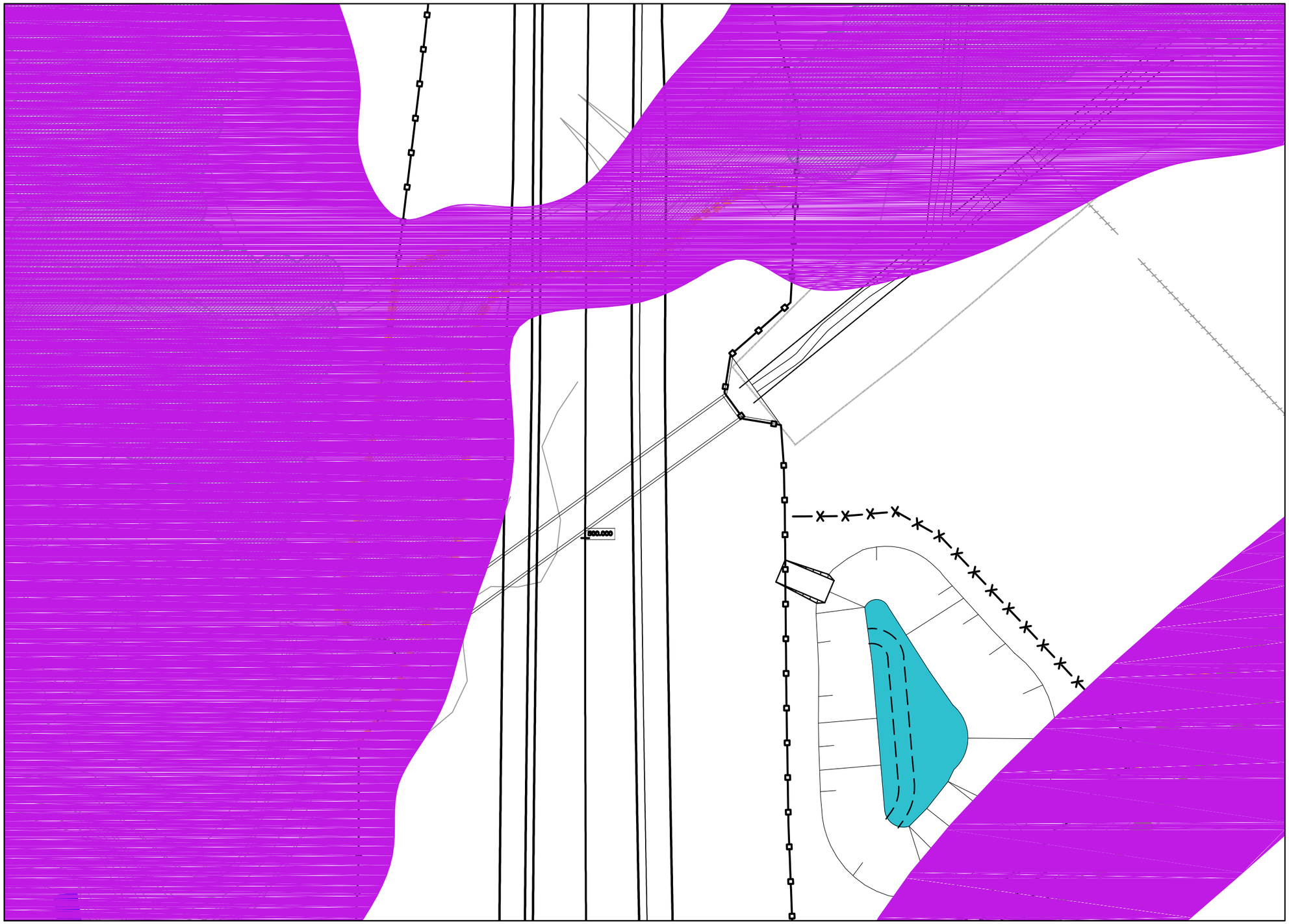
2.34

FIGURES 3.1 TO 3.4 – TEMPORARY FENCING ARRANGEMENT EXAMPLES



Key

- Highway Boundary
- Attenuation Pond
- Post and wire stock proof fencing
- Highway boundary fencing
- Otter fencing
- Existing Woodland
- Existing Hedgerow
- Native Woodland
- Native Woodland Edge Shrubs
- Native Hedgerow
- Cleared vegetation
- Temporary movable debris netting replaced daily until culvert being constructed
- Areas of Potential Lesser Horseshoe

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Fencing Arrangement Plans Following Vegetation Clearance During Culvert Construction

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3.1

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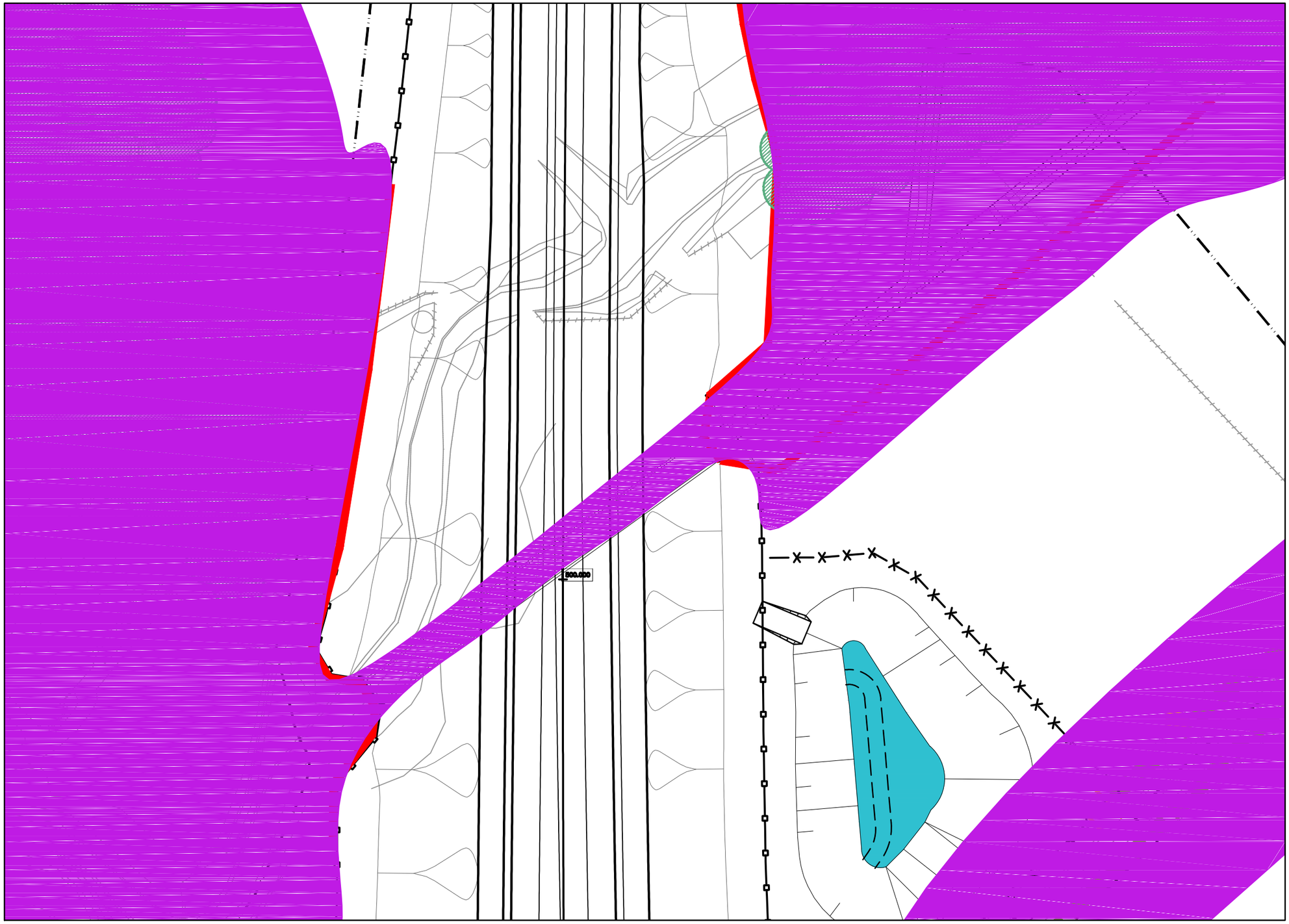

Key

- Highway Boundary
- Attenuation Pond
- Post and wire stock proof fencing
- Highway boundary fencing
- Otter fencing
- Existing Woodland
- Existing Hedgerow
- Native Woodland
- Native Woodland Edge Shrubs
- Native Hedgerow
- Debris netting replaced daily until construction complete
- Areas of Potential Lesser Horseshoe Bat Foraging Activity

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A487 CAERNARFON AND BONTNEWYDD BYPASS

Fencing Arrangement Plans Post Culvert Construction During Embankment Construction

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Welsh Government

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Ty Glyn, Canol Y Dre, Ruthin
Denbighshire Tel: 01824 703661

FINAL

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• SCALE 1:500

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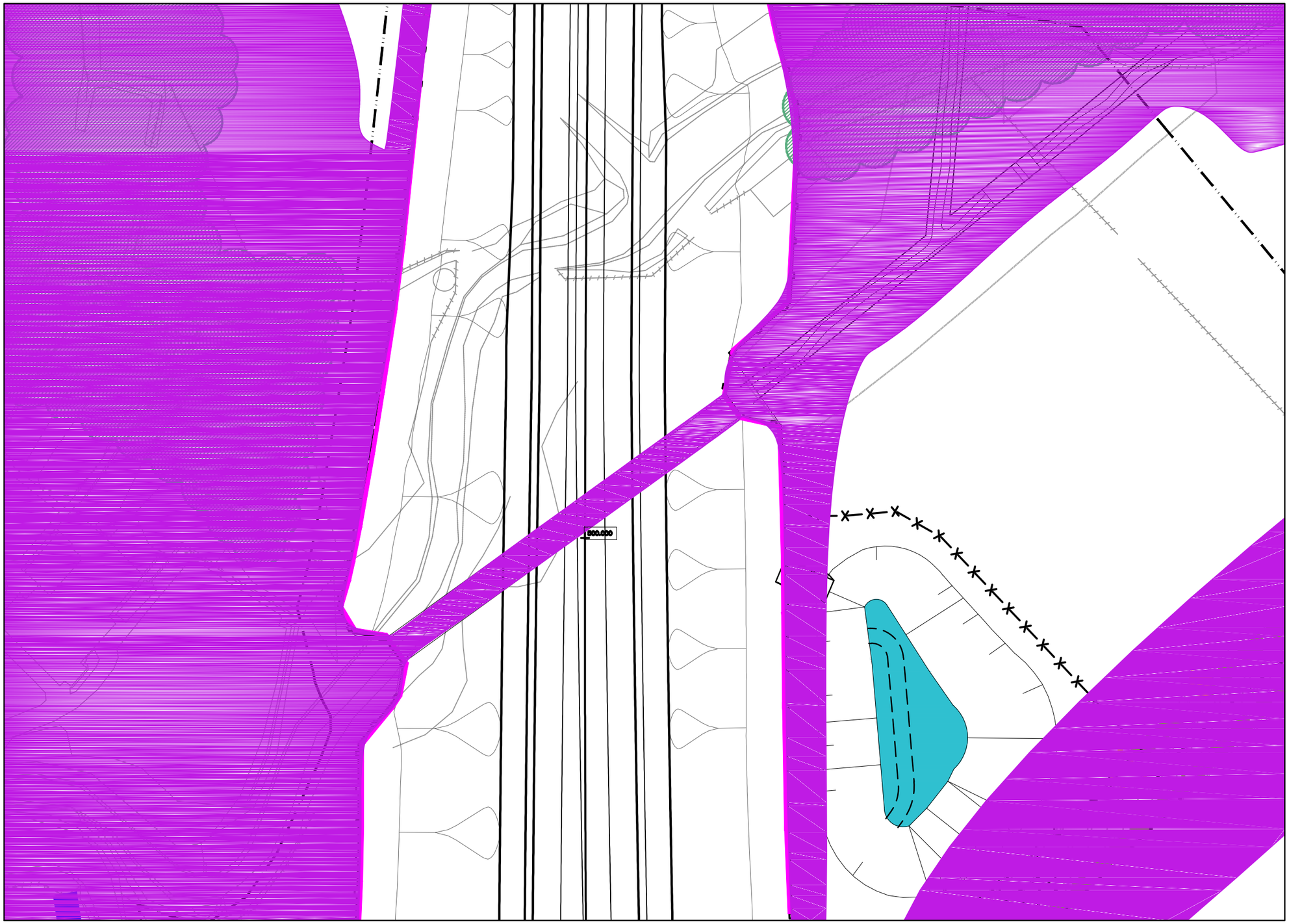
• FIGURE NUMBER
3.2 | P01.1



Key

- Highway Boundary
- Attenuation Pond
- Post and wire stock proof fencing
- Highway boundary fencing
- Otter fencing
- Existing Woodland
- Existing Hedgerow
- Native Woodland
- Native Woodland Edge Shrubs
- Native Hedgerow
- Debris netting on otter fence until planting sufficiently dense
- Areas of Potential Bat Foraging Activity

REV	DATE	DESCRIPTION	BY	CHKD	APPD

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Fencing Arrangement Plans Post Construction

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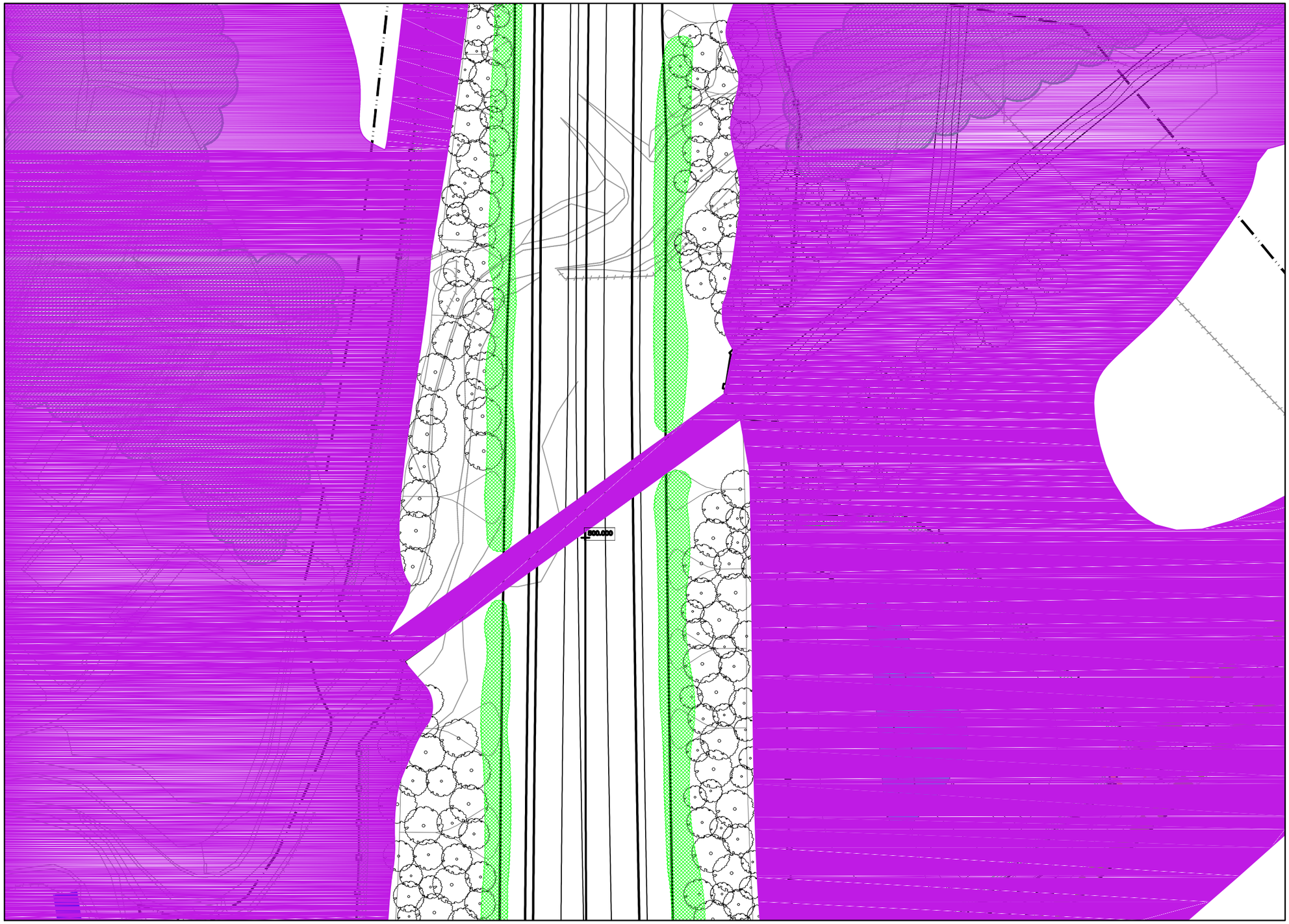

Key

- Highway Boundary
- Attenuation Pond
- Post and wire stock proof fencing
- Highway boundary fencing
- Otter fencing
- Existing Woodland
- Existing Hedgerow
- Native Woodland
- Native Woodland Edge Shrubs
- Native Hedgerow
- Welsh Government Land Boundary
- Areas of Potential Lesser Horseshoe Bat Foraging Activity

REV	DATE	DESCRIPTION	BY	CHKD	APPD

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Fencing Arrangement Plans Operational Phase

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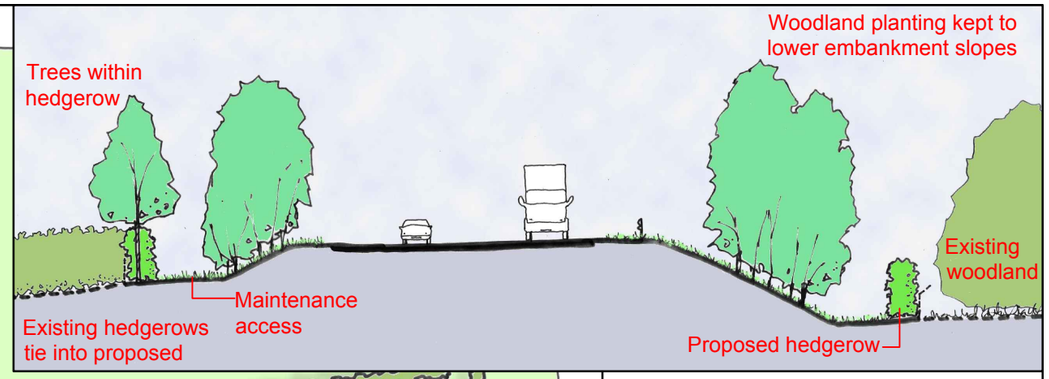
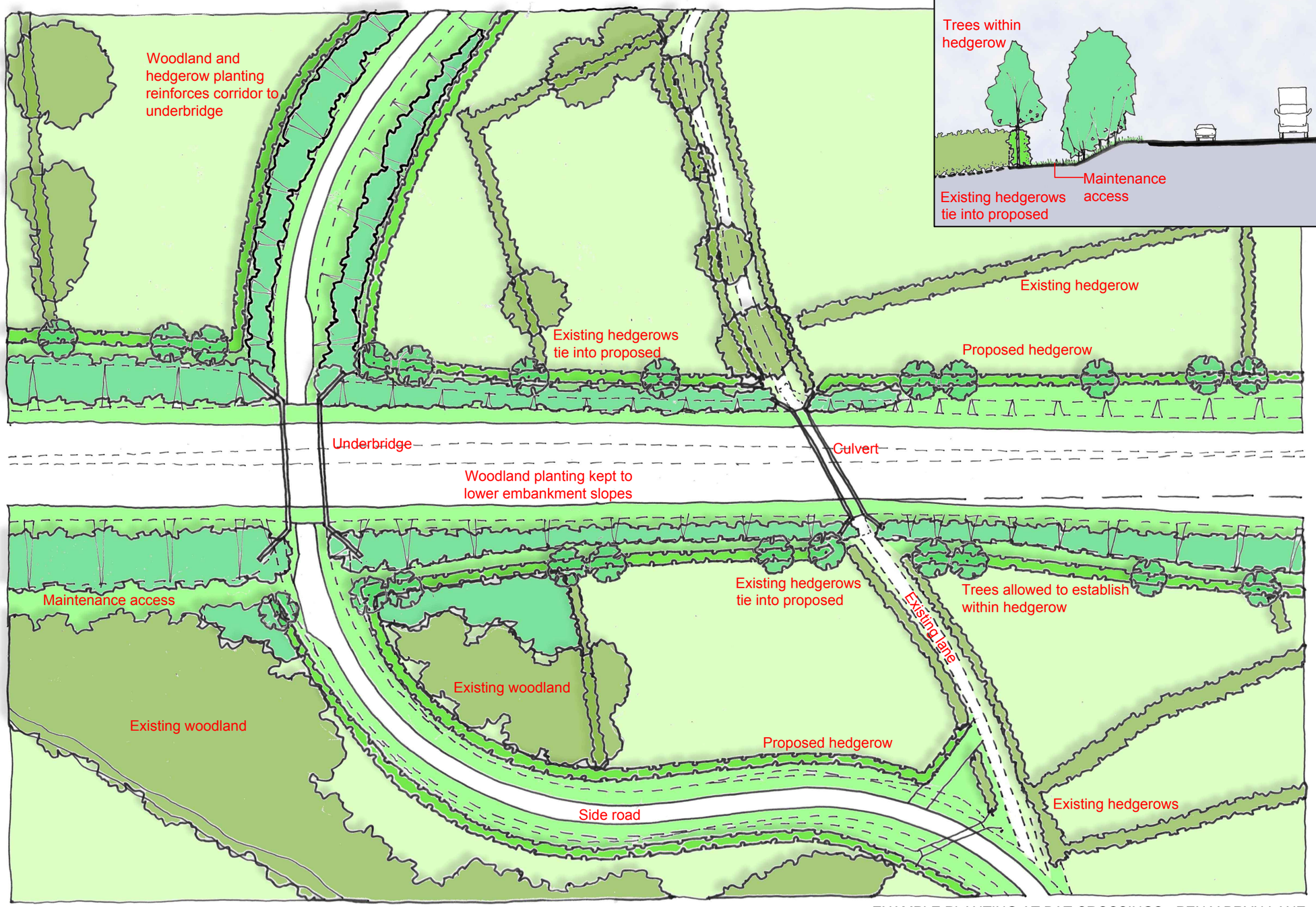
FIGURE 4 – DETAILED LANDSCAPE PLANTING EXAMPLE



TYPICAL SECTION THROUGH EMBANKMENT PLANTING



EXAMPLE PLANTING AT BAT CROSSINGS - PEN Y BRYN LANE

KEY

- Existing hedgerow
- Existing woodland/ trees
- Proposed hedgerow
- Proposed woodland/ trees

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Detailed Landscape Planting Example

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APPENDIX A: PERFORMANCE INDICATORS FOR EUROPEAN SITES

Afon Gwyrfai a Llyn Cwellyn SAC

Table 1: Performance indicators for Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and /or of the *Isoteo-Nanojuncetea* within Afon Gwyrfai a Llyn Cwellyn SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. *Extent of Oligotrophic to mesotrophic standing waters*	*Lower limit is based upon current extent.*	*Upper limit*: none *Lower limit*: no losses of extent other than due to climatic conditions
A2*. Condition of Oligotrophic to mesotrophic standing waters*	*Based on the CSM attributes for this feature.*	Llyn Cwellyn meets CSM attributes as outlined in Burgess, Goldsmith & Hatton-Ellis (2006). All of the water quality parameters must be met. Any indication of former acidification must be showing improvement.
Performance indicators for factors affecting the feature		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. *Abstraction*	*There should be no new abstractions where this could affect the feature.*	*Upper limit: abstraction should not exceed limits of any abstraction licence and should not expose macrophyte communities of the shallow water close to the shore.*
F2. *Recreational activity*	*Fishing – stocking with native and non-native fish*	*Upper limit: no stocking with non-native fish and any stocking with native species must be strictly controlled*

Table 2: Performance indicators for Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation within Afon Gwyrfai a Llyn Cwellyn SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. *Distribution within catchment*	*Though surveys have identified this feature at various sample sites, the feature's extent, or the extent of suitable habitat for it, within the protected site has never been mapped.*	*Upper limit: Insufficient information* *Lower limit: Insufficient information*
A2*. Typical species*	*Should conform to Plant community: species composition and abundance targets in Table 1a of the current version of JNCC's Common Standards Monitoring Guidance for Rivers (Current version – March 2005)*	*Upper limit: Insufficient Information* *Lower limit: See Table 1a of the current version of JNCC's Common Standards Monitoring Guidance for Rivers*
A3*. Plant community Reproduction*	*For this attribute, the 'Targets', 'Method of assessment', and 'Comments' criteria are as those described in Table 1a of the current version of JNCC's Common Standards Monitoring Guidance for Rivers (Current version – March 2005),* ***except*** *for the lower limit. In the guidance, the 'minimum value is defined in terms of the "total habitat /macrophyte population that should be left uncut". For the Gwyrfai percentages of total habitat area or total macrophyte population cannot be expressed because the total area covered by the habitat is not known. Therefore in this SAC, the value expressed applies to a percentage of the width of channel, but only at locations where control measures such as weed cutting are an established practice as agreed by CCW. In all other locations there should be no cutting of feature vegetation.*	*See comments (to the left) for details of when cutting can occur.* *Upper limit: at least 50% of the habitat / macrophyte population should be left uncut for the full duration of the remaining growing season and there should be no further cutting at the same location for at least two further growing seasons.* *Lower limit: Nil*

A4. *Bank and riparian zone vegetation*	*In addition to being integral to SSSI river habitat (plant community) types, it is clear that the various types of semi-natural bank and riparian zone vegetation each contribute to the ecological well being of the site and its features in different ways. Examples include: -* *• Fallen leaves - these provide of a source of allochthonous vegetative input to the aquatic food web.* *• Fallen trees and branches – woody debris in the water provides cover for fish and invertebrates, and may generate eddies that aid their movement within the site.* *• Fringing and emergent vegetation at the waters edge provides cover for juvenile fish and invertebrates.* *• Dense vegetation on river banks provides a buffer between intensively farmed land and the river* *• Ground layer, dense scrub and woodland vegetation on river banks provide a range of terrestrial habitat for otter. Conversely, dense woodland excludes light from the river and may limit the extent of this feature. In view of these and other known and unknown associated factors, the "mosaic" objective should ensure that all the wide-ranging interactions between bank-side vegetation and the in-river ecosystem can continue to take place.*	*Upper limit : None set* *Lower limit: Bank and riparian zone vegetation should form a semi-natural mosaic. However, where it forms part of a plant community classified as a qualifying SSSI habitat feature, it should remain within its notified classification*
A5. *Species indicative of eutrophication*	*Cover values should not increase significantly from an established baseline. Methods used to establish these values should be as indicated in the current version of JNCC's Common Standards Monitoring Guidance for Rivers (Current version – March 2005), which rely on the method of Holmes (1983) and a standard check-list of macrophyte species.* *Taxa typically associated with enrichment are considered negative indicators of favourable condition. The species will vary depending on the River Community Type.*	*Upper limit: The Combined cover values of blanket weed, epiphytic or other algae should not exceed 25%* *Lower limit: none set*
A6. *Alien / introduced species*	*In the CSM guidance, the SERCON scoring system for naturalness of aquatic and marginal macrophytes and naturalness of banks and riparian zone, are used to assess this attribute.* *SERCON protocols have not yet been applied in the Afon Gwyrfai SAC, therefore assessment of this attribute relies on locally defined thresholds and expert judgement. Details to be confirmed*	*Upper limit: No impact on native biota from alien or introduced species.* *Lower limit: None set*
Performance indicators for factors affecting the feature		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. *Water quality*	*Based on Table 1a of JNCC's Common Standards Monitoring Guidance for Rivers (Current version – March 2005), for the Attributes: "Habitat functioning: water quality (General assessments)" and "Habitat functioning: water quality".*	*Upper limit: None set* *Lower limit:* *Chemical GQA Class: B* *Biological GQA Class: B*
F2. *Flow*	*Flow regime should be characteristic of the river.*	*Upper limit +10% of naturalised flow* *Lower limit: -10% of naturalised flow.*

F3. *Light levels*	*This factor is partly addressed above in relation to "Bank and riparian zone vegetation" and "Species indicative of eutrophication". However, light levels reaching this feature vegetation community may be affected by other factors such as buildings, bridges or other structures. The specific ranges and values of light parameters beyond which this feature would be significantly effected is not known and therefore in all cases of doubt, the precautionary principal should apply.*	*Upper limit: Insufficient Information* *Lower limit: Insufficient information*
F4. *Changes to substrate*	*Substrate types vary naturally, depending upon reach type and hydrodynamic regime. At almost any scale there are varieties of channel substrate. Localised accumulations of silt on the inside of bends or in back channels do not necessarily indicate a problem. However, widespread siltation of riverine sediments, caused by high particulate loads and / or reduced scour within the channel, is a major threat to this and other interest features.* *For river types characterised by extensive Ranunculus beds, there should be a predominance of 'clean' gravels, pebbles and cobbles, with relatively low cover by silt- dominated substrates. Maximum fines content should not be too great to prevent establishment of new plants. (Fines are defined as particles <0.83 mm in the CSM Guidance). The SSSI and SAC boundaries do not extend to the entire catchment. This and other site features are susceptible to siltation, the source of which may lie outside the site boundary. Sources of silt could include run-off from agricultural land, forestry plantations, and sewage discharges. The only specified target relating to substrate in Table 1a of the current CSM guidance applies specifically to siltation. It states "No excessive siltation. Channels should contain characteristic ranges of substrate types for unmodified rivers." Therefore, in the absence of any more detailed guidance or information, the precautionary principal should apply in any decisions relating to change or detected damaging impact to any substrate affecting this feature.*	*Upper limit: Insufficient Information* *Lower limit: Insufficient information*

Table 3: Performance Indicators for Atlantic Salmon within Afon Gwyrfai a Llyn Cwellyn SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Adult run size	*As there is no fish counter in the Afon Gwyrfai, adult run size can be calculated using rod catch data.*	*Total run size at least matching an agreed reference level, including a seasonal pattern of migration characteristic of the river and maintenance of the multi-seawinter component.*
A2. Juvenile densities	*CSM guidance states: These should not differ significantly from those expected for the river type/reach under conditions of high physical and chemical quality. Assessed using electro-fishing data.*	*Expected densities for each sample site using HABSCORE*
Performance indicators for factors affecting the feature		
F1. Water - Biological quality	*This is the class required in the CSM guidance for Atlantic salmon, the most sensitive feature*	*Biological GQA class A*
F2. Water - Chemical quality	*It has been agreed through the Review of Consents process that RE1 will be used throughout the SAC.*	*RE1*
F3. Flow	*Targets are set in relation to river/reach type(s)*	*Targets to be agreed between CCW & EAW in the Review of Consents. As a guideline flow should be +/-10%of the naturalised daily flow throughout the year.*
F4. Illegal fish poaching	*Removal of salmonids*	*Insufficient data*
F5. Invasive alien species	*Japanese knotweed is found growing next to the watercourses and is usually controlled via herbicides. Herbicide handled inappropriately may enter the water course and poison fish and invertebrates*	*Assessment of plans and projects.*
F6. Coarse woody debris (CWD)	*It is natural to find CWD in water courses and it assists with maintaining good water quality and can provide refuge areas for young fish*	*Presumption against CWD removal from the watercourse except on grounds of health and safety. Assessment of plans and projects*

Table 4: Performance indicators for Floating water-plantain *Luronium natans* within Afon Gwyrfai a Llyn Cwellyn SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Species extent and abundance	*Presence of Luronium natans recorded as plants that are attached to substrate. Detached fragments (unless obviously detached during monitoring) will not be counted. Deep-water surveillance to monitor extent and abundance of Luronium natans, is programmed to occur prior to 2010.*	*Upper limit:* None set *Lower limit: Luronium natans* will be present at Site 1 on the periphery of Llyn Cwellyn AND *Luronium natans* will be present within each of Sections 1-6 as identified in the maps in monitoring report (2005). This may be revised following the programmed surveillance. **Site-specific Descriptions** Presence of *Luronium natans*
A2. Sufficient habitat.	*Submerged populations of L . natans require substrates comprising of mud or stable fine gravel or silt in depths of clear water up to 3m.*	Sufficient good quality habitat should exist to support the expansion of existing populations. Extent of good quality habitat should not be reduced.
Performance indicators for factors affecting the feature		
Factor	***Factor***	***Factor***
F1. Water quantity (flow):Refer to factors affecting water courses – 4.1		
F2. Water quality	*L. natans is recorded elsewhere across a spectrum of nutrient levels including fairly eutrophic canals, so it appears it is not highly sensitive to some enrichment. Water quality is set to protect the most sensitive feature.*	Refer to factors affecting water courses – 4.1
F.3 Dredging	*Dredging could directly damage L. natans beds.*	No dredging likely to affect *L.natans* should where suitable habitat is found.
F.4 Competition	*L. natans* cannot compete with other aquatic plant species including algae.	Review to assess if competition is an issue.

Table 5: Performance indicators for Otter within Afon Gwyrfai a Llyn Cwellyn SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Population distribution.	*Although Performance Indicators are given it is difficult to assess the condition of the otter population distribution feature because of the relatively small size of the SAC areas compared to the typical home range size of otters. As otters are mobile animals occupying very large home ranges, the condition of the otter feature should be considered at the landscape level.*	*Upper limit: None set.* *Lower limit: Otter signs are found at five of the seven (71%) sites searched within the Gwyrfai*
A2. Breeding activity	*Breeding Centres are used to provide an estimate of the number of females breeding in the system. They can only be a "best guess" but are based on our present knowledge of the size of otter home ranges, the juxtaposition of potential breeding sites, and records of breeding activity for the catchment.*	*Upper limit: None set.* *Lower limit: Breeding Centre: There should be no deterioration in, or loss of, bank side habitats within the assumed breeding centre.*
A3. Actual & potential breeding sites.	*Within the home range of a single female there maybe two or more potential breeding sites. When this is the case, the female may use a different breeding site each year (Liles, 2003). Birth takes place in a Natal Den, either above ground in a small patch of cover (i.e.1m x 1m) such as scrub or a pile of timber, or below ground, for example in a tree root system or a pile of boulders. Females often use a different natal den site each year (Liles, 2003). Although targets are set for the number of Potential Breeding sites within the SAC areas and wider subcatchments, the quality, habitat type, and location of sites is also important. Priority should be given to retaining existing sites. If the number or quality of sites does decline, alternative breeding sites can be created at nearby Habitat Improvement Sites.*	*Lower limit: There should be an increase in the number of mapped potential breeding sites on the Gwyrfai from five to eight.* *Upper limit: None set*

Table 6: Site-specific habitat definitions for Otter within Afon Gwyrfai a Llyn Cwellyn SAC

Site-specific habitat definitions	
Breeding Centre	*A Breeding Centre is an area of the catchment in which otter breeding activity and potential breeding sites have been recorded, and which equates in size (i.e. length of watercourse) to the home range of a female otter (approximately 20km of waterway). A Breeding Centre can be based entirely on one tributary or long stretch of main river, or can incorporate a stretch of main river and one or more tributaries. Because otters are territorial it is assumed that, within a Breeding Centre, only one female will breed at a time.*
Potential Breeding Sites	*An area of good quality vegetation for breeding otters usually > 0.5 ha free from flood risk and is within 3km of a good food supply.* *The risk of flooding at a site is considered to be a problem for breeding if flooding at the site is a regular occurrence (i.e. occurs in most years).* *Access to a good food supply that is within easy travelling distance for a female is likely to be important so that very young and vulnerable cubs are not left unattended for long periods.*
Good quality vegetation for breeding otters	*Good quality vegetation for breeding otters includes dense scrub (e.g. bramble, blackthorn and gorse); reed-beds; deciduous woodland with an under-story; young conifer plantations; rhododendron thickets; and wetlands (particularly with areas of Molinia caerulea).*

Performance indicators for factors affecting otter		
Factor	***Factor rationale and other comments***	***Specified limits***
F1. Water quality: See performance indicators for generic factors for SAC as a whole		
F2. Water quantity (flow): See performance indicators for factors		
F3. Food availability & riparian habitat	The availability of food within the catchment is likely to be a major factor influencing both the distribution and breeding success of otters.	*Upper limit*: None set. *Lower limit*: Fish & amphibian biomass should stay within expected fluctuations.
F4. Invasive alien species**:** See factors affecting Atlantic salmon.		
F5. Coarse woody debris (CWD)	Where CWD has accumulated alongside the river bank it can create suitable sites for laying up couches and natal dens.	See factors affecting Atlantic salmon
F6. Illegal fish poaching: See factors affecting Atlantic salmon		
F7. Diffuse & point source pollution: See factors affecting SAC as a whole		
F8. Agricultural operations**:** See factors affecting SAC as a whole		
F9. Forestry operations: See factors affecting SAC as a whole		
F10. River engineering: See factors affecting SAC as a whole		
F11. Recreation	Breeding otters can be sensitive to disturbance by humans and dogs so recreational areas should be sited at a distance from suitable breeding habitat and known breeding dens.	To be determined
F12. Deposition	Atmospheric pollution Eutrophication and acidification can have an indirect impact on otter by affecting the food chain.	See factors affecting SAC as a whole.
F13. Climate change	Change in rainfall patterns and increased flooding could affect the otter breeding cycle and success rates if natal dens are flooded and feeding patterns disrupted.	See factors affecting SAC as a whole.

Menai Strait and Conwy Bay SAC

The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.

For the intertidal mudflats and sandflats feature these include;

- Muddy gravel communities
- Dwarf eelgrass, *Zostera noltei* beds
- Sediment communities at Traeth Lafan

For the reef feature these include;

- Reef communities in high energy wave-sheltered, tide-swept conditions
- Under-boulder, overhang and crevice communities
- Limestone reef communities
- Clay outcrop reef communities

For the large shallow bay feature these include;

- Organically enriched muddy sediment areas

STRUCTURE AND FUNCTION

The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Important elements include;

- Geology,
- Sedimentology,
- Geomorphology,
- Hydrography and meteorology,
- Water and sediment chemistry,
- Biological interactions.

This includes a need for nutrient levels in the water column and sediments to be:

- At or below existing statutory guideline concentrations
- Within ranges that are not potentially detrimental to the long term maintenance of the features species populations, their abundance and range.

Contaminant levels in the water column and sediments derived from human activity to be:

- At or below existing statutory guideline concentrations
- Below levels that would potentially result in increase in contaminant concentrations within sediments or biota
- Below levels potentially detrimental to the long-term maintenance of the features species populations, their abundance or range.

Restoration and recovery

This includes the need for restoration of some reef features such as underboulder, overhang and crevice communities, and of some mudflat and sandflat features such as the muddy gravel habitats and sheltered muddy habitats. All of these habitats are also part of the large inlets and bays feature.

TYPICAL SPECIES

The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. Important elements include:

- Species richness:
- Population structure and dynamics,
- Physiological heath,

- Reproductive capacity
- Recruitment,
- Mobility
- Range

As part of this objective it should be noted that:

- Populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve maximum sustainable yield and secure in the long term.
- The management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term.

Glynllifon SAC

Table 7 Performance indicators for lesser horseshoe bats within Glynllifon SAC

Performance indicators for feature condition			
Attribute	***Specified Limits***		**Attribute rationale and comments**
A1. Extent (bats) Maternity Roosts	Upper limit:	None set	The fundamental objective of the site will be to maintain, and if possible, increase the population of lesser horseshoe bats. Unit 16 pre-breeding count corresponds to the automated count data from 2000. Units 32 and 36 pre-breeding count corresponds to the automated count data using standard protocol (Halliwell and Matthews, 2002).
	Lower limit:	On at least one occasion between the 29th May and the 17th June of every year, there will be: • 580 pre-breeding adults at unit 16 (Glynllifon Mansion). • 30 pre-breeding adults at unit 32 (Melin y Cim). • 40 pre-breeding adults at unit 36 (Pen y Bont).	
A2. Extent (bats) Hibernacula	Upper limit:	None set	
	Lower limit:	During at least one surveillance visit between 1st January and 28th February of every year, there will be: • 180 bats at unit 16 (Glynllifon Mansion). • Continued use by bats of unit 37 (Simdde – dylluan mine levels).	The fundamental objective of the site will be to maintain, and if possible, increase the population of lesser horseshoe bats. Unit 16 count data corresponds to 2000 data from internal count using NBMP protocol
Performance indicators for factors affecting the feature			
Factor	***Operational limits***		***Factor rational and other comments***
F1. Site security	Upper limit	None set	Derived from Common Standards Monitoring advice.
	Lower limit	Access to the site is under the control of the owner / occupier or site secured against unauthorised access. Doors, gates or security fences in sound condition and able to resist unauthorised access attempts. Grilles in good condition, with no evidence of forced entry through or around the grille and no damage caused by attempts at entry. Security fence in sound condition.	It is essential to minimise disturbance within roosts and potential harm to bats.
F2. External condition of the building (maternity roost)	Upper limit	None set	Derived from Common Standards Monitoring advice.

	Lower limit	Weatherproof roof. The roof covering materials (slates, tiles etc.) in good condition with no significant gaps, slippage or damage. No holes large enough to allow soaking of roof timbers, excessive heat loss or high light levels in the roost area. Walls sound, rainwater goods in adequate condition. The building is structurally stable. No significant deterioration in overall condition of the building.	Fabric of building sufficient to maintain roost conditions internally.
F3. Roost entrance	Upper limit	None set	Derived from Common Standards Monitoring advice.
	Lower limit	Unobstructed roost entrance large enough for bats to fly through unimpeded. Normal minima: 300mm x200mm. No artificial lights shining on access or associated flight paths. No unplanned new entrances causing a change to ventilation. No change in size sufficient to affect airflow and internal temperature.	
F4. External disturbance (maternity and hibernation roosts).	Upper limit	Disturbance levels acceptable to bats with: No increase since previous visit. Human access to roost controlled and limited.	Derived from Common Standards Monitoring advice.
	Lower limit	None set	
F5. Internal condition (maternity and hibernation roosts).	Upper limit	None set	Derived from Common Standards Monitoring advice
	Lower limit	Low light levels with no through draught (maternity). No toxic substances present, which would adversely affect the health of the bats (e.g. chemical timber treatment with inappropriate substances). Cool (8 – 12°C) and dark, once beyond the entrance zone (hibernation). No significant unplanned change to ventilation or temperature regime (hibernation).	
F6. Temperature of roost area	Upper limit	None set	Derived from Common Standards Monitoring advice.
	Lower limit	Range of temperatures available to bats with mean temperature in July greater than 20°C.	

		Maintenance of the heating system within the cellar in unit 16 (Glynllifon Mansion).	
F7. Internal disturbance (maternity and hibernation roosts)	Upper limit	Human access to roost area controlled and limited (e.g. grilles on underground sites). Disturbance is kept to a minimum.	Derived from Common Standards Monitoring advice.
	Lower limit	None set	
A3. Quality None set. (habitat within the SAC boundary).	Upper limit	None set	**Woodland**: vegetation dominated (>30% cover) by trees >5m high when mature. The trees can be native or non-native (NCC, 1990). **Semi-natural broadleaf woodland**: vegetation where trees (>30% of trees) do not originate from planting (NCC, 1990). **Tree lined stream**: tree or scrub lined stream corridors with no canopy gaps in the riparian trees and scrub, >5m in length. **Good condition hedgerow**: hedgerows >2m in height with no gaps >5m in length.
	Lower limit	The extent of the woodland around Glynllifon Mansion (units 6 – 31) is maintained and the extent of the seminatural broadleaf woodland is at least maintained. • Habitat along the Afon Llyfni between Pen y Bont and Melin y Cim (units 32 – 35) is described as “a tree lined stream”. • Potential flight lines A to G are described as either “tree lined streams” or “good condition hedgerows” (see Map 3 in Wilkinson, 2006).	

Meirionnydd Oakwoods and Bat Sites SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Extent of broad-leaved woodland and associated habitats	Lower limit is based on current extent of SAC woodland.	*Lower limit*: 1832ha
A2. Location of woodland types	Map in Annex 2	
A3. Tree canopy cover	The tree canopy percentage cover within the woodland area (as defined on Map) is about 87% of the woodland area. If there is a natural catastrophic event assessment should be made to see if follow up management is required.	*Upper Limit:* Tree canopy 87% of woodland area. *Lower Limit:* Tree canopy may only be less after a natural catastrophic event.
A4. Canopy and shrub layer	The canopy and shrub layer comprises locally native species.	Some non-native species may be tolerated where they support important species such as lichens and are not highly invasive. Phased removal of non-natives is often appropriate with long term management to control regrowth/ reinvasion
A5. Native tree and shrub regeneration	Natural regeneration of native trees*. * *Quercus petraea, Q. robur, Q. hybrids, Betula pubescens, Fraxinus excelsior, Ilex aquifolium, Salix cineria, Alnus glutinosa, Tilia cordata, Ulmus sp, Salix sp.*	*Upper Limit*: none set. *Lower Limit*: This may vary considerably compartment to compartment depending on ecological assessment. A general guide is 2 viable seedlings/saplings per 0.01 ha (100 square metre ie 200 per hectare) of gap, within 15 years of gap formation (where viable seedlings/saplings are taken to be healthy and vigorous native* tree species reaching a minimum height of 3m and comprise species that will replenish the canopy.
A6. Ground layer	The ground layer should be characteristic of the vegetation subcommunity and at a height where there is there is the most plant diversity for which that location is special or has been designated. Usually this means that it should not be too overgrown.	*Upper Limit:* Areas of overgrown vegetation (eg bramble, ivy and holly) may be mapped for individual sites /compartments with planned management such as grazing reintroduction when the upper limit of taller vegetation is exceeded. *Lower Limit:* none set
A7. Common mosses, liverworts, lichens and slime moulds	The abundance and distribution of common and typical (Atlantic, sub-Atlantic, western, oceanic) mosses and liverworts, lichens (and slime moulds), will be maintained or increased. Refer to indicative lists in Tables 3 and 4.	*Upper Limit:* none set *Lower Limit:* The current abundance and distribution should be maintained or preferably increased.
A8. Uncommon mosses, liverworts, lichens and slime moulds	Current populations of uncommon mosses, liverworts, lichens and ferns will flourish and expand where possible. (See tables 5 & 6)	*Upper Limit:* none set *Lower Limit:* The current abundance and distribution should be maintained or preferably increased.
A8. Mature / Veteran trees	There will be a scattering of mature (c60cm diameter plus for oak and ash and/or with signs of decay, holes etc.) and eventually veteran trees (c100cm diameter	*Upper Limit:* none set *Lower Limit:* This is set at a level appropriate to each unit

	plus for oak and ash and 75cms birch) through the wood where they are not likely to be affected by health and safety considerations of paths, tracks and power lines.	which is usually above the current number. Achievement of this limit is dependant on time passing and lack of disturbance/destruction of mature and maturing trees so they may be allowed to grow into veterans.
A9. Dead wood	The volume of dead wood exceeds 30 cubic metres per hectare throughout and consists of a mixture of fallen trees (minimum 1 per hectare), broken branches, dead branches on live trees, and standing dead trees (minimum 1 per hectare).	*Upper Limit:* Not required *Lower Limit:* 30 cubic metres per hectare N.B In the very long term a target of 40+ cubic metres might be appropriate, but only when the active management associated with non-native removal has been completed and the wood is essentially operating under natural processes.
Performance indicators for factors affecting the features: woodland		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. Grazing	Without an appropriate light grazing regime, the woodland tend to become overgrown with a reduction in lower plant diversity. Too light grazing can result in stock, often sheep, concentrating just on the grassy areas. There are some areas that have not been grazed for 30 years or more and which now need grazing and conversely some woods are grazed too heavily suppressing regeneration. Too heavy grazing can result in excessive trampling, poaching and loss or disturbance of the ground flora and soils.	Favourable management is often light summer grazing by sheep, cattle and /or ponies at a rate of 0.15 LSU/ha/year. This guidance level of grazing is based on recent trials and observations at Coed y Rhygen.
F2. Non-native Species	Beech, rhododendron, Japanese knotweed, conifers, Himalayan balsam, sycamore, sweet chestnut.	Non-native species should be absent, unless individual trees are known to be important for maintaining humidity or for defined wildlife interest and there are mechanisms in place to ensure no seeding or encroachment. Exceptionally individual trees may be retained for landscape reasons provided there is no adverse impact on nature conservation.
F3. Humidity	High humidity is essential for mosses and liverworts to survive and reproduce.	High humidity must be maintained.
F4. Goats	Grazing by goats can be detrimental to regenerating trees in areas e.g. Rhinog where the numbers are increasing.	Keep grazing by goats under control
F5. Woodland management	Tree felling and scrub clearance, can be beneficial if carried out appropriately. It could however cause damage if for example important trees are felled or if mosses, other plants and/or wildlife are damaged or disturbed as a result.	Any woodland management that is proposed will be considered by looking carefully at the advantages and disadvantages on a case-by-case basis.
F6. Woodland fragmentation	Sites where the remaining woodland is only a small fragment of its former size should be enlarged wherever possible.	Increase the size of woodlands where only fragments remain.
F7. Adventure gorge walking & white water canoeing rafting	Activities such as gorge walking and kayaking should be monitored so that this may provide feedback to management. No significant damage to mosses,	Gorge walking and kayaking at sensitive sites may be permitted through access agreements with local users

	liverworts and ferns growing within the gorges should take place.	providing monitoring shows that there is no risk to rare and notable species.
Performance indicators for feature condition: lesser horseshoe bats		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Population of lesser horseshoe bats	Emergence counts in June for SAC roosts. See table 3 above. Some roosts are split between buildings or adits but counts are combined to form a 'site' count. If a decline or lack of increase cannot be explained, a licensed bat worker should investigate.	We expect roost counts to be within the normal range for that particular site, but also to be in line with current trends identified by the National Bat Monitoring Program. If numbers are lower (or higher) than usual we consider factors such as roost integrity, weather, disturbance, predation and annual and longer term trends within Wales/UK.
A2. Roosts	Breeding roosts (buildings, structures and trees), Hibernation roosts (mines and buildings), Night, transitional, leks and swarming sites of appropriate quality.	See factors F1-F4
A3. Foraging or feeding habitat	Sufficient surrounding roosts.	No loss of foraging habitat or decline in its quality affecting invertebrate availability, such as over intensive woodland or grassland management and drainage of marshes or bogs,
A4. Range of the population	SAC/Gwynedd	See map of known roosts which should be maintained. We expect to continue to find new roosts.
Performance indicators for factors affecting the feature: lesser horseshoe bats		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. Building or structure including mine	Lesser horseshoe bats have very specific requirements for roosts and hibernation sites, see section 5.3 for more detail.	Condition of breeding and hibernating roosts should be enhanced wherever possible, see section 5.3 for more detail.
F2. Disturbance to roosts	Disturbance to bats, particularly during the breeding season and hibernation period can affect the population's success at a specific roost.	Human access should be controlled & disturbance kept to minimum levels, so that they do not negatively impact on the bats.
F3. Bat navigation flight lines	Bats use linear and other features including hedges, walls, lines of trees, scrub, ditches streams etc. between roosts and feeding areas. Clear felling of conifers around mine roosts can be an issue as the bats can abandon the roost site.	There should be no loss or decline in the quality of physical features used as flight lines. There should be no clearance of vegetation, trees or shrubs near the roost without assessment of likely impact.
F4. Roads and Development	Roads, particularly new widened routes, can cause increased mortality through collision with vehicles. This may also be through interruption to flight lines, by removal of traditional safe flight lines along linear features or by lighting. Lighting of roosts can have similar effects.	Maintain closed canopy crossings over roads with connectivity to hedges and tree lines to foraging sites and roosts. Lighting should be avoided.
F5. Weather	This is very significant factor acting on bats through temperature and severe unseasonable weather, including storms & unusually high temperatures. Thus weather affects bat emergence from roosts, feeding (availability of prey), hibernation timing, activity, breeding timing and success.	We must always be mindful of the effects of weather when analysing trends and interpreting data and bat behaviour.

Performance indicators for features condition: heath		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Extent of dry heath	Lower limit is based on the most recent estimate from the CCW SAC feature assessment report (2006).	*Lower limit* Dry heath: 21 ha *Upper limit:* Dry heath: 21 ha
A2. Distribution of dry heath	As mapped.	
A3. Vegetation composition	Typical species (refer to table 8) are important so that natural biodiversity is maintained and enhanced.	Refer to site quadrat data and Rodwell (1991) for typical species frequencies.
A5. Heath land structure	The heath surface should be regenerating and characteristic of the vegetation community and generally at a height where there is the most plant diversity.	Set limits relevant to particular location/stand in context of whole site.
A6. Non-native species	Non-native species especially invasive species such as conifers, rhododendron, Japanese knotweed and Himalayan balsam should not be present.	*Acceptable limit:* None present within SAC. *Target:* None present within species specific buffer zones around SAC.
Performance indicators for factors affecting the features: heath		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. Grazing	Heaths are likely to have always been grazed to some extent, by a variety of herbivores. In an unmodified heathland, species composition is regulated by soil composition, water levels, altitude and aspect, as well as factors such as grazing. Where stock are excluded, the heath vegetation becomes very deep and bushy, and the scattered scrub develops into woodland. If this is undesirable, then some light grazing of the relevant compartments may be necessary.	Favourable management is often summer grazing by sheep, cattle and /or ponies at a rate of 0.225 LSU/ha/year (1.4 ewes).
F2 Burning	Burning generally is not appropriate here as lack of adequate control could result in devastation of woodland habitat immediately adjacent. If it is to be considered, the proposal should have clearly stated objectives and be limited to: appropriate areas of dry heath, at a small scale, be well controlled and follow good practise and codes.	There is therefore a general presumption against burning of heath within Meirionnydd Oakwoods and Bat Sites SAC. Burning of some stands of dry heath may be consented on a case-by-case basis.
F3. Mowing	Cutting can be a viable alternative to burning and offers a controlled, safe way to manage heather without the associated risks of fires. The main areas of dry heath in this SAC are however either on very steep slopes or in inaccessible areas, so cutting is generally difficult.	May be consented where practical.
F4. Afforestation / conifer encroachment	The presence of conifers (and other invasive non-native species) on heaths immediately places the conservation status of the heath as 'unfavourable'. Conifers/trees shade out the heath vegetation and acidify the groundwater. Associated activities such as heavy plant access, planting, fertiliser input, construction and maintenance of access tracks, and drainage works lead to further damage of the heath. The trees also provide seed-source of future conifers to encroach further out onto the heath.	No planting of conifers or other trees on heath.
F5. Bracken	Bracken is a natural component of the moorland edge communities, however, where bracken is encroaching at the expense of dry heath, some form of control may be required.	Defined limits for bracken and bracken encroachment bordering heath where it is not expected that woodland may expand.
Performance indicators for feature condition: river with floating vegetation		
Attribute	***Attribute rationale and other comments***	***Specified limits***

A1 Extent	The extent of suitable river habitat where the plant community can occur should be stable or increasing, see Annex 2.	

Gwydir Forest Mines SAC

Performance indicators for feature condition		
Attribute	***Attribute rationale and other comments***	***Specified limits***
A1. Extent of calaminarian grassland.	Lower limit is based on the extent at the time of SAC notification being 6.82% of the total site area	*Upper limit:* None specified *Lower limit:* 2.71 ha
A2. Condition of the calaminarian grassland – sample target.	For the calaminarian grassland to be in favourable condition on the SAC each of the management units outlined for calaminarian grassland is required to have either good quality calaminarian grassland with *D. plumbicola* or good quality calaminarian grassland (metal spoil) without D. plumbicola. Furthermore, there is a requirement of the presence of *D. plumbicola* (to be confirmed by contracted experts) at each of the known locations 1 in every 6 years.	Where calaminarian grassland is the Key Habitat in the following management units; 1, 3 – 15, 17, 20, 25 – 33, 35 – 41, 43 – 44. Sample target for calaminarian grassland. Upper limit: None specified Lower limit: Calaminarian grassland with *Ditrichum plumbicola*: 100% of the *D. plumbicola* stands have "good quality" *D. plumbicola* habitat and *D. plumbicola* is present at each previously recorded stand 1 in every 6 years. Calaminarian grassland (metal spoil) without *Ditrichum plumbicola*: 100% of the metal spoil stands have "good quality" metal spoil vegetation.
A3. Condition of the calaminarian grassland – "good quality" calaminarian grassland habitat	Calaminarian grassland with *Ditrichum plumbicola*: 1. Fine grade substrate (fine spoil, clay or silt). 2. <10% cover of *Campylopus introflexus*. 3. >50% of the assessment area (see SAC Monitoring PI table) is free of algae, acrocarpous mosses and angiosperm litter. 4. Pleurocarpous mosses are absent. 5. Broadleaf and coniferous seedlings of any height are absent. 6. Exotic species are absent. 7. Conifers >30cm in height within 10m of the stand are absent. 8. Evidence of disturbance is absent.	The definition of good quality calaminarian grassland habitat has been based on the CSM attributes for this feature. However, due to the unusual nature of the calaminarian grassland at this site the attributes have been modified somewhat according to site specific requirements. Calaminarian grassland with *Ditrichum plumbicola:* The majority of the attributes aim to give information regarding the micro-condition of the habitat, e.g. *Campylopus introflexus* signifies the availability of organic substrates, which are not conducive to colonization by *D.plumbicola*. For more information see Creer (2004) SAC monitoring report.
	Calaminarian grassland (metal spoil) without *Ditrichum plumbicola:* 1. >50% cover of lichen species. OR At least one of the following species is present (where previously recorded) *Asplenium septentrionale*, *Silene uniflora* and *Thlaspi caerulescens.*	Calaminarian grassland (metal spoil) without *Ditrichum plumbicola:* The attributes are more general for this calaminarian grassland type. The attributes aim to give

	2. Tree and scrub species >50cm in height are absent. 3. Evidence of excessive or significant disturbance is absent.	information regarding the overall condition of the habitat. However, where the rarer metallophytes have been recorded i.e. *Asplenium septentrionale, Silene uniflora* and *Thlaspi caerulescens,* these should continue to be present, with the populations stable or increasing.
Performance indicators for factors affecting the feature		
Factor	***Factor rationale and other comments***	***Operational Limits***
F1. Disturbance (human impact and recreation)	The type of disturbance to the feature can vary, from the effect of mountain and BMX bikes, scrambler and quad bikes, radio controlled cars and 4x4 vehicles, to tipping of waste material on the mine spoil and the removal of mine spoil material. Any type of human disturbance should be recorded, because there will be an effect to the fragile calaminarian grassland.	Evidence of disturbance is absent within stands of calaminarian grassland with and without *Ditrichum plumbicola*.
F2. Broadleaf, coniferous, exotic and scrub species encroachment	Encroachment of any higher plant species is undesirable on the calaminarian grassland stands. The encroaching species will shade out the slower growing moss and lichen species, and in time will smother the lower plants with litter material. There is a further requirement for conifers (>30cm in height) to be absent from within 10m of the calaminarian grassland with *D. plumbicola* stands. The removal of conifers will arrest the current shading and accumulation of litter onto the *D. plumbicola* stands.	Calaminarian grassland with *Ditrichum plumbicola:* 1. Broadleaf and coniferous seedlings of any height are absent. 2. Exotic species are absent. 3. Conifers >30cm in height within 10m of the stand are absent Calaminarian grassland (metal spoil) without *Ditrichum plumbicola*: Tree and scrub species >50cm in height are absent.

APPENDIX B: BAT SURVEY DATA

		June/July 09	Sept/Oct 09	Aug / Sept 14	May-15	Jul-15	Sep-15	Total (excl. AnBat)	Activity Index without AnaBat
Transect 1 / R1	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	2	1	0	0	1	4.00	20.0
Transect 2 / R2	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	0	1	1	0	3	5.00	25.0
Transect 3 / R3	Survey effort	4	4	0	2	2	4	16.00	
	LHB events	0	1	0	1	0	0	2.00	12.5
Transect 4	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
R4	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	2	0	0	2	4.00	33.3
Transect 5	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	1	0	0	0	0	1.00	12.5
Transect 6 / R5	Survey effort	4	4	8	2	2	4	24.00	
	LHB events	0	1	2	0	0	2	5.00	20.8
Transect 7	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	6	3	0	0	0	0	9.00	112.5
Transect 8	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
Transect 9 / R6	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	4	0	0	1	5.00	41.7
Transect 10 / R7	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	6	5	11	1	4	6	33.00	165.0
Transect R7a	Survey effort (h)	0	0	0	0	0	4	4.00	
	LHB events (be)	0	0	0	0	0	4	4.00	100.0
R8	Survey effort	0	0	0	2	2	4	8.00	
	LHB events	0	0	0	2	0	0	2.00	25.0
Transect 11	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	1	1	0	0	0	0	2.00	25.0
Transect 12 /R9	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	0	1	0	0	0	1.00	5.0
Transect 13 / R10	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	1	0	6	0	0	7.00	35.0
R11	Survey effort	0	0	0	2	2	4	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
R12	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	1	1	4	1	7.00	58.3
Transect 14	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	2	0	0	0	0	0	2.00	25.0
Transect 16 / R13	Survey effort	4	4	0	2	2	4	16.00	
	LHB events	2	2	0	0	0	0	4.00	25.0

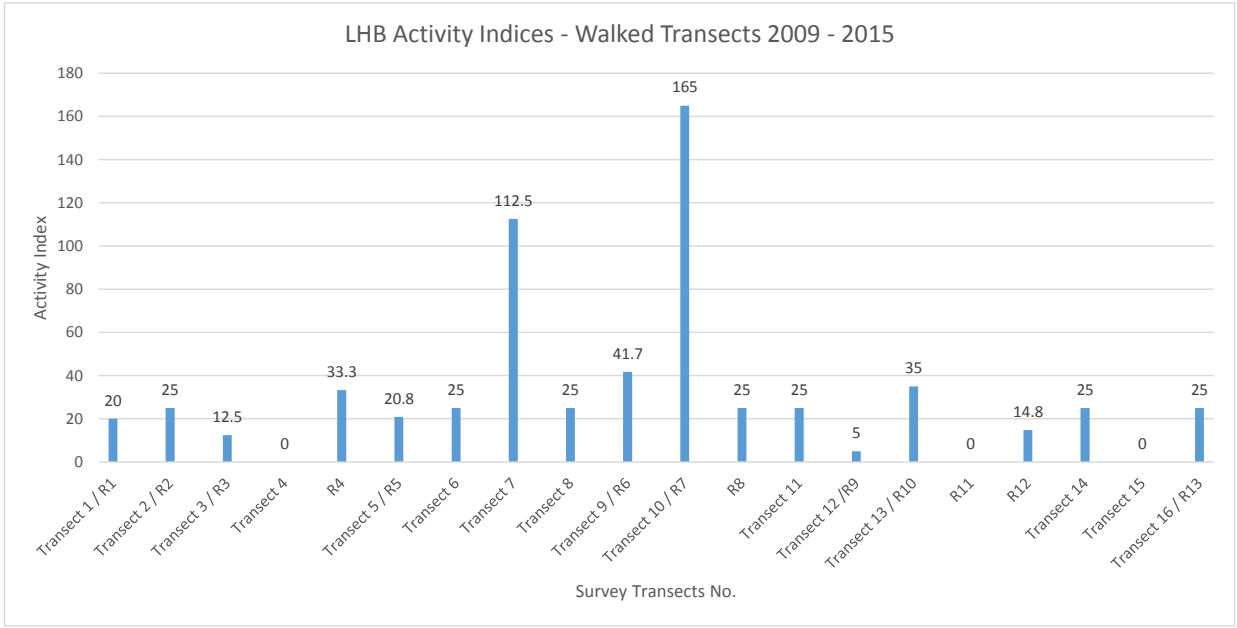
Not surveyed 2009

Only surveyed 2009

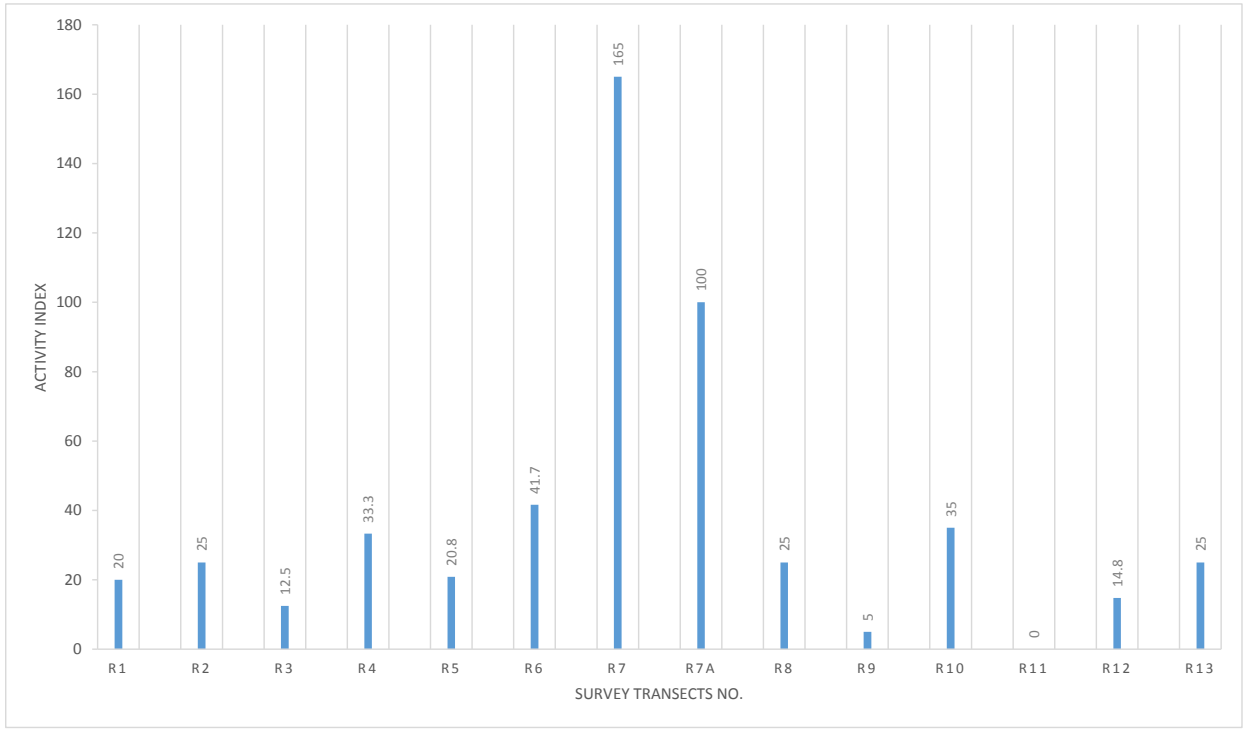
Surveys not undertaken in 2014

Check info from Mike Freeman

Hand held AI	
Transect 1 / R1	20
Transect 2 / R2	25
Transect 3 / R3	12.5
Transect 4	0
R4	33.3
Transect 5 / R5	20.8
Transect 6	25
Transect 7	112.5
Transect 8	25
Transect 9 / R6	41.7
Transect 10 / R7	165
R8	25
Transect 11	25
Transect 12 /R9	5
Transect 13 / R10	35
R11	0
R12	14.8
Transect 14	25
Transect 15	0
Transect 16 / R13	25

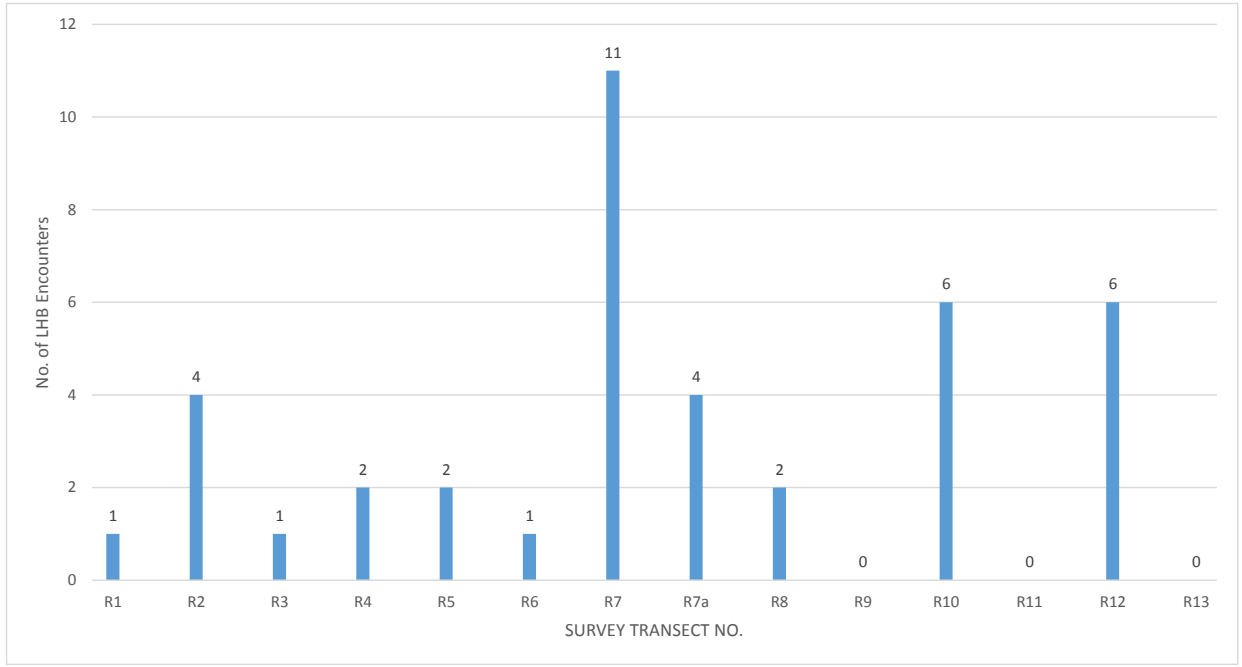


Hand held AI Along Scheme	
R1	20
R2	25
R3	12.5
R4	33.3
R5	20.8
R6	41.7
R7	165
R7a	100
R8	25
R9	5
R10	35
R11	0
R12	14.8
R13	25



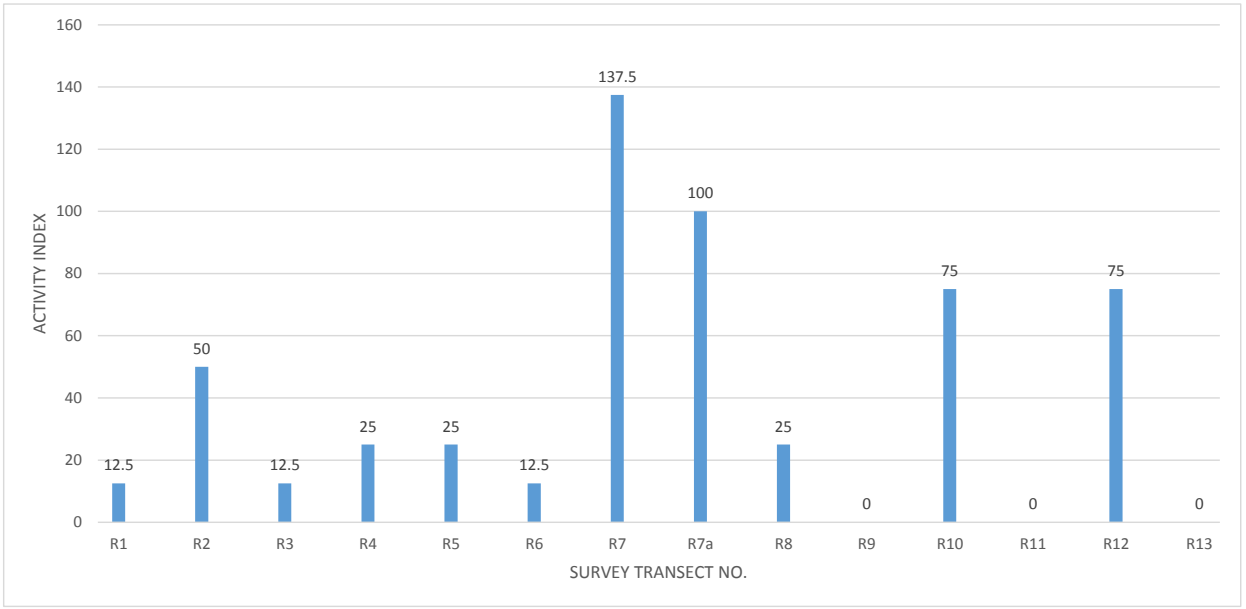
LHB totals 2015

R1	1
R2	4
R3	1
R4	2
R5	2
R6	1
R7	11
R7a	4
R8	2
R9	0
R10	6
R11	0
R12	6
R13	0



LHB AI 2015

R1	12.5
R2	50
R3	12.5
R4	25
R5	25
R6	12.5
R7	137.5
R7a	100
R8	25
R9	0
R10	75
R11	0
R12	75
R13	0



APPENDIX C: SCREENING MATRICES

Project name	**A487 Caernarfon and Bontnewydd Bypass**	
Natura 2000 site under consideration	**Afon Gwyrfai a Llyn Cwellyn SAC**	
Date:	**Author:**	**Verified:**
June 2016	J Hamilton	L Jones
Brief Description of Project		
The proposed Scheme consists of a new 9.7km highway commencing at the Goat roundabout (A499/A487 junction) and terminating at the Plas Menai Roundabout. In addition to the major construction there would also be on-line improvements to the existing trunk road, comprising improvements to existing junctions, traffic management, parking restrictions and improving visibility at junctions.		
Brief Description of the Natura 2000 Site		
Name and EU Code of Natura 2000 Site	Afon Gwyrfai a Llyn Cwellyn - UK0030046	
Site designation status (e.g. SAC, SPA, SSSI)	SAC, SSSI	
Site size	114.29ha	
Location and distance from the Scheme	The Afon Gwyrfai and Llyn Cwellyn SAC is located in north west Wales, comprising the Afon Gwyrfai, which flows out of Llyn y Gader near Rhyd Ddu and passes through Llyn Cwellyn on its way to the sea at Y Foryd, Caernarfon Bay. The proposed Scheme crosses the Natura 2000 site in its westerly end, via a viaduct near Cae-rhos, southwest of Caernarfon.	
Key features of the European Site including the primary reasons for selection and any other qualifying interests	• Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea*, • Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation. • Atlantic salmon *(Salmo salar),* • Floating water-plantain *(Luronium natans)*.* • Otter *(Lutra lutra).* *It is of note that, according to the Core Management Plan for the Afon Gwyrfai a Llyn Cwellyn SAC, the habitat *Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea only occurs within Llyn Cwellyn, which lies within Management Unit 3, and that Floating water plantain is restricted to Management Units 3 & 5. As all of these areas are upstream of the Scheme works, they will not be affected by the proposed works and so are not considered further in this SIAA.*	
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	From the Natura 2000 Standard Data Form for the Afon Gwyrfai a Llyn Cwellyn SAC: '*The lake is utilised as a raw drinking water reservoir. The present abstraction regime is compatible with its nature conservation status. Recent investigations have revealed that Llyn Cwellyn has acidified by 0.7 pH units since the late 1800s, due to increases in emissions of oxides of sulphur and nitrogen and subsequent acidic depositions in the form of 'acid rain'. The management of the extensive block of coniferous plantation on the shores of Llyn Cwellyn is an important factor in safeguarding the conservation value of the lake. A management plan has been agreed upon between the Countryside Council for Wales and Forest Enterprise. Negotiations are in progress to redesign the plantation to remove trees from around tributary streams, and hence reduce any further risk of acidification.*	

	The Afon Gwyrfai is likely to be most vulnerable to cumulative impacts of small-scale changes along its length which may affect water quality and habitat structure.'
Natura 2000 site conservation objectives – where these are readily available	See Section 3 of the main SIAA text for the Conservation Objectives and Appendix A of the SIAA for Performance Indicators.
Scheme interaction with the Natura 2000 site Describe any likely direct, indirect or secondary impacts of the Scheme on the Natura 2000 site by virtue of the following:	
Size and scale (road type and probable traffic volume)	The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land will be required for temporary works associated with the Scheme. Predicted traffic volumes for the Scheme for the opening year are 7032 (light vehicles) and 953 (heavy vehicles) over a 12 hour period.
Land-take within Natura 2000 site	An area of approximately 0.1348ha of the Afon Gwyrfai a Llyn Cwellyn SAC is crossed by the Scheme; this comprises the river bed and banks. This area will be crossed via a viaduct, so there would be no permanent land-take within the SAC, but there may be indirect or secondary impacts during the construction phase.
Distance from the European Site or key interests of the site (from the edge of the project assessment corridor)	The Scheme would pass over the SAC via a viaduct. This Scheme design was chosen in order to minimise impacts to the SAC. Therefore, it is unlikely that the Scheme would have direct impacts on the SAC, but there may be indirect or secondary impacts during the construction phase.
Resource requirements (from the Natura 2000 Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Where the Scheme crosses the Afon Gwyrfai via a viaduct near Cae-rhos, construction work would take place on the floodplain and above the river, requiring access. Seven abutments would be constructed where the viaduct crosses the SAC, however none would be built in the SAC itself. The bank seats of the structure would be a minimum of 5.8m from the edge of the river on both sides.
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	**Surface Water** There would be potential for the Scheme to generate water-borne pollution, including suspended solids and particulates, hydrocarbons and other chemicals during the construction phase of the Scheme, as it passes over the Afon Gwyrfai at Cae-rhos. No operational impacts would be expected in this regard, as the SAC would be crossed by a viaduct of length 250m. Surface water pollution would be controlled by a Construction Environment Management Plan (CEMP) – see details below. **Air quality** The conclusions of an air quality assessment conducted for the Scheme were that the overall impacts of atmospheric pollutants on the Afon Gwyrfai a Llyn Cwellyn SAC would be neutral, as the SAC traverses both the Scheme itself and the A487.
Excavation requirements (e.g. impacts of local hydrogeology)	There are no excavation requirements within the SAC and no changes to hydromorphology anticipated.
Transportation requirements	Construction traffic would access the site via the existing road network and previously constructed road built as part of this Scheme. There would likely be localised haulage of excavated materials to achieve cut and fill balances and from the construction of balancing ponds on the north-eastern and south-

	western sides of the road near the viaduct. These transportation requirements would not be expected to have a significant impact on the SAC.
Duration of construction, operation etc.	The total construction period for the section of the Scheme in this area would be expected to be approximately 24 months.
Other	None
Description of avoidance and/or mitigation measures - plainly established and uncontroversial (PEU) measures only; detailed mitigation measures would be developed in a Stage 2 Assessment, if necessary.	
Nature and location of proposals	**Surface Runoff/ Water quality** The Scheme would follow mandatory guidance given in the Design Manual for Roads and Bridges (DMRB) HD 33/06 which gives '*Standard guidance on the selection of the types of surface and subsurface drainage for trunk roads'*. During construction, silt fencing would be used where appropriate to prevent additional sediment from entering the watercourse. Twenty new culverts will be constructed along the Scheme to cross existing watercourses along with two dry pipes to the northern end of the Scheme. Two widespan bridges will also be constructed, including over the Gwyrfai itself where the viaduct pillars will be located to avoid the watercourse itself and therefore no groundworks will take place within the watercourse. Balancing ponds would be incorporated on the northeast and southwest sides of the Scheme to control the flow of increased surface water runoff during periods of high rainfall. **Atlantic Salmon** Construction of the pier bases of the viaduct would be restricted during spawning periods (17th October to 15th May in the Afon Gwyrfai (NRW comments) and during smolt migration periods (spring and early summer). No pier construction would take place within the SAC. Further restrictions will be in place during the summer months in relation to the lamprey spawning period. **Otters** - (By design). The bank seats of the viaduct crossing the Afon Gwyrfai would be set back at a minimum distance of 5.8m from the SAC, allowing sufficient room for otters to continue using the bank as a dispersal corridor. The flood consequences assessments show that the north bank will remain clear during flood events and there is only minimal changes in flood depth on the south bank (which is existing flood plain). - Dispersal routes outside the SAC boundary are maintained through the use of wide-span structures and oversized pipes, installation of mammal ledges and dry pipes where the Scheme crosses other watercourses. - During construction, no obstructions would be left within a 5m buffer of the river or other watercourses overnight. - Efforts would be made to minimise disturbance of otters during the construction phase of the proposed Scheme, for example by limiting night-time works and controlling light spill onto the river at night-time, as per the guidance provided in the DMRB, Vol. 10 Section 4 Part 4, HA 81/99. This will be

	applied the entire length of the Scheme, not just within the vicinity of the SAC. - Otter fencing is proposed 100m either side of all watercourse crossings and new ponds along the Scheme including to the north and south of the viaduct where it crosses Afon Gwyrfai. This fencing would meet the required standards as defined by NRW, following the guidance provided in the DMRB, Vol. 10 Section 4 Part 4, HA 81/99.
Evidence for effectiveness	All of the above mitigation measures would follow approved methods of mitigation, such as the standards provided in DMRB guidance.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	The contractor would be contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this will be the Register of Commitments (ROC), which would list the obligations made in documents, such as the overall Environmental Statement for the proposed Scheme. The delivery team's Environmental Coordinator and Environmental Clerk of Works (who would be a full time member of staff on site during construction) would be responsible for the implementation and monitoring of the CEMP. The delivery team would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP would contain procedures for checking, auditing and corrective action.
Assessment Criteria - Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	
• Potential pollution events during the construction phase of the proposed Scheme, which may impact the qualifying features of the SAC, that are all water-dependent; • Otters from the SAC may forage or travel within the vicinity of the proposed Scheme. However, the Scheme would not result in the loss of river channel habitat within the SAC, losses along smaller watercourses outside the SAC boundary will be minimised reducing disruption to other dispersal routes. • Potential for disturbance effects on otters and Atlantic salmon during construction. All of these impacts will be minimised through the implementation of plainly established and uncontroversial (PEU) mitigation measures as outlined above.	
Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There will be no reduction in area of any of the qualifying habitats of the site as a result of the proposed Scheme.
Disturbance to key species	The proposed works may result in temporary disturbance to otter and Atlantic salmon, which are key species of the site. This impact would be minimised through PEU mitigation measures as outlined above.
Habitat or species fragmentation	As the SAC would be crossed by a viaduct, there would be no habitat or species fragmentation within the SAC. There would be no disruption to otter dispersal routes as the Scheme does not cause the loss of river channel habitat, and there would be a minimum set back distance of 5.8m between the river bank and the bank seats of the viaduct on either side, allowing sufficient room for otters. Outside the SAC boundary dispersal routes are maintained through the implementation of PEU mitigation measures outlined above.

Reduction in species density	A significant pollution incident could result in a reduction in species density, but the likelihood of a significant pollution event will be minimised through the implementation of PEU mitigation measures as outlined above.
Changes in key indicators of conservation value (water quality, etc)	A key indicator of conservation value within the site is water quality, which may be affected by a significant pollution event; as outlined above, the likelihood of a significant pollution event would be minimised through the implementation of PEU mitigation measures as outlined above.
Climate change	The potential impacts of climate change on the qualifying interests of the site are uncertain, but it is not expected that the proposed Scheme would exacerbate the impacts of climate change on the SAC.
Likely impacts on the Natura 2000 site as a whole in terms of:	
Interference with the key relationships that define the structure and function of the site	The key relationship that defines the structure and function of the site is that between water quality within the aquatic habitats of the site, and the populations of water-dependent species within them. It is not expected that the proposed Scheme would affect the Natura 2000 site in this regard.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not applicable
Loss/reduction in species density	Provided the PEU mitigation measures as outlined above are implemented correctly, no loss or reduction in species density is foreseen.
Habitat or species fragmentation	Not applicable.
Disruption of key species	None expected.
Disturbance to key species	The implementation of PEU mitigation measures as outlined above will minimise the potential for disturbance to key species, and so this impact is considered to be of low significance.
Change to key elements of the site (e.g. water quality, hydrological regime etc)	The key element of the site is water quality; provided the PEU mitigation measures as outlined above are implemented correctly, there will be no change in water quality as a result of the proposed Scheme.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	
Provided the plainly established and uncontroversial mitigation measures as outlined above are implemented correctly, none of the above impacts are expected to result in significant impacts to the Natura 2000 site, alone or in combination with other plans or projects in the area.	
Outcome of screening stage	**Not Likely to be Significant Effects**
Are the appropriate statutory environmental bodies in agreement with this conclusion? (*delete as appropriate and attach relevant correspondence).*	**YES/ NO**

Project name	A487 Caernarfon and Bontnewydd Bypass	
Natura 2000 site under consideration	**Menai Strait and Conwy Bay SAC**	
Date:	**Author:**	**Verified:**
June 2016	J Hamilton/ S Shove	L Jones
Brief Description of Project		
The proposed Scheme consists of a new 9.7km highway commencing at the Goat roundabout (A499/A487 junction) and terminating at the Plas Menai Roundabout. In addition to the major construction there would also be on-line improvements to the existing trunk road, comprising improvements to existing junctions, traffic management, parking restrictions and improving visibility at junctions.		
Brief Description of the Natura 2000 Site		
Name and EU Code of Natura 2000 Site	Menai Strait and Conwy Bay SAC - UK0030202	
Site designation status (e.g. SAC, SPA, SSSI)	SAC and SSSI	
Site size	26482.67ha	
Location and distance from the Scheme	The Menai Strait and Conwy Bay SAC is situated in north-west Wales and includes the whole of the Menai Strait, from its south-western entrance at Abermenai Point through to Red Wharf Bay and Conwy Bay to the north. The proposed Scheme lies 0.38km to the east (and upstream) of the Natura 2000 site.	
Key features of the European Site including the primary reasons for selection and any other qualifying interests	• Sand banks which are slightly covered by sea water all the time • Mudflats and sandflats not covered by seawater at low tide • Reefs • Large shallow inlets and bays • Submerged or partly submerged sea caves	
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	From the Standard Natura 2000 Data Form for the Site: *'Construction, e.g. of slipways, coastal defence and marinas/harbours could cause disturbance to the European habitats and disrupt physical processes essential for the maintenance of these habitats. CCW is consulted by the local planning authorities and other statutory bodies over such developments Although the level of commercial fishing (excluding shellfish) is relatively low, trawling occurs in some areas.* *The potential impacts of heavy bottom-fishing gear on the subtidal sandbank and shallow inlet and bay habitats will need to be assessed. There are relatively extensive mussel lays in the eastern end of the Menai Strait, and CCW will be working with the fishing industry and the local fisheries regulator (the North Western & North Wales Sea Fisheries committee) to assess the potential impacts of this fishery on the features of the cSAC. There are many boat moorings present in the Menai Strait and a demand for additional facilities (moorings and marina developments) to accommodate more craft. CCW will need to work with the other relevant authorities to assess the implications of all proposed developments of this sort for the SAC features. Disposal of dredged material may be contributing to increasing turbidity, which affects the distribution and composition of subtidal algal communities. Appropriate assessment of the significance of future proposed activities is required. Many of the marine wildlife communities in the cSAC are sensitive to oil pollution.*	

	The development of oil wells and frequent boat traffic in Liverpool Bay present potential pollution sources. CCW is working with the oil companies and with other statutory organisations so that adequate safety measures are in place to try and prevent pollution incidents. Also, CCW is a member of the North Wales Standing Environment Group which is preparing a regional contingency plan to help coordinate response to try and minimise environmental impacts in the event of a pollution incident.'
Natura 2000 site conservation objectives – where these are readily available	See Section 3 of the main SIAA text for the Conservation Objectives and Appendix A of the SIAA for Performance Indicators..
Scheme interaction with the Natura 2000 site Describe any likely direct, indirect or secondary impacts of the Scheme on the Natura 2000 site by virtue of the following:	
Size and scale (road type and probable traffic volume)	The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land will be required for temporary works associated with the Scheme. Predicted traffic volumes for the Scheme for 2018 are 7032 (light vehicles) and 953 (heavy vehicles) over a 12 hour period.
Land-take within Natura 2000 site	There will be no land-take within the Natura 2000 site.
Distance from the European Site or key interests of the site (from the edge of the project assessment corridor)	The proposed Scheme lies 0.32km east of, and upstream of, the Natura 2000 site. At this distance, no direct impacts are expected. However, there may be some indirect impacts in the form of run-off of surface water pollution.
Resource requirements (from the Natura 2000 Site or from areas in proximity to the site, where of relevance to consideration of impacts)	There will be no impacts in this regard.
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	**Surface water** The Scheme would be unlikely to have any significant impact on emissions in relation to surface water runoff, as the A487 already runs parallel to the site and the Scheme is 0.5kms to the Site at its closest, most northern point. Surface water pollution would be controlled by a Construction Environment Management Plan (CEMP) – see details below. **Air quality** The Air Quality assessment conducted for the Scheme concluded that there would be no impacts on the Menai Straits SAC in terms of air quality as a result of the Scheme.
Excavation requirements (e.g. impacts of local hydrogeology)	There will be no impacts in this regard.
Transportation requirements	Construction traffic would access the site via the existing road network and previously constructed road built as part of this Scheme. There is likely to be localised haulage of excavated materials to achieve cut and fill balances and from the construction of balancing ponds on the north eastern and south western sides of the road near the viaduct. These transportation requirements are not expected to have a significant impact on the SAC.
Duration of construction, operation etc.	The total construction period is expected to be approximately 24 months.
Other	None

Description of avoidance and/or mitigation measures - plainly established and uncontroversial (PEU) measures only; detailed mitigation measures would be developed in a Stage 2 Assessment, if necessary.	
Nature and location of proposals	**Surface Runoff/ Water quality** The Scheme would follow mandatory guidance given in the Design Manual for Roads and Bridges (DMRB) HD 33/06 which gives '*Standard guidance on the selection of the types of surface and subsurface drainage for trunk roads'.* During construction, silt fencing would be used where appropriate to prevent additional sediment from entering the watercourse. Balancing ponds would be incorporated on the northeast and southwest sides of the Scheme to control the flow of increased surface water runoff during periods of high rainfall. **Construction** Pollution prevention measures would be used during construction, for example the control of run-off to existing surface drains and the use of silt traps, bunding and the establishment of settling ponds, lagoons and temporary oil interceptors to prevent silt run-off and/or uncontrolled pollution events. Measures would be designed in accordance with Natural Resources Wales Pollution Prevention Guidelines (PPG5).
Evidence for effectiveness	All of the above PEU mitigation measures would follow approved methods of mitigation, such as the standards provided in DMRB guidance.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	The contractor would be contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this will be the Register of Commitments (ROC), which would list the obligations made in documents, such as the overall Environmental Statement for the proposed Scheme. The delivery team's Environmental Coordinator and Environmental Clerk of Works (who will be a full time member of staff on site during construction) will be responsible for the implementation and monitoring of the CEMP. The delivery team would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP would contain procedures for checking, auditing and corrective action.
Assessment Criteria - Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	
• Potential pollution events during the construction phase of the proposed Scheme, which may impact the qualifying features of the SAC, that are all aquatic habitats	
Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There would be no reduction in area of any of the qualifying habitats of the site as a result of the proposed Scheme.
Disturbance to key species	Not applicable; the Natura 2000 site is designated for the presence of habitats only.
Habitat or species fragmentation	There would be no habitat or species fragmentation within the SAC.

Reduction in species density	There would be no reduction in species density in the SAC.
Changes in key indicators of conservation value (water quality, etc)	A key indicator of conservation value within the site is water quality, which may be affected by a significant pollution event; as outlined above, the likelihood of a significant pollution event would be minimised through the implementation of PEU mitigation measures as outlined above.
Climate change	The potential impacts of climate change on the qualifying interests of the site are uncertain, but it is not expected that the proposed Scheme would exacerbate the impacts of climate change on the SAC.
Likely impacts on the Natura 2000 site as a whole in terms of:	
Interference with the key relationships that define the structure and function of the site	The key relationship that defines the structure and function of the site is that between water quality and the condition of key aquatic habitats of the site. It is not expected that the proposed Scheme will affect the Natura 2000 site in this regard.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	Not Applicable
Loss/reduction in species density	Not Applicable
Habitat or species fragmentation	Not Applicable
Disruption of key species	Not Applicable
Disturbance to key species	Not Applicable
Change to key elements of the site (e.g. water quality, hydrological regime etc)	The key element of the site is water quality; provided the PEU mitigation measures as outlined above are implemented correctly, there will be no change in water quality as a result of the proposed Scheme.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	
Provided the plainly established and uncontroversial mitigation measures as outlined above are implemented correctly, none of the above impacts are expected to result in significant impacts to the Natura 2000 site, alone or in combination with other plans or projects in the area.	
Outcome of screening stage	**Not Likely to be Significant Effects**
Are the appropriate statutory environmental bodies in agreement with this conclusion? (*delete as appropriate and attach relevant correspondence).*	**YES/ NO**

Project name	A487 Caernarfon and Bontnewydd Bypass	
Natura 2000 site under consideration	**Glynllifon SAC**	
Date:	**Author:**	**Verified:**
June 2016	J Hamilton/ S Shove	L Jones
Brief Description of Project		
The proposed Scheme consists of a new 9.7km highway commencing at the Goat roundabout (A499/A487 junction) and terminating at the Plas Menai Roundabout. In addition to the major construction there would also be on-line improvements to the existing trunk road, comprising improvements to existing junctions, traffic management, parking restrictions and improving visibility at junctions.		
Brief Description of the Natura 2000 Site		
Name and EU Code of Natura 2000 site	Glynllifon SAC – UK0012661	
Site designation status (e.g. SAC, SPA, SSSI)	SAC/SSSI	
Site size	189.27ha	
Location and distance from the Scheme	This site is located in north west wales, situated in the former Glynllifon estate. The site is 1.2km south of the southernmost point of the Scheme.	
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Lesser Horseshoe Bat *(Rhinolophus hipposideros)*	
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	From the Natura 2000 Standard Data Form for the Glynllifon SAC: *'The site includes the roost and adjacent feeding areas utilised by the bats. The building in which the roost is located is currently on sale, and the management of the estate grounds, including the woodlands, is being revised. A recent road improvement scheme, which has interfered with a key flightpath out of the estate and which has failed to incorporate adequate mitigation for the bats, also illustrates the pressure on this site. A management agreement exists with the current owners of the roost building but this does not extend to the feeding areas, currently excluded from the SSSI and SAC. There is some scope for improving management of the site as a whole for the bats, through management agreement, agri-environment schemes and other partnership initiatives.'*	
Natura 2000 site conservation objectives – where these are readily available	See Section 3 of the main SIAA text for the Conservation Objectives and Appendix A of the SIAA for Performance Indicators..	
Scheme interaction with the Natura 2000 site Describe any likely direct, indirect or secondary impacts of the Scheme on the Natura 2000 site by virtue of the following:		
Size and scale (road type and probable traffic volume)	The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land will be required for temporary works associated with the Scheme. Predicted traffic volumes for the Scheme for 2018 are 7032 (light vehicles) and 953 (heavy vehicles) over a 12 hour period.	
Land-take within Natura 2000 site	There would be no land-take within the Natura 2000 site.	
Distance from the European Site or key interests of the site (from the edge of the project assessment corridor)	The Natura 2000 site is located 1.2km from the proposed Scheme, but Lesser Horseshoe Bats, which are the reason for the site's designation, are known to range over areas of up to 30km, and this species has been recorded along the length of the Scheme alignment. Therefore, the proposed Scheme has the	

	potential to cause direct impacts to the Natura 2000 site through direct mortalities or severance of hedgerows and other field boundaries that may be used as commuting/foraging corridors by Lesser Horseshoe Bats, and loss of habitats such as woodland, scrub, grassland and open water that may be used for foraging.
Resource requirements (from the Natura 2000 site or from areas in proximity to the site, where of relevance to consideration of impacts)	There would be no impacts in this regard.
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	**Surface Water** There is the potential for the Scheme to generate water-borne pollution, including suspended solids and particulates, hydrocarbons and other chemicals during construction and operation of the Scheme, however will not result in effects on the Glynllifon SAC. The A487 and A499 already run parallel to the site and the site is 1.2km south of the southernmost part of the Scheme. **Air Quality** Air quality assessments conducted for the Scheme concluded that there would be adverse impacts at the roadside of Glynllifon SAC due to increases in traffic on both the A487 and the A499. The significance of the impacts of the enhanced levels of air pollution on the Glynllifon SAC is hard to predict but is unlikely to affect the population of the Lesser Horseshoe Bats significantly. Bats may be exposed to direct effects of air pollution whilst breathing when flying. There are no physiological data on direct effects of air pollution on Lesser Horseshoe Bats or guidelines for air quality standards for them, so the ambient air quality objectives for human health are taken as an indicative guide (NO_2 40 µg/m^3 annual mean; PM_{10} 40 µg/m^3 annual mean). The existing background levels are well within the guidelines (Do minimum; Table 5.3.3), as are the predicted levels (Do something; Table 5.3.4). The ambient air quality objectives for protection of vegetation (which forms the structure of the SAC) for NOx are 30 µg/m^3 annual mean, and again the predicted levels are within the guidelines. Similarly, it is unlikely there would be direct effects on the overall abundance of their invertebrate food resources, such as small flies (mainly midges), moths, caddis flies, lacewings, beetles, wasps and spiders. Furthermore, the 1.4% of the SAC affected by enhanced NOx levels is confined to the edges of the SAC parallel to the roads (up to 18 m from the A499 and up to 23 m from the A487). The total area affected is small compared to the area designated as SAC, or very small to the extensive areas of the wider landscape which the bats may utilise. The daily mean nitrogen oxides concentrations exceed the air quality objective (75µg/m^3) in all cases for up to 105 m from the A499 and 210 m from the A487 and 19.8% of the SAC could be affected by enhanced daily concentrations. However, as the main periods of bat activity during the summer are generally at night (typically about half an hour after dusk until near dawn) when traffics levels are low, the bats are likely to experience much lower than average daily exposures, though there may be

	some overlap with peak evening traffic flow during the spring (April/May onwards) and autumn (September/October). It is possible that deposition of nitrogen-based air pollution might affect either Lesser Horseshoe Bats indirectly through effects on habitats where they forage (the main maternity roosts and hibernation roosts are in buildings or mines and would not be affected by deposition). The Glynllifon SAC has mixed broad-leaved and conifer woodland over areas of bracken, which suits the Lesser Horseshoe Bats which typically feed amongst open woodland in sheltered lowland valleys, in the canopies of mature trees or within 5 m of the ground. The critical loads for nitrogen deposition are 10-20 kg N/ha/yr for broad-leaved woodland and the background deposition levels (16.8-25.6 kg N/ha/yr) are already above these loads (Table 5.3.4). The nitrogen deposition models predict enhanced significantly levels for nitrogen deposition up to 15 m parallel to the A499 and 65 m parallel to the A487. The most likely consequence is a continuing slow change in the composition of the ground flora in these areas with increases in nitrophilous species such as brambles, nettles and grasses, whilst the canopy trees and shrubs remaining broadly the same. Thus the structure will probably remain broadly the same providing similar foraging and feeding roost opportunities as now.
Excavation requirements (e.g. impacts of local hydrogeology)	There will be no impacts on the SAC in this regard due to the distance of the Scheme from the Natura 2000 site.
Transportation requirements	Construction traffic would access the construction site via the existing road network and previously constructed road built as part of this Scheme. There is likely to be localised haulage of excavated materials to achieve cut and fill balances and from the construction of balancing ponds on the north eastern and south western sides of the road near the viaduct. These transportation requirements are not expected to have a significant impact on the SAC, which lies 1.2km from the Scheme.
Duration of construction, operation etc.	The total construction period would be approximately 24 months.
Other	Not applicable
Description of avoidance and/or mitigation measures - plainly established and uncontroversial (PEU) measures only; detailed mitigation measures would be developed in a Stage 2 Assessment, if necessary.	
Nature and location of proposals	**Runoff** The Scheme would follow mandatory guidance given in the Design Manual for Roads and Bridges (DMRB) HD 33/06 which gives '*Standard guidance on the selection of the types of surface and subsurface drainage for trunk roads'*. The Scheme may also incorporate the use of soakaways, which are addressed in HA 118/06, concerning the design of soakaways. This advises on how *'soakaways may be incorporated into systems used to treat and store road runoff prior to discharging to ground'.* **Surface Runoff/ Water** The use of attenuation ponds for the storage and settlement of surface runoff from roads is recommended by the Design Manual for Roads and Bridges (DMRB) in Part 1 of HA 103/06 *Vegetated Drainage Systems for Highway Runoff*. This guidance would be followed throughout the Scheme including in the design and construction of attenuation ponds.

	All new or retained land drainage culverts would convey a 1% (1 in 100 year) chance flow including 20% allowance for climate change. Checks would also be made to ensure that a 0.1% (1 in 1000 year) chance event does not increase flood risk in the locality. A total of twenty-two structures would be constructed to deal with existing watercourses crossed by the Scheme. These would consist of wide-span bridges and precast reinforced concrete pipes and box sections. **Construction** Pollution prevention measures would be used during construction, for example the control of run-off to existing surface drains and the use of silt traps, bunding and the establishment of settling ponds, lagoons and temporary oil interceptors to prevent silt run-off and/or uncontrolled pollution events. Measures would be designed in accordance with Natural Resources Wales Pollution Prevention Guidelines (PPG5). **Lighting** Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs. At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction. The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts. The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.
Evidence for effectiveness	All of the above PEU mitigation measures would follow approved methods of mitigation, such as the standards provided in DMRB guidance.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	The contractor would be contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this will be the Register of Commitments (ROC), which would list the obligations made in documents, such as the overall Environmental Statement for the proposed Scheme. The delivery team's Environmental Coordinator and Environmental Clerk of Works (who will be a full time member of staff on site during construction) will be responsible for the implementation and monitoring of the CEMP. The delivery team would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP shall contain procedures for checking, auditing and corrective action.
Assessment Criteria - Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	
Construction impacts: • Generation of disturbance to Lesser Horseshoe Bat (LHB) roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme. • Loss of potential LHB commuting routes and foraging areas due to site clearance.	

- Disruption of potential LHB commuting routes due to removal of linear features or construction lighting.
- Disruption to LHB foraging areas due to construction lighting.

Operational impacts:

- Disturbance to LHBs or disruption of LHB roost use or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
- Continued fragmentation of potential commuting routes and associated prevention of access to foraging areas through 'barrier effect' created by operational Scheme.
- Risk of injury/incidental killing to LHBs crossing the Scheme carriageway.

In combination impacts

- There is potential for a cumulative effect with the Scheme in relation to LHB as there is a known roost within the brickworks. The magnitude and significance of this impact cannot be determined at present with the information provided

Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There would be no land-take within Glynllifon SAC, and so there will be no reduction of habitat area within the Natura 2000 site; however, the Scheme would result in the loss of hedgerows and treelines within the footprint of the Scheme, that may be used by foraging or commuting LHB from Glynllifon SAC, and other habitats such as woodlands, scrub, grasslands and wetlands, that may be used for foraging.
Disturbance to key species	• The construction phase of the proposed Scheme may result in disturbance of LHB roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme. • The operational phase of the proposed Scheme may also result in disturbance to LHBs or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
Habitat or species fragmentation	• The Scheme would result in the fragmentation of habitats such as woodlands, hedgerows and treelines outside the SAC that may be used by LHB from Glynllifon as potential commuting routes or foraging areas. • The operational Scheme would create a 'barrier effect' and may result in the fragmentation of LHB populations.
Reduction in species density	• The potential disturbance, disruption and fragmentation effects of the Scheme may result in a reduction in population densities of LHB in the vicinity of the Scheme and could affect the population within the Glynllifon SAC. • The operational phase of the Scheme may also result in mortalities of LHBs crossing the Scheme carriageway.
Changes in key indicators of conservation value (water quality, etc)	The key indicator of conservation value of the SAC is the LHB population within the site. A reduction in the numbers of LHB caused by the Scheme would suggest the Scheme had had an adverse impact on the SAC qualifying feature.
Climate change	The potential impacts of climate change on the qualifying interests of the site are uncertain, but it is not expected that the proposed Scheme would exacerbate the impacts of climate change on the SAC.
Likely impacts on the Natura 2000 site as a whole in terms of:	

Interference with the key relationships that define the structure and function of the site	Potential effects on LHB as described above.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	The loss of habitats such as woodlands, hedgerows and treelines within the footprint of the Scheme could have fragmentation effects on LHB populations as described above. The significance of this impact is considered to be **large adverse**.
Loss/reduction in species density	The significance of the potential reduction in LHB density is considered to be **large adverse**.
Habitat or species fragmentation	The significance of the potential fragmentation of LHB populations is considered to be **large adverse**.
Disruption of key species	The significance of the disruption of LHB as described above is considered to be **large adverse**.
Disturbance to key species	The significance of the disturbance of LHB as described above is considered to be **large adverse**.
Change to key elements of the site (e.g. water quality, hydrological regime etc)	The significance of impacts to LHB, which is the key element of the site, is considered to be **large adverse**.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	
The Scheme has the potential to have significant effects on LHB, the key element of the SAC, through disruption of potential commuting routes, reduction in foraging areas, disruption, disturbance and potential injuries/mortalities.	
Outcome of screening stage	**Significant Effects are Likely**
Are the appropriate statutory environmental bodies in agreement with this conclusion? (*delete as appropriate and attach relevant correspondence).*	**YES/ NO**

Project name	**A487 Caernarfon and Bontnewydd Bypass**	
Natura 2000 site under consideration	**Meirionnydd Oakwoods and Bat Sites SAC**	
Date:	**Author:**	**Verified:**
June 2016	J Hamilton/ S Shove	L Jones
Brief Description of Project		
The proposed Scheme consists of a new 9.7km highway commencing at the Goat roundabout (A499/A487 junction) and terminating at the Plas Menai Roundabout. In addition to the major construction there would also be on-line improvements to the existing trunk road, comprising improvements to existing junctions, traffic management, parking restrictions and improving visibility at junctions.		
Brief Description of the Natura 2000 Site		
Name and EU Code of Natura 2000 site	Meirionnydd Oakwoods and Bat Sites – UK0014789	
Site designation status (e.g. SAC, SPA, SSSI)	SAC, SSSI	
Site size	1832.55ha	
Location and distance from the Scheme	The Meirionnydd Oakwoods and Bat Sites SAC comprises a number of scattered sites, lying between 14km and 30km of the Scheme. The closest of these sites occurs at Beddgelert, 14.7km southeast of the most southerly point on the Scheme at Llanwnda.	
Key features of the European Site including the primary reasons for selection and any other qualifying interests	• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with Alnus glutinosa and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • North Atlantic wet heaths with Erica tetralix • European dry heaths • Tilio-Acerion forests of slopes, screes and ravines • Bog woodland • **Lesser horseshoe bat (*Rhinolophus hipposideros*)*** *** Due to the distance of the Meirionnydd Oakwoods and Bat Sites SAC, the only qualifying feature of the site likely to be affected by the works is Lesser Horseshoe Bat. Therefore, this feature alone is considered in the remainder of the Screening Matrix.**	
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	From the Natura 2000 Standard Data Form for the site: *'Management of the key features of these woodlands i.e. the Atlantic bryophyte and lichen assemblages requires light grazing of the field layer vegetation, usually by sheep grazing. This must be balanced against the requirements to allow natural regeneration of trees. Within the NNRs, fencing is maintained to allow grazing regimes ranging from total exclusion to relatively heavy periodic grazing. Mosses and liverworts in gorges where recreational activities such as gorge-walking and extreme canoeing take place are threatened by over-use.* *A Code of Conduct is being drawn up, combined with restrictions on use. There are CCW management plans for the areas declared as National Nature Reserves. In other areas there are S15 management agreements with landowners and occupiers where appropriate grazing regimes have been implemented. Feral goats present within some of the sites require careful*	

	control to prevent bark-stripping and browsing damage to sapling and seedling trees. CCW undertakes annual monitoring of the herds throughout the cSAC and implements control measures when numbers exceed set limits. *Due to the very acid nature of the soils throughout the woodlands, they are vulnerable to acidification. In the past the heathland has been threatened by inappropriate burning/grazing and afforestation. These issues are being addressed through agri-environment schemes (Tir Cymen/Tir Gofal) and S15 Management Agreements. The populations of Lesser Horseshoe Bats are most vulnerable in their summer and winter roosts. They are also affected by a reduction in the availability of insect prey due to changes in agricultural practices and pesticide use. Roosts are most often protected through the planning system, by incorporating the bats' requirements into the plans at an early stage. Also many roosts in mine adits have now been grilled to prevent disturbance to hibernating bats.'*
Natura 2000 site conservation objectives – where these are readily available	See Section 3 of the main SIAA text for the Conservation Objectives and Appendix A of the SIAA for Performance Indicators.
Scheme interaction with the Natura 2000 site Describe any likely direct, indirect or secondary impacts of the Scheme on the Natura 2000 site by virtue of the following:	
Size and scale (road type and probable traffic volume)	The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land will be required for temporary works associated with the Scheme. Predicted traffic volumes for the Scheme for 2018 are 7032 (light vehicles) and 953 (heavy vehicles) over a 12 hour period.
Land-take within Natura 2000 site	There would be no land take within the SAC.
Distance from the European Site or key interests of the site (from the edge of the project assessment corridor)	The SAC is 14.7km from the Scheme at its closest point; however, Lesser Horseshoe Bats, which are the reason for the site's designation, are known to range over areas of up to 30km, and this species has been recorded along the length of the Scheme alignment. Therefore, the proposed Scheme has the potential to cause direct impacts to the Natura 2000 site through direct mortalities or severance of hedgerows and other field boundaries that may be used as commuting/foraging corridors by Lesser Horseshoe Bats, and habitats such as woodland, scrub, grassland and open water that may be used for foraging.
Resource requirements (from the Natura 2000 site or from areas in proximity to the site, where of relevance to consideration of impacts)	There will be no impacts in this regard.
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	**Surface Water** There is the potential for the Scheme to generate water-borne pollution, including suspended solids and particulates, hydrocarbons and other chemicals during construction and operation of the Scheme, however this is unlikely to cause a significant impact due to the distance of the Scheme from the SAC. **Air quality**

	No impacts on the Meirionnydd Oakwoods and Bat Sites SAC were identified in a study of the potential air quality impacts of the Scheme.
Excavation requirements (e.g. impacts of local hydrogeology)	There will be no impacts on the SAC in this regard.
Transportation requirements	Construction traffic would access the site via the existing road network and previously constructed road built as part of this Scheme. There would likely be localised haulage of excavated materials to achieve cut and fill balances and from the construction of balancing ponds on the north eastern and south western sides of the road near the viaduct. These transportation requirements are not expected to have a significant impact on the SAC.
Duration of construction, operation etc.	The total construction period is expected to be approximately 24 months.
Other	Not applicable
Description of avoidance and/or mitigation measures - plainly established and uncontroversial (PEU) measures only; detailed mitigation measures would be developed in a Stage 2 Assessment, if necessary.	
Nature and location of proposals	**Runoff** The Scheme would follow mandatory guidance given in the Design Manual for Roads and Bridges (DMRB) HD 33/06 which gives '*Standard guidance on the selection of the types of surface and subsurface drainage for trunk roads'*. There is already a significant road network in this area, and there is a potential for cumulative effects with regard to runoff and atmospheric pollution but this is unlikely to cause any significant impact on the Site. **Surface Runoff/ Water** The use of attenuation ponds for the storage and settlement of surface runoff from roads is recommended by the Design Manual For Roads and Bridges (DMRB) in Part 1 of HA 103/06 *Vegetated Drainage Systems for Highway Runoff*. This guidance would be followed throughout the Scheme including in the design and construction of attenuation ponds. All new or retained land drainage culverts would convey a 1% (1 in 100 year) chance flow including 20% allowance for climate change. Checks would also be made to ensure that a 0.1% (1 in 1000 year) chance event does not increase flood risk in the locality. A total of twenty-two structures would be constructed to deal with existing watercourses crossed by the Scheme. These would consist of wide-span bridges and precast reinforced concrete pipes and box sections. **Construction** Pollution prevention measures would be used during construction, for example the control of run-off to existing surface drains and the use of silt traps, bunding and the establishment of settling ponds, lagoons and temporary oil interceptors to prevent silt run-off and/or uncontrolled pollution events. Measures would be designed in accordance with Natural Resources Wales Pollution Prevention Guidelines (PPG5).

Evidence for effectiveness	All of the above PEU mitigation measures would follow approved methods of mitigation, such as the standards provided in DMRB guidance.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	The contractor would be contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this will be the Register of Commitments (ROC), which would list the obligations made in documents, such as the overall Environmental Statement for the proposed Scheme. The delivery team's Environmental Coordinator and Environmental Clerk of Works (who would be a full time member of staff on site during construction) would be responsible for the implementation and monitoring of the CEMP. The delivery team would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP would contain procedures for checking, auditing and corrective action. **Lighting** Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs. At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction. The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts. The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.

Assessment Criteria - Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.

Construction:

- Generation of Disturbance to Lesser Horseshoe Bat (LHB) roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme
- Loss of potential LHB commuting routes and foraging areas due to site clearance.
- Disruption of potential LHB commuting routes due to removal of linear features or construction lighting.
- Disruption to LHB foraging areas due to construction lighting.

Operational impacts:

- Disturbance to LHBs or disruption of LHB roost use or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
- Continued fragmentation of potential commuting routes and associated prevention of access to foraging areas through 'barrier effect' created by operational Scheme.
- Risk of injury/incidental killing to LHBs crossing the Scheme carriageway.

In combination impacts

- There is potential for a cumulative effect with the Scheme in relation to LHB as there is a known roost within the brickworks. The magnitude and significance of this impact cannot be determined at present with the information provided

Initial Assessment

The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There would be no land-take within Meirionnydd Oakwoods and Bat Sites SAC, and so there would be no reduction of habitat area within the Natura 2000 site; however, the Scheme would result in the loss of hedgerows and treelines within the footprint of the Scheme, that may be used by foraging or commuting LHB from Meirionnydd Oakwoods and Bat Sites SAC, and other habitats such as woodlands, scrub, grasslands and wetlands, that may be used for foraging.
Disturbance to key species	• The construction phase of the proposed Scheme may result in disturbance of LHB roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme. • The operational phase of the proposed Scheme may also result in disturbance to LHBs or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
Habitat or species fragmentation	The proposed Scheme would result in the fragmentation of habitats such as woodlands, hedgerows and treelines outside the SAC that may be used by LHB from Meirionnydd Oakwoods and Bat Sites as potential commuting routes or foraging areas. The operational Scheme would create a 'barrier effect' and may result in the fragmentation of LHB populations.
Reduction in species density	• The potential disturbance, disruption and fragmentation effects of the Scheme may result in a reduction in population densities of LHB in the vicinity of the Scheme and could affect the population within the Meirionnydd Oakwoods and Bat Sites SAC. • The operational phase of the Scheme may also result in mortalities of LHBs crossing the Scheme carriageway.
Changes in key indicators of conservation value (water quality, etc)	The key indicator of conservation value of the SAC is the LHB population within the site. A reduction in the numbers of LHB caused by the Scheme would suggest the Scheme had had an adverse impact on the SAC qualifying feature.
Climate change	The potential impacts of climate change on the qualifying interests of the site are uncertain, but it is not expected that the proposed Scheme would exacerbate the impacts of climate change on the SAC.
Likely impacts on the Natura 2000 site as a whole in terms of:	
Interference with the key relationships that define the structure and function of the site	Potential effects on LHB as described above.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	The loss of habitats such as woodlands, hedgerows and treelines within the footprint of the Scheme could have fragmentation effects on LHB populations as described above. The significance of this impact is considered to be **moderate adverse**.
Loss/reduction in species density	The significance of the potential reduction in LHB density is considered to be **large adverse**.
Habitat or species fragmentation	The significance of the potential fragmentation of LHB populations is considered to be **large adverse**.
Disruption of key species	The significance of the disruption of LHB as described above is considered to be **large adverse**.
Disturbance to key species	The significance of the disturbance of LHB as described above is considered to be **large adverse**.

Change to key elements of the site (e.g. water quality, hydrological regime etc)	The significance of impacts to LHB, which is the key element of the site, is considered to be **large adverse**.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	
The Scheme has the potential to have significant effects on LHB, a key element of the SAC, through disruption of potential commuting routes, reduction in foraging areas, disruption, disturbance and potential injuries/mortalities.	
Outcome of screening stage	**Significant Effects are Likely**
Are the appropriate statutory environmental bodies in agreement with this conclusion? (*delete as appropriate and attach relevant correspondence).*	**YES/ NO**

Project name	**A487 Caernarfon and Bontnewydd Bypass**	
Natura 2000 site under consideration	**Gwydir Forest Mines SAC**	
Date:	**Author:**	**Verified:**
June 2016	J Hamilton/ S Shove	L Jones
Brief Description of Project		
The proposed Scheme consists of a new 9.7km highway commencing at the Goat roundabout (A499/A487 junction) and terminating at the Plas Menai Roundabout. In addition to the major construction there would also be on-line improvements to the existing trunk road, comprising improvements to existing junctions, traffic management, parking restrictions and improving visibility at junctions.		
Brief Description of the Natura 2000 Site		
Name and EU Code of Natura 2000 site	**Gwydir Forest Mines - UK0030161**	
Site designation status (e.g. SAC, SPA, SSSI)	SAC, SSSI	
Site size	39.75ha	
Location and distance from the Scheme	At its closest point, this site is located 24.9km from the Scheme boundary.	
Key features of the European Site including the primary reasons for selection and any other qualifying interests	*Calaminiarian* grasslands of the *Violetalia calaminariae* **Lesser Horseshoe Bat (*Rhinolophus hipposideros*)*** ***As a highly mobile species, Lesser Horseshoe Bat is the only feature of this site which is likely to be affected by the Scheme, and so only this feature is considered hereafter in the Screening Assessment.**	
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	From the Natura 2000 Standard Data Form for the site: *'The component grassland sites are generally unmanaged and are not used recreationally. The SAC will require continued monitoring for purposes such as the assessment of conifer encroachment, as well as an agreement with the site owners to effect positive management.'*	
Natura 2000 site conservation objectives – where these are readily available	See Section 3 of the main SIAA text for the Conservation Objectives and Appendix A of the SIAA for Performance Indicators.	
Scheme interaction with the Natura 2000 site Describe any likely direct, indirect or secondary impacts of the Scheme on the Natura 2000 site by virtue of the following:		
Size and scale (road type and probable traffic volume)	The Scheme would be 9.7km in length, and would have a permanent land take of 71.67ha. A further 51.28ha of land will be required for temporary works associated with the Scheme. Predicted traffic volumes for the Scheme for 2018 are 7032 (light vehicles) and 953 (heavy vehicles) over a 12 hour period.	
Land-take within Natura 2000 site	There would be no land take within the SAC.	
Distance from the European Site or key interests of the site (from the edge of the project assessment corridor)	At its nearest point, the Gwydir Forest Mines SAC lies 24.9km from the Scheme corridor. At this distance, the only element of the site that may be affected is the Lesser Horseshoe Bat, a highly mobile species. Lesser Horseshoe Bats, which are the reason for the site's designation, are known to range over areas of up to 30km, and this species has been recorded along the length of the Scheme alignment. Therefore, the proposed Scheme has the potential to cause direct impacts to the Natura 2000 site through direct mortalities or severance of hedgerows and other field boundaries that may be used as commuting/foraging corridors by Lesser Horseshoe Bats, and	

	habitats such as woodland, scrub, grassland and open water that may be used for foraging.
Resource requirements (from the Natura 2000 site or from areas in proximity to the site, where of relevance to consideration of impacts)	No impacts are expected in this regard.
Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	**Surface Water** There is the potential for the Scheme to generate water-borne pollution, including suspended solids and particulates, hydrocarbons and other chemicals during construction and operation of the Scheme, however this is unlikely to cause a significant impact due to the distance of the Scheme from the SAC. **Air pollution** No impacts on the Gwydir Forest Mines SAC were identified in a study of the potential air quality impacts of the Scheme.
Excavation requirements (e.g. impacts of local hydrogeology)	Any excavation works are not expected to have any discernible impact on the site, due to being 24.6km from the Scheme.
Transportation requirements	Construction traffic would access the site via the existing road network and previously constructed road built as part of this Scheme. There would likely be localised haulage of excavated materials to achieve cut and fill balances and from the construction of balancing ponds on the north eastern and south western sides of the road near the viaduct. These transportation requirements are not expected to have a significant impact on the SAC.
Duration of construction, operation etc.	The total construction period is expected to be approximately 24 months.
Other	Not applicable
Description of avoidance and/or mitigation measures - plainly established and uncontroversial (PEU) measures only; detailed mitigation measures would be developed in a Stage 2 Assessment, if necessary.	
Nature and location of proposals	**Runoff** The Scheme would follow mandatory guidance given in the Design Manual for Roads and Bridges (DMRB) HD 33/06 which gives '*Standard guidance on the selection of the types of surface and subsurface drainage for trunk roads'*. The Scheme may also incorporate the use of soakaways, which are addressed in HA 118/06, concerning the design of soakaways. This advises on how *'soakaways may be incorporated into systems used to treat and store road runoff prior to discharging to ground'.* **Surface Runoff/ Water** The use of attenuation ponds for the storage and settlement of surface runoff from roads is recommended by the Design Manual for Roads and Bridges (DMRB) in Part 1 of HA 103/06 *Vegetated Drainage Systems for Highway Runoff*. This guidance would be followed throughout the Scheme including in the design and construction of attenuation ponds. All new or retained land drainage culverts would convey a 1% (1 in 100 year) chance flow including 20% allowance for climate change. Checks would also be made to ensure that a 0.1% (1 in

	1000 year) chance event does not increase flood risk in the locality. A total of twenty-two structures would be constructed to deal with existing watercourses crossed by the Scheme. These would consist of wide-span bridges and precast reinforced concrete pipes and box sections. **Construction** Pollution prevention measures would be used during construction, for example the control of run-off to existing surface drains and the use of silt traps, bunding and the establishment of settling ponds, lagoons and temporary oil interceptors to prevent silt run-off and/or uncontrolled pollution events. Measures would be designed in accordance with Natural Resources Wales Pollution Prevention Guidelines (PPG5). **Lighting** Meifod Roundabout would be provided with full standard lighting for the roundabout itself and the existing A487 spurs. At Cibyn a 'ring of light' would be provided for the roundabout with the existing A4086 towards Caernarfon only being fully lit in order to link with the existing lighting at Cibyn Industrial Estate junction. The Bypass mainline spurs would not be lit on Meifod and Cibyn roundabouts. The lighting provision to the existing Bethel Roundabout is not in accordance with current standards. To minimise the ecological impacts, the proposed Bethel Roundabout would require lighting to the same standards as the existing Bethel Roundabout.
Evidence for effectiveness	All of the above PEU mitigation measures would follow approved methods of mitigation, such as the standards provided in DMRB guidance.
Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	The contractor would be contractually obliged to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme. Central to this will be the Register of Commitments (ROC), which would list the obligations made in documents, such as the overall Environmental Statement for the proposed Scheme. The delivery team's Environmental Coordinator and Environmental Clerk of Works (who will be a full time member of staff on site during construction) will be responsible for the implementation and monitoring of the CEMP. The delivery team would monitor, measure and review the environmental performance against the commitments, objectives and targets/key performance indicators identified in the CEMP (contained in the ROC). The CEMP shall contain procedures for checking, auditing and corrective action.
Assessment Criteria - Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	
Construction impacts: • Generation of Disturbance to Lesser Horseshoe Bat (LHB) roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme • Loss of potential LHB commuting routes and foraging areas due to site clearance. • Disruption of potential LHB commuting routes due to removal of linear features or construction lighting. • Disruption to LHB foraging areas due to construction lighting.	

Operational impacts:

- Disturbance to LHBs or disruption of LHB roost use or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
- Continued fragmentation of potential commuting routes and associated prevention of access to foraging areas through 'barrier effect' created by operational Scheme.
- Risk of injury/incidental killing to LHBs crossing the Scheme carriageway.

In combination impacts

- There is potential for a cumulative effect with the Scheme in relation to LHB as there is a known roost within the brickworks. The magnitude and significance of this impact cannot be determined at present with the information provided

Initial Assessment The key characteristics of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There would be no land-take within Gwydir Forest Mines SAC, and so there would be no reduction of habitat area within the Natura 2000 site; however, the Scheme would result in the loss of hedgerows and treelines within the footprint of the Scheme, that may be used by foraging or commuting LHB from the Gwydir Forest Mines SAC, and other habitats such as woodlands, scrub, grasslands and wetlands, that may be used for foraging.
Disturbance to key species	• The construction phase of the Scheme may result in disturbance of LHB roosts in the vicinity of the Scheme due to noise, vibration, lighting or blasting during the construction phase of the Scheme. • The operational phase of the Scheme may also result in disturbance to LHBs or retained roosts close to the Scheme. Such effects could result from lighting (lighting columns or vehicle headlamps) or noise associated with operation of the Scheme.
Habitat or species fragmentation	• The Scheme would result in the fragmentation of habitats such as woodlands, hedgerows and treelines outside the SAC that may be used by LHB from the Gwydir Forest Mines SAC as potential commuting routes or foraging areas. • The operational Scheme would create a 'barrier effect' and may result in the fragmentation of LHB populations.
Reduction in species density	• The potential disturbance, disruption and fragmentation effects of the Scheme may result in a reduction in population densities of LHB in the vicinity of the Scheme and could affect the population within the Gwydir Forest Mines SAC. • The operational phase of the Scheme may also result in mortalities of LHBs crossing the Scheme carriageway.
Changes in key indicators of conservation value (water quality, etc)	The key indicator of conservation value of the SAC is the LHB population within the site. A reduction in the numbers of LHB caused by the Scheme would suggest the Scheme had had an adverse impact on the SAC qualifying feature.
Climate change	The potential impacts of climate change on the qualifying interests of the site are uncertain, but it is not expected that the Scheme would exacerbate the impacts of climate change on the SAC.
Likely impacts on the Natura 2000 site as a whole in terms of:	
Interference with the key relationships that define the structure and function of the site	Potential effects on LHB as described above.

Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	The loss of habitats such as woodlands, hedgerows and treelines within the footprint of the Scheme could have fragmentation effects on LHB populations as described above. Taking account of the distance between the Scheme and the SAC, the significance of this impact is considered to be **slight adverse**.
Loss/reduction in species density	The significance of the potential reduction in LHB density is considered to be **large adverse**.
Habitat or species fragmentation	The significance of the potential fragmentation of LHB populations is considered to be **large adverse**.
Disruption of key species	The significance of the disruption of LHB as described above is considered to be **large adverse**.
Disturbance to key species	The significance of the disturbance of LHB as described above is considered to be **large adverse**.
Change to key elements of the site (e.g. water quality, hydrological regime etc)	The significance of impacts to LHB, which is the key element of the site, is considered to be **large adverse**.
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known:	
The Scheme has the potential to have significant effects on LHB, a key element of the SAC, through disruption of potential commuting routes, reduction in foraging areas, disruption, disturbance and potential injuries/mortalities.	
Outcome of screening stage	**Significant Effects are Likely**
Are the appropriate statutory environmental bodies in agreement with this conclusion? (*delete as appropriate and attach relevant correspondence).*	**YES/ NO**

Appendix E.3 – Phase 1 Target Notes

APPENDIX E.3

The abundances of the individual species provided are based on the DAFOR scale where D = Dominant, cD = Co-dominant, A = Abundant, F = Frequent, O = Occasional and R = Rare. Where species are locally more abundant within the sward than overall L is added to the scale above to denote local dominance, abundance, frequent etc.

These abundances are not representative of the wider distribution of the species but a reflection of their extent and relative abundance within the habitat sward.

Target Note 1 – Broadleaf plantation beside residential area and footpath, mown grassland beside A487, some dead wood, standing and fallen, stone wall to east boundary separating woodland and grass verge, ditch along west edge beside footpath, damp not wet at the time of survey, ditches through wood, wetter but no obvious flow, scrub to southern end now matured to semi-mature woodland habitat.

Species Name	Common Name	Abundance
Acer campestre	Field maple	R
Acer pseudoplatanus	Sycamore	cD
Aesculus hippocastanum	Horse chestnut	O
Allium ursinum	Wild garlic	R/LF
Arum maculatum	Lords and ladies	O
Betula pendula	Silver birch	R
Cardamine pratensis	Cuckoo flower	R
Centaurea nigra	Common knapweed	R
Chamerion angustifolium	Rosebay willowherb	R
Corylus avellana	Hazel	R
Crataegus monogyna	Hawthorn	R
Fallopia japonica	Japanese knotweed	R
Filipendula ulmaria	Meadowsweet	O/LF
Fraxinus excelsior	Ash	R
Galium aparine	Cleavers	R/LF
Geranium robertianum	Herb robert	O/LF
Hedera helix	Ivy	D
Heracleum sphondylium	Hogweed	R
Holcus lanatus	Yorkshire fog	R/LO
Hyacinthoides non-scriptus	Bluebell	R
Ilex aquifolium	Holly	R
Plantago lanceolata	Ribwort plantain	R
Plantago major	Greater plantain	R
Pleurozium schreiberi	Red-stemmed feather moss	F
Primula vulgaris	Primrose	R
Prunus spinosa	Blackthorn	R
Pteridium aquilinum	Bracken	O
Ranunculus acris	Meadow buttercup	R/LF
Rubus fruticosus	Bramble	O
Rumex crispus	Curled dock	R
Rumex obtusifolius	Broad-leaved dock	R
Salix caprea	Goat willow	cD
Silene dioica	Red campion	R
Stellaria media	Common chickweed	R/LO
Taraxacum officinale	Dandelion	R

Species Name	Common Name	Abundance
Ulex europaeus	European gorse	R/LO
Urtica dioica	Stinging nettle	O/LF
Veronica chamaedrys	Germander speedwell	R
Vicia sativa	Common vetch	R

Target Note 2 – Woodland behind houses, mixed broadleaf and conifer species, ornamental species also present, amenity grassland and garden vegetation beneath, fairly frequently mown, bluebells within the road verge, northern end is dominated by open grassland.

Species Name	Common Name	Abundance
Abies sp	Conifer sp	cD
Acer pseudoplatanus	Sycamore	cD
Aesculus hippocastanum	Horse chestnut	O
Cardamine pratensis	Cuckoo flower	O
Carpinus betulus	Hornbeam	O
Cotoneaster sp	Cotoneaster	R
Galium aparine	Cleavers	R/LF
Hedera helix	Ivy	F/LA
Heracleum sphondylium	Hogweed	R
Ilex aquifolium	Holly	R
Narcissus pseudonarcissus	Daffodil	R
Primula vulgaris	Primrose	R
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	O/LF
Salix fragilis	Crack willow	cD
Taraxacum officinale	Dandelion	O
Ulex europaeus	European gorse	O
Urtica dioica	Stinging nettle	F

Target Note 3 – Area of broadleaf woodland beside the existing railway, heavily grazed (sheep) beneath resulting in a limited understorey.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	A
Corylus avellana	Hazel	O
Geranium robertianum	Herb robert	F
Hedera helix	Ivy	A
Ilex aquifolium	Holly	F
Juncus effusus	Soft rush	R/vLO
Pteridium aquilinum	Bracken	O
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	R/LO
Salix caprea	Goat willow	D
Salix cinerea	Grey willow	O
Ulex europaeus	European gorse	O
Urtica dioica	Stinging nettle	O/LF

Target Note 4 – Broadleaf woodland, generally wet ground conditions, very wet/ standing water in places, stream through centre, scrub/less mature area to north is denser but has a similar species composition, grazed (sheep) beneath but not as heavily as other woodlands in the area.

Species Name	Common Name	Abundance
Caltha palustris	Marsh marigold	R
Corylus avellana	Hazel	F
Dryopteris filix-mas	Common male fern	O
Geranium robertianum	Herb robert	R/LO
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	R/LO
Ilex aquifolium	Holly	O
Iris pseudacorus	Yellow flag iris	R
Juncus effusus	Soft rush	R/LF
Lonicera periclymenum	Honeysuckle	R
Pleurozium schreiberi	Red-stemmed feather moss	A
Pteridium aquilinum	Bracken	O
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	R
Salix caprea	Goat willow	D
Salix cinerea	Grey willow	O
Tortula ruralis	Star moss	O
Ulex europaeus	European gorse	R
Urtica dioica	Stinging nettle	R/LO

Target Note 5 – Broadleaf woodland, wet ditches to the eastern, northern and southern boundaries, grazed (sheep) beneath, some of the existing stone walls have resulted in the creation of standing water, some fallen ash and willow trees although these are still in leaf with new growth.

Species Name	Common Name	Abundance
Caltha palustris	Marsh marigold	R/LF
Cardamine pratensis	Cuckoo flower	R
Corylus avellana	Hazel	cD
Dryopteris filix-mas	Common male fern	O
Fagus sylvatica	Beech	R
Filipendula ulmaria	Meadowsweet	R/LO
Fraxinus excelsior	Ash (sapling)	R
Geranium robertianum	Herb robert	R/LO
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	O/LF
Ilex aquifolium	Holly	O
Iris pseudacorus	Yellow flag iris	R
Lonicera periclymenum	Honeysuckle	R
Pleurozium schreiberi	Red-stemmed feather moss	A
Pteridium aquilinum	Bracken	F
Quercus robur	Common oak	R
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	R
Salix cinerea	Grey willow	cD
Tortula ruralis	Star moss	O/LF
Ulex europaeus	European gorse	R
Urtica dioica	Stinging nettle	R

Target Note 6 – Broadleaf woodland, wet, ditches to the western, northern and southern boundaries, area of marshy grassland to east, both areas are relatively heavily grazed (sheep).

Species Name	Common Name	Abundance
Corylus avellana	Hazel	cD
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	O
Ilex aquifolium	Holly	R
Juncus effusus	Soft rush	F
Pleurozium schreiberi	Red-stemmed feather moss	F/LA
Pteridium aquilinum	Bracken	O
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	R
Salix caprea	Goat willow	cD
Salix cinerea	Grey willow	F
Tortula ruralis	Star moss	O
Urtica dioica	Stinging nettle	R

Target Note 7 – Broadleaf woodland habitat on rail embankment, drainage ditch along the base of the embankment to the western boundary, dry at the time of survey, which joins the Afon Gwyrfai to north, bank top dominated by grass verges along the tarmac footpath and railway.

Woodland vegetation

Species Name	Common Name	Abundance
Acer campestre	Field maple	F
Acer pseudoplatanus	Sycamore	cD
Arum maculatum	Lords and ladies	R
Corylus avellana	Hazel	R
Crataegus monogyna	Hawthorn	D
Digitalis purpurea	Foxglove	R
Fraxinus excelsior	Ash	cD
Geranium robertianum	Herb robert	O
Hedera helix	Ivy	A
Hyacinthoides non-scriptus	Bluebell	R/LF
Ilex aquifolium	Holly	R
Mercurialis annua	Annual mercury	O/LA
Phyllitis scolopendrium	Hart's tongue	F
Plantago lanceolata	Ribwort plantain	R
Prunus spinosa	Blackthorn	R/LO
Pteridium aquilinum	Bracken	O
Quercus robur	Common oak	R
Rosa sp	Rose sp	R
Rubus fruticosus	Bramble	F/LA
Stellaria media	Common chickweed	R
Urtica dioica	Stinging nettle	O/LF
Viola riviniana	Common dog violet	R

Grassland vegetation

Species Name	Common Name	Abundance
Anthoxanthum odoratum	Sweet vernal grass	R
Anthriscus sylvestris	Cow parsley	R

Species Name	Common Name	Abundance
Arum maculatum	Lords and ladies	R
Cardamine pratensis	Cuckoo flower	R
Convolvulus arvensis	Field bindweed	R
Festuca pratensis	Meadow fescue	F
Galium aparine	Cleavers	A/LD
Geranium dissectum	Cut-leaved cranesbill	R
Geranium robertianum	Herb robert	cD
Heracleum sphondylium	Hogweed	R
Holcus lanatus	Yorkshire fog	R
Lamium album	White dead-nettle	R
Plantago lanceolata	Ribwort plantain	A/LD
Pleurozium schreiberi	Red-stemmed feather moss	O
Poa annua	Annual meadow grass	O
Ranunculus acris	Meadow buttercup	F
Ranunculus bulbosus	Bulbous buttercup	R
Rubus fruticosus	Bramble	R
Rumex obtusifolius	Broad-leaved dock	R
Silene dioica	Red campion	R
Taraxacum officinale	Dandelion	cD
Trifolium pratense	Red clover	O
Trifolium repens	White clover	R
Urtica dioica	Stinging nettle	F/LA
Veronica chamaedrys	Germander speedwell	R/LF
Veronica hederifolia	Ivy-leaved speedwell	R/LO

Target Note 8 – Broadleaf woodland habitat on railway embankment, grass verges dominate the top of the bank beside a tarmac footpath and adjacent rail tracks, the Afon Gwyrfai runs to the south of this area.

Woodland vegetation

Species Name	Common Name	Abundance
Acer campestre	Field maple	R
Acer pseudoplatanus	Sycamore	cD
Arum maculatum	Lords and ladies	R
Carpinus betulus	Hornbeam	R
Corylus avellana	Hazel	O/LF
Crataegus monogyna	Hawthorn	D
Fraxinus excelsior	Ash	cD
Geranium robertianum	Herb robert	F
Hedera helix	Ivy	A
Hyacinthoides non-scriptus	Bluebell	R
Ilex aquifolium	Holly	R
Lonicera periclymenum	Honeysuckle	R
Phyllitis scolopendrium	Hart's tongue	O
Primula vulgaris	Primrose	R
Prunus spinosa	Blackthorn	F
Pteridium aquilinum	Bracken	R
Quercus robur	Common oak	R
Rosa sp	Rose sp	R
Salix caprea	Goat willow	R/LO
Sambucus nigra	Elder	R

Species Name	Common Name	Abundance
Silene dioica	Red campion	O

Grassland vegetation

Species Name	Common Name	Abundance
Anthoxanthum odoratum	Sweet vernal grass	R
Arum maculatum	Lords and Ladies	R
Bellis perennis	Daisy	R
Bromus mollis	Soft brome	R/LF
Cirsium arvense	Creeping thistle	R
Convolvulus arvensis	Field bindweed	R
Dactylis glomerata	Cocksfoot	R
Epilobium hirsutum	Great willowherb	R
Festuca pratensis	Meadow fescue	F
Fragaria vesca	Wild strawberry	R
Galium aparine	Cleavers	F/LA
Geranium dissectum	Cut-leaved cranesbill	R
Geranium robertianum	Herb robert	F
Hedera helix	Ivy	R
Heracleum sphondylium	Hogweed	R
Holcus lanatus	Yorkshire fog	A
Juncus effusus	Soft rush	R
Lotus pedunculatus	Greater birds-foot trefoil	R/LF
Plantago lanceolata	Ribwort plantain	O/LF
Plantago major	Greater plantain	R/LF
Poa annua	Annual meadow grass	O
Poa pratensis	Smooth meadow grass	F/LA
Poa trivialis	Rough meadow grass	F/LA
Prunella vulgaris	Selfheal	R
Ranunculus acris	Meadow buttercup	O/LF
Ranunculus bulbosus	Bulbous buttercup	O
Ranunculus ficaria	Lesser celandine	R
Rubus fruticosus	Bramble	R
Rumex crispus	Curled dock	R/LO
Rumex obtusifolius	Broad-leaved dock	O
Stellaria media	Common chickweed	R
Taraxacum officinale	Dandelion	F/LA
Trifolium repens	White clover	R/LO
Tussilago farfara	Coltsfoot	R/LF
Urtica dioica	Stinging nettle	O/LA
Veronica chamaedrys	Germander speedwell	R/LF
Veronica hederifolia	Ivy-leaved speedwell	R
Vicia sativa	Common vetch	R
Viola riviniana	Common dog violet	R

Target Note 9 – Broadleaf woodland habitat within the western part of Gypsy Wood Park beside a large pond/lake, management is generally limited to certain areas where there is public access while the rest is left generally unmanaged.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O/LF
Aesculus hippocastanum	Horse chestnut	O/LF

Species Name	Common Name	Abundance
Anthoxanthum odoratum	Sweet vernal grass	R
Anthriscus sylvestris	Cow parsley	O
Carex sp	Sedge sp	F
Conopodium majus	Pignut	R
Corylus avellana	Hazel	cD
Crataegus monogyna	Hawthorn	F
Cynosurus cristatus	Crested dogstail	A
Dactylis glomerata	Cocksfoot	F
Dactylorhiza fuchsii	Common spotted orchid	R
Digitalis purpurea	Foxglove	R
Equisetum arvense	Field horsetail	A
Fagus sylvatica	Beech	F
Fraxinus excelsior	Ash	F
Galium aparine	Cleavers	F
Geranium robertianum	Herb robert	O/LF
Glechoma hederacea	Ground ivy	O/LF
Hedera helix	Ivy	O/LF
Holcus lanatus	Yorkshire fog	F/LA
Hyacinthoides hispanica	Spanish bluebell	R
Hyacinthoides non-scriptus	Bluebell	R
Ilex aquifolium	Holly	R
Iris pseudacorus	Yellow flag iris	R/LA
Juncus effusus	Soft rush	O/LA
Lotus corniculatus	Common birds-foot trefoil	R
Lychnis flos-cuculi	Ragged robin	R
Myosotis arvensis	Field forget-me-not	R
Plantago lanceolata	Ribwort plantain	O
Potentilla reptans	Creeping cinquefoil	R
Quercus robur	Common oak	cD
Ranunculus acris	Meadow buttercup	O
Rosa canina	Dog rose	O
Rubus fruticosus	Bramble	F
Rumex acetosa	Common sorrel	O/LF
Salix caprea	Goat willow	A
Silene dioica	Red campion	R
Stachys officinalis	Betony	R
Trifolium pratense	Red clover	O
Trifolium repens	White clover	R
Ulex europaeus	European gorse	R
Urtica dioica	Stinging nettle	F

Target Note 10 – Poor semi-improved grassland within Gypsy Wood Park with a mixed level of management and disturbance, the latter of which in particular increases to western end around visitor centre.

Species Name	Common Name	Abundance
Anthoxanthum odoratum	Sweet vernal grass	F
Carex sp	Sedge sp	O
Cynosurus cristatus	Crested dogstail	F
Deschampsia caespitosa	Tufted hair grass	O
Holcus lanatus	Yorkshire fog	F

Species Name	Common Name	Abundance
Hyacinthoides non-scriptus	Bluebell	R/LF
Iris pseudacorus	Yellow flag iris	R/LF
Juncus effusus	Soft rush	R/LF
Lotus corniculatus	Common birds-foot trefoil	O/LF
Plantago lanceolata	Ribwort plantain	O/LF
Poa annua	Annual meadow grass	F
Potentilla anserina	Silverweed	O
Rumex obtusifolius	Broad-leaved dock	R/LO
Trifolium pratense	Red clover	F
Trifolium repens	White clover	O
Typha latifolia	Bulrush	R/LO
Urtica dioica	Stinging nettle	R/LF

Target Note 11 – Marshy grassland within the northern part of Gypsy Wood Park, tall sward, three ditches run through area with varying degrees of damp and wetness, management generally appears to be minimal and aimed at maintaining a high level of floral diversity.

Species Name	Common Name	Abundance
Alopecurus geniculatus	Marsh foxtail	R
Anthoxanthum odoratum	Sweet vernal grass	O
Apium nodiflorum	Fool's watercress	O
Athyrium filix-femina	Lady fern	O
Caltha palustris	Marsh marigold	O
Carex sp	Sedge sp	F
Cirsium palustre	Marsh thistle	O/LF
Cynosurus cristatus	Crested dogstail	O
Dactylorhiza fuchsii	Common spotted orchid	R
Deschampsia caespitosa	Tufted hair grass	O
Epilobium hirsutum	Great willowherb	F
Equisetum arvense	Field horsetail	F
Hyacinthoides non-scriptus	Bluebell	F
Hypericum sp	St John's wort	R
Iris pseudacorus	Yellow flag iris	A
Juncus acutiflorus	Sharp-flowered rush	F
Juncus effusus	Soft rush	A
Lathyrus pratensis	Meadow vetchling	R/LO
Lotus corniculatus	Common birds-foot trefoil	O/LF
Lychnis flos-cuculi	Ragged robin	O
Lythrum salicaria	Purple loosestrife	O
Mentha aquatica	Water mint	O/LF
Myosotis arvensis	Field forget-me-not	O
Pedicularis sylvatica	Lousewort	R
Plantago lanceolata	Ribwort plantain	F
Potentilla anserina	Silverweed	F
Potentilla reptans	Creeping cinquefoil	O
Prunella vulgaris	Selfheal	R
Rubus fruticosus	Bramble	O
Rumex acetosa	Common sorrel	A
Rumex crispus	Curled dock	O
Rumex obtusifolius	Broad-leaved dock	F

Species Name	Common Name	Abundance
Silene dioica	Red campion	O
Sphagnum sp	Sphagnum	F
Stachys officinalis	Betony	O
Trifolium pratense	Red clover	O
Trifolium repens	White clover	R
Typha latifolia	Bulrush	O/LA
Urtica dioica	Stinging nettle	O

Target Note 12 – Small area of scrub along the boundary of Gypsy Wood Park, behind a residential property to the east of the park entrance, appears to be generally unmanaged.

Species Name	Common Name	Abundance
Carpinus betulus	Hornbeam	O
Corylus avellana	Hazel	A
Galium aparine	Cleavers	O/LA
Hedera helix	Ivy	F
Heracleum sphondylium	Hogweed	R
Quercus robur	Common oak	cD
Rubus fruticosus	Bramble	F
Rumex obtusifolius	Broad-leaved dock	R/LO
Salix caprea	Goat willow	cD
Ulex europaeus	European gorse	O
Urtica dioica	Stinging nettle	R/LF

Target Note 13 – Broadleaf plantation woodland with the plastic protective sheaths still present on some trunks, patches of dense winter heliotrope (Petasites fragrans); ground flora highly variable throughout, ground flora quite mossy with sparse distributions of higher plants, dense understorey of willow in patches. Willow warbler and stone chat recorded within this area during the survey.

Species Name	Common Name	Abundance
Canopy layer		
Acer pseudoplatanus	Sycamore	R
Betula pendula	Silver birch	F
Crataegus monogyna	Hawthorn	F
Corylus avellana	Hazel	A
Fraxinus excelsior	Ash	D
Ilex aquifolium	Holly	O
Prunus avium	Bird cherry	A
Quercus petraea	Sessile oak	A
Salix caprea	Goat willow	F
Sorbus aucuparia	Rowan	O
Field Layer		
Ajuga reptans	Bugle	O
Arum maculatum	Lords and ladies	O
Asplenium scolopendrium	Hart's-tongue fern	F
Centaurea nigra	Black knapweed	LF
Chamerion angustifolium	Rosebay willowherb	LA
Galium aparine	Cleaver	F
Geranium robertianum	Herb robert	F

Species Name	Common Name	Abundance
Epilobium sp.	willowherb	O
Equisetum arvense	Field horsetail	LA
Geum urbanum	Wood-avens	F
Heracleum sphondylium	Hogweed	O
Holcus lanatus	Yorkshire fog	F
Hyacinthoides non-scripta	Bluebell	LF
Lathyrus pratensis	Meadow vetchling	O
Lonicera periclymenum	Honeysuckle	O
Lotus corniculatus	Bird's-foot trefoil	F
Mercurialis perennis	Dog's mercury	O
Ranunculus acris	Meadow buttercup	O
Ranunculus repens	Creeping buttercup	O
Rubus fruticosus	Bramble	D
Rumex crispus	Curled dock	O
Rumex obtusifolius	Broad-leaved dock	O
Silene dioica	Red campion	LF
Taraxacum sp.	Dandelion	O
Trifolium pratense	Red clover	O
Urtica dioica	Stinging nettle	LF
Veronica serpyllifolia	Thyme-leaved speedwell	O
Vicia sativa	Common vetch	O
Viola riviniana	Common dog violet	O

Target Note 14 – Marshy grassland by track, grades into wet willow woodland to the south east.

Species Name	Common Name	Abundance
Angelica sylvestris	Wild angelica	O
Cardamine flexuosa	Wavy bittercress	A
Cirsium palustre	Marsh thistle	O
Filipendula ulmaria	Meadowsweet	D
Galium aparine	Cleavers	O
Geranium robertianum	Herb robert	O
Heracleum sphondylium	Common hogweed	F
Juncus effusus	Soft rush	O
Juncus inflexus	Hard rush	A/D
Ranunculus repens	Creeping buttercup	F
Rubus fruticosus	Bramble	O
Rumex acetosa	Common sorrel	F
Stellaria uliginosa	Bog stitchwort	O
Urtica dioica	Stinging nettle	A

Target Note 15 – Graded sides of quarry/clay pit, quite steep (50°) with lots of loose rock and gravel, recolonising with mosses and higher plants. The previous Phase 1 survey undertaken as part of the Stage 2 Assessment identified this area as woodland suggesting subsequent clearance. The floral species assembly reflects this.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O
Agrostis capillaris	Common bent	F
Ajuga reptans	Bugle	O
Anthoxanthum odoratum	Sweet vernal	O
Chamerion angustifolium	Rosebay willowherb	O

Species Name	Common Name	Abundance
Cirsium palustre	Marsh thistle	O
Digitalis purpurea	Foxglove	O
Hedera helix	Ivy	O
Hieracium sp.	Hawkweed	O
Hypochaeris radicata	Cat's-ear	O
Lotus corniculatus	Bird's-foot trefoil	O
Lysimachia nemorum	Yellow pimpernel	R
Primula vulgaris	Primrose	O
Sorbus aucuparia	Rowan	O
Teucrium scorodonia	Wood sage	O
Trifolium pratense	Red clover	O
Viola reichenbachiana	Early dog-violet	R

Target Note 16 – Dry neutral, unimproved grassland colonised on quarry edge, which is developing into broadleaf woodland at bottom of slope, some large, dense patches of winter heliotrope recorded.

Species Name	Common Name	Abundance
Anthoxanthum odoratum	Sweet vernal	F
Cardamine pratensis	Lady's smock	O
Carex flacca	Glaucous sedge	O
Cerastium fontanum	Common mouse-ear	O
Cynosurus cristatus	Crested dog's-tail	O
Dactylis glomerata	Cock's-foot	D
Lotus corniculatus	Bird's-foot trefoil	A
Luzula campestris	Field woodrush	O
Petasites fragrans	Winter heliotrope	LA
Plantago lanceolata	Plantain	O
Rumex crispus	Curled dock	O
Senecio jacobaea	Common ragwort	O
Trifolium campestre	Hop trefoil	O
Trifolium pratense	Red clover	A
Tussilago farfara	Colt's-foot	F
Vicia hirsuta	Hairy tare	O

Target Note 17 – Marshy grassland, forming a mosaic with scrub and tall ruderal.

Species Name	Common Name	Abundance
Alchemilla xanthochlora	Lady's mantle	O
Cardamine flexuosa	Wavy bittercress	F
Centaurea nigra	Common knapweed	O
Cerastium fontanum	Common mouse-ear	F
Cirsium palustre	Marsh thistle	O
Cynosurus cristatus	Crested dog's-tail	F
Epilobium hirsutum	Great willowherb	O
Galium uliginosum	Fen bedstraw	O
Geranium robertianum	Herb robert	R
Holcus lanatus	Yorkshire fog	F
Juncus effusus	Soft rush	A
Lotus pedunculatus	Greater bird's-foot trefoil	F
Luzula campestris	Field woodrush	O
Plantago lanceolata	Ribwort plantain	F
Poa trivialis	Rough meadowgrass	F

Species Name	Common Name	Abundance
Potentilla angelica	Trailing tormentil	O
Potentilla anserina	Silverweed	F
Potentilla reptans	Creeping cinquefoil	F
Ranunculus acris	Meadow buttercup	O
Ranunculus flammula	Lesser spearwort	O
Ranunculus repens	Creeping buttercup	F
Rumex acetosa	Common sorrel	O
Rumex crispus	Curled dock	O
Rumex obtusifolius	Broad-leaved dock	O
Senecio jacobaea	Common ragwort	O
Silene dioica	Red campion	O
Stellaria uliginosa	Bog stitchwort	O
Taraxacum officinale	Dandelion	O
Trifolium pratense	Red clover	LF
Trifolium repens	White clover	F
Veronica serpyllifolia	Thyme-leaved speedwell	O
Vicia sativa	Common vetch	O

Target Note 18 – Broadleaf woodland and dense scrub covered bank above the Afon Seiont with some tall, mature trees with bat potential.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O
Alnus glutinosa	Alder	O
Crataegus monogyna	Hawthorn	F
Digitalis purpurea	Foxglove	O
Dryopteris filix-mas	Male fern	F
Epilobium sp.	willowherb	F
Hedera helix	Ivy	A
Hyacinthoides non-scripta	Bluebell	F
Impatiens glandulifera	Himalayan balsam	F
Pteridium aquilinum	Bracken	F
Quercus robur	Pedunculate oak	F
Sorbus aria	Common whitebeam	O
Teucrium scorodonia	Wood-sage	F

Target Note 19 – Scrub and tall ruderal mosaic with Himalayan Balsam scattered throughout.

Target Note 20 – Area of dense Himalayan Balsam.

Target Note 21 – Broadleaf woodland on steep bank above river, levelling to top, scrubby edges, relatively dense understorey, gorse to centre of wood with individual scattered trees between.

Species Name	Common Name	Abundance
Abies sp	Conifer sp 1	R
Abies sp	Conifer sp 2	R
Acer campestre	Field maple	R
Agrostis stolonifera	Creeping bent	R/LF
Arum maculatum	Lords and ladies	O
Betula pendula	Silver birch	R
Blechnum spicant	Hard fern	R

Species Name	Common Name	Abundance
Calystegia silvatica	Great bindweed	R
Carex sp	Sedge sp	R/LO
Cerastium fontanum	Common mouse-ear	O/LA
Cirsium vulgare	Spear thistle	R/LA
Convolvulus arvensis	Field bindweed	R
Corylus avellana	Hazel	cD/F
Crataegus monogyna	Hawthorn	cD
Digitalis purpurea	Foxglove	R/LO
Fragaria vesca	Wild strawberry	O
Fraxinus excelsior	Ash	cD
Galium aparine	Cleavers	F/LA
Geranium robertianum	Herb robert	R/LF
Glechoma hederacea	Ground ivy	O/LF
Hedera helix	Ivy	A
Heracleum sphondylium	Hogweed	R
Holcus lanatus	Yorkshire fog	R/LF
Ilex aquifolium	Holly	R/LO
Phyllitis scolopendrium	Hart's tongue	R
Plantago lanceolata	Ribwort plantain	R/LF
Pleurozium schreiberi	Red-stemmed feather moss	A
Potentilla reptans	Creeping cinquefoil	R/LA
Prunus spinosa	Blackthorn	cD
Pteridium aquilinum	Bracken	O/LA
Quercus robur	Common oak	F
Ranunculus acris	Meadow buttercup	R/LF
Ranunculus ficaria	Lesser celandine	O/LF
Rubus fruticosus	Bramble	F
Rumex crispus	Curled dock	R
Rumex obtusifolius	Broad-leaved dock	R/LO
Salix caprea	Goat willow	R
Sambucus nigra	Elder	R
Silene dioica	Red campion	R
Stellaria media	Common chickweed	O/LF
Taraxacum officinale	Dandelion	R
Teucrium scorodonia	Wood sage	R/LO
Ulex europaeus	European gorse	R/LO
Ulex galli	Western gorse	O/LD
Urtica dioica	Stinging nettle	R/LF
Veronica persica	Common field speedwell	R
Viola riviniana	Common dog violet	R

Target Note 22 – Marshy grassland, not very species-diverse despite a relatively tall sward (roughly 30cm).

Species Name	Common Name	Abundance
Alopecurus pratensis	Meadow foxtail	D
Anthoxanthum odoratum	Sweet vernal-grass	D
Cardamine pratensis	Lady's smock	O
Carex flacca	Glaucous sedge	O
Centaurea nigra	Common knapweed	O
Cerastium fontanum	Common mouse-ear	R
Cirsium palustre	Marsh thistle	O

Species Name	Common Name	Abundance
Festuca rubra	Red fescue	A
Ficaria verna	Lesser celandine	O
Holcus lanatus	Yorkshire fog	A
Juncus effusus	Soft rush	F
Lotus pedunculatus	Greater bird's-foot trefoil	F
Luzula campestris	Field woodrush	O
Plantago lanceolata	Ribwort plantain	O
Potentilla anserina	Silverweed	D
Potentilla reptans	Creeping cinquefoil	A
Ranunculus acris	Meadow buttercup	O
Ranunculus repens	Creeping buttercup	A
Rumex acetosa	Common sorrel	O
Rumex crispus	Curled dock	O
Senecio jacobaea	Common ragwort	R
Taraxacum officinale	Dandelion	O
Urtica dioica	Stinging nettle	F
Veronica serpyllifolia	Thyme-leaved speedwell	R

Target Note 23 – Mixed broadleaved woodland on embankment above the Glan Gwna Holiday Park, grades into scrub at top of slope, some open grassy areas, lots of bird cherry (Prunus avium) saplings within the ground flora and understorey.

Species Name	Common Name	Abundance
Acer campestre	Field maple	F
Acer pseudoplatanus	Sycamore	A
Brachypodium sylvaticum	Wood false-brome	F
Crataegus monogyna	Hawthorn	F
Digitalis purpurea	Foxglove	O
Galium aparine	Cleaver	O
Hedera helix	Ivy	A
Hypericum perforatum	Perforate St. John's-wort	R
Ilex aquifolium	Holly	O
Lonicera periclymenum	Honeysuckle	O
Prunus avium	Bird cherry	A
Prunus spinosa	Blackthorn	F
Quercus petraea	Sessile oak	F
Rubus fruticosus	Bramble	A
Silene dioica	Red campion	O
Stellaria holostea	Greater stitchwort	O
Teucrium scorodonia	Wood sage	F
Vaccinium myrtillus	Bilberry	R
Viola riviniana	Common dog violet	O

Target Note 24 – Broadleaf woodland area above the Afon Seiont.

Species Name	Common Name	Abundance
Acer campestre	Field maple	O
Acer pseudoplatanus	Sycamore	F
Allium ursinum	Wild garlic	O
Anemone nemorosa	Wood anemone	A
Arum maculatum	Lords and ladies	O
Circaea lutetiana	Enchanter's nightshade	O
Crataegus monogyna	Hawthorn	O

Species Name	Common Name	Abundance
Dryopteris filix-mas	Male fern	F
Ficaria verna	Lesser celandine	F
Fraxinus excelsior	Ash	A
Hyacinthoides non-scripta	Bluebell	F
Ilex aquifolium	Holly	O
Quercus petraea	Sessile oak	O
Ulmus procera	English elm	F
Viola riviniana	Common dog violet	O

Target Note 25 – Small area of semi-mature broadleaf woodland with individual mature oaks.

Species Name	Common Name	Abundance
Arum maculatum	Lords and ladies	O
Brachypodium sylvaticum	Wood false-brome	O
Crataegus monogyna	Hawthorn	O
Fraxinus excelsior	Ash	D
Galium aparine	Cleaver	F
Geranium robertianum	Herb robert	O
Geum urbanum	Wood avens	O
Hedera helix	Ivy	O
Primula vulgaris	Primrose	O
Pteridium aquilinum	Bracken	F
Quercus petraea	Sessile oak	O
Rosa canina	Common dog-rose	O
Rubus fruticosus	Bramble	F
Rumex acetosa	Broad-leaved dock	O
Salix caprea	Goat willow	A
Silene dioica	Red campion	O
Umbilicus rupestris	Wall pennywort	O

Target Note 26 – Broadleaf plantation associated with residential property, two ponds present (ponds 10 and 11), damp and wet in places through the woodland areas, dense scrub area to eastern boundary.

Species Name	Common Name	Abundance
Alnus glutinosa	Alder	F
Corylus avellana	Hazel	F
Epilobium hirsutum	Great willowherb	F
Fraxinus excelsior	Ash	D
Galium aparine	Cleavers	O
Holcus lanatus	Yorkshire fog	O
Juncus effusus	Soft rush	R/LF
Pteridium aquilinum	Bracken	F
Quercus robur	Common oak	O/LF
Ranunculus acris	Meadow buttercup	O
Ranunculus ficaria	Lesser celandine	O
Rubus fruticosus	Bramble	F
Salix cinerea	Grey willow	A
Stellaria media	Common chickweed	F/LA
Urtica dioica	Stinging nettle	O/LF

Target Note 27 – Broadleaf woodland and scrub along stream, grazed beneath, dry on banks with some wetter areas.

Species Name	Common Name	Abundance
Agrostis stolonifera	Creeping bent	O
Blechnum spicant	Hard fern	R
Corylus avellana	Hazel	cD
Crataegus monogyna	Hawthorn	O
Digitalis purpurea	Foxglove	R
Fraxinus excelsior	Ash	R
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	F/LA
Hyacinthoides non-scriptus	Bluebell	R
Juncus effusus	Soft rush	R/LO
Oenanthe crocata	Hemlock water dropwort	R/vLD
Pteridium aquilinum	Bracken	O
Quercus robur	Common oak	O
Ranunculus ficaria	Lesser celandine	O/LA
Rubus fruticosus	Bramble	R/LF
Salix caprea	Goat willow	cD
Ulex europaeus	European gorse	R/vLA
Urtica dioica	Stinging nettle	F/LA

Target Note 28 – Mature scrub and broadleaf woodland along stream, generally dry with some wetter patches in small hollows and depressions.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	D
Agrostis stolonifera	Creeping bent	O
Arum maculatum	Lords and ladies	R
Betula pendula	Silver birch	R
Cerastium fontanum	Common mouse-ear	D
Crataegus monogyna	Hawthorn	R
Digitalis purpurea	Foxglove	R/LO
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	F/LA
Hyacinthoides non-scriptus	Bluebell	O
Ilex aquifolium	Holly	R
Iris pseudacorus	Yellow flag iris	R/LF
Juncus effusus	Soft rush	R
Pleurozium schreiberi	Red-stemmed feather moss	O
Ranunculus ficaria	Lesser celandine	F/LA
Rubus fruticosus	Bramble	R/LF
Sambucus nigra	Elder	R
Stellaria media	Common chickweed	R
Ulex europaeus	European gorse	R
Urtica dioica	Stinging nettle	O/LF

Target Note 29 – Broadleaf woodland beside stream, some wet areas including flowing water dominated by rushes and willow.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O/LF

Species Name	Common Name	Abundance
Arum maculatum	Lords and ladies	R
Betula pendula	Silver birch	R
Cardamine pratensis	Cuckoo flower	R
Chrysosplenium oppositifolium	Opposite-leaved golden saxifrage	O/LD
Cirsium arvense	Creeping thistle	R
Cirsium vulgare	Spear thistle	R
Corylus avellana	Hazel	A
Festuca pratensis	Meadow fescue	F
Filipendula ulmaria	Meadowsweet	R/LA
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	O/LF
Ilex aquifolium	Holly	R
Juncus effusus	Soft rush	R/vLD
Oenanthe crocata	Hemlock water dropwort	R/vLD
Pleurozium schreiberi	Red-stemmed feather moss	F
Poa annua	Annual meadow grass	O
Poa pratensis	Smooth meadow grass	O
Ranunculus ficaria	Lesser celandine	A
Salix caprea	Goat willow	D
Sambucus nigra	Elder	R
Urtica dioica	Stinging nettle	R/LF

Target Note 30 – Broadleaf woodland beside Bryn Covert on the slope beside a small road, scattered dead wood, old stone wall boundary largely defunct, very open understorey due to grazing, eastern boundary denser with Blackthorn and Hawthorn, rocky outcrop to southern end with some rubbish and sheep remains.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O/LA
Anthoxanthum odoratum	Sweet vernal grass	O
Arum maculatum	Lords and ladies	R
Cerastium fontanum	Common mouse-ear	R/LD
Crataegus monogyna	Hawthorn	O/LF
Digitalis purpurea	Foxglove	R
Festuca pratensis	Meadow fescue	A
Hedera helix	Ivy	R/LF
Holcus lanatus	Yorkshire fog	O/LF
Hyacinthoides non-scriptus	Bluebell	O
Pleurozium schreiberi	Red-stemmed feather moss	F
Poa annua	Annual meadow grass	A
Prunus spinosa	Blackthorn	O/LA
Quercus robur	Common oak	D
Ranunculus acris	Meadow buttercup	R
Ranunculus ficaria	Lesser celandine	O
Rumex crispus	Curled dock	R
Stellaria media	Common chickweed	R/LO
Taraxacum officinale	Dandelion	R
Urtica dioica	Stinging nettle	R/LF
Veronica persica	Common field speedwell	R

Target Note 31 – Conifer plantation (Bryn Covert) with a grassland sheep grazed understorey, some fallen trees and other dead wood, ditch along north western boundary, dry at time of survey.

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O/vLD
Arum maculatum	Lords and ladies	R
Cerastium fontanum	Common mouse-ear	D
Corylus avellana	Hazel	R
Daucus carota	Wild carrot	R
Digitalis purpurea	Foxglove	R/LF
Festuca pratensis	Meadow fescue	F
Galium aparine	Cleavers	R
Holcus lanatus	Yorkshire fog	O/vLD
Hyacinthoides non-scriptus	Bluebell	R
Larix decidus	European larch	cD
Mercurialis perennis	Dog's mercury	O/vLA
Oxalis acetosella	Wood sorrel	R/LF
Picea sp	Spruce	cD
Poa annua	Annual meadow grass	F
Prunus spinosa	Blackthorn	R
Ranunculus ficaria	Lesser celandine	R/LF/vLD
Stellaria media	Common chickweed	F
Urtica dioica	Stinging nettle	R/LA

Target Note 32 – Dense scrub with some trees at field corner beside the Plas Menai roundabout, appears unmanaged and not grazed (fenced off from adjacent field).

Species Name	Common Name	Abundance
Acer pseudoplatanus	Sycamore	O
Arum maculatum	Lords and ladies	R
Betula pendula	Silver birch	R
Carpinus betulus	Hornbeam	R
Cirsium vulgare	Spear thistle	R
Convolvulus arvensis	Field bindweed	R/LF
Corylus avellana	Hazel	cD
Crataegus monogyna	Hawthorn	F
Fragaria vesca	Wild strawberry	R
Fraxinus excelsior	Ash	cD
Galium aparine	Cleavers	R/LO
Geranium dissectum	Cut-leaved cranesbill	R
Geranium robertianum	Herb robert	R/LA
Glechoma hederacea	Ground ivy	R
Hedera helix	Ivy	R
Heracleum sphondylium	Hogweed	R/LO
Hyacinthoides hispanica	Spanish bluebell	R
Hyacinthoides non-scriptus	Bluebell	R
Ilex aquifolium	Holly	R
Lamium album	White dead-nettle	R
Prunus spinosa	Blackthorn	O/LA
Pteridium aquilinum	Bracken	R
Rosa sp	Rose sp	R

Species Name	Common Name	Abundance
Rubus fruticosus	Bramble	D
Rumex crispus	Curled dock	R
Rumex obtusifolius	Broad-leaved dock	R
Taraxacum officinale	Dandelion	R/LO
Ulex europaeus	European gorse	R
Urtica dioica	Stinging nettle	O

Appendix E.4 – Breeding Birds Report

Magf = Magpie

LiGr = Little Grebe

L. Whit = ~~Lesser~~ Whitethroat

Table 1.0 Species recorded during survey

Latin Name	**Common Name**	**Species Code**
Accipter nisus	Sparrow Hawk	SH
Acrocephalus schoenobaenus	Sedge Warbler	SW
Acrocephalus scirpaceus	Reed Warbler	RW
Aegithalos caudatus	Long Tailed Tit	LTT
Alauda arvensis	Skylark	Sk
Alcedo atthis	Kingfisher	Ki
Anas platyrhynchos	Mallard	Ma
Anthus pratensis	Meadow Pipit	MP
Apus apus	Swift	Swi
Ardea cinerea	Grey Heron	GH
Aythya fuligala	Tufted Duck	TD
Branta canadiensis	Canada Goose	CG
Buteo buteo	Buzzard	Buz
Carduelis cannabia	Linnet	Lin
Carduelis carduelis	Goldfinch	Gof
Carduelis chloris	Greenfinch	Grf
Certhia familiaris	Treecreeper	Tc
Chroicocepahalus ridibundus	Black Headed Gull	BHG
Cinclus cinclus	Dipper	Di
Columba livia	Feral pigeon	FP
Columba oenas	Stock Dove	SD
Columba palumbus	Wood Pigeon	WP
Corvus corone	Carrion Crow	CC
Corvus corax	Raven	Ra
Corvus frugilegus	Rook	Roo
Corvus monedula	Jackdaw	Jac
Cuculus canorus	Cuckoo	Cu
Cyanistes caeruleus	Blue Tit	BT
Delichon urbica	House Martin	HM
Dendrocops major	Greater Spotted Woodpecker	GSW
Emberiza schoeniclus	Reed Bunting	RB
Erithacus rubecula	Robin	Rob
Ficedula hypoleuca	Pied Flycatcher	PF
Fulica atra	Coot	Coo

Moo = Moorhen

GlgG Greylag Goose

LE - Little Egret

LiGr - Little Grebe

Fringilla coelebs	Chaffinch	Chf
Glandarius garrulus	Jay	Jay
Hirundo rustica	Swallow	Swa
Larus argentaus	Herring Gull	HG
Mergus merganser	Goosander	Go
Milvus milvus	Red Kite	RK
Motacilla alba	Pied Wagtail	PW
Motacilla cinerea	Grey wagtail	GrW
Musicapa striata	Spotted Flycatcher	SF
Oenanthe oenanthe	Wheatear	Whe
Parus major	Great tit	GT
Passer domesticus	House sparrow	HS
Periparus ater	Coal tit	CT
Phalacrocorax carbo	Cormorant	Cor
Phasianus colchicus	Pheasant	Ph
Phoenicurus phoenicurus	Redstart	Re
Phylloscopus collybita	Chiffchaff	Cc
Phylloscopus sibilatrix	Wood Warbler	WoW
Phylloscopus trochilus	Willow warbler	WiW
Pica pica	Magpie	Ma
Prunella modularis	Dunnock	Du
Pyrrhula pyrrhula	Bullfinch	Buf
Regulus regulus	Goldcrest	Gc
Riparia riparia	Sand Martin	SM
Saxicola rubetra	Whinchat	Whin
Sitta europea	Nuthatch	Nu
Streptopelia decaocto	Collared Dove	CD
Strix aluco	Tawny Owl	TO
Sturnus vulgaris	Starling	Sta
Sylvia atricapilla	Blackcap	Bc
Sylvia borin	Garden Warbler	GaW
Sylvia communis	Whitethroat	Whit
Troglodytes troglodytes	Wren	Wr
Turdus merula	Blackbird	Bb
Turdus philomelos	Song Thrush	ST
Turdus viscivorus	Mistle Thrush	MT

Table 2.0 Breeding behaviour displayed.

Breeding behaviour	Breeding Behaviour Code
Singing	/S
Display Flight	/DF
Carrying Food	/CF
Alarm Call	/AC
Foraging	/F
Nest	/N
Carrying Nest Material	/CNM
Males fighting	/Fi
PAIR	P
YOUNG	Y

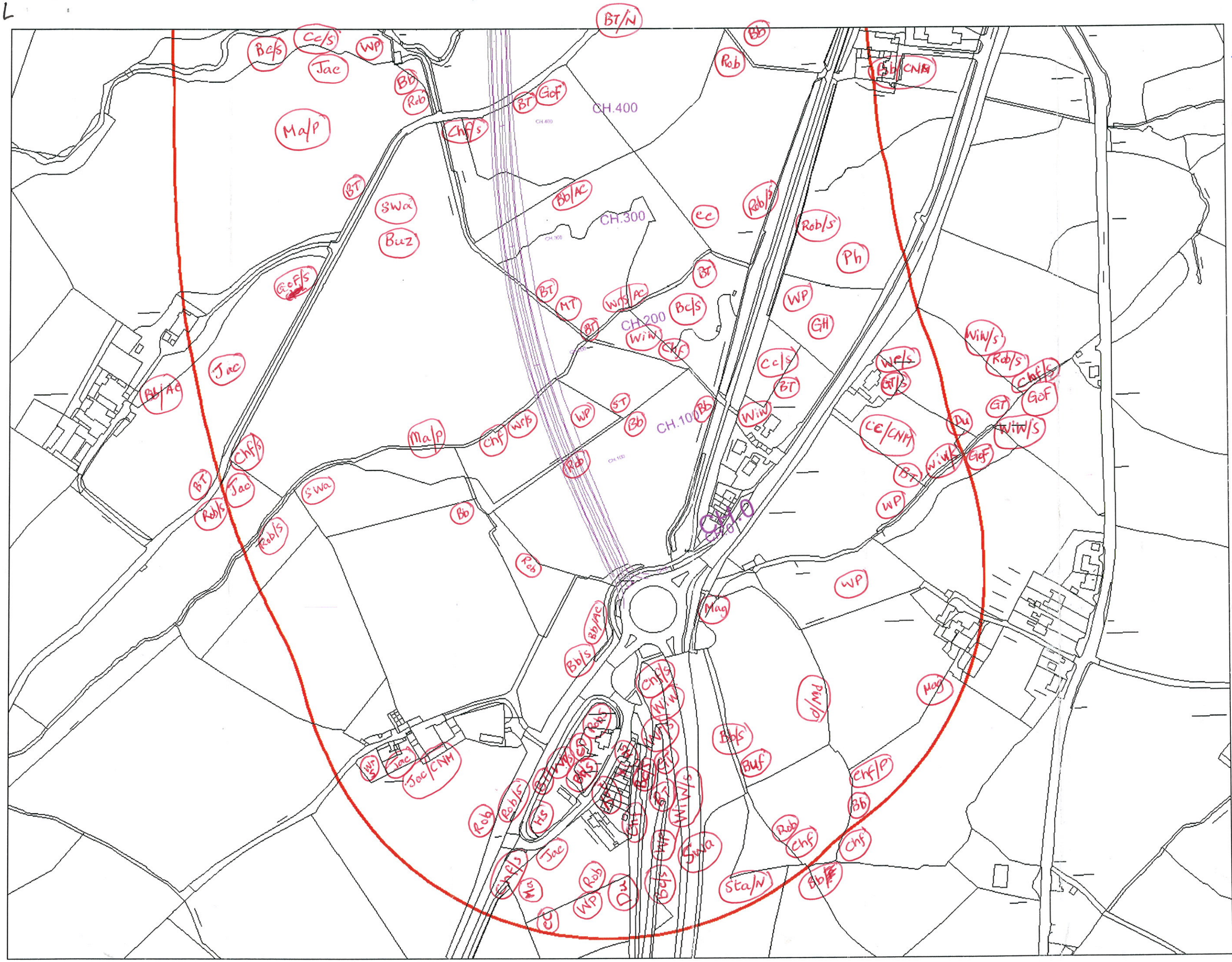
L

MIKE

FRIDAY
24TH APRIL 201

WEATHER: DRY
BUT CLOUDY.
LIGHT BREEZE
10°C

SUNRISE 06'00 HRS

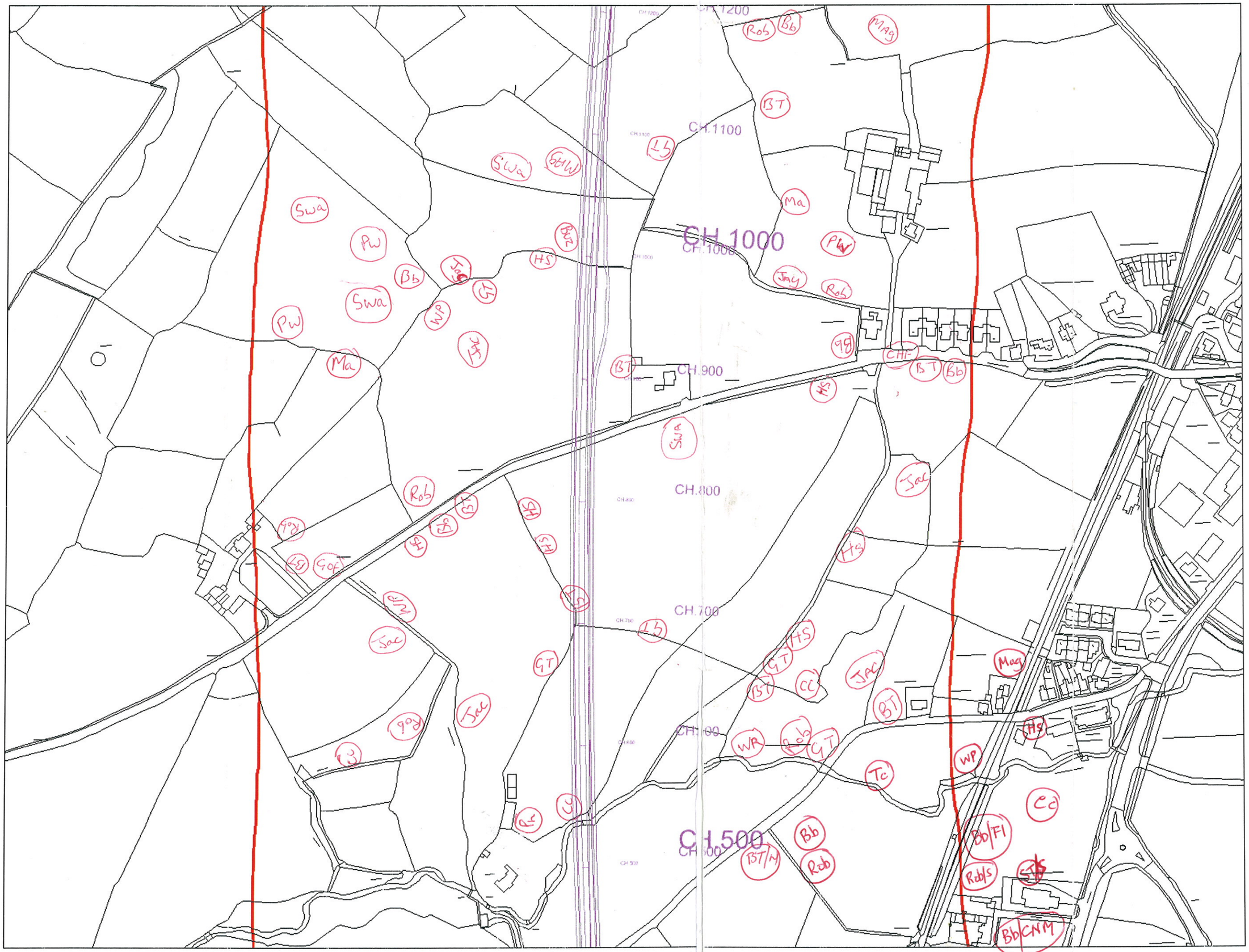


GEO

FRIDAY 24TH
APRIL 2015
+
TUES 28/4/15

FINE, SUNNY DRY

TEMP
5°C @ 06.00 hrs
10°C @ 15.00 hrs



C.E.D 7 MILE
28/4/15 (PART)
13/5/15 (PART)

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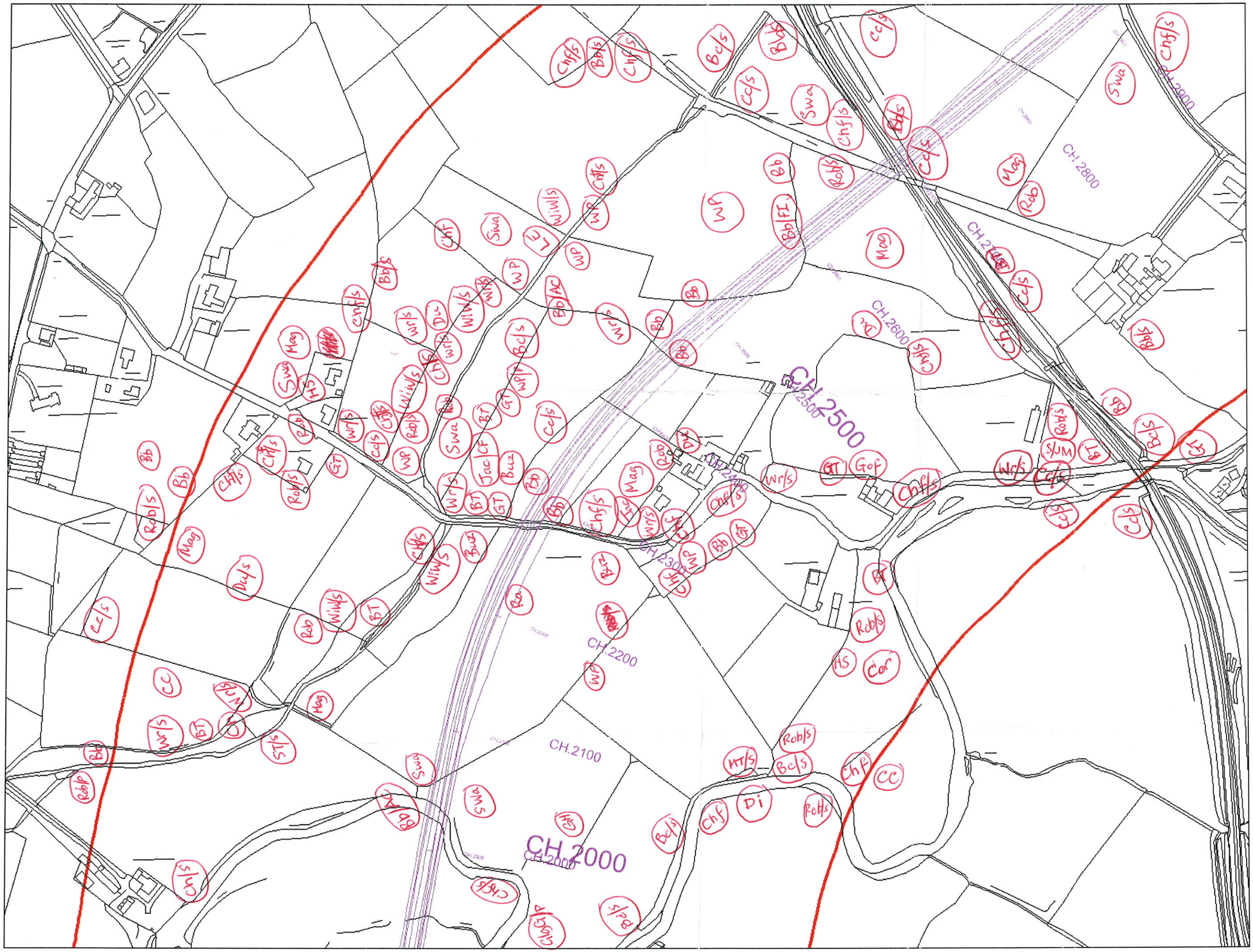
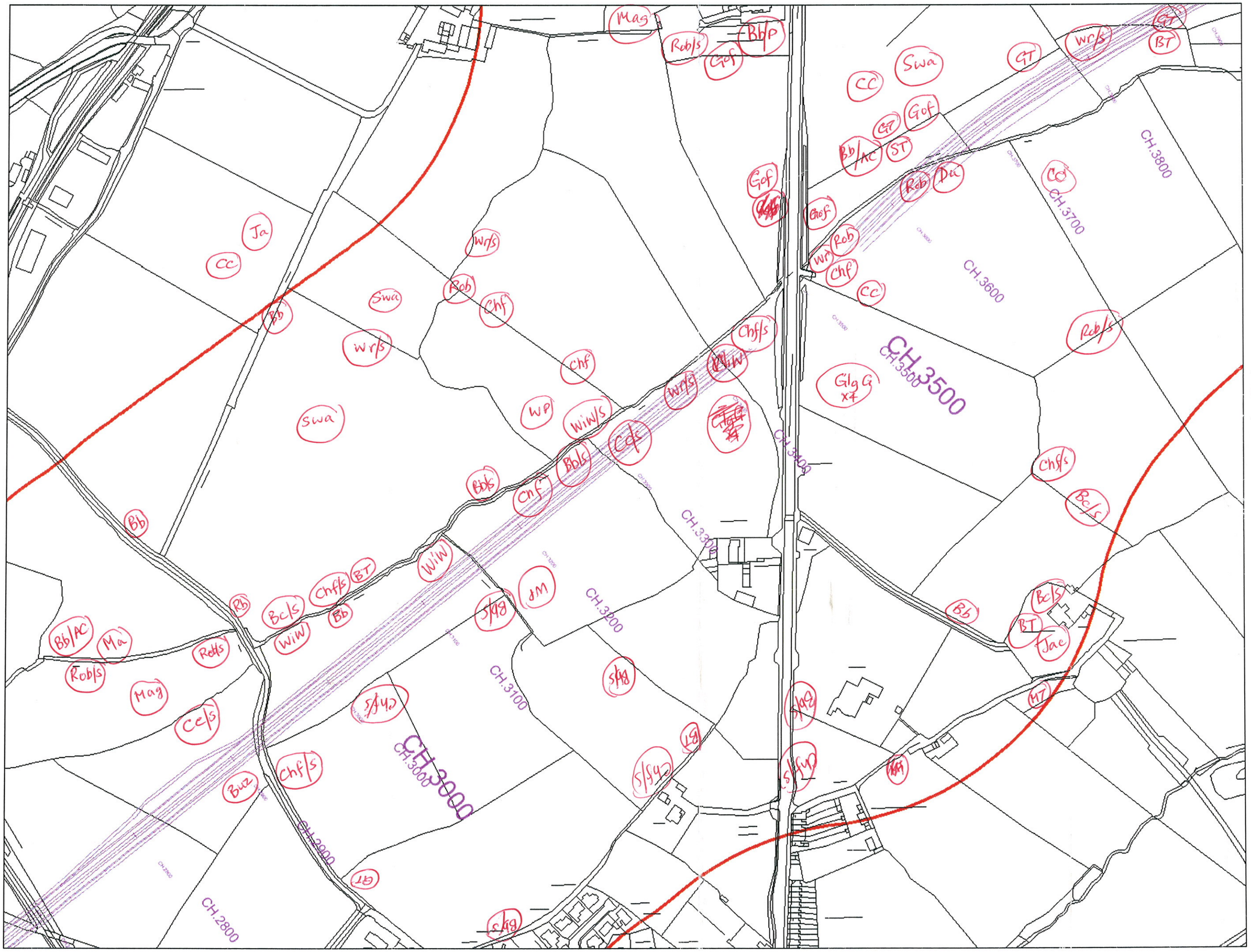
CH.1800
CH.1700
CH.1600
CH.1500
CH.1400
CH.1300
CH.1200

28/4/15
MIKE



28/4/15
MIKE



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CH.3700
CH.3800
CH.3400
CH.3300
CH.3200
CH.3100
CH.3000
CH.2900
CH.2800
Mag
Rob/s
Bb/p
Gof
Swa
CC
GT
Wr/s
BT
Bb/AC
ST
Rob
Du
Ja
Bb
Chf
Chf/s
WP
WiW/s
Bb/s
Bc/s
Rb
Ma
Ce/s
Buz
JM
Jac
MT
Glg G x4

S.

MGF

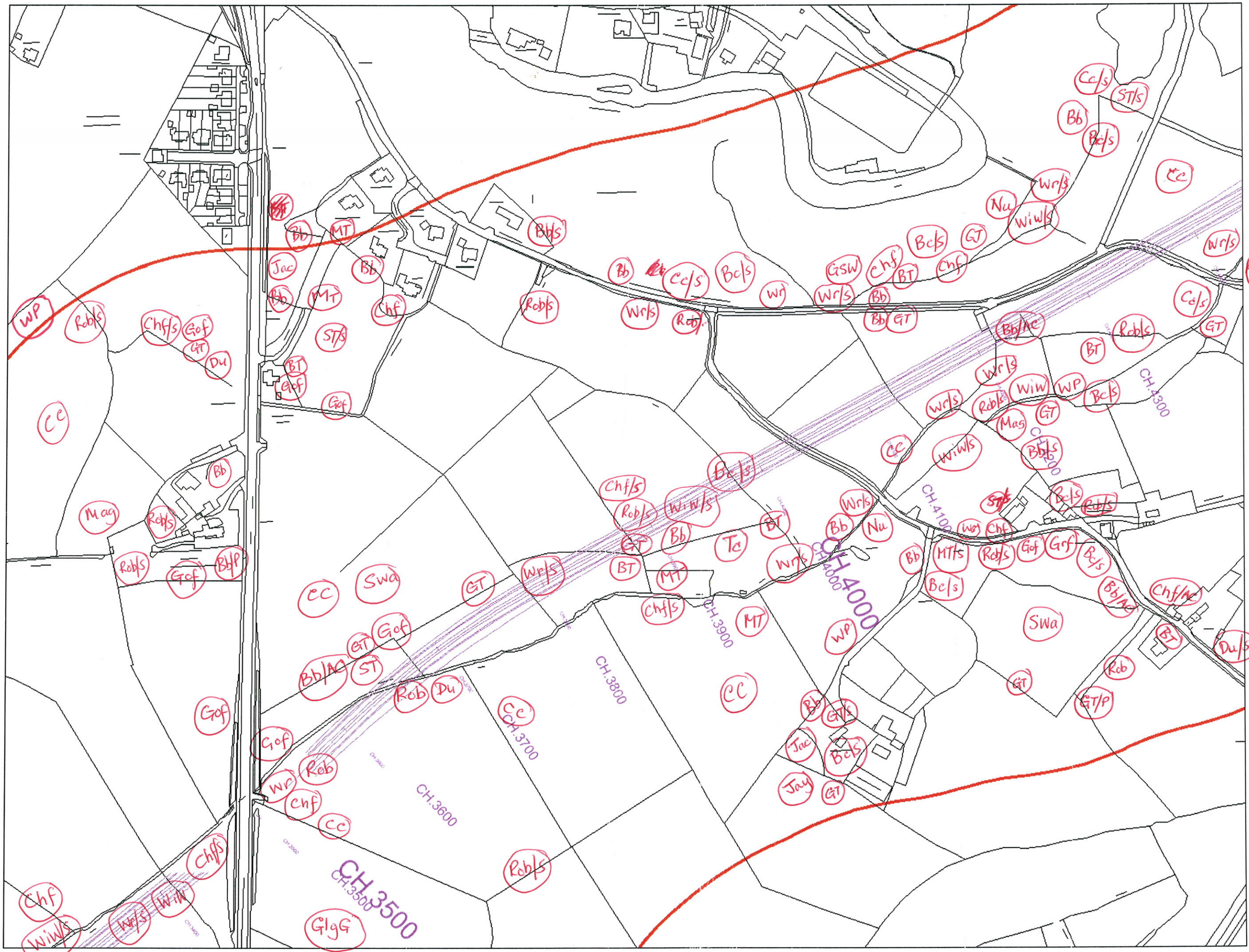
28/4/15 (PART)

1/5/15

7°c @ 06.00

BREEZE - DRY

11°c @ 15.00



MJKE
1/5/15

CH.5000

CH.4900

CH.4800

CH.4700

CH.4600

CH.4500

CH.4400

CH.4300

CH.4200

CH.4100

GED
1/5/15

CH.5500

CH.5400

CH.5300

CH.5200

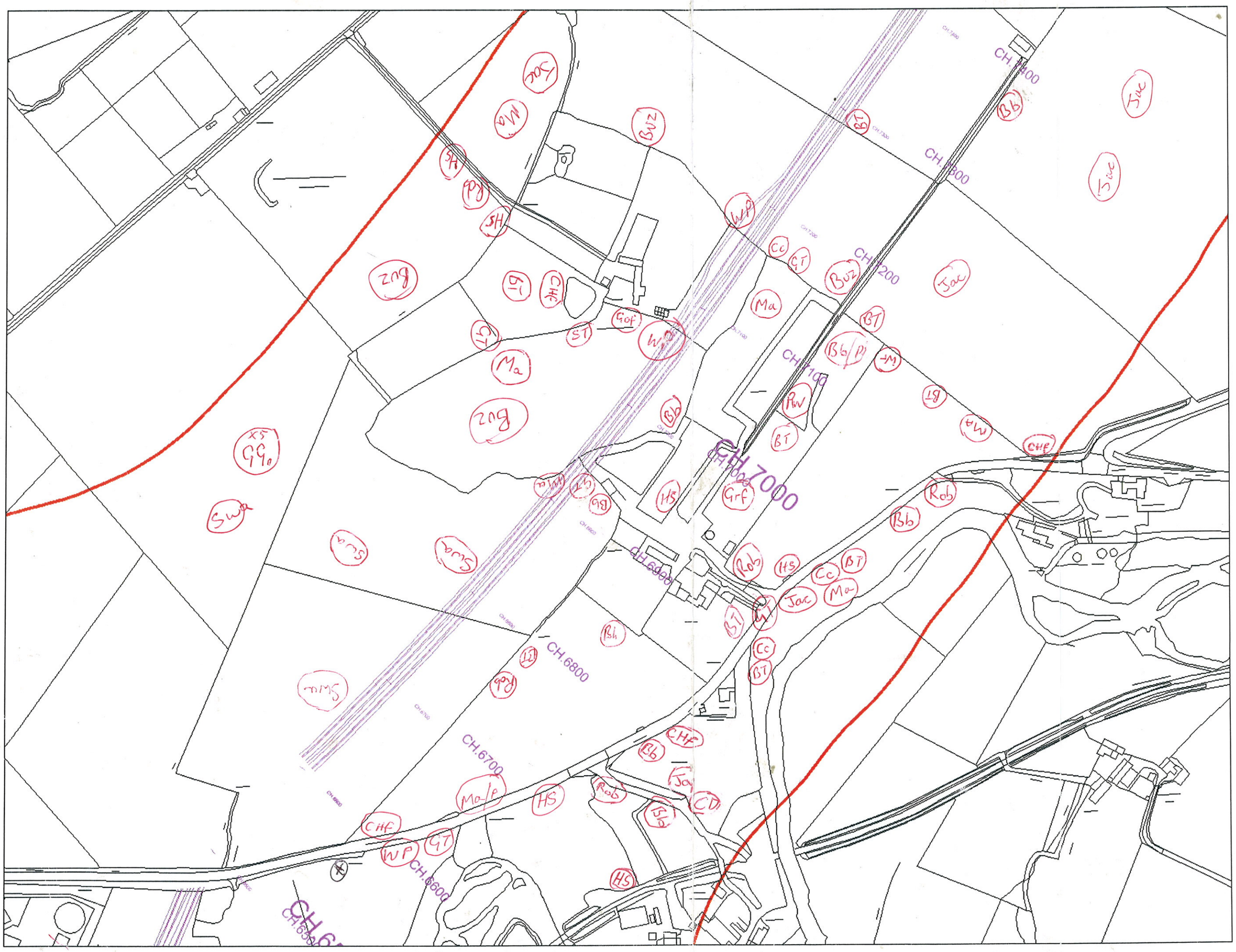
CH.5100

CH.5000

GBM + MIKE
1/5/15

CH.6800
CH.6700
CH.6600
CH.6500
CH.6400
CH.6300
CH.6200
CH.6100
CH.6000
CH.5900
Swa
BT
MAP
Cnf
Buz
Bb/s
Jac
CHF
Rock
Rob
MA
WP
HS
Bb
Du
Mag
Wi'W
Rob
Bc/s
Rad/s
Jac
CC
CC/s
Wi'W
Wi'W/s
Bb/s
Bb
Rob
Bb
Bb
Bb

GED
7/5/15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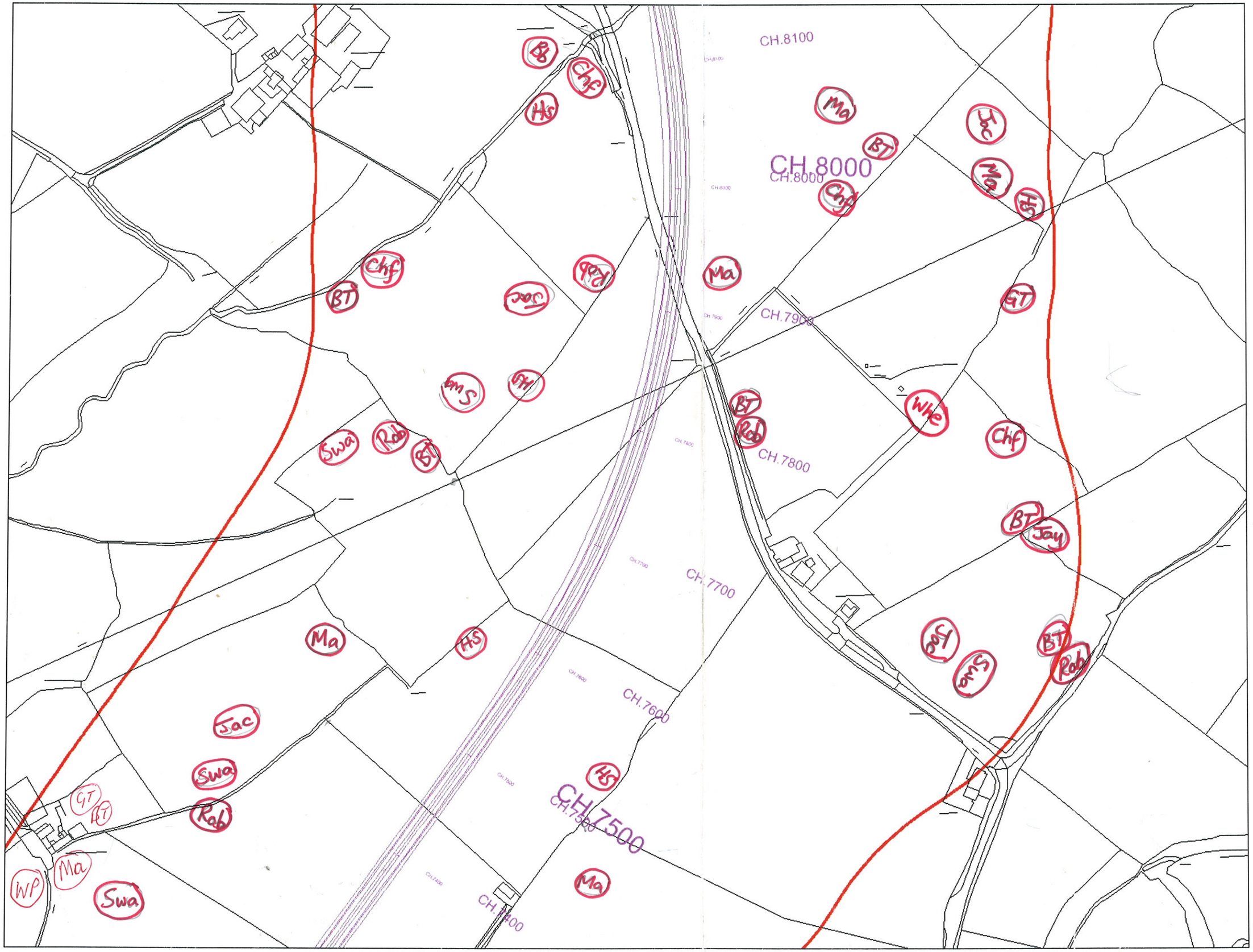
BT
Buz
Ma
Cc
GT
WP
Bb/P
Rw
Rob
HS
Grf
Swa
Gof
ST
CHF
Ma/P
CD
N
10.

GED
7/5/15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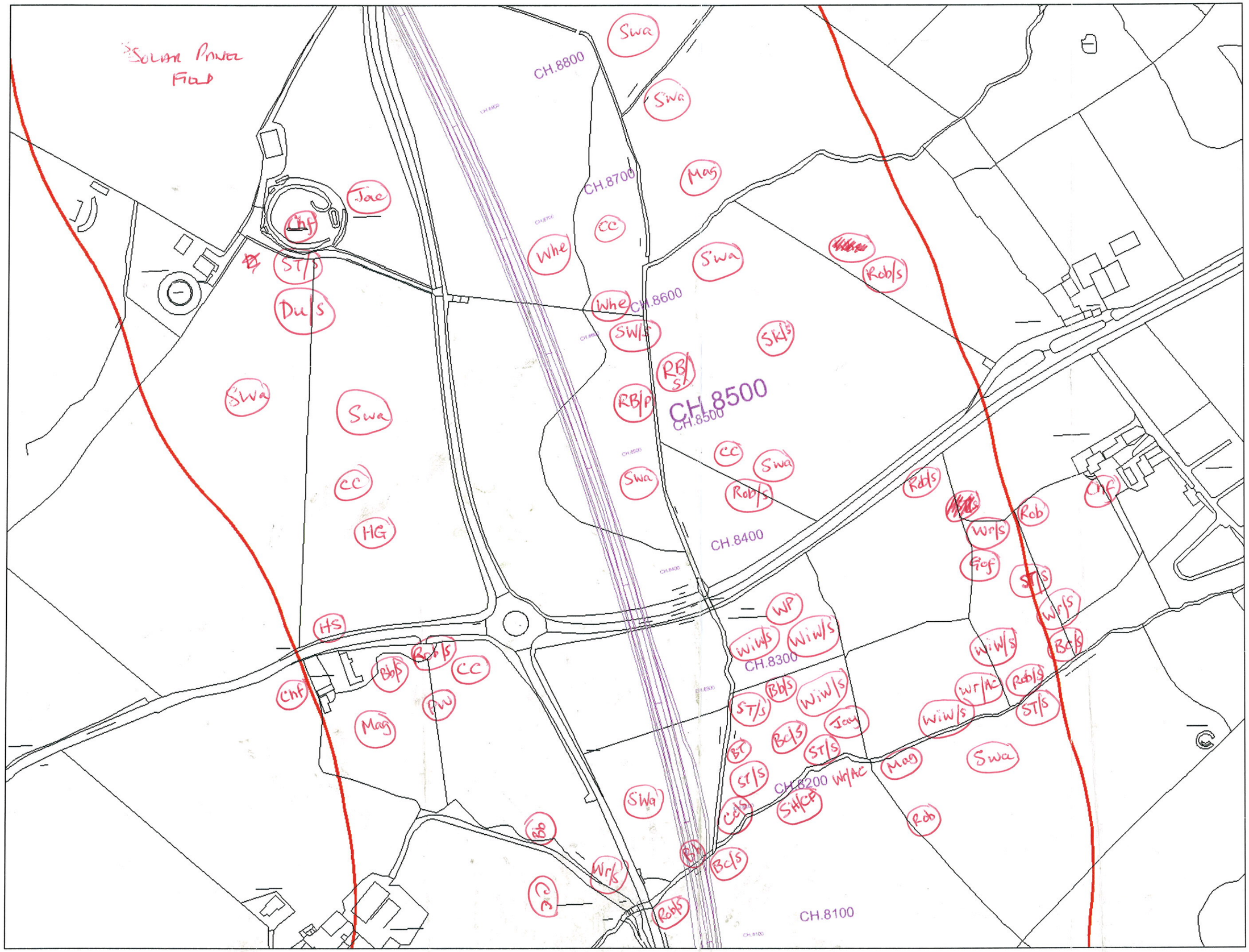
CH.7400
Bb
Chf
Hs
Ma
BT
Jac
Ma
Hs
Chf
BT
Rob
Jac
Ma
GT
Swa
Hs
BT
Rob
Whe
Chf
Swa
Rob
BT
BT
Jay
Ma
HS
Jac
Swa
BT
Rob
Jac
Swa
Rob
GT
BT
Ma
WP
Swa
HS
Ma

N

11.

MGF
7/5/15

Showers, cloudy
sunny later
10° – 14°C



N
12

MGF
7/5/15

CH 9500
CH 9400
CH 9300
CH 9200
CH 9100
CH 9000
CH 8800
CH 8800
CH 8800

Solar Panel Field

Solar Panel Field

N
13

MGR

7/5/15

CH 9700

CH 9600

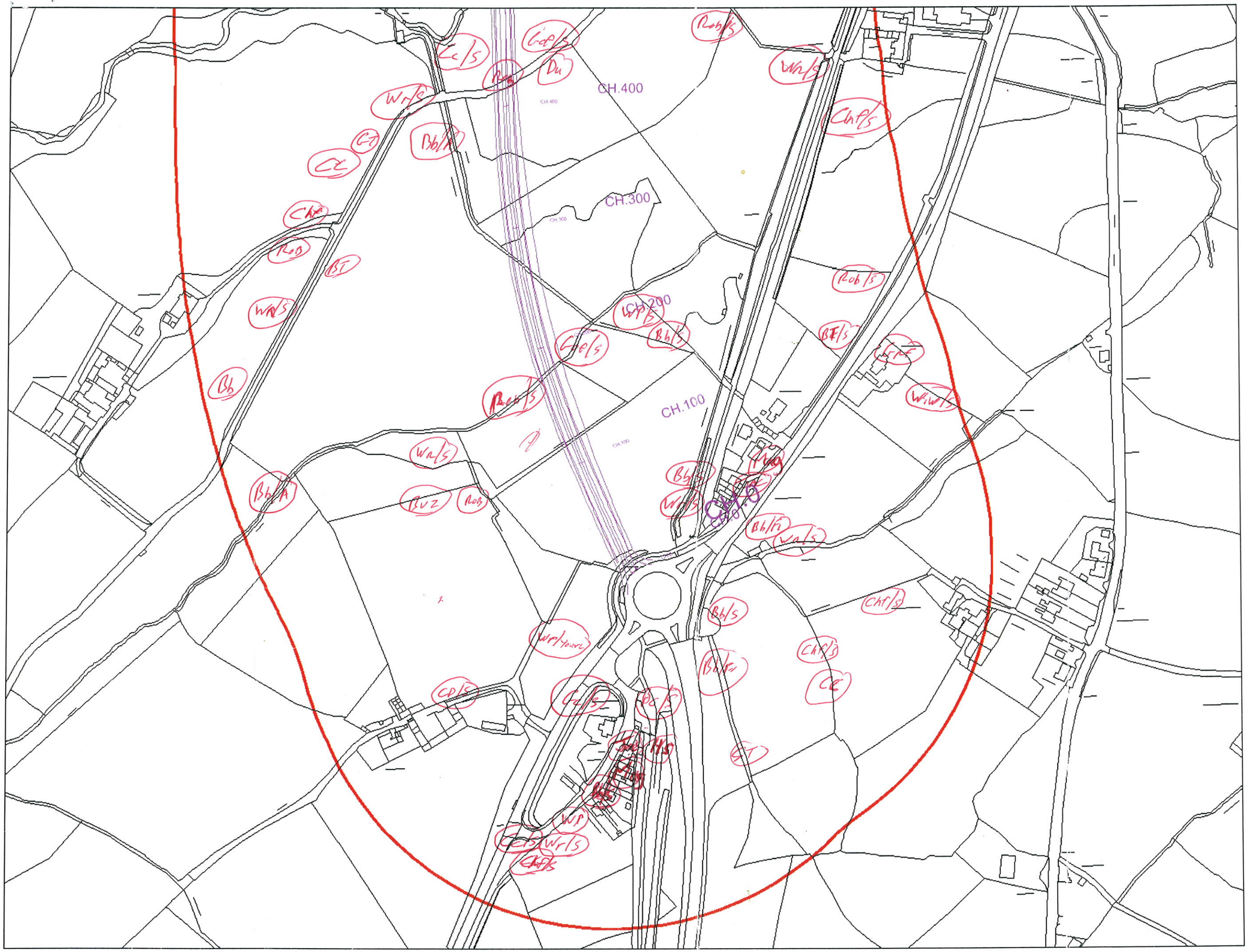
CH 9500

CH 9400

CH 9300

N

14



Joe
12/6/15

N

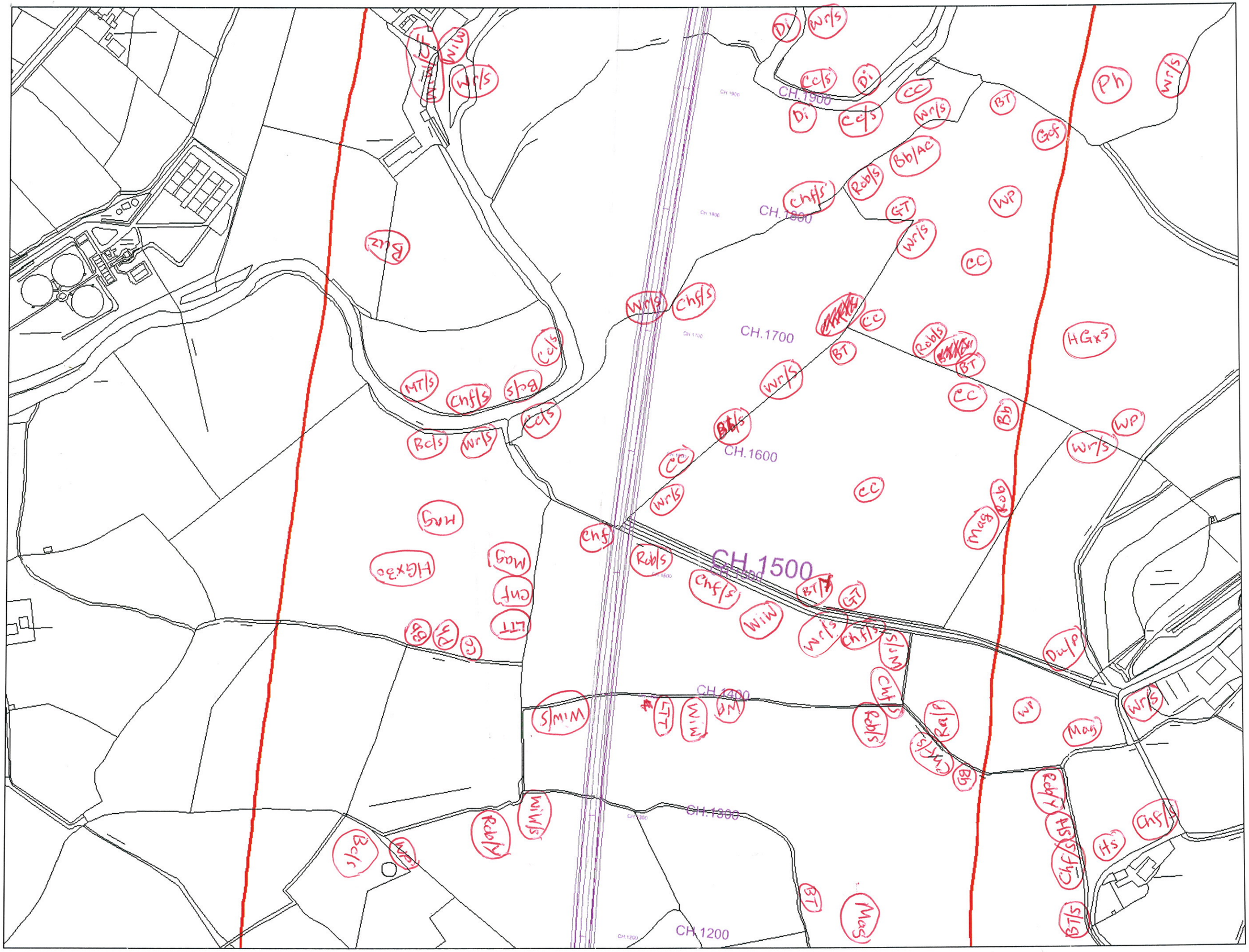
1

CH.1200
CH.1100
CH.1000
CH.900
CH.800
CH.700
CH.600
CH.500

J.C.
12/6/18

N

2.

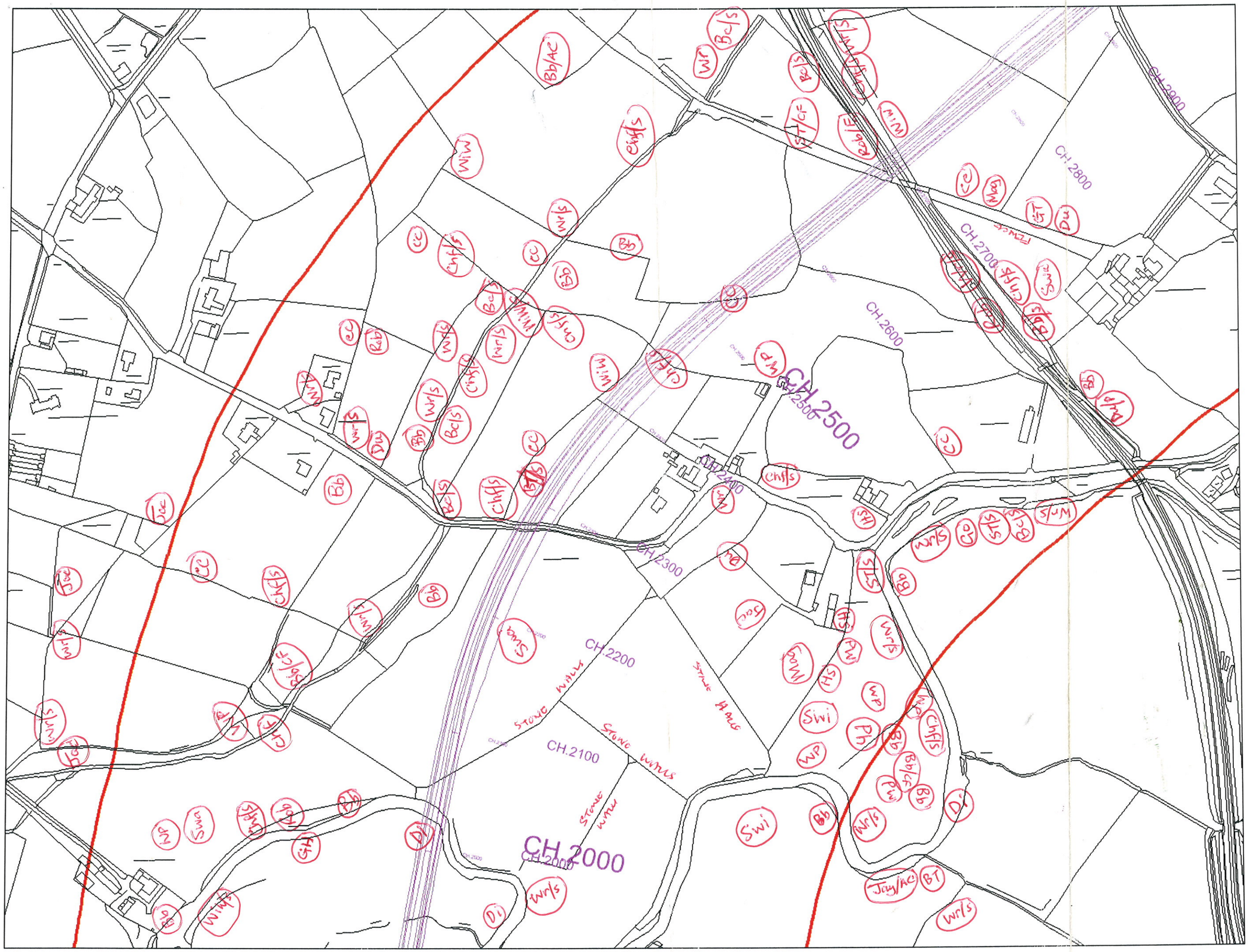


MIKE

DRY BRIGHT
12/6/15
START
05:00 HRS

N

3.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CH.2800
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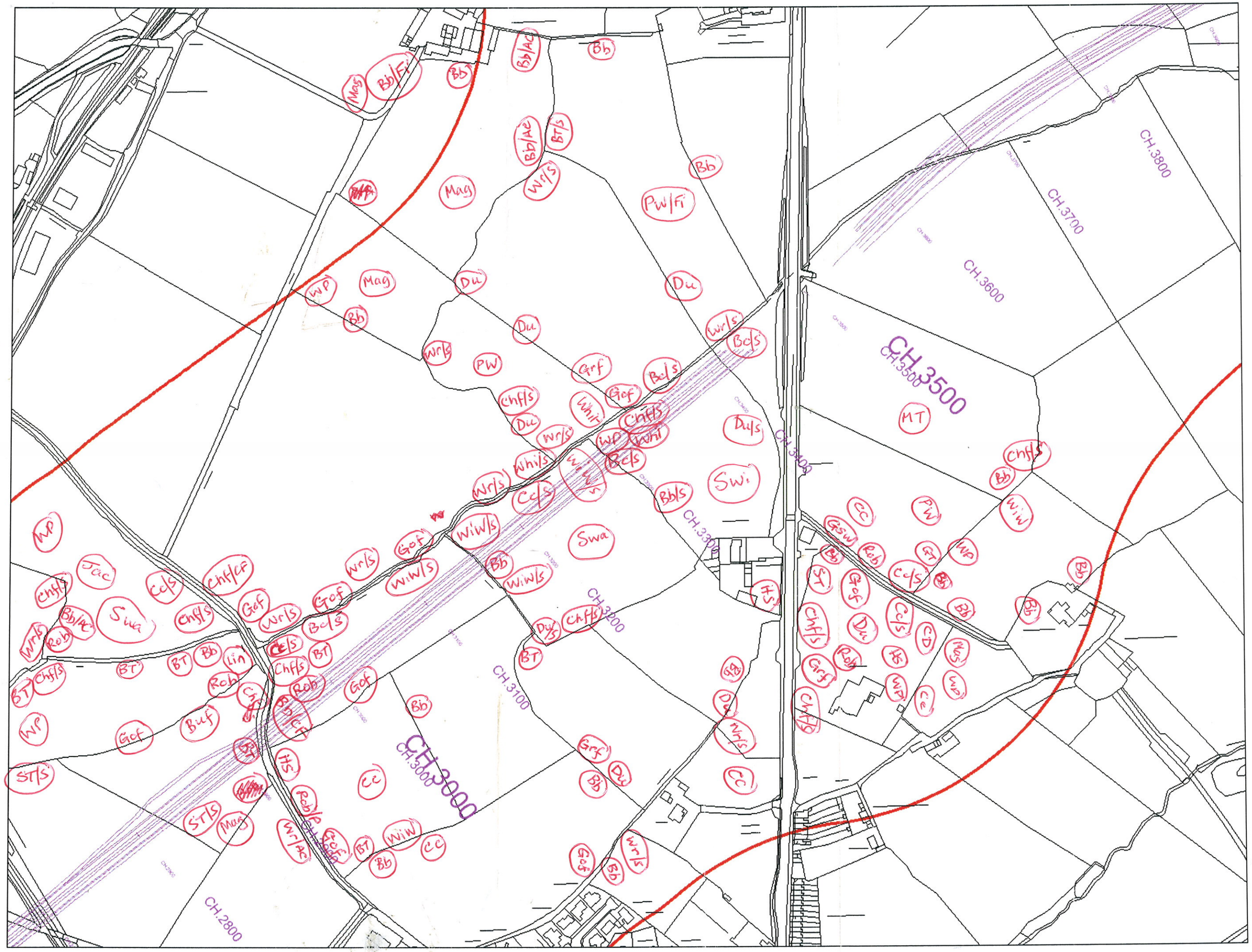
Stone Walls
Stone Walls
Stone Walls
Stone Walls

MIKE
12/6/15

N



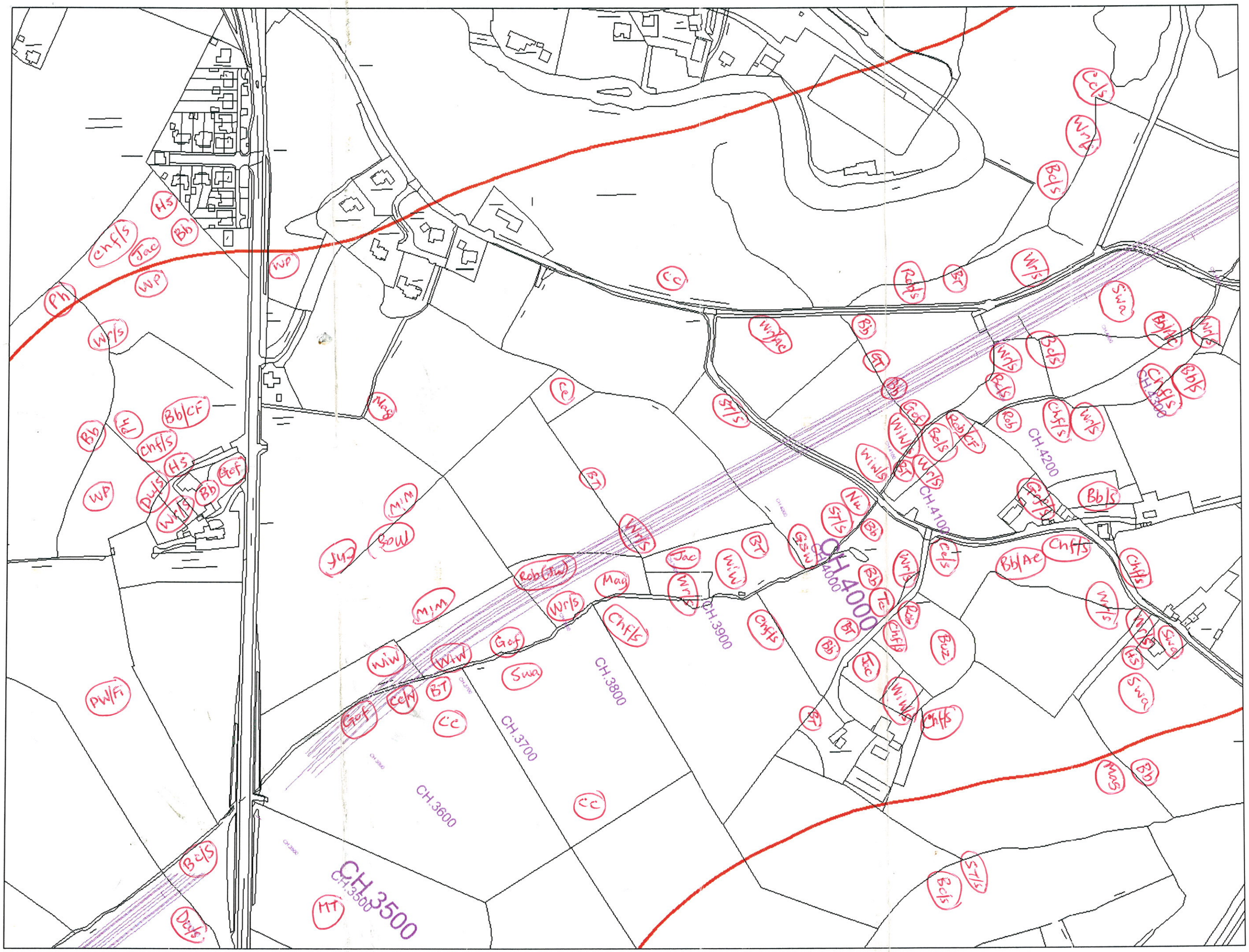
BRIGHT SUNNY, DRY WARM

SISKIN NUTHATCH } GWESTY MELFOD HOTEL

MIKE 16/6/15

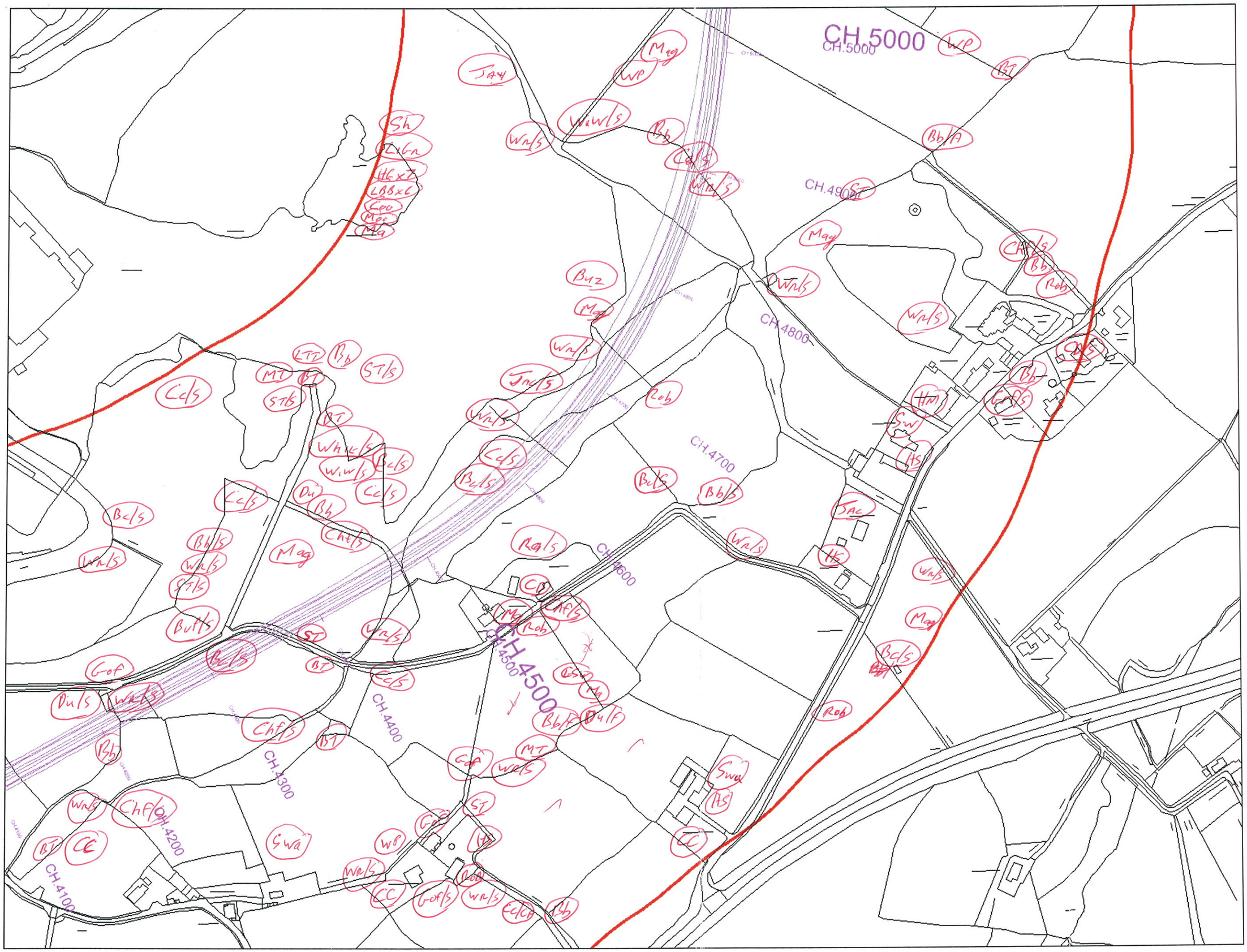
N

S.



MIKE
16/6/15

6.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16/6/16
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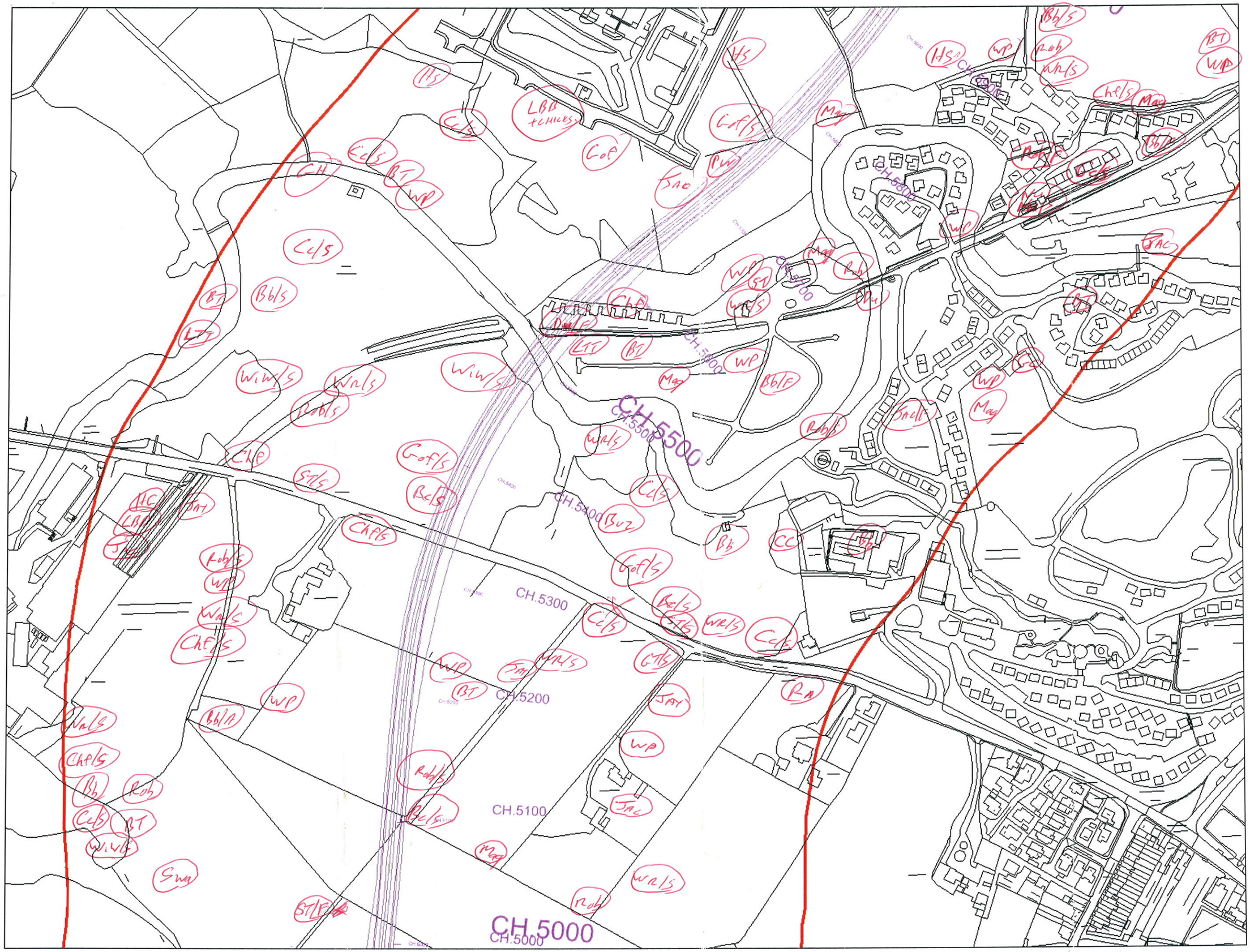
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LBB +CHICKS
Hs
Cc/s
Gof
Gof/s
Pw
Jac
Mag
Rob
Wr/s
Chf/s
Bb/s
Bb/F
Bb
Bt
Wp
Wiw/s
Rob/s
Chf
St/s
Bc/s
Buz
Cc
Ra
Gt/s
Jay
Bb/A
Swa
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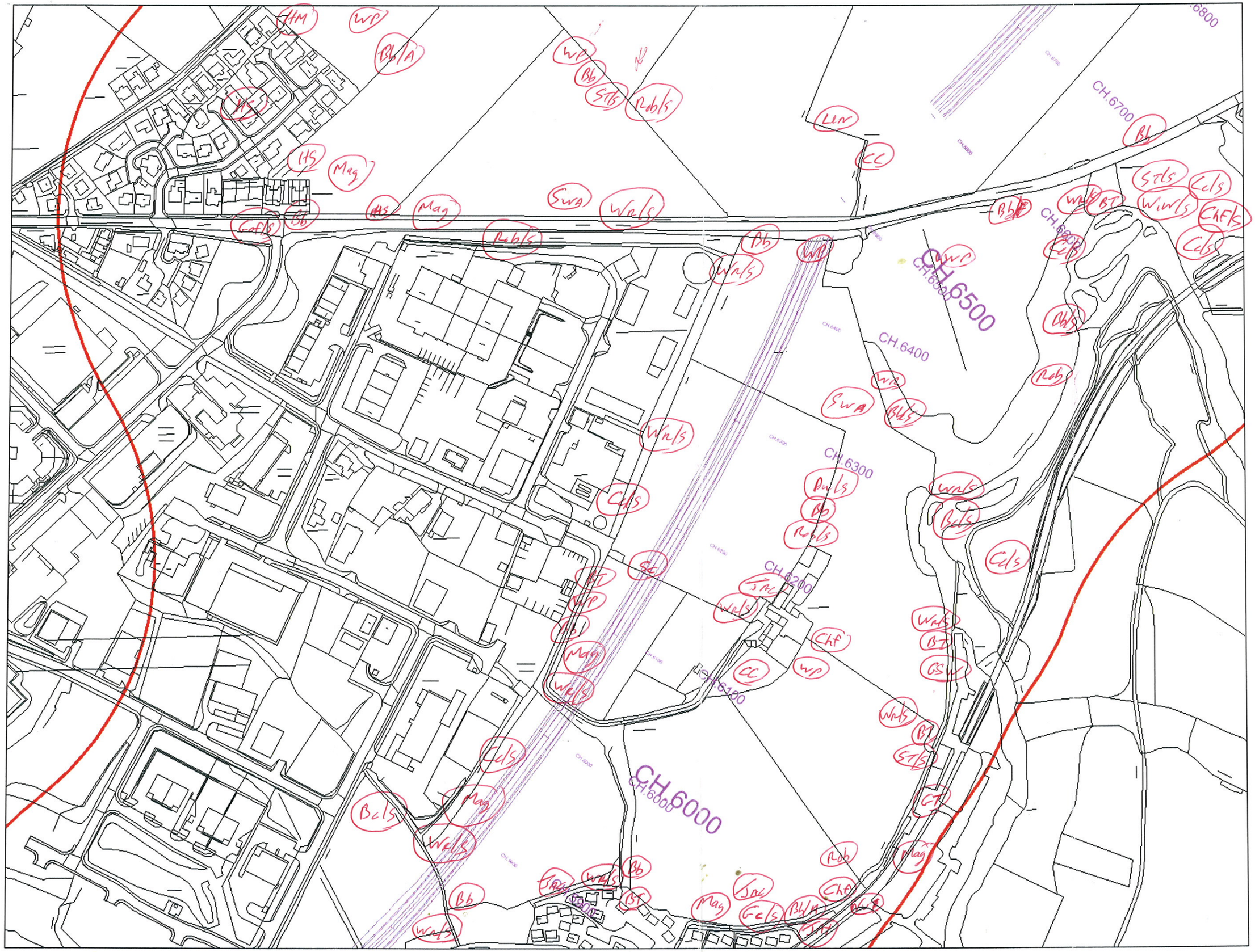
Rob/s
Bc/s
Mag
Wr/s
Rob

Joe
16/8/15

N

8.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CH.6500
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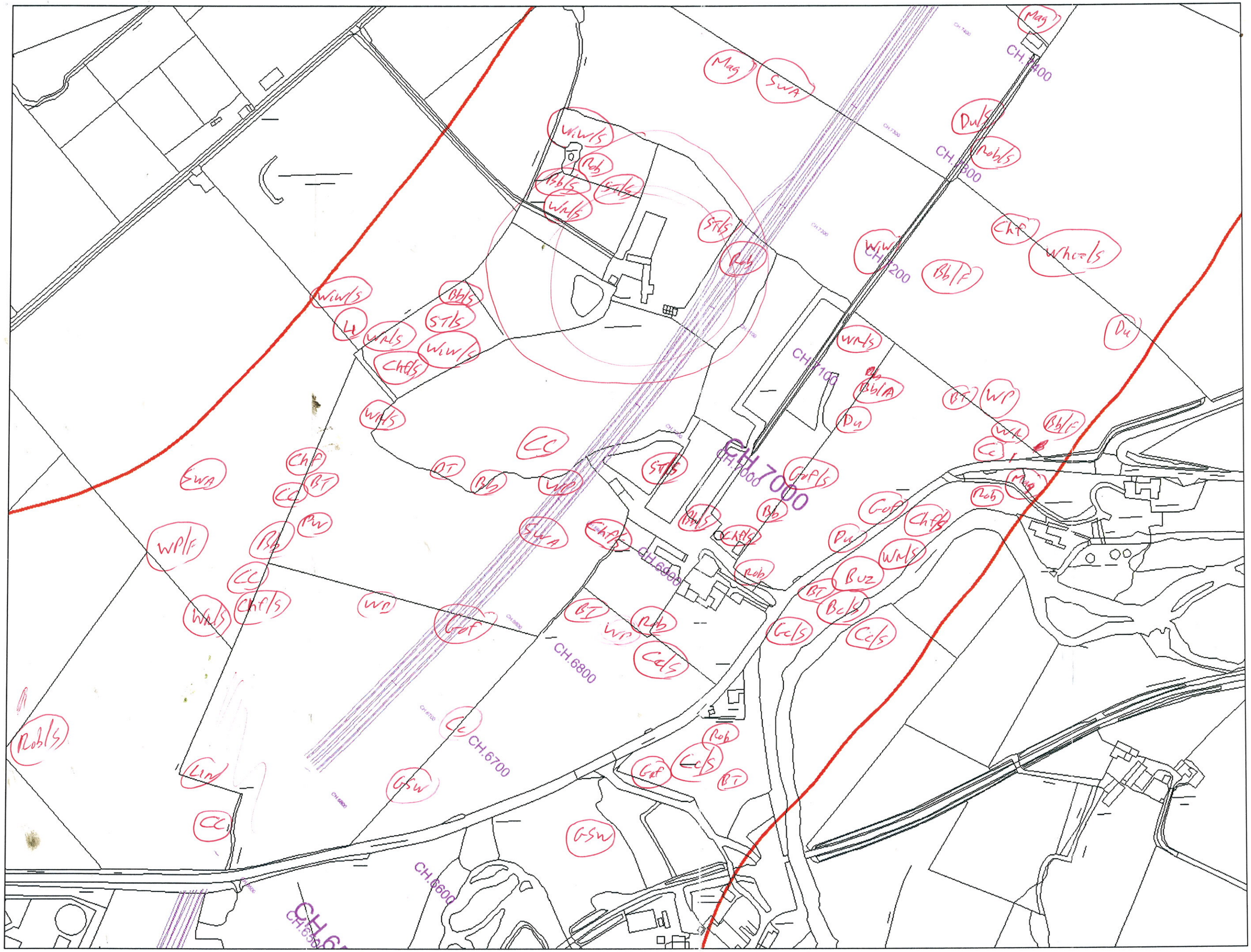
CH.6300
CH.6200
CH.6100
CH.6000
HM
WP
Bb/A
Bb
Rob/s
Mag
Swa
Wr/s
Bb/F
Cc/s
Bb/s
Rob
Bc/s
Chf
GSW
Gc/s
Bb/A
N

Joe
19/6/15

a.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CH.6700
CH.7100
Mag
SWA
Wwls
Rob
Stls
Whls
Chls
Wls
Bbls
Du
Bb/F
Wheels
Ch/F
Wp
Bb/A
Bb/C
Gpls
Gof
Buz
Bcls
Ccls
Rob/s
Lin
Gsw
CC
BT
Cc
Ew
Ww
Ch/s
Ch/Pls
Ch/Bls
Ch/Wls
Ch/Whls
Ch/Ccls
Ch/Gpls
Ch/Stls
Ch/Rob
Ch/Wwls
Ch/Bbls
Ch/Ch

CH.8100

CH.8000

CH.7900

CH.7800

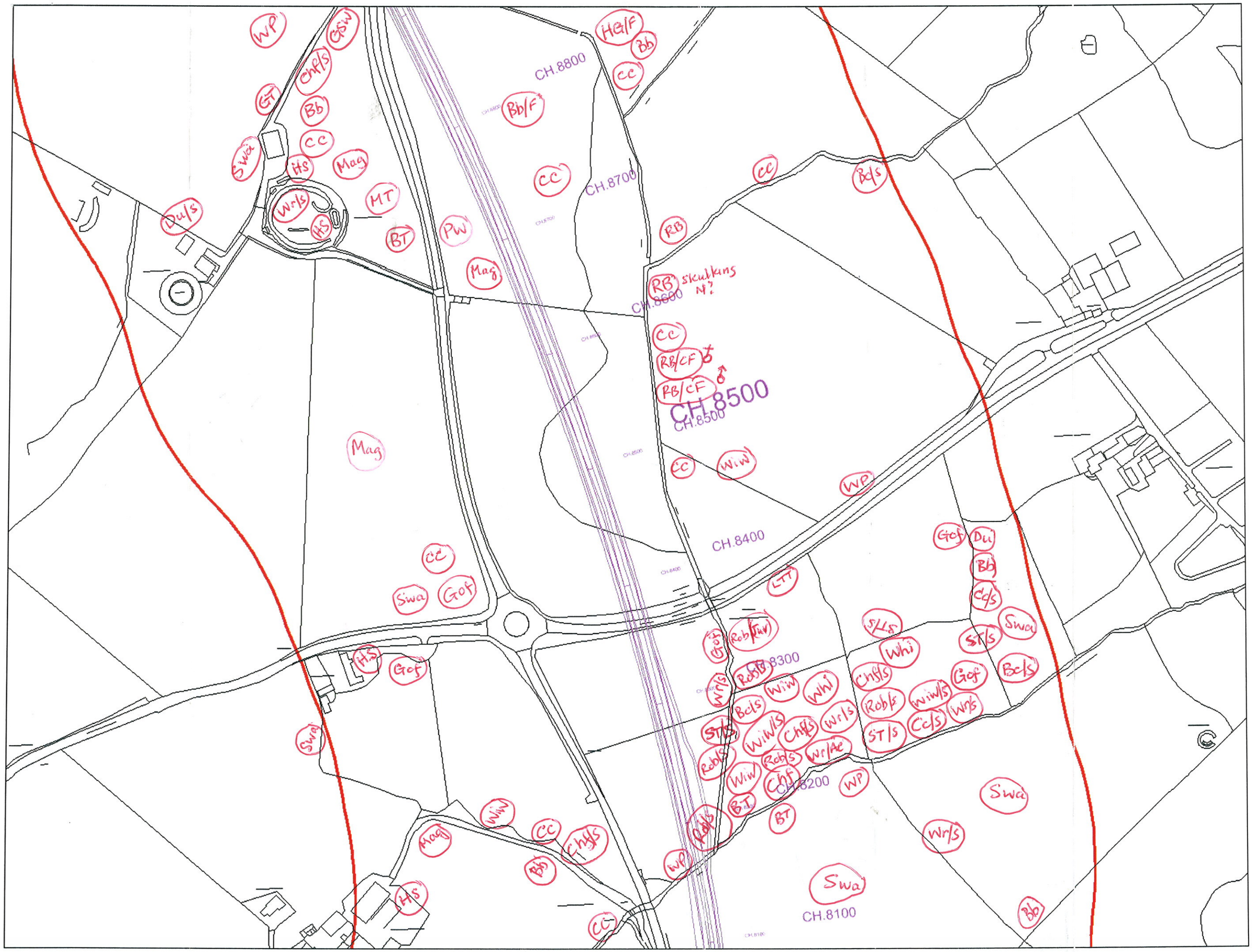
CH.7700

CH.7600

CH.7500

MIKE
19/6/15
CLOUDY BUT
~~MAIN~~ DRY
APART FROM
SLIGHT LIGHT
DRIZZLE
COOL 12°C

N



MIKE
19/6/15

N

12.

CH.9500

CH.9400

CH.9300

CH.9200

CH.9100

CH.9000

CH.8900

CH.8800

NURSERY INFO

TAWNY OWL ~~NESTED~~

SPARROWHAWK NESTED ACCORDING TO NURSERY STAFF

Jol
23/6/15

N

13



MIKE
23/6/15

weather
Fine sunny
warm - v. light
breeze

N

14

Magf = Magpie

LiGr = Little Grebe

L. Whit = ~~Lesser~~ Whitethroat

Table 1.0 Species recorded during survey

Latin Name	**Common Name**	**Species Code**
Accipter nisus	Sparrow Hawk	SH
Acrocephalus schoenobaenus	Sedge Warbler	SW
Acrocephalus scirpaceus	Reed Warbler	RW
Aegithalos caudatus	Long Tailed Tit	LTT
Alauda arvensis	Skylark	Sk
Alcedo atthis	Kingfisher	Ki
Anas platyrhynchos	Mallard	Ma
Anthus pratensis	Meadow Pipit	MP
Apus apus	Swift	Swi
Ardea cinerea	Grey Heron	GH
Aythya fuligala	Tufted Duck	TD
Branta canadiensis	Canada Goose	CG
Buteo buteo	Buzzard	Buz
Carduelis cannabia	Linnet	Lin
Carduelis carduelis	Goldfinch	Gof
Carduelis chloris	Greenfinch	Grf
Certhia familiaris	Treecreeper	Tc
Chroicocepahalus ridibundus	Black Headed Gull	BHG
Cinclus cinclus	Dipper	Di
Columba livia	Feral pigeon	FP
Columba oenas	Stock Dove	SD
Columba palumbus	Wood Pigeon	WP
Corvus corone	Carrion Crow	CC
Corvus corax	Raven	Ra
Corvus frugilegus	Rook	Roo
Corvus monedula	Jackdaw	Jac
Cuculus canorus	Cuckoo	Cu
Cyanistes caeruleus	Blue Tit	BT
Delichon urbica	House Martin	HM
Dendrocops major	Greater Spotted Woodpecker	GSW
Emberiza schoeniclus	Reed Bunting	RB
Erithacus rubecula	Robin	Rob
Ficedula hypoleuca	Pied Flycatcher	PF
Fulica atra	Coot	Coo

Moo = Moorhen

GlgG Greylag Goose

LE - Little Egret

LiGr - Little Grebe

Fringilla coelebs	Chaffinch	Chf
Glandarius garrulus	Jay	Jay
Hirundo rustica	Swallow	Swa
Larus argentaus	Herring Gull	HG
Mergus merganser	Goosander	Go
Milvus milvus	Red Kite	RK
Motacilla alba	Pied Wagtail	PW
Motacilla cinerea	Grey wagtail	GrW
Musicapa striata	Spotted Flycatcher	SF
Oenanthe oenanthe	Wheatear	Whe
Parus major	Great tit	GT
Passer domesticus	House sparrow	HS
Periparus ater	Coal tit	CT
Phalacrocorax carbo	Cormorant	Cor
Phasianus colchicus	Pheasant	Ph
Phoenicurus phoenicurus	Redstart	Re
Phylloscopus collybita	Chiffchaff	Cc
Phylloscopus sibilatrix	Wood Warbler	WoW
Phylloscopus trochilus	Willow warbler	WiW
Pica pica	Magpie	Ma
Prunella modularis	Dunnock	Du
Pyrrhula pyrrhula	Bullfinch	Buf
Regulus regulus	Goldcrest	Gc
Riparia riparia	Sand Martin	SM
Saxicola rubetra	Whinchat	Whin
Sitta europea	Nuthatch	Nu
Streptopelia decaocto	Collared Dove	CD
Strix aluco	Tawny Owl	TO
Sturnus vulgaris	Starling	Sta
Sylvia atricapilla	Blackcap	Bc
Sylvia borin	Garden Warbler	GaW
Sylvia communis	Whitethroat	Whit
Troglodytes troglodytes	Wren	Wr
Turdus merula	Blackbird	Bb
Turdus philomelos	Song Thrush	ST
Turdus viscivorus	Mistle Thrush	MT

Table 2.0 Breeding behaviour displayed.

Breeding behaviour	Breeding Behaviour Code
Singing	/S
Display Flight	/DF
Carrying Food	/CF
Alarm Call	/AC
Foraging	/F
Nest	/N
Carrying Nest Material	/CNM
Males fighting	/Fi
PAIR	P
YOUNG	Y

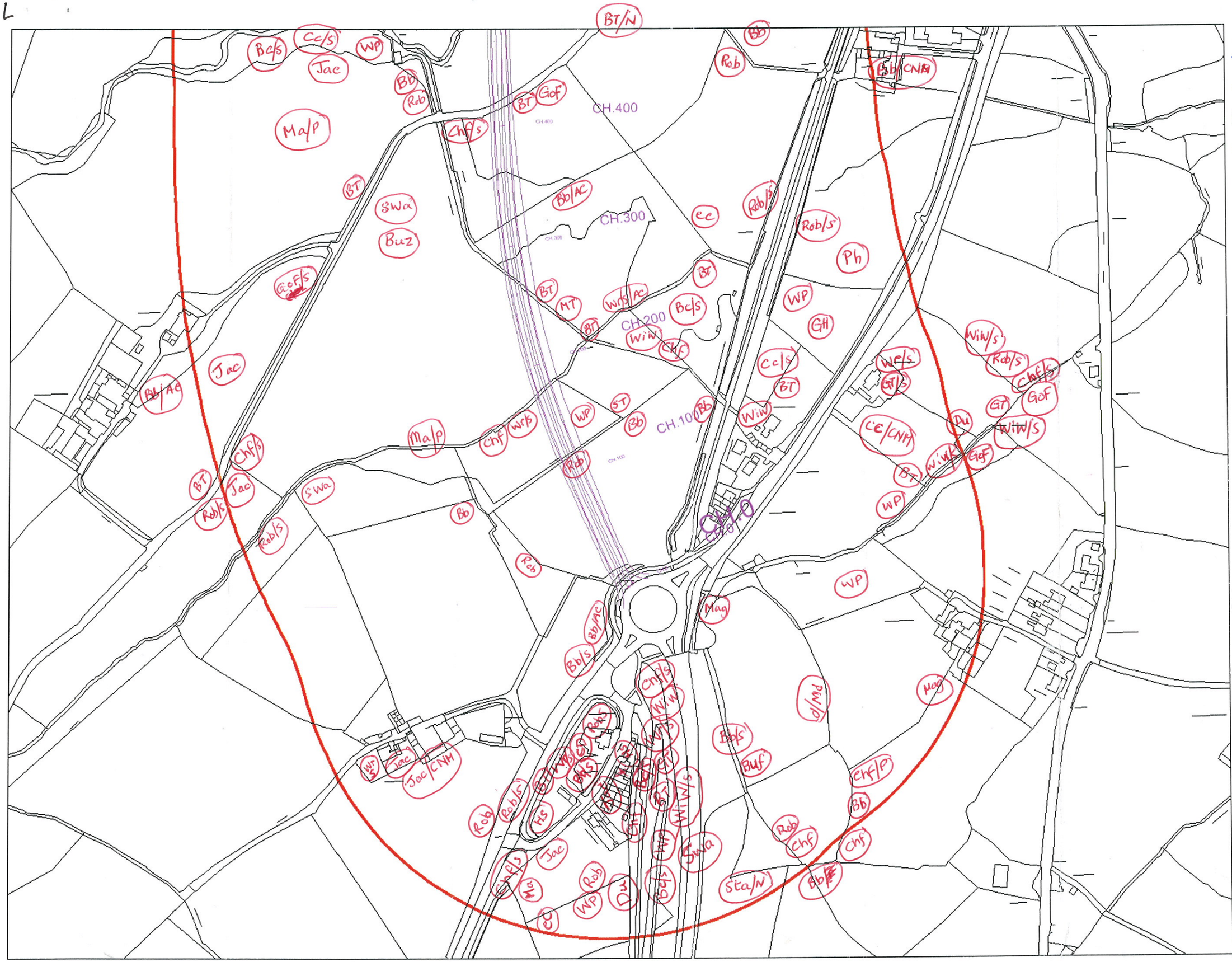
L

MIKE

FRIDAY
24TH APRIL 201

WEATHER: DRY
BUT CLOUDY.
LIGHT BREEZE
10°C

SUNRISE 06'00 HRS

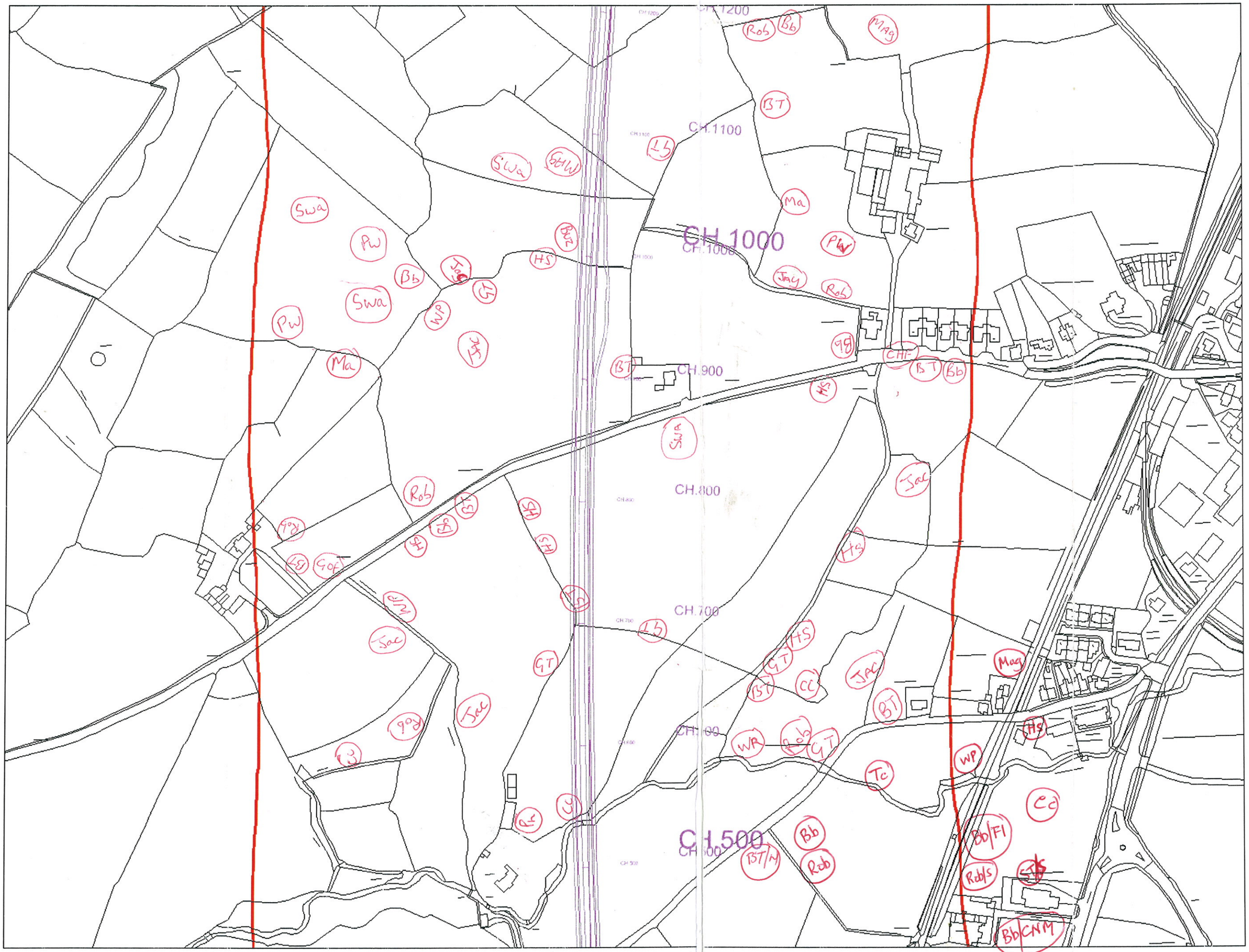


GEO

FRIDAY 24TH
APRIL 2015
+
TUES 28/4/15

FINE, SUNNY DRY

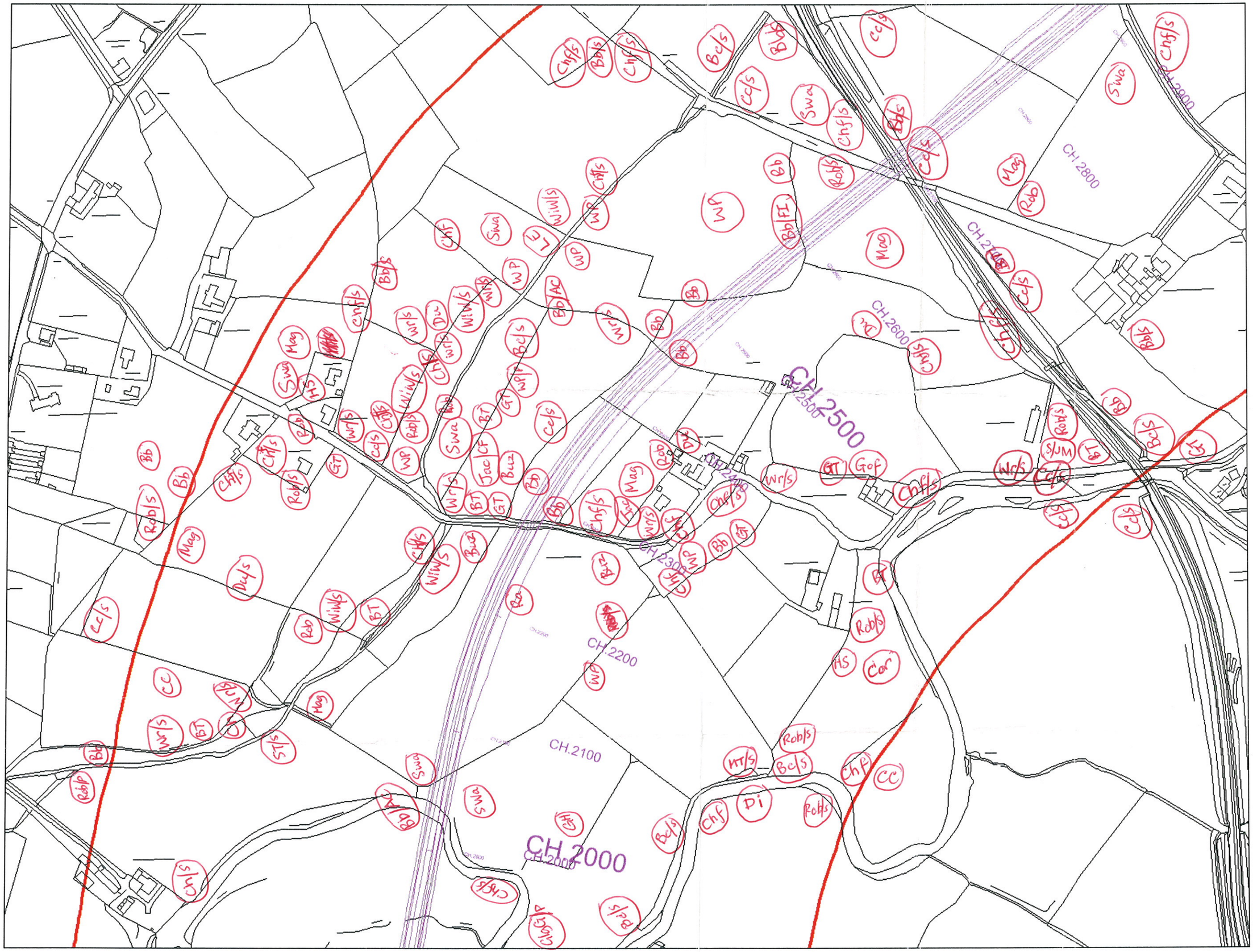
TEMP
5°C @ 06.00 hrs
10°C @ 15.00 hrs



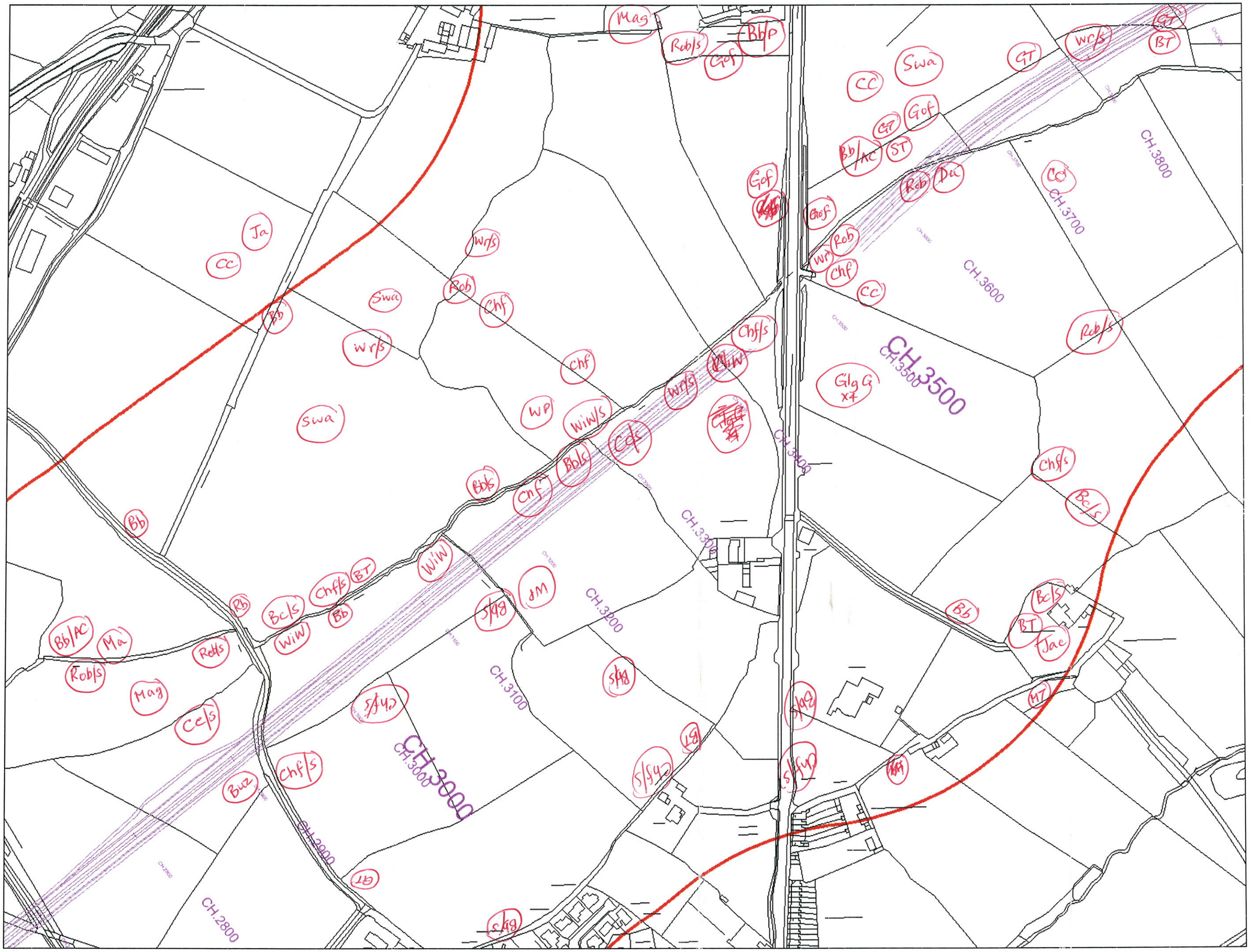
C.E.D 7 MILE
28/4/15 (PART)
13/5/15 (PART)

CH.1900
CH.1800
CH.1700
CH.1600
CH.1500
CH.1400
CH.1300
CH.1200

28/4/15
MIKE



28/4/15
MIKE



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CH.3600
CH.3700
CH.3800
CH.3400
CH.3300
CH.3200
CH.3100
CH.3000
CH.2900
CH.2800
Mag
Rob/s
Bb/p
Gof
Swa
CC
GT
Wr/s
BT
Bb/AC
ST
Rob
Du
Ja
Bb
Chf
Chf/s
WP
WiW/s
Bb/s
Bc/s
Rb
Ma
Ce/s
Buz
JM
Jac
MT
Glg G x4

S.

MGF

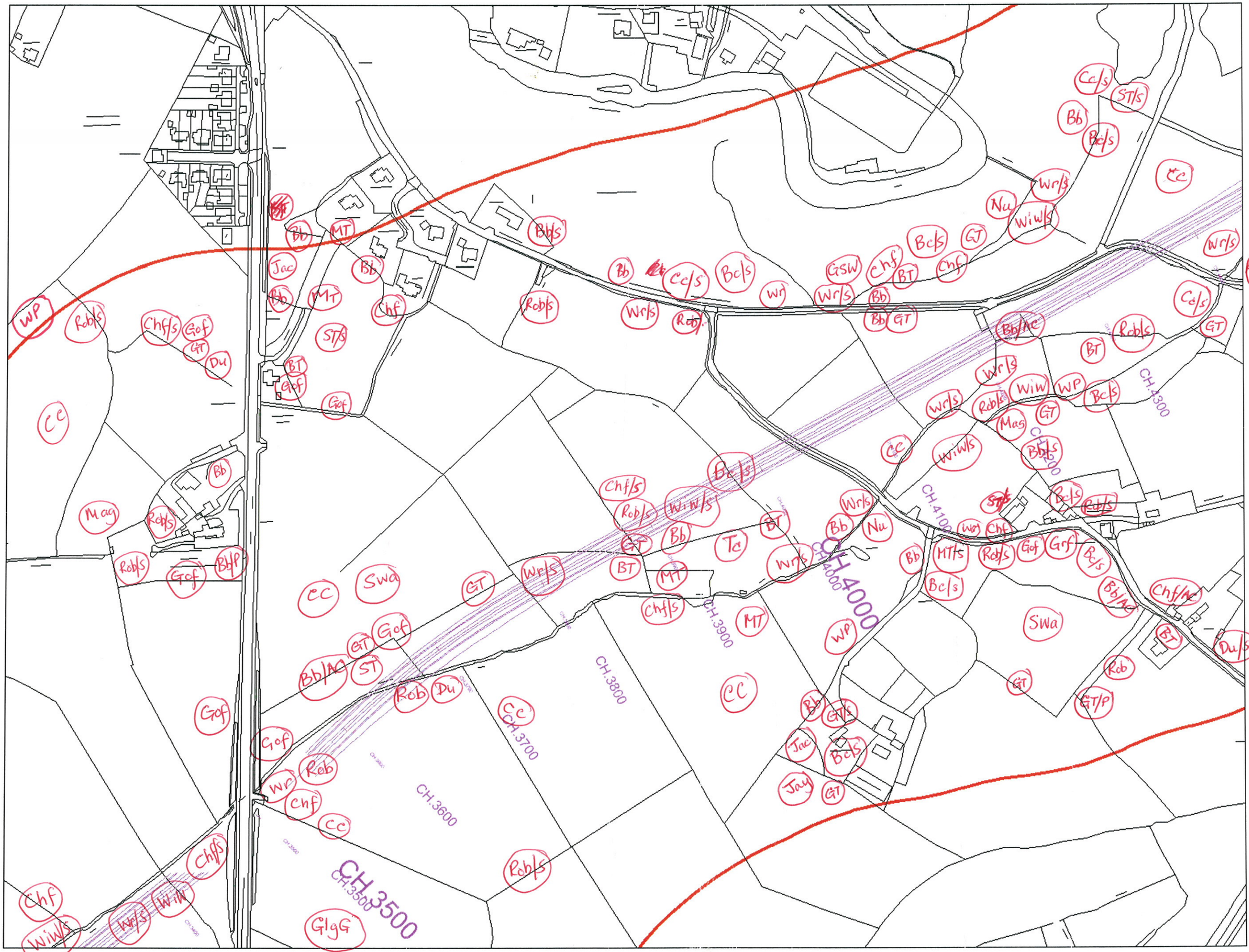
28/4/15 (PART)

1/5/15

7°c @ 06.00

BREEZE - DRY

11°c @ 15.00



MJKE
1/5/15

CH.5000

CH.4900

CH.4800

CH.4700

CH.4600

CH.4500

CH.4400

CH.4300

CH.4200

CH.4100

GED
1/5/15

CH.5500

CH.5400

CH.5300

CH.5200

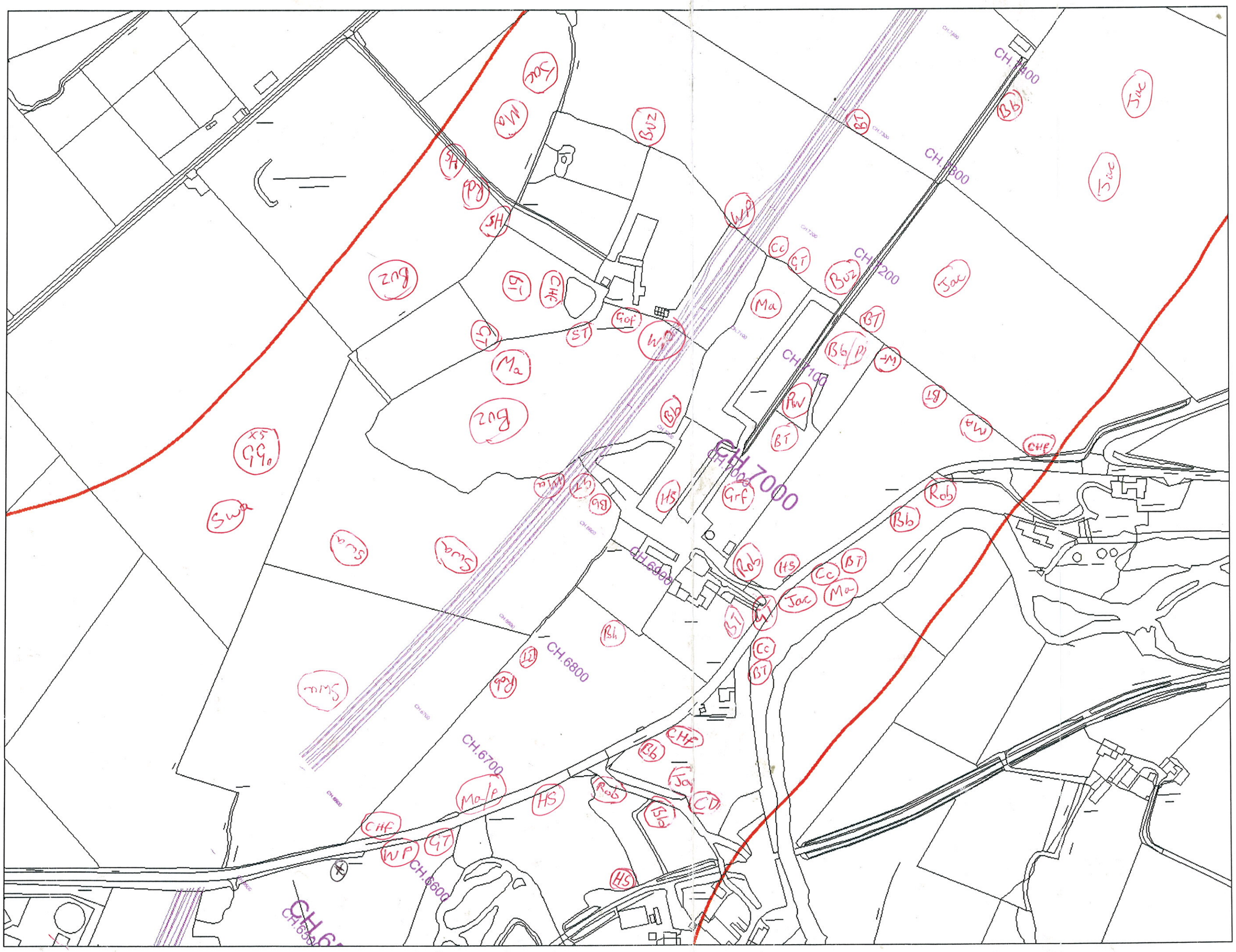
CH.5100

CH.5000

GBM + MIKE
1/5/15

CH.6800
CH.6700
CH.6600
CH.6500
CH.6400
CH.6300
CH.6200
CH.6100
CH.6000
CH.5900
Swa
BT
MAP
Cnf
Buz
Bb/s
Jac
CHF
Rock
Rob
MA
WP
HS
Bb
Du
Mag
Wi'W
Rob
Bc/s
Rad/s
Jac
CC
CC/s
Wi'W
Wi'W/s
Bb/s
Bb
Rob
Bb
Bb
Bb

GED
7/5/15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CH.6900
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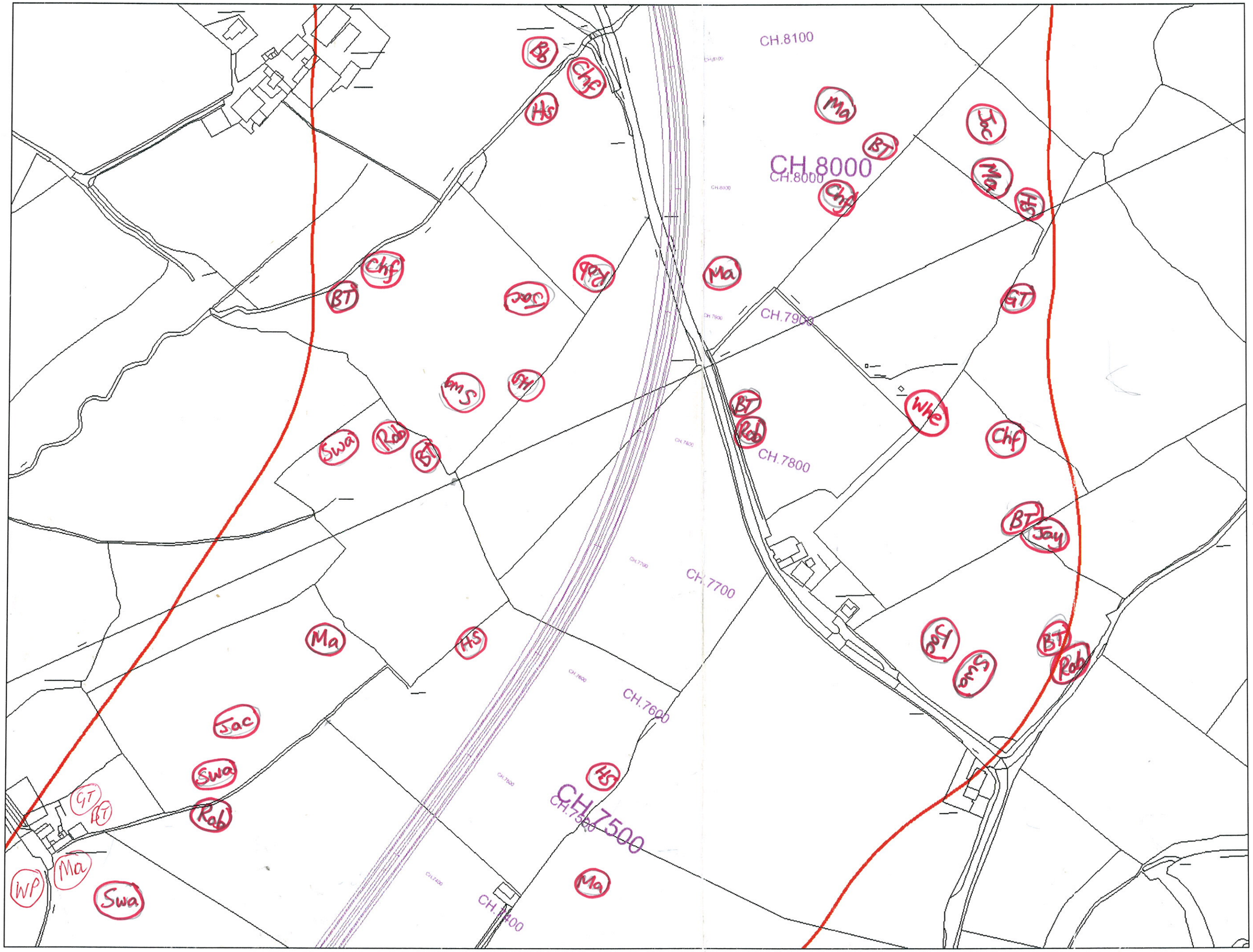
Jac
Bb
BT
Buz
Ma
Cc
GT
WP
Bb/P
Rw
Rob
HS
Grf
Swa
Gof
ST
CHF
Ma/P
CD
N
10.

GED
7/5/15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Bb
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Hs
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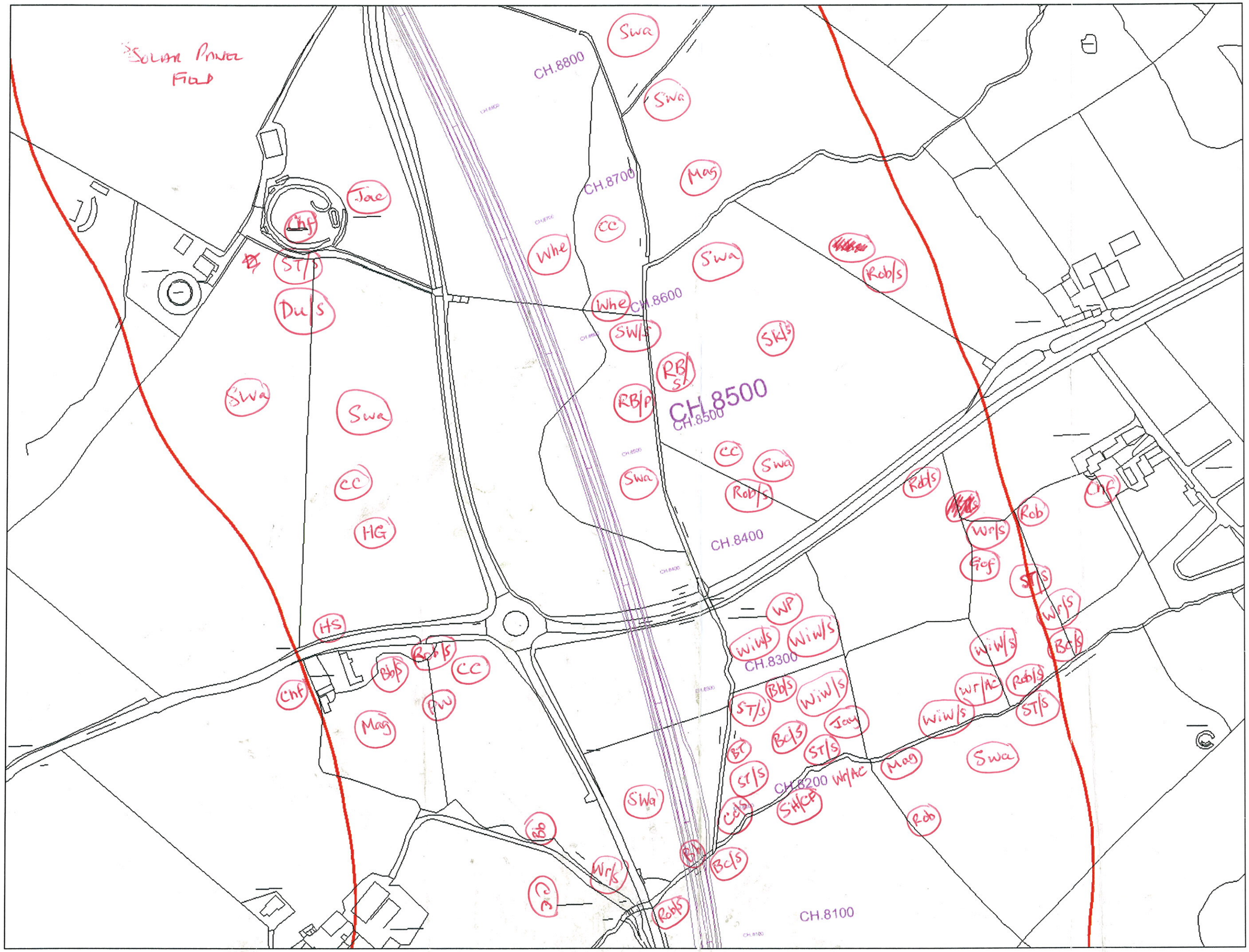
Jac
Ma
Hs
Chf
BT
Rob
Jac
Ma
GT
Swa
Hs
BT
Rob
Whe
Chf
Swa
Rob
BT
BT
Jay
Ma
HS
Jac
Swa
BT
Rob
Jac
Swa
Rob
GT
BT
Ma
WP
Swa
HS
Ma

N

11.

MGF
7/5/15

Showers, cloudy
sunny later
10° – 14°C



N
12

MGF
7/5/15

CH 9500
CH 9400
CH 9300
CH 9200
CH 9100
CH 9000
CH 8800
CH 8800
CH 8800

Solar Panel Field

Solar Panel Field

N
13

MGR

7/5/15

CH 9700

CH 9600

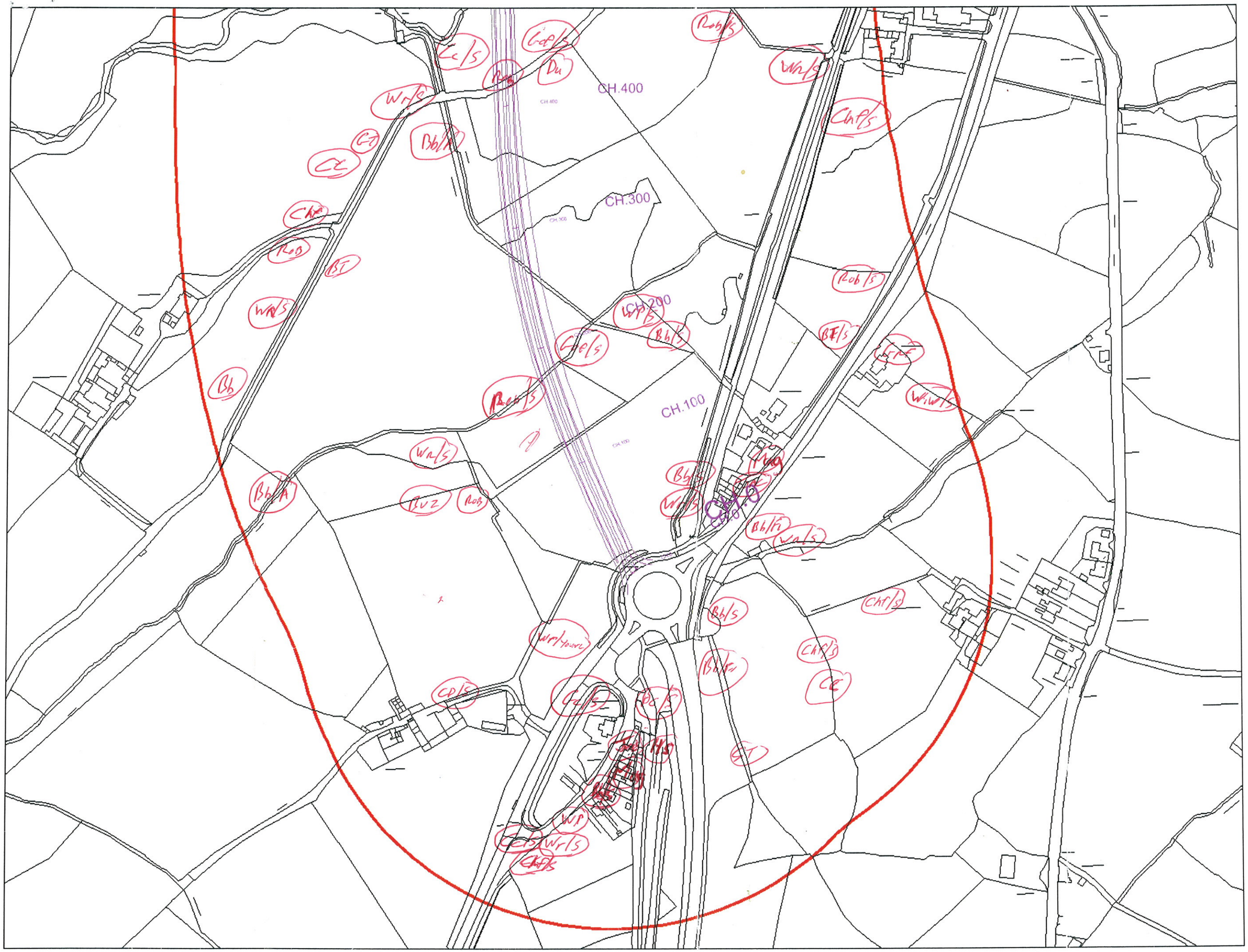
CH 9500

CH 9400

CH 9300

N

14



Joe
12/6/15

N

1

CH.1200
CH.1100
CH.1000
CH.900
CH.800
CH.700
CH.600
CH.500

J.C.
12/6/18

N

2.

Appendix E.5 –Bat Survey Report

Llywodraeth Cymru
Welsh Government

A487 CAERNARFON TO BONTNEWYDD BYPASS

BAT SURVEY REPORT

Welsh Government

3513874-PB-XX-XX-RP-EN-00001

Draft

Balfour Beatty JONES BROS CIVIL ENGINEERING UK
PARSONS BRINCKERHOFF
TACP
EC HARRIS BUILT ASSET CONSULTANCY
RAMBOLL

A487 Caernarfon and Bontnewydd Bypass

Bat Survey Report

3513874-PB-XX-XX-RP-EN-00001

Prepared for
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Sarn Mynach
Llandudno Junction
Conwy LL31 9RZ

Prepared by
Balfour Beatty/Jones Bros JV
Ty Glyn, Canol Y Dre
Ruthin LL15 1QW

Telephone 01824 703661

Report Title	**:**	**Bat Survey Report**
Doc Number	**:**	**3513874-PB-XX-XX-RP-EN-00001**
Report Status	**:**	**Draft**
Job No	**:**	**3513874A-HHC**
Date	**:**	**June 2016**

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4.0			

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Position:

Date:

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Position:

Date:

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LIST OF ABBREVIATIONS

AI – Activity Index
AIES – Assessment of Implications on European Sites
BE – Bat Event/Pass
CCW – Countryside Council for Wales (now part of Natural Resources Wales)
DMRB – Design Manual for Roads and Bridges
ECI – Early Contractor Involvement (contract under which the scheme is being delivered)
EcIA – Ecological Impact Assessment
EIA – Environmental Impact Assessment
ES – Environmental Statement
HRA – Habitats Regulations Assessment
HS – Hours surveyed
JNCC – Joint Nature Conservation Committee
KS2 – Key Stage 2 (refers to the study of transportation options undertaken in 2009 on behalf of the Welsh Government)
NERC Act – Natural Environment and Rural Communities Act 2006
NMWTRA – North and Mid Wales Trunk Road Agency
SAC – Special Area of Conservation
SIAA – Statement to Inform an Appropriate Assessment
SSSI – Site of Special Scientific Interest
TPO – Transport Planning Objectives
WelTAG –Welsh Transport Planning and Appraisal Guidance
WG – Welsh Government

1 INTRODUCTION

This report presents the findings of bat activity surveys undertaken during 2015 as part of the A487 Caernarfon and Bontnewydd Bypass (hereinafter referred to as the 'Scheme').

The Ecological Impact Assessment (EcIA) in relation to bats, and proposed mitigation is described within Volume 1, Chapter 8 of the Environmental Statement (ES).

Potential impacts and mitigation in relation to Special Areas of Conservation (SAC) designated for Lesser Horseshoe Bats are described within the Statement to Inform an Appropriate Assessment (ES Volume 3, Appendix E.2).

1.1 Location of the proposed project

The Welsh Ministers propose to provide a 10.35km long Trunk Road to the west of Bontnewydd and to the east of Caernarfon in Gwynedd, north Wales. The Scheme is located between the Plas Menai Roundabout north of Caernarfon (Grid ref. 53.167961, -4.237478) and the Goat Roundabout south of Llanwnda (Grid ref. 53.094795, -4.282511) along the A487 Trunk Road (refer to Figure A below).

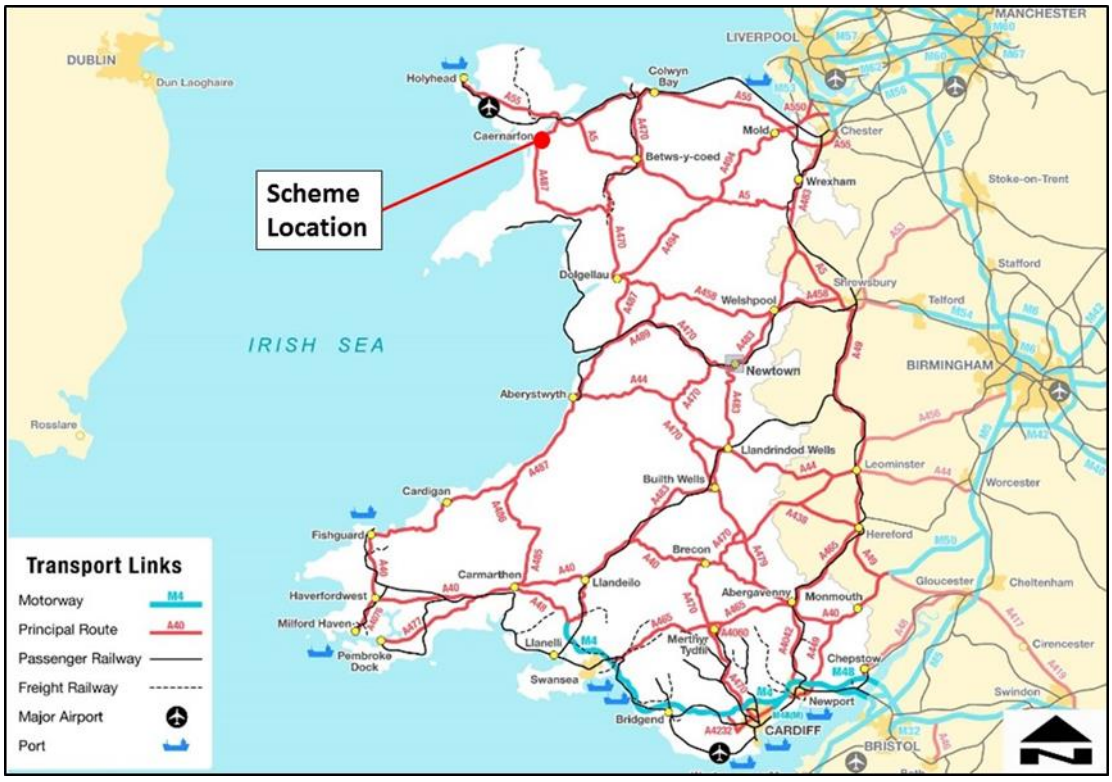


Figure A: Scheme Location

1.2 Why the Scheme is needed

The problems that the Scheme is attempting to address include:

- Traffic congestion;

- A lack of high quality road infrastructure hindering economic development of the area;
- Community severance and quality of life for settlements along the A487;
- A high risk of collisions in urban areas;
- Vehicles using county roads to bypass the A487; and
- Difficulty in maintaining the trunk road due to high traffic levels and lack of suitable alternative routes.

1.3 Description of the Scheme

The Scheme would be 10.35km in length and would comprise a Wide Single 2+1 Road (WS2+1). This would provide two lanes in one direction and one lane in the opposite direction throughout the Scheme. The Scheme would provide a total of 4.60km of overtaking length in the northbound direction and 4.57km of overtaking length in the southbound direction. This route would be made up of three sections of WS2+1 standard carriageway separated by new at-grade roundabouts at Meifod and Cibyn. All the proposed alignment would be offline from the existing A499/A487(T) Goat roundabout to the existing A487(T) Plas Menai roundabout.

For the proposed alignment there would be two significant river crossings over the Afon Gwyrfai and the Afon Seiont.

New or diverted Public Rights of Way and Private Means of Access would be provided to replace those affected by the Scheme.

Road drainage would be provided through 'over the edge' drainage which would discharge into attenuation ponds along the Scheme. The attenuation ponds would be provided for each of the carriageway drainage sub-catchments to mitigate for the increased rates and volume of run-off that would arise post-scheme construction. These ponds would attenuate and treat the collected surface water prior to discharging it into existing watercourses.

The drainage of both the Afon Seiont and Afon Gwyrfai viaducts would be via combined kerb and drainage bridge-deck compatible units.

The majority of the Scheme would be fenced with stock proof fencing. Otter fencing would also be provided at appropriate points on the Scheme.

1.4 Aim of the survey

The aim of these surveys is to identify the species of bat present at the various transect locations, how they are using their surrounding environment (e.g. commuting along linear features or foraging in certain locations) and to what level they are using specific areas, if at all. Bats are vulnerable to being hit by moving traffic therefore new road developments, which sever bat commuting routes and foraging areas have the potential to negatively affect these animals by causing mortality, and/or by fragmenting roosts from foraging areas or from alternative (e.g. hibernation) roosts used by the same bats. They can also suffer negative affects through loss of foraging habitat, which may cause them to search elsewhere for food, potentially expending more energy.

This report addresses all species of bat encountered during the surveys, but a stronger emphasis is given to Lesser Horseshoe Bats *(Rhinolophus hipposideros)*.

This is because Lesser Horseshoes are a qualifying interest of three SACs (Special Areas of Conservation), which lie within 30km of the Scheme (refer to Section 1.6 below). The Scheme not only has the potential to affect individuals and local populations of this species, but also the integrity of the three SACs.

This report also includes the results of the preliminary tree roost assessments which aim to identify and quantify the bat roost potential for trees within c50m of the proposed Scheme. This survey also identifies potential roosts in buildings and other structures within the vicinity of the Scheme.

This report will inform the Environmental Impact Assessment (EIA) and the Assessment of Implications on European Sites (AIES) for the Scheme and will form part of the technical appendices (Volume 3) of the Environmental Statement (ES) for the Scheme.

1.5 Bat ecology

Bats are the only mammals which use powered flight. They belong to the Order of mammals *(Chiroptera)*, which is the second largest Order following Rodents. The UK has 17 species of bat that are known to breed in this country. These belong to two families: *Rhinolophidae* (horseshoe bats) and *Vespertilionidae* (vesper bats).

All UK species are nocturnal and use ultrasound to locate prey and find their way in their environment. They do this by emitting pulses of high frequency sound through their mouth, or noses, and listen for the returning sound which bounces back off objects in their surroundings. Bats use features within their environment to find their way around. These are often linear features, such as hedgerows, ditches and streams.

UK bats feed on a range of invertebrate, with different species preferring different prey items and using different techniques in order to hunt. For example, Pipistrelle species *(Pipistrellus* spp*.),* hunt small insects, such as midges by aerial hawking (catching them in the air), whereas the Brown Long-eared *(Plecotus auritus)* preys on larger insects such as moths and butterflies by gleaning (picking stationary insects off vegetation).

When they are not active, bats require a roost in which to shelter and rest. There are a number of different types of roost including day roosts (where bats shelter during the day), night roosts (where bats shelter intermittently during the night), maternity roosts (where bats give birth and raise their young), hibernation roosts (where bats spend the winter in hibernation and torpor) and transitional roosts (where bats may stay between their summer and winter roosts). Bats can also use particular areas or roosts for swarming, especially during the autumn when they are breeding.

Different species have different roosting requirements and prefer different locations in which to roost. For example, Noctules *(Nyctalus noctula)* roost almost exclusively in trees, whereas Horseshoe Bats, *(Rhinolophus* spp*.)* roost almost exclusively in buildings during the summer where they require a free space in which to hang and an entrance wide enough for them to fly through. During the winter all UK bats require a hibernation roost, which must have a stable temperature and a high humidity.

1.6 Bat legislation and policy

Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations)

All UK bat species are protected by European legislation and are listed under Annex IV of the Habitats Directive (Council Directive 92/43/EEC), which is transposed into UK law by the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations). Under regulation 41(1): '*a person who:*

- *Deliberately captures, injures or kills any wild animal of a European Protected Species,*
- *Deliberately disturbs wild animal of any such species,*
- *Deliberately takes or destroys the eggs of such an animal, or*
- *Damages, destroys a breeding site, or resting place of such an animal.*

Is guilty of an offence'

For the purposes of the above*, disturbance of animals includes in particular any disturbance which is likely—*

(a)to impair their ability—

- *(i)to survive, to breed or reproduce, or to rear or nurture their young, or*
- *(ii)in the case of animals of a hibernating or migratory species, to hibernate or migrate; or*

(b)to affect significantly the local distribution or abundance of the species to which they belong.

It is an offence for any person—

(a)to be in possession of, or to control,
(b)to transport,
(c)to sell or exchange, or
(d)to offer for sale or exchange,

However, under Regulation 53 (1 & 2), *'the relevant licencing body may grant a licence for the purposes specified'* below:

- *Scientific or educational purposes;*
- *Ringing or marking, or examining any ring or mark on, wild animals;*
- *Conserving wild animals or wild plants or introducing them to particular areas;*
- *Protecting any zoological or botanical collection;*
- *Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment;*
- *Preventing the spread of disease; or*
- *Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property to fisheries'.*

Under Regulation 53(9) *'the relevant licensing body must not grant a licence under this regulation unless they are satisfied:*

- *That there is no satisfactory alternative; and*
- *That the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.*

The following four UK bat species are also listed on Annex II of Council Directive 92/43/EEC, and are therefore species for which Special Areas of Conservation can be designated:

- Greater Horseshoe *(Rhinolophus ferrumequinum)*
- Lesser Horseshoe
- Bechstein's Bat *(Myotis bechsteinii)*
- Barbastelle *(Barbastella barbastellus)*

There are three SACs within 30km of the Scheme which have been designated primarily for Lesser horseshoe bats. These include:

- Glynllifon SAC – approx. 1.2km to the south of Scheme's southern end (Goat Roundabout)
- Meirionnydd Oakwoods and Bat Sites SAC – approx. 14.7km southeast of the Scheme's southern end (Goat Roundabout)
- Gwydir Forest Mines SAC – approx. 25km east of the Scheme (Cibyn Roundabout)

Council Directive 92/43/EEC is transposed into UK law by the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations). Before deciding to give consent for a plan or project, the competent authority (in this case, the Welsh Government) must consider under the requirements of Regulation 61 whether the plan or project -

(a) is likely to have a significant effect on a European site (either alone or in combination with other plans or projects); and
(b) is not directly connected with or necessary to the management of that site,

and in such cases they must make an 'appropriate assessment 'of the implications for that site in view of its conservation objectives.

A plan or project should only be undertaken or authorised if it can be shown that it will not result in an adverse effect on the integrity of European sites except in situations of imperative reasons of overriding public interest where compensation measures have been included. In the case of road schemes this is achieved through the Assessment of Impacts on European Sites (AIES) process. The SIAA which reports this process in relation to SACs potentially affected by the Scheme is provided in the ES Volume 3, Appendix E.2.

Bats are also partially protected under the Wildlife and Countryside Act 1981 (as amended). This legislation is less significant since the implementation of the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations).

Wildlife and Countryside Act 1981 (as amended) Section 28G (SSSI Commitment)

In Wales, this places duties on section 28G authorities (which includes Ministers, Government Departments, local authorities, statutory undertakers and any other public body) to notify Natural Resources Wales before reaching its decision. Section 28G authorities have specific duties and responsibilities in respect of SSSIs and the *'Act sets out specific procedures that must be followed by these authorities when carrying out or authorising operations which are likely to damage the special interest features of SSSIs.*'

The Government expects all section 28G authorities, including planning authorities, to:

a) apply strict tests when carrying out any functions within or affecting SSSIs, to ensure that they avoid or at least minimise adverse effects;

b) adopt the highest standards of management in relation to SSSIs in their ownership, and to take appropriate action to prevent damage by third parties; and

c) as owners or otherwise to take positive steps, wherever possible, to conserve and enhance the special interest features of a SSSI where their activities may be affecting it, or as opportunities arise in the exercise of their functions. [NRW] will advise on a case by case basis as to opportunities for enhancement.

Although the Scheme does not fall within a SSSI boundary, its affect must be considered in relation to bats at the Glynllifon SSSI and otters at Afon Gwyrfai a Llyn Cwellyn SSSI, due to the mobile nature of these qualifying features. Consultation with NRW has taken place in relation to these features.

The Environmental Damage (Prevention and Remediation) Regulations 2009 (as amended) applies in relation to prevention and remediation of environmental damage to protected species, natural habitats, SSSIs, surface and ground water and land. In the case of damage to species and habitats (e.g. bat roosts) the regulations have the power to make the operators of activities which have caused damage carry out:

- Primary remediation (clean up)
- Complementary remediation (cleaning up an alternative site if the damaged site cannot be fully restored), and
- Compensatory remediation (carry out other measures to provide alternative natural resources to compensate for the time during which the damaged site remains in its damaged state)

The following seven bats are listed as Species of Principal Importance for Nature Conservation under Section 42 of the Natural Environment and Rural Communities (NERC) Act 2006:

- Soprano Pipistrelle *(Pipistrellus pygmaeus)*
- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Greater Horseshoe
- Lesser Horseshoe
- Bechstein's Bat
- Barbastelle
- Noctule
- Brown Long-eared

1.7 Summary of previous activity surveys

Activity surveys were undertaken in 2009 during the Key Stage 2 Route Selection Study (TACP, 2009) and during 2014 (Freeman, 2014), prior to the letting of the early contractor involvement (ECI) Contract. These are summarised below.

1.7.1 Activity surveys 2009 (TACP, 2009)

Activity surveys were undertaken across fourteen transects during 2009 as part of the Stage 2 route selection study. Transect locations are shown in Appendix A.

The transect locations were based on areas that were most likely to have particular concentrations of bat activity based on the habitats and/or features present or in the immediate area or be potential commuting routes that were intersected by the Study's route options. These targeted mature and/or dense hedgerows and wooded areas and those less suitable features that provided connectivity between higher quality locations. This was ascertained through analysis of OS maps and aerial photographs in conjunction with field walkover surveys together with records of bat roosts received from Cofnod. Those areas with the highest potential for bat commuting and/or foraging and/or those features that provided potential connectivity between such areas were highlighted and suitable transects identified to maximise the coverage of these areas. The Countryside Council for Wales (now part of Natural Resources Wales) were consulted on the proposed transect locations and layouts and approval was received on 19/05/2009.

Sixteen transects were identified, but only fourteen were surveyed as landowner permission was not granted to survey Transects 9 and 15. The transects were surveyed for two hours at dusk and two hours the following dawn on two occasions in June/July and September/October 2009 during suitable weather conditions. The surveys were carried out by two surveyors using heterodyne (Bat Box Duet) and frequency division (AnaBat) bat detectors (static detectors were not used during these surveys). It was not always possible to observe all bats' behaviours in the field due to poor light levels. Therefore, it was not always possible to say for certain whether all bats recorded were foraging or commuting to a feeding area.

Calls were identified using AnalookW software, however it should be noted that such identification has a number of limitations. Species with quiet calls, such a Brown Long-eared are often underrepresented as their calls are not always picked up by bat detectors. Conversely, bats with louder calls, such as Noctules can be detected at a much longer distance, so may be over-represented.

There are also limitations identifying bats from interpretation of their calls using sound analysis software and identification to species level is not always possible. This is particularly true of the 'Myotis' genus and 'large bat species' (i.e. Noctule, Leisler's (N. leisleri) and Serotine (Eptesicus serotinus). There are often overlaps in call parameters of the 'frequency modulated' parts of large bat species calls, particularly when they are flying in a cluttered environment. Identification has been made through examination of call parameters and using professional judgement and experience. In many cases it has not been possible to identify to species level with reasonable surety and so the genus or possible species have been stated.

Table 1.1.1 shows the species and the total number of Lesser Horseshoe Bat (LHB) passes recorded at each transect location over the two surveys conducted in 2009.

Table 1.1.1 – Bat Survey Results 2009 – species present and numbers of LHB

Survey Location	Species recorded during all surveys	No. Lesser Horseshoe passes recorded during all surveys
Transect 1	Common Pipistrelle Soprano Pipistrelle	2

Survey Location	Species recorded during all surveys	No. Lesser Horseshoe passes recorded during all surveys
	Noctule *Myotis sp.* Lesser Horseshoe	
Transect 2	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.*	0
Transect 3	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.* Brown Long-eared Lesser Horseshoe	1
Transect 4	Common Pipistrelle Soprano Pipistrelle Daubenton's *(Myotis daubentonii)* *Myotis sp.*	0
Transect 5	Common Pipistrelle Soprano Pipistrelle Noctule Daubenton's *Myotis sp.* Lesser Horseshoe	1
Transect 6	Common Pipistrelle Soprano Pipistrelle Noctule Daubenton's *Myotis sp.* Lesser Horseshoe	1
Transect 7	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.* Lesser Horseshoe	9

Survey Location	Species recorded during all surveys	No. Lesser Horseshoe passes recorded during all surveys
Transect 8	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.*	0
Transect 9	N/A – not surveyed due to access restrictions	N/A
Transect 10	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.* Lesser Horseshoe	11
Transect 11	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.* Lesser Horseshoe	2
Transect 12	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.*	0
Transect 13	Common Pipistrelle Soprano Pipistrelle Noctule Daubenton's *Myotis sp.* Lesser Horseshoe	1
Transect 14	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.* Lesser Horseshoe	2
Transect 15	N/A – not surveyed due to access restrictions	N/A
Transect 16	Common Pipistrelle	4

Survey Location	Species recorded during all surveys	No. Lesser Horseshoe passes recorded during all surveys
	Soprano Pipistrelle Noctule Daubenton's *Myotis sp.* Lesser Horseshoe	

A total of six species were recorded across all transects with several other *Myotis* species recorded, but which could not be identified to species level. Lesser Horseshoe Bats were recorded at ten of the fourteen transects surveyed. The highest number of passes with Lesser Horseshoe Bats occurred at Transect 10 (known as Transect R7 in the 2014 and 2015 surveys), where eleven Lesser Horseshoe Bat passes were recorded over the two surveys with a peak count of six passes recorded during the June/July survey.

1.7.2 Activity surveys 2014

Activity surveys were undertaken in 2014 prior to the letting of the ECI Contract. The methodology reflected that used during the 2009 surveys. Transects were surveyed for two hours at dusk and two hours the following dawn on one occasion in September 2014. An additional survey was conducted at Transect R5. The surveys were carried out by two surveyors using heterodyne (Bat Box Duet) during suitable weather conditions with the exception of the odd night at the end of August and the end of September and frequency division (AnaBat) bat detectors both carried and left in situ for the duration of the survey night. It was not always possible to observe all bats' behaviours in the field due to poor light levels. Therefore, it was not always possible to say for certain whether all bats recorded were foraging or commuting to a feeding area.

Calls were identified using AnalookW software, however it should be noted that such identification has a number of limitations. Species with quiet calls, such a Brown Long-eared are often underrepresented as their calls are not always picked up by bat detectors. Conversely, bats with louder calls, such as Noctules can be detected at a much longer distance, so may be over-represented.

There are also limitations identifying bats from interpretation of their calls using sound analysis software and identification to species level is not always possible. This is particularly true of the 'Myotis' genus and 'large bat species' (i.e. Noctule, Leisler's and Serotine. There are often overlaps in call parameters of the 'frequency modulated' parts of large bat species calls, particularly when they are flying in a cluttered environment. Identification has been made through examination of call parameters and using professional judgement and experience. In many cases it has not been possible to identify to species level with reasonable surety and so the genus or possible species have been stated.

Thirteen transects which were along the preferred route of the Scheme were identified for survey (refer to Appendix B). The other transects that were surveyed during the Key Stage 2 study, along routes that had been rejected were not considered for further survey. Four of the thirteen identified transects were not surveyed due to landowner permission not being granted.

Table 1.1.2 shows the species and the total number of Lesser Horseshoe Bat passes recorded at each transect location in 2014.

Table 1.1.2 - Bat Survey Results 2014 – species present and numbers of LHB

Survey Location	Species recorded	No. Lesser Horseshoe passes recorded during all surveys
Transect R1 (Transect 1 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.* Lesser Horseshoe	1
Transect R2 (Transect 2 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.* Lesser Horseshoe	1
Transect R3 (Transect 3 in 2009)	N/A – not surveyed due to access restrictions	N/A
Transect R4 (Not surveyed in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.* Lesser Horseshoe	2
Transect R5 (Transect 6 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.* Lesser Horseshoe	2
Transect R6 (Transect 9 in 2009)	Soprano Pipistrelle *Myotis sp.* Lesser Horseshoe	4
Transect R7 (Transect 10 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule	11

Survey Location	Species recorded	No. Lesser Horseshoe passes recorded during all surveys
	Myotis sp. Lesser Horseshoe	
Transect R8 (Not surveyed in 2009)	N/A – not surveyed due to access restrictions	N/A
Transect R9 (Transect 12 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared Natterer's *(Myotis nattereri)* *Myotis sp.* Lesser Horseshoe	1
Transect R10 (Transect 13 in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule Brown Long-eared *Myotis sp.*	0
Transect R11 (Not surveyed in 2009)	N/A – not surveyed due to access restrictions	N/A
Transect R12 (Not surveyed in 2009)	Common Pipistrelle Soprano Pipistrelle Noctule *Myotis sp.* Lesser Horseshoe	1
Transect R13 (Transect 16 in 2009)	N/A – not surveyed due to access restrictions	N/A

A total of six species were recorded across all transects with several other *Myotis* species recorded, which could not be identified to species level. Lesser horseshoe bats were recorded at eight of the nine transects surveyed. The highest number of passes with Lesser Horseshoe Bats occurred at Transect 7 (known as Transect 10 in the 2009 surveys), where eleven Lesser Horseshoe Bat passes were recorded during a single survey night.

2 METHODS

2.1 Desk study

Cofnod, the biodiversity records centre for the North Wales region, was contacted in February 2015 and protected species records were obtained to identify any existing information on all bat species within a 5km buffer of the Scheme. Further information was obtained for Noctule bats within a 10km and Lesser Horseshoe Bats within a 30km buffer.

Results from previous surveys undertaken in 2009 (TACP, 2014) and 2014 (Freeman, 2014) (refer to Section 1.7.1 and 1.7.2 above) have been reviewed.

Natural Resources Wales (NRW) were contacted in order to obtain output from a habitat suitability predictive model for Lesser Horseshoe Bats in Wales (Matthews, 2015). This provides information on the likely presence of maternity or hibernation roosts within a given area based on a variety of eco-geographical variables including:

1. Qualitative data
    a. Hydrology
    b. Scrub
    c. Marshy grassland
    d. Conifer
    e. Broadleaved woodland
    f. Ancient monuments
    g. Caves & mines
    h. Towns
    i. Existing Lesser Horseshoe Bat maternity & hibernation roosts

2. Quantitative data
    a. Elevation
    b. Slope
    c. Aspect
    d. Rainfall
    e. Temperature

2.2 Preliminary roost assessments

All buildings, structures and trees potentially directly affected by the Scheme (within approximately 50m either side of the proposed Scheme alignment) through damage, destruction or disturbance have been subject to preliminary roost assessments in accordance with Hundt (2012) in May 2015.

Further inspections and/or activity surveys were identified as a future requirement for all buildings and structures categorised as having low roost potential or above.

Preliminary tree roost assessments were undertaken in accordance with the protocol for visual inspection of trees due to be affected by arboricultural work (Hundt, 2012) with trees inspected from the ground with the aid of close-focusing binoculars and a high-powered torch. Each tree was categorised for its value to bats based on the presence of features commonly used by bats to roost and field signs that may indicate use of trees by bats (as described in Hundt 2012).

Further climbing inspection surveys were identified as a future requirement for all trees categorised as 1 or 1* with those categorised as 2 identified to be soft felled

only. Category 3 trees are not considered to require any specific measures relating to bats or their roosts. Given the period between these surveys and the start of construction and the variable nature in the use of tree roosts it is considered most appropriate for these inspections and any subsequent emergence/re-entry surveys to be undertaken as part of the pre-construction works to ensure the most accurate and up-to-date information is used to inform felling requirements.

2.3 Bat activity surveys

The same thirteen transects identified in 2014 (refer to Section 1.7.2) were again surveyed during May, July and September 2015 (refer to Figure 1.0). These transects were originally identified in 2009 and were originally based on areas that were most likely to have particular concentrations of bat activity based on the habitats and/or features present or in the immediate area or be potential commuting routes that were intersected by the proposed route options. These targeted mature and/or dense hedgerows and wooded areas and those less suitable features that provided connectivity between higher quality locations. This was ascertained through analysis of OS maps and aerial photographs in conjunction with field walkover surveys together with records of bat roosts received from Cofnod. Those areas with the highest potential for bat commuting and/or foraging and/or those features that provided potential connectivity between such areas were highlighted and suitable transects identified to maximise the coverage of these areas. These were reviewed and those considered the most appropriate areas for survey due to likely concentrations of bat activity and potential commuting routes intersected by proposed Scheme alignment were proposed within the Environmental Scoping Report and agreed with NRW. This approach to deciding on the most suitable survey locations is in line with best practice guidance given in Hundt, (2012) para. 7.4.

The results from previous surveys along the transects have shown varying concentrations and several species of bats to be present. There has also been no significant change to the vegetation and landscape features along the Scheme since 2009. The thirteen transects surveyed previously in 2009 and 2014 were therefore considered the most appropriate to survey once more in 2015. This would also build on the survey results at these locations from previous years and so provide a larger comparable data set on which to base decisions.

Each transect was surveyed for two hours at dusk (commencing at sunset) with additional two hour dawn surveys included during September, finishing at sunrise.

Following discussions with the Welsh Government, an additional transect (Transect R7a) was surveyed during September 2015. The transect was along a mature hedgerow and tree line that adjoins the south western end of transect R7.

The walked transect surveys were undertaken using AnaBat frequency division, Elekon Bat Scanner and Bat Box Duet heterodyne bat detectors. The Bat Box Duets were set at 110kHz specifically to audibly detect Lesser Horseshoe Bats, while the Elekon Bat Scanner scanned all frequencies so other bats species were audible in the field. Notes were made of bat activity and behaviour to help understand how the bats were using the surrounding habitats (e.g. foraging, commuting, roosting etc.). This informs the understanding of how the Scheme may affect the local bat population. Static detectors were not considered necessary due to the low level widespread nature of the activity recorded to date and the lack of identifiable commuting routes

Bat calls were recorded and analysed using AnalookW software with reference to Russ, (2012) and Middleton *et. al.* (2014) to aid identification. Recorded bats were

identified to species level where necessary. However, given the focus of the surveys on Lesser Horseshoe Bats, calls were not identified to species level for the larger bat species, which tend to fly higher and are therefore less vulnerable to traffic or for *Myotis* sp., as these would not influence the mitigation required for the Scheme. It can also be difficult to identify these two groups to species level as detailed in Section 2.5 below.

The above survey method was included within the Environmental Scoping Report (JV, 2015), which was issued to NRW for their consideration and comment. It was also discussed with NRW during a teleconference. No comments were received regarding the bat activity survey methodology and no changes to the methods were suggested during the teleconference.

The table at Appendix C shows the dates that surveys were undertaken, the times of sunset and sunrise and the weather conditions during the surveys.

2.3.1 Supplementary static detector surveys

In addition to the walked transects, static detector surveys using AnaBat SD2 and AnaBat Express frequency division detectors were carried out at transects R1, R2, R4, R5, R7, R7a and R10 at the surveyor's discretion. Static detectors were located along suitable habitat features.

Four AnaBats were placed out on each transect for the duration of the walked transect surveys in May and July and over the entire night during September. Surveys were undertaken during September only at R7a.

Bat calls were analysed using AnalookW software with reference to Russ, (2012) and Middleton *et. al.* (2014) to aid identification. The 'filters' function in AnalookW was used to help analyse the large data sets. Recorded bats were identified to species level where possible.

2.4 Personnel used

Surveys were undertaken by:

- Samantha Shove – BSc (Joint Hons), MCIEEM, CEnv
- Jean Hamilton – BSc (Hons), MSc, MIEEM
- James Bilham – BSc (Hons), MSc, ACIEEM
- Tim Wroblewski – BSc (Hons), MRes
- Kiri Jones – BSc (Hons), MSc
- Millie Coleing – BSc (Hons), MSc
- Nick Weaver – BSc (Hons), MCIEEM
- Alison Johnston – BSc (Hons), MCIEEM
- Alice Jackson – BSc (Hons)
- Sarah Cartmel – PhD, NRW Bat Licence No. 68942:OTH:CSAB:2015
- Dervla Corduff – Trainee bat worker
- Mike Freeman – (ACIEEM), Chairman of Cheshire Bat Group, NRW Bat Licence No. 61024:OTH:CSAB:2014
- Ged Ryan – Licenced bat worker and member of Cheshire Bat Group
- Chris Ryan – Trainee bat worker and member of Cheshire Bat Group
- David Mort – Licenced bat worker and member of Cheshire Bat Group

2.5 Constraints, limitations and assumptions

The 2015 surveys were generally undertaken in suitable weather conditions. However, during some of the surveys undertaken in September (particularly at dawn), temperatures were lower than forecast. Bats were recorded during these surveys at comparable if not higher levels of activity than earlier in the year and as such this is not considered a significant constraint.

The July 2015 survey at Transect R8 was limited to the verge along the existing A487 due to landowner access restrictions.

It was not always possible to observe all bats' behaviours in the field due to poor light levels. Therefore, it was not always possible to say for certain whether all bats recorded were foraging or commuting to a feeding area.

Static detectors were not available to use along all 2015 survey transects.

Surveys which rely on species identification from interpretation of bat calls have a number of limitations. Species with quiet calls, such a Brown Long-eared are often underrepresented as their calls are not always picked up by bat detectors. Conversely, bats with louder calls, such as Noctules can be detected at a much longer distance, so may be over-represented.

There are also limitations identifying bats from interpretation of their calls using sound analysis software and identification to species level is not always possible. This is particularly true of the *'Myotis'* genus and 'large bat species' (i.e. Noctule, Leisler's and Serotine. There are often overlaps in call parameters of the 'frequency modulated' parts of large bat species calls, particularly when they are flying in a cluttered environment. Identification has been made through examination of call parameters with reference to Russ (2012), Middleton *et. al.* (2014) and using professional judgement and experience. In many cases it has not been possible to identify to species level with reasonable surety and so the genus or possible species have been stated. Call analysis was undertaken by:

- Max Burrell – BSc (Hons), MSc, MCIEEM
- Samantha Shove – BSc (Joint Hons), MCIEEM, CEnv
- Jean Hamilton – BSc (Hons), MSc, MIEEM
- James Bilham – BSc (Hons), MSc, ACIEEM

Plecotus species recorded and observed during the surveys were presumed to be *Plecotus auritus* (the Brown Long-eared Bat) as the very rare Grey Long-eared *(Plecotus austriacus)* is not present in the area.

3 RESULTS AND DISCUSSION

3.1 Desk study

The Cofnod data search identified the following SACs designed for Lesser horseshoe bats within 30km of the Scheme and SSSIs for all bat species within 10km of the Scheme.

- Gynllifon SSSI & SAC – approx. 1.2km to the south of Scheme's southern end (Goat Roundabout). Designated for Lesser horseshoe bat population
- Meirionnydd Oakwoods and Bat Sites SAC – approx. 14.7km southeast of the Scheme's southern end (Goat Roundabout)
- Gwydir Forest Mines SAC – approx. 25km east of the Scheme (Cibyn Roundabout)

The Cofnod data search identified the following species within 2km of the Scheme:

- Common Pipistrelle
- Soprano Pipistrelle
- Unspecified *Pipistrellus* species
- Noctule
- Brown Long-eared
- Unspecified *Plecotus* species
- Unspecified *Myotis* species
- Natterer's Bat
- Whiskered Bat *(Myotis mystacinus)*
- Lesser Horseshoe
- Unspecified bat

Table 3.1.1 shows Lesser Horseshoe roost sites within 2.5km of the Scheme identified from the Cofnod data search. It should be noted that there are other Lesser Horseshoe roosts associated with the Glynllifon SAC that have not been included as they are more than 2.5km from the Scheme. They have, however, been included within the Environmental Statement and the Statement to Inform an Appropriate Assessment.

NRW confirmed in correspondence with TACP that during the post construction monitoring of the A487 Llanwnda to Llanllyfni Road Improvements in 2015 a Barbastelle and Greater Horseshoe were recorded (Kudelska, 2016).

Table 3.1.1– Lesser Horseshoe Roosts within 2.5km of the Scheme (source Cofnod).

Site Name	Distance from Scheme (m)	Notes	Max / Latest Count
Glan Morfa	390	Emerged from cottage	31 (06/06/2012)
Glangwna Hall, Caeathro	430	Roost in cellar – day counts and emergence counts	50 observed roosting during day count (01/09/1993)
Caernarfon Brickworks	440	Observed in basement and emerging from building.	23 adult (27/09/2001) Latest record from 2004 (7 adults). 11 adults counted in

Site Name	Distance from Scheme (m)	Notes	Max / Latest Count
			2008 (Meilleur, *pers. comm.*)
Bontnewydd derelict barn	530	-	1 adult (01/07/1986)
Outbuilding, Felin Bach, Caeathro, Caernarfon	660	Dropping pile (stringed and sized as LHB) in outbuilding (brick, corrugated iron). Possible night roost (2014)	Droppings
Capel Saron	790	-	6 adult (June 2012)
Cae-Cipris	1100	Observed in roof	4 (04/08/2011)
Plas Mawr	1530	Within Glyllifon SAC. Droppings found in area leading into the barn. Suggestion of a night roost site.	Droppings (15/06/2005)
Plas Brereton	1640	-	8 (08/09/2014)
Coach House West	1640	-	1 (11/09/2014)
Glynllifon Estate	1730	Within Glynllifon SAC. In roof space	Droppings (12/08/1992)
Plas ty Coch	1750	-	12 (11/09/2014)
Fourteenth Peak, Palace Street, Caernarfon	2075	In small cavity of cellar roof. Bats have used this site in the past.	1 adult (25/02/1987)
Plas Isaf	2080	Within Glynllifon SAC. LHB droppings were recorded. Night roost identified. Building type: Outbuilding.	Droppings (08/06/2006)

The output from the habitat suitability model received from NRW for the north-west of Wales is provided at Appendix D. The colours indicate the predicted suitability of an area to host a maternity or hibernation roost, ranging from dark blue as the least suitable to deep red as the most suitable (Matthews, 2015).

The area towards the middle of the Scheme (east of Caernarfon) is predicted to be more suitable to host a maternity roost than the northern and southern sections. This is also shown in the hibernation roost model, but with less contrast. The area towards the middle of the Scheme appears to be less suitable to host a hibernation roost when compared with the maternity roost model.

3.2 Preliminary roost assessments

The roost assessments identified only two buildings that would be directly affected the Scheme, neither of which had features that provide bat roost potential.

Of the 162 trees on the route of the Scheme, 15 trees were considered to be Category 1* and 79 were considered to be Category 1. There were also 2 tree clusters of Category 1 & 1* trees. The remaining trees were generally Category 2 (62

trees) with some Category 3 (4 trees). None of these trees have been confirmed as roosts and no evidence of roosting such as staining etc. were observed.

The Category 1 and 1* trees were spread along much of the Scheme although there are fewer around the Goat roundabout and between the Cibyn Industrial Estate and the Bethal Road than elsewhere along the Scheme. A similar pattern was noted in relation to the Category 2 trees.

3.3 Activity surveys – walked transects overview

The species recorded at each transect during the surveys undertaken in May, July and September 2015 are shown in Table 3.1.2 below. A minimum of eight species were recorded across all sites. As *Myotis* were not recorded to species level, it is highly likely these represent more than one species (e.g. Whiskered, Daubenton's or Natterer's).

The most common species recorded at all transects were Common and Soprano Pipistrelles, which are the two most common British species. One pipistrelle pass recorded at Transect R7 could not be determined to species level. One Nathusius' pipistrelle (*Pipistrellus nathusii*) was recorded at R12.

Bats of the *Myotis* genus were widespread and were recorded at all but one of the transects. Noctules were also widespread and recorded at all but three transects. Less widespread were Brown Long-eared, which were recorded at four of the transects. A Serotine was recorded on one occasion at R13. 'Large bat' species (i.e. Noctule, Leisler's or Serotine), which could not be determined to species level during the survey were recorded at R3, R6, R9 and R12. These calls were not picked up by the Anabat detectors and as such could not be analysed further.

Lesser Horseshoe Bats were recorded at all but three of the transects (refer to Table 3.1). The number of Lesser Horseshoe passes at each transect during the surveys undertaken in May, July and September are shown in Graph 1. The highest total number of Lesser Horseshoe passes (eleven) were recorded at Transect R7, towards the middle of the Scheme. The next highest number of passes (six) were recorded at Transects R10 and R12 towards the south of the Scheme.

Four Lesser Horseshoe Bat passes were recorded at R7a but survey effort was less as the transect was only surveyed in September 2015. In order to make a fairer comparison an activity index has been applied to each of the data. The activity index (ai) is calculated by: number of bats passes (be) divided by the length of time in hours of the survey (hs) and then multiplied by 100, expressed as follows:

$$ai = (be / hs) \times 100$$

When the activity index is applied (refer to Graph 2) Transect R7a is the second highest, following R7.

The activity index has been applied to all Lesser Horseshoe Bat survey data collected during 2009, 2014 and 2015 (refer to Graph 3). The tabled data is provided in Appendix E. This utilises and calibrates all survey data available to give a comparison of Lesser Horseshoe activity across the Scheme.

The use of this activity index allows comparisons to be made between different locations and/or years without the information being skewed by differences in survey effort (due to access restrictions, more recent transect additions etc.). This method

has been used on a number of schemes where baseline data and on-going monitoring of specific bat species has been required, for example the A465 Heads of the Valleys Dualling: Section 1 Abergavenny to Gilwern.

3.4 Static detector surveys – overview

The species recorded on static detectors at Transect R1, R2, R4, R5, R7, R7a and R10 during May, July and September 2015 are shown in Table 3.1.3 below. A minimum of six species were recorded. As with the walked transects, the most common species recorded were Common and Soprano Pipistrelle. *Myotis* species and Noctules were also recorded at each transect, but in far fewer numbers.

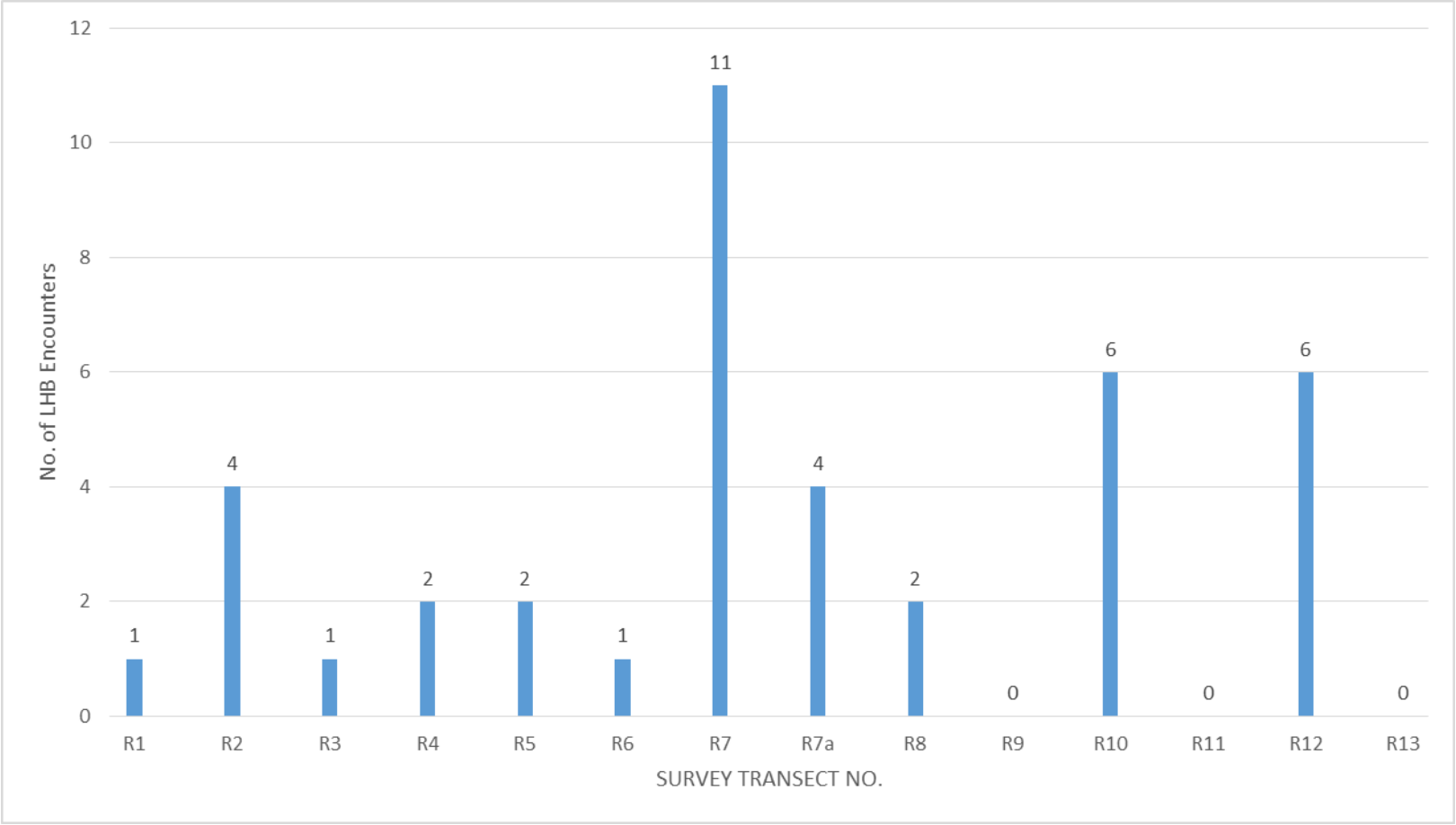
Brown Long-eared were recorded at transect R1 and R7 as they had been during the walked transects. Brown Long-eared were also recorded at R7a and R10 where they had not been during the walked transects.

Lesser Horseshoes were recorded at each of the transects surveyed but in low numbers (refer to Graph 4 and Table 3.1.3). The maximum count was three Lesser Horseshoe bat passes recorded on static detector A4 at transect R5, and A2 at transect R7 over the three months that surveys took place.

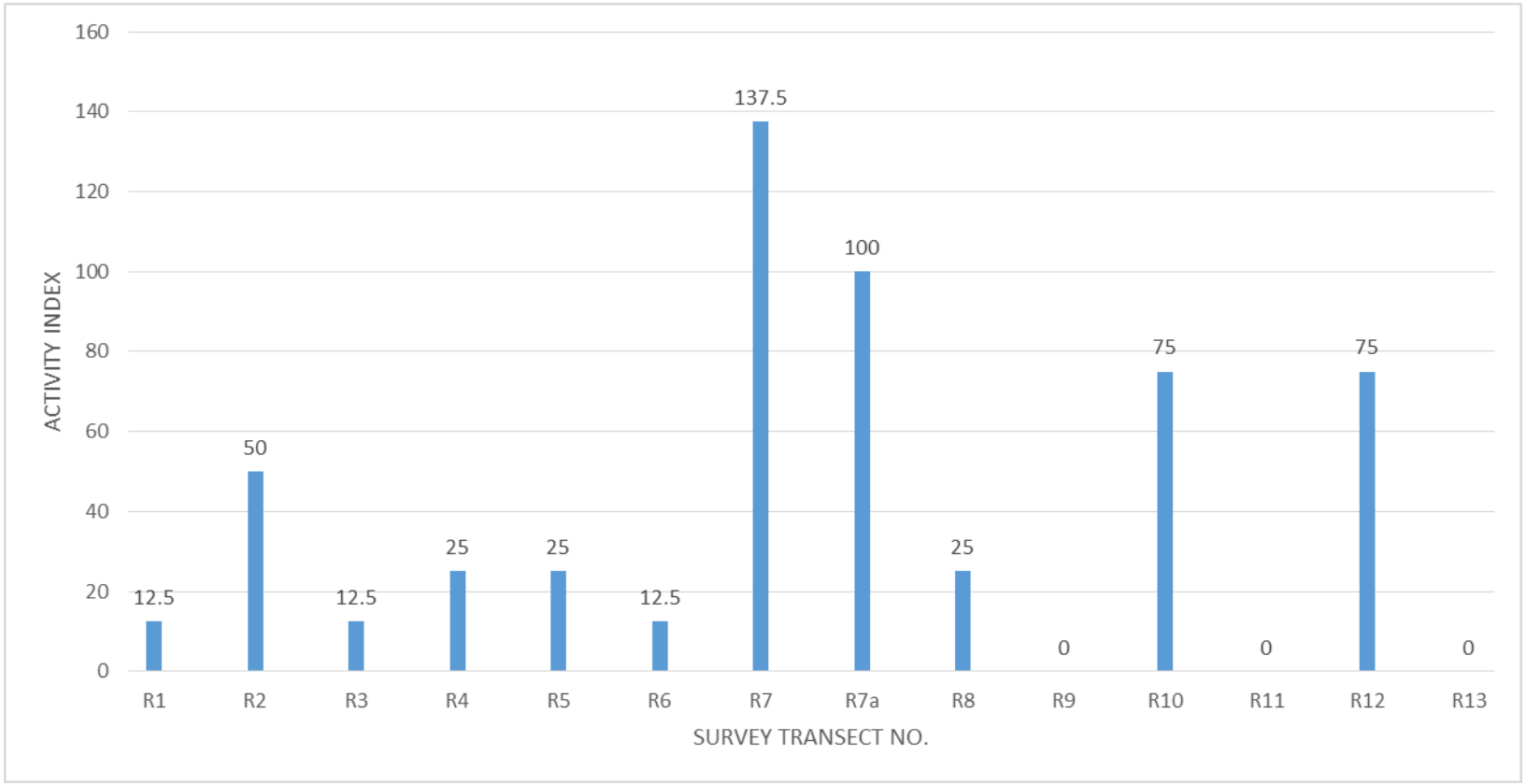
Table 3.1.2 – Species of bat recorded at each transect location (walked data only) during May, July and September 2015

Species recorded	Transect Number													
	R1	R2	R3	R4	R5	R6	R7	R7a	R8	R9	R10	R11	R12	R13
Common Pipistrelle	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔	✔
Soprano Pipistrelle	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Nathusius' Pipistrelle													✔	
Pipistrellus species							✔							
Noctule	✔	✔	✔	✔	✔	✔	✔		✔	✔	✔			✔
Serotine														✔
'Large bat' (i.e. Noctule, Leisler's, Serotine)			✔			✔				✔			✔	
Brown Long-eared	✔			✔	✔		✔							
Myotis species	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔
Lesser Horseshoe	✔	✔	✔	✔	✔	✔	✔	✔	✔		✔		✔	

Graph 1 – No. of Lesser Horseshoe Bat passes at each transect (walked data only) during May, July and September Surveys 2015



Graph 2 - Lesser Horseshoe Bat activity index walked transects only May, July and September 2015



Graph 3 - Lesser Horseshoe Bat activity index walked transects only - all surveys 2009, 2014 and 2015

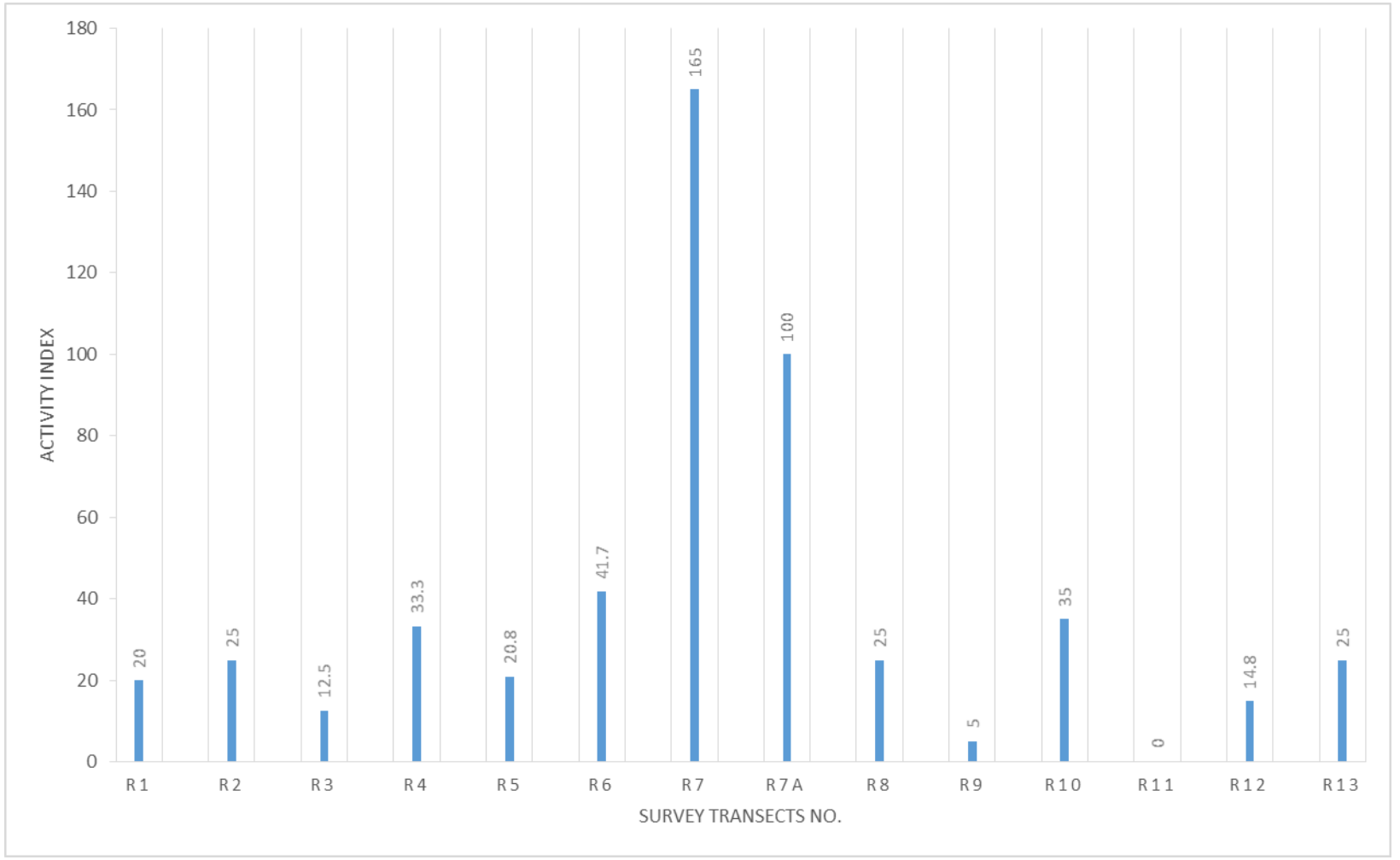
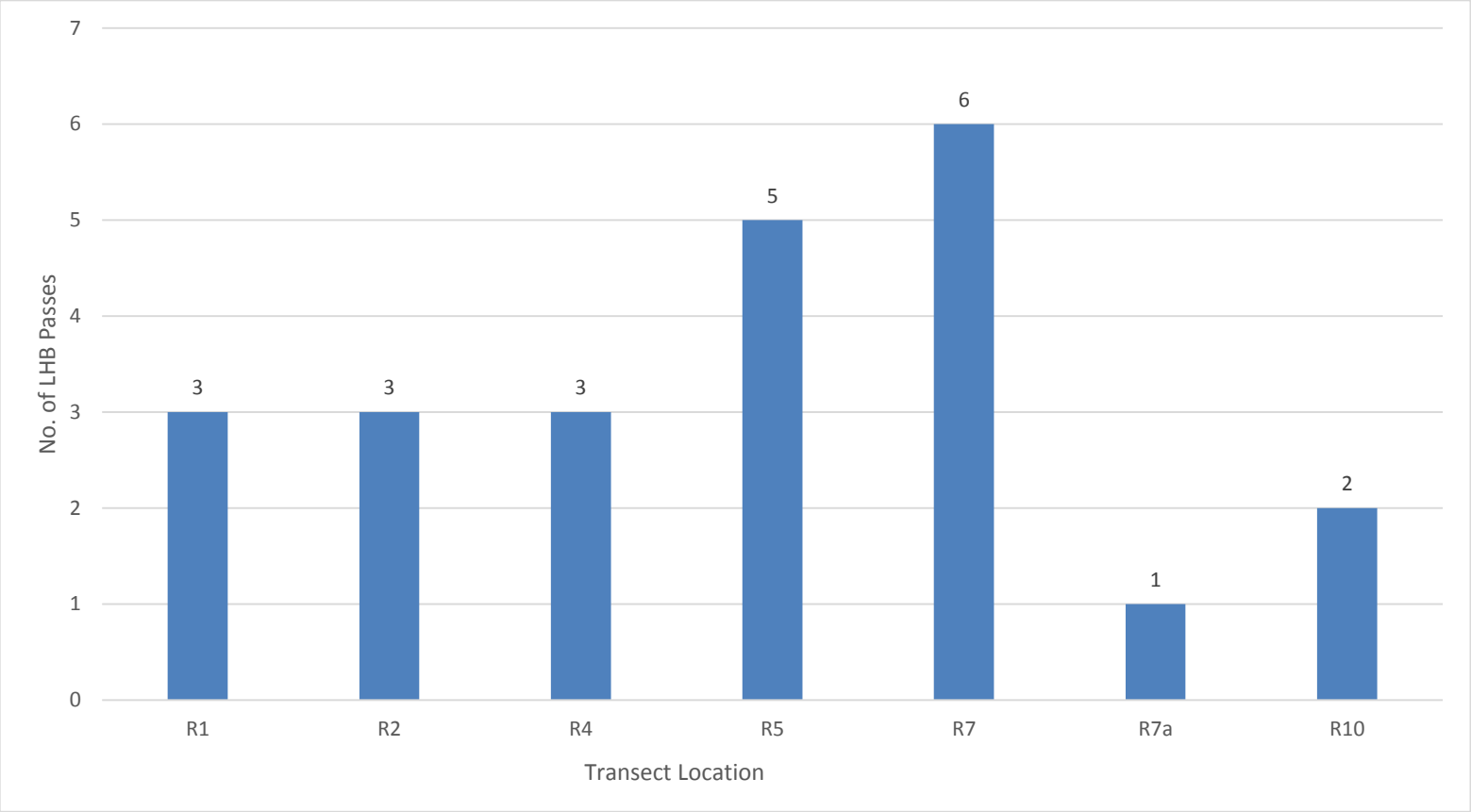


Table 3.1.3 – Species of bat recorded at each transect location on static AnaBats during May, July and September 2015

Species recorded	R1	R2	R4	R5	R7	R7a	R10
Common Pipistrelle	✔	✔	✔	✔	✔	✔	✔
Soprano Pipistrelle	✔	✔	✔	✔	✔	✔	✔
Pipistrellus species							✔
Noctule	✔	✔	✔	✔	✔	✔	✔
'Large bat' (i.e. Noctule, Leisler's, Serotine)	✔		✔		✔	✔	✔
Brown Long-eared	✔				✔	✔	✔
Myotis species	✔	✔	✔	✔	✔	✔	✔
Lesser Horseshoe	✔	✔	✔	✔	✔	✔	✔

Graph 4 – No. of Lesser Horseshoe Bat passes recorded on each AnaBat during May, July and September Surveys 2015



3.5 Activity surveys – walked transects R1 – R13

3.5.1 Transect R1

Activity in this area was mainly associated with Soprano Pipistrelles and Common Pipistrelles to a lesser extent. Most activity was associated with foraging and possible commuting along the woodland edges, although the latter lacked the appearance of definite travel from one area to another indicative of such behaviour. However, in May, dusk activity was almost exclusively associated with foraging behaviour in the denser woodland areas due to high winds offering only a few sheltered spots at the north-eastern end of the transect.

Noctules, Brown Long-eared and *Myotis* species were occasionally recorded in low numbers throughout the walked transect surveys and on the static detectors.

One Lesser Horseshoe was recorded during the walked transect surveys. This was during September 2015.

Two Lesser Horseshoe passes were recorded on the static detector A1 located along the woodland edge at the south-east of the site during the evening of the September survey. One Lesser Horseshoe pass was also recorded on static detector A3 located at the southern end of the transect on the western side of the existing Crug Lane. This was recorded during the morning of the September survey.

3.5.2 Transect R2

Soprano and Common Pipistrelles were most commonly recorded along the southern boundary hedgerow of R2 during the walked transect surveys. Occasional Noctules and *Myotis* species were recorded during every visit.

The majority of bat activity (all species) was along the southern boundary with considerable foraging activity of Soprano Pipistrelles at the western end of the transect.

Lesser Horseshoes were recorded during two of the three walked transect surveys, once in May and three times during September.

Single Lesser Horseshoe passes were recorded on static detectors A1, A2 and A4 during September, September and July respectively.

3.5.3 Transect R3

Activity along R3 was dominated by Soprano Pipistrelle with Common Pipistrelle activity increasing during the September survey. Activity was fairly evenly spread along the transect with no obvious bat 'hot spots'. This is possibly due to the nature of the transect which followed the linear feature of a hedgerow and stream that form the eastern and southern field boundaries.

Activity was largely foraging behaviour with some possible commuting behaviour also noted, although this lacked the appearance of definite travel from one area to another that is indicative of such behaviour.

A single foraging Lesser Horseshoe was recorded foraging alongside the stream to the southern end of the transect during the May survey.

3.5.4 Transect R4

Activity at R4 was generally low and dominated by Soprano Pipistrelles. Brown Long-eared and Common Pipistrelles were occasionally recorded.

Two Lesser Horseshoe Bat passes were recorded during the September walked transect (one at dusk and one at dawn) in the area of the nursery.

Single Lesser Horseshoe passes were recorded on static detectors A1, A2 and A3 during September, September and May respectively.

3.5.5 Transect R5

R5 is a riverside transect along a tree-lined embankment, which provides good foraging habitat. Activity was again dominated by Soprano Pipistrelles foraging and potentially commuting with *Myotis* species recorded frequently during every walked transect visit (possibly Daubenton's given the riparian habitat). Common Pipistrelles, Noctules and Brown Long-eared were occasionally recorded.

Lesser Horseshoes were recorded twice in September during the dusk walked transect survey, towards the northern and southern ends of the transect.

Two Lesser Horseshoe passes were recorded on static detector A1 located at the eastern end of the transect, both during the September survey. Three Lesser Horseshoe passes were recorded on static detector A4 located at the western end of the transect twice during July and once during September. The bat passes recorded in July were within the same minute of each other and are therefore likely to be the same bat.

3.5.6 Transect R6

Activity along R6 was dominated by Soprano Pipistrelles during all surveys. Activity was concentrated towards the middle and north-eastern end of the transect although there was some activity recorded towards the south-western end, particularly during the September survey. Activity tended to be foraging behaviour along the treeline and track.

What was thought to be Pipistrelle 'lekking' behaviour was recorded to the north-eastern end of R6 during the September survey, with numerous social calls recorded.

One Lesser Horseshoe Bat was recorded during the September survey to the south-western end of the transect, although no visual observation could be made to determine its behaviour.

3.5.7 Transect R7

Activity at R7 was again dominated by Soprano Pipistrelles, with Noctule, *Myotis* species and Common Pipistrelles recorded on most walked transect visits with occasional Brown Long-eared.

Lesser Horseshoes were recorded on every walked transect visit (once during May, four times during July and six times during September). The majority of their activity

was along the tree-lined stream where they appeared to be foraging. The main areas of activity for other species was also along this stream, the bridge, and the public footpath/driveway towards the house at the southern end of the transect.

Two Lesser Horseshoe passes were recorded on static detector A1 located along the stream at the western end of the transect during July and September. Three Lesser Horseshoe passes were also recorded on static detector A2 located along the driveway towards the house at the southern end of the transect during May, July and September. One Lesser Horseshoe passes was recorded on static detector A4 located along the stream at the eastern end of the transect during July.

There is a discrepancy between the human and static results as the LHB passes recorded by the surveyors were generally located away from the static locations and on the opposite side of the habitat feature being surveyed. This, in combination with the quieter call of LHB (as detailed within Section 2.5), reduces the potential for the static detectors to record those picked up by the surveyors.

R7 has shown the highest levels of Lesser Horseshoe activity of all the transects surveyed.

3.5.8 Transect R7a

As with R7 (which it adjoins) the bat species most commonly recorded along the hedgerows both foraging and commuting was Soprano Pipistrelle. A single *Myotis* species was also recorded during the walked transect survey.

Four Lesser Horseshoe bat passes were recorded along the hedgerow during the walked transect. Taking account of the reduced survey effort at this location through the activity index, R7a has shown the second highest level of Lesser Horseshoe activity of all the transects surveyed (refer to Graph 2).

A single Lesser Horseshoe pass was recorded on static detector A5 located at the northern end of the transect.

3.5.9 Transect R8

Activity along R8 was dominated by Soprano Pipistrelles during all three surveys and was concentrated along field boundaries. Most activity was recorded between the two northern fields and around the culvert beneath the existing A487 (towards the north-western corner of the southern field).

Activity appeared to be largely foraging with some Pipistrelles possibly commuting along the field boundaries.

Two Lesser Horseshoe passes were recorded during the May survey along the hedgerow/tree line between the two northern fields.

3.5.10 Transect R9

Activity along R9 was dominated by Soprano Pipistrelles with a high proportion of Common Pipistrelles recorded during May. Noctule were recorded on occasion and several *Myotis* species were recorded during the September survey.

There was generally an even distribution of activity along the transect, although greater activity was recorded towards the middle and southern end during July. Bats recorded mostly displayed characteristics of foraging behaviour.

No Lesser Horseshoe bats were recorded at R9 during any of the 2015 surveys.

3.5.11 Transect R10

This riparian transect was dominated by Soprano Pipistrelles showing intense foraging activity. The timing and level of activity may indicate the presence of a roost in the vicinity. *Myotis* species were also recorded together with Noctule and the occasional Common Pipistrelle.

Lesser Horseshoes were recorded during the May walked transect survey on six occasions along the northern side of the tree-lined river.

Two Lesser Horseshoe bat passes were recorded on static detector A3, located along the river at the southern end of the transect also during the May survey when Lesser Horseshoe activity was recorded during the walked transect.

3.5.12 Transect R11

Activity along R11 was dominated by Soprano Pipistrelles during the May and September surveys. A higher proportion of Common Pipistrelles were recorded during the July survey.

There was generally an even distribution of activity along the transect with no obvious bat 'hot spots' identified. Much of the activity appeared to be foraging behaviour although there may have been some pipistrelle commuting activity, although difficult to confirm due to poor light levels.

No Lesser Horseshoes were recorded during any of the 2015 surveys along R11.

3.5.13 Transect R12

Activity along R12 was dominated by Soprano and Common Pipistrelles during the May and July surveys and Soprano Pipistrelles during September. A single Nathusius' Pipistrelle was also recorded. The majority of activity was concentrated around the mature hedgerow at the northern end of the transect. Activity mainly appeared to be bats foraging with bats flying repeatedly along the field boundaries.

Six Lesser Horseshoe Bat passes were recorded at R12 during the 2015 surveys. In May and July a single Lesser Horseshoe was recorded along the hedgerow towards the north of the transect. In July three were recorded along the same hedgerow and one along the hedgerow within the field at the southern end of the transect. These appeared to be foraging rather than commuting as the flight pattern observed lacked the appearance of definite travel from one area to another that is indicative of such behaviour.

3.5.14 Transect R13

Activity along R13 was dominated by Soprano and Common Pipistrelles during the May and September surveys with a higher proportion of Common Pipistrelles recorded during July. Noctules and *Myotis* species were occasionally recorded and a single Serotine was also recorded. The majority of activity was concentrated around

the hedgerow and watercourse although some bats were observed flying across adjacent fields. The majority of the behaviour appeared to be bats foraging with the occasional more direct route across the adjacent fields.

No Lesser Horseshoe Bats were recorded during any of the 2015 surveys along R13.

4 CONCLUSIONS

The preliminary roost assessments identified two buildings directly affected by the Scheme, neither of which had sufficient roost potential for further inspection/survey. Over half of the trees surveyed were considered to be either Category 1 or 1* trees due to the potential roost features present. These will require climbing inspections to be undertaken prior to construction with activity surveys should evidence of roosting bats be found. The remaining trees require no further inspections however those considered to be Category 2 trees will be soft felled if they are to be removed as part of the works.

The species of bat most commonly recorded across all transects during 2015 were Soprano Pipistrelle with the second most common being Common Pipistrelle. This is as expected as these are the two most common species of British bat. Pipistrelles are considered to be at a lower risk from the impacts of road schemes than species adapted to flying within cluttered habitats, such as *Myotis* species, Brown Long-eared and Lesser Horseshoe. This is because they generally fly higher than clutter adapted species and are therefore less prone to traffic collisions.

Noctules were recorded at most of the transects during 2015. These are a species adapted for fast, high flight, where they hunt large insects by aerial hawking in the open air or along the edge of the canopy. This behaviour makes them the least prone to impacts of road Schemes of all the species recorded.

Lesser Horseshoes were recorded at all but three transects in 2015. Taking account of the surveys undertaken in 2009 and 2014, they have been recorded at all except Transect R11. Surveys were not conducted at R11 in 2009 and 2014 (refer to Table 1.1.2) due to the access restrictions. This may in part explain this result.

The record search data has shown there to be fourteen LHB roost sites within 2.5km of the Scheme. The most significant of these are located approximately 1.7 – 2km to the south and are part of the Glynllifon SAC, designated for Lesser Horseshoe bats. There are also three smaller roosts within 500m of the Scheme located at Glan Morfa, Glangwna Hall and Caernarfon Brickworks.

The surveys undertaken in 2009, 2014 and 2015 show that Lesser Horseshoes are widespread throughout the area but have been recorded in relatively low numbers. They are not always recorded along transects where they are known to occur. When recorded in 2015 numbers of bat passes have ranged from one to a maximum of six during a two hour walked transect survey period.

These surveys have not identified any commuting routes where Lesser Horseshoe bats pass along within a few hours after dusk, heading in a definite direction from one area to another, often with the reverse seen a few hours before dawn. These are often associated with linear features in close proximity to large roosts (e.g. Hopyard Farm underpass along the A465 Section 1 – Abergavenny to Gilwern). If these types of feature are severed by a road scheme, without appropriate mitigation they have the potential to cause major impacts.

The results show a clear peak of activity at Transects 7 and 7a towards the centre of the Scheme with less activity towards the north and south (refer to Graphs 1, 2 and 3). This broadly correlates with the output of the NRW Lesser Horseshoe Bat habitat suitability models for maternity and hibernation roosts (Appendix D) and the distribution of the closest known roosts (e.g. Caernarfon Brick works and Glan Morfa Hall). It is therefore likely that this area of the Scheme is where Lesser Horseshoe

Bats are most in need of some form of access to cross the Scheme, and where they may be most vulnerable to mortality and injury from traffic collisions. However, it should be noted that despite the peaks in activity associated with this area, the survey data and survey observations do not indicate the presence of significant commuting routes.

5 REFERENCES

Freeman, M. (2014*). Brief notes on dusk and dawn bat surveys along the proposed Caernarfon by pass Aug – Sept 2014*. Welsh Government

Hundt, L. (2012). *Bat Surveys: Good Practice Guidelines, 2nd Ed.* Bat Conservation Trust ISBN-13: 9781872745985

JV, (2015). *A487 Caernarfon and Bontnewydd Bypass Environmental Scoping Report*. Welsh Government

Kudelska, T. (2016). *Consultation Response Letter from NRW* - Consultation: Draft Environmental Statement (partial)

Matthews, J. (2015). *Predictive Modelling of the Lesser Horseshoe Bat (Rhinolophus hipposideros) in Wales – Summary of Methods and Results.* Natural Resources Wales.

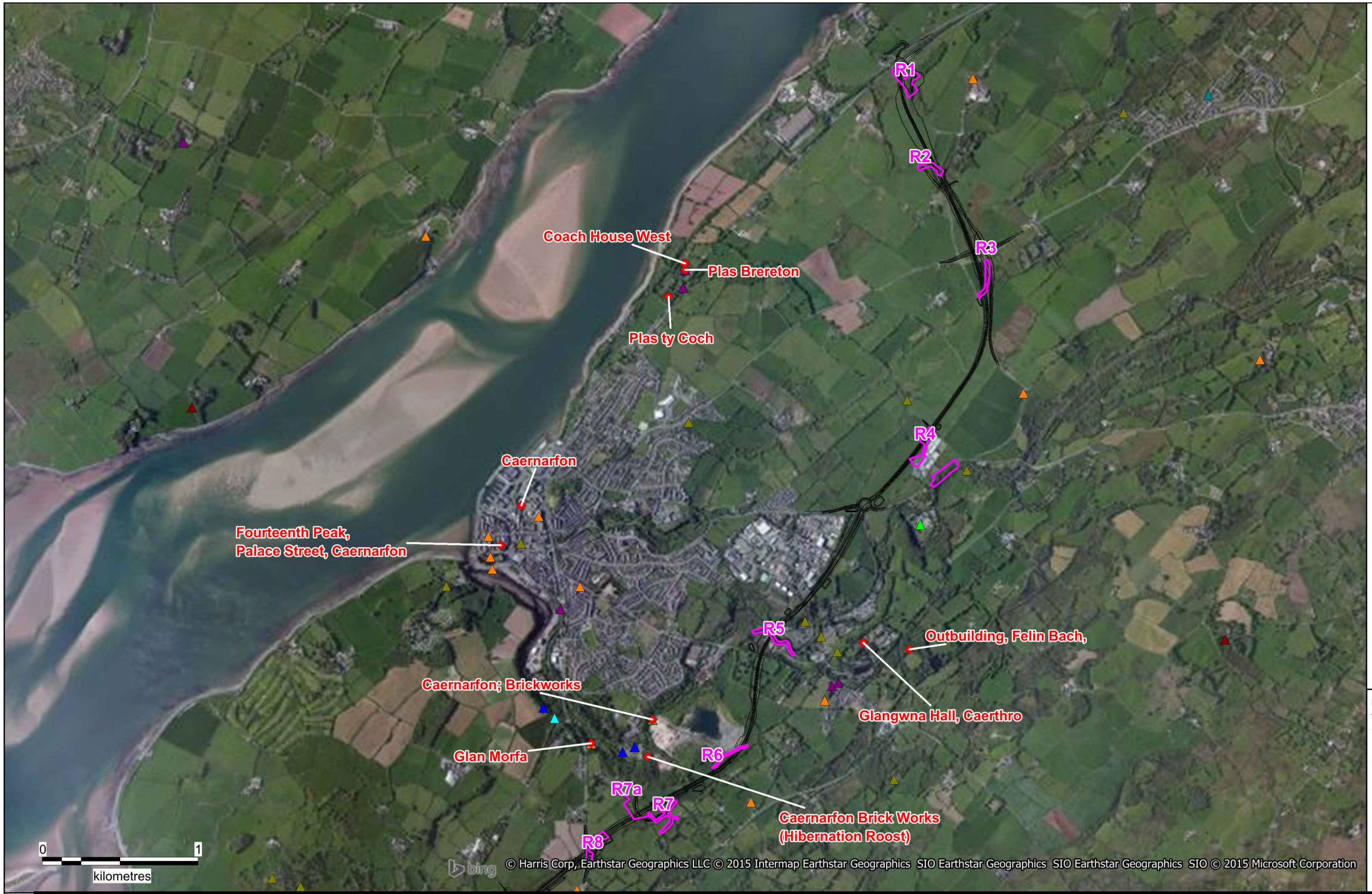
Meilleur, E., T. (2015). Senior Biodiversity Officer, Gwynedd Council. *Personal Communication.*

Middleton, N., Froud, A. & French, K. (2014). *Social Calls of the Bats of Britain and Ireland*. Pelagic Publishing

TACP (2009). *A487 Caernarfon to Bontnewydd Study – Bat and Barn Owl Survey 2009*. Welsh Government.

Russ, J. (2012). *British Bat Calls – A Guide to Species Identification.* Pelagic Publishing

FIGURE 1.0 (A – B) – TRANSECT AND ROOST LOCATIONS



Legend

- Bat Survey Transect 2015
- Scheme Alignment
- Lesser Horseshoe Bat Roost

Other Bat Roosts

- Brown Long-eared Bat
- Common Pipistrelle
- Long-eared Bat Species
- Myotis Bat Species
- Natterer's Bat
- Noctule Bat
- Pipistrelle
- Pipistrellus Bat Species
- Soprano Pipistrelle
- Unknown Bat
- Whiskered Bat

REV	DATE	DESCRIPTION	BY	CHKD	APPD

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• TITLE

A487 CAERNARFON AND BONTNEWYDD BYPASS
Bat Survey Report

Transect and Roost Locations

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Llywodraeth Cymru
Welsh Government

Balfour Beatty JONES BROS CIVIL ENGINEERING UK

EC HARRIS BUILT ASSET CONSULTANCY · RAMBOLL · WSP | PARSONS BRINCKERHOFF · TACP

DRAFT

• DATE 15/12/2015
• SCALE Not To Scale

DRAWN BY MS
CHECKED MB
APPROVED BS

• FIGURE NUMBER
1a



Legend

- Bat Survey Transect 2015
- Scheme Alignment
- Lesser Horseshoe Bat Roost

Other Bat Roosts

- Brown Long-eared Bat
- Common Pipistrelle
- Long-eared Bat Species
- Myotis Bat Species
- Natterer's Bat
- Noctule Bat
- Pipistrelle
- Pipistrellus Bat Species
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- Unknown Bat
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REV	DATE	DESCRIPTION	BY	CHKD	APPD

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Transect and Roost Locations

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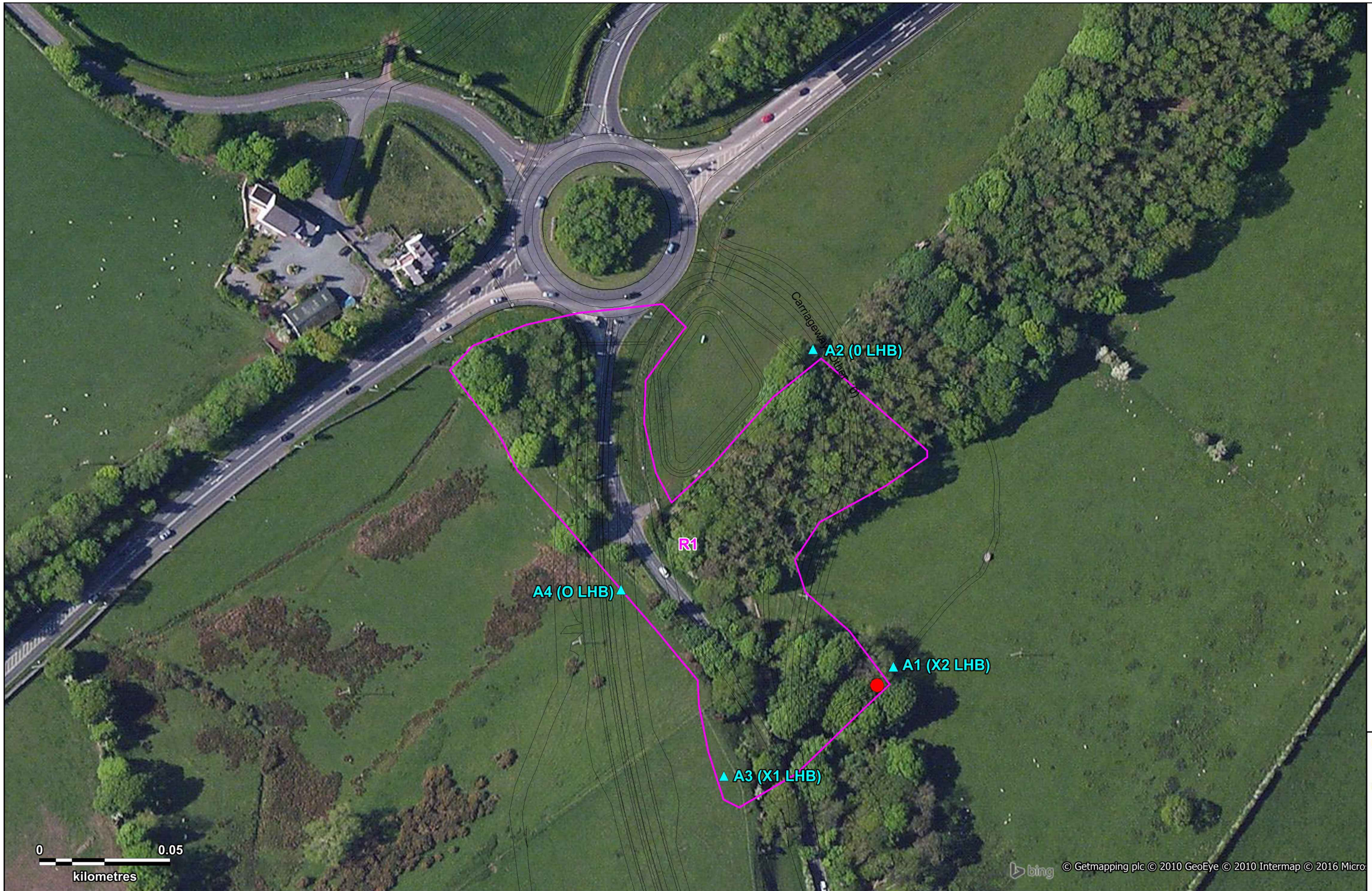
FIGURE 2.0 (A – N) – LESSER HORSESHOE BAT PASSES (TRANSECTS R1 TO R13)



Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
- July 2015 LHB Events (Walked Transect)
- September 2015 LHB Events (Walked Transect)
- Static Detector (Anabat) Location and Number of LHB Events Recorded

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Lesser Horseshoe Bat Events & Transect R1

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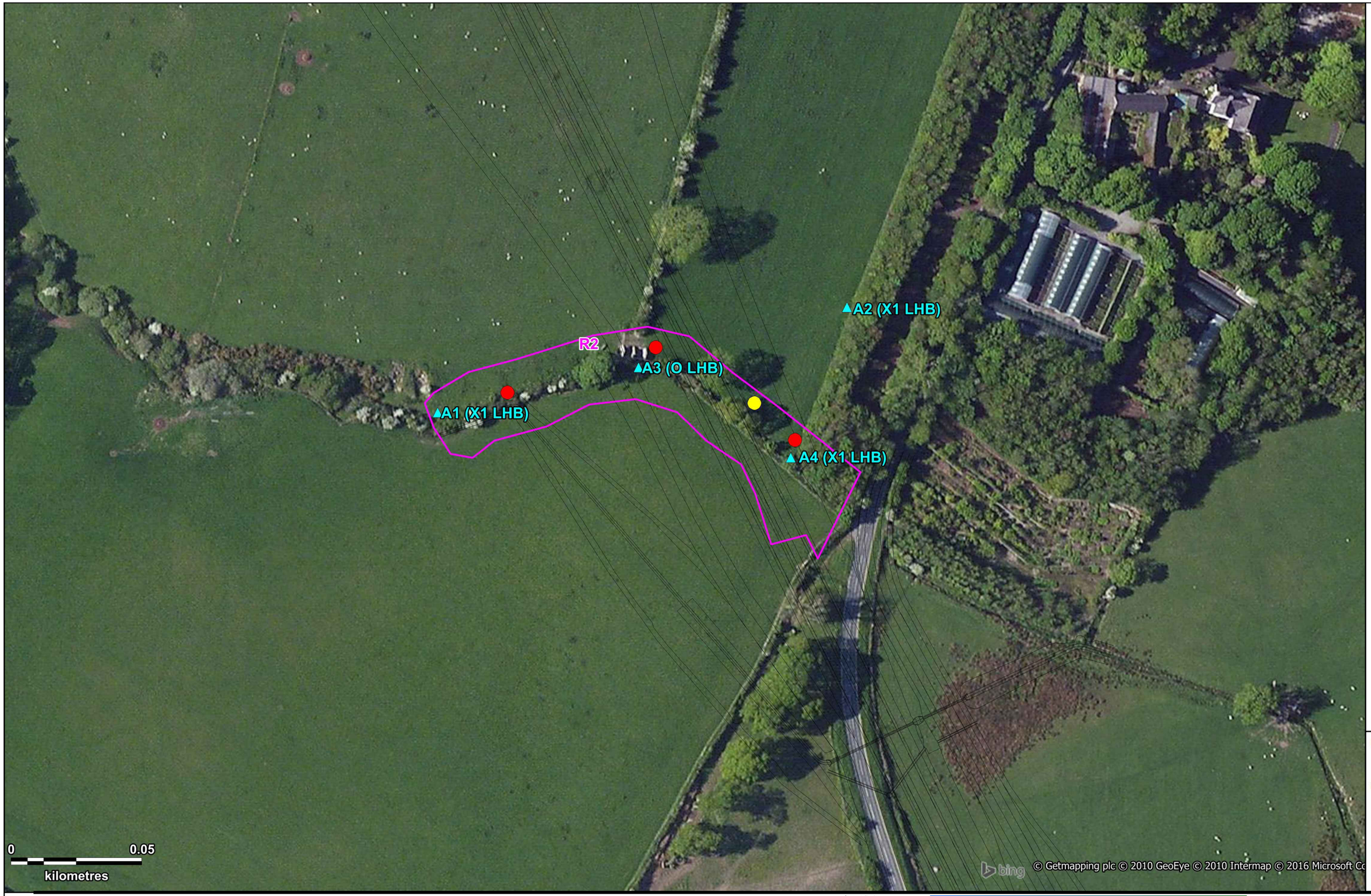

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
- July 2015 LHB Events (Walked Transect)
- September 2015 LHB Events (Walked Transect)
- Static Detector (Anabat) Location and Number of LHB Events Recorded

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Lesser Horseshoe Bat Events & Transect R2

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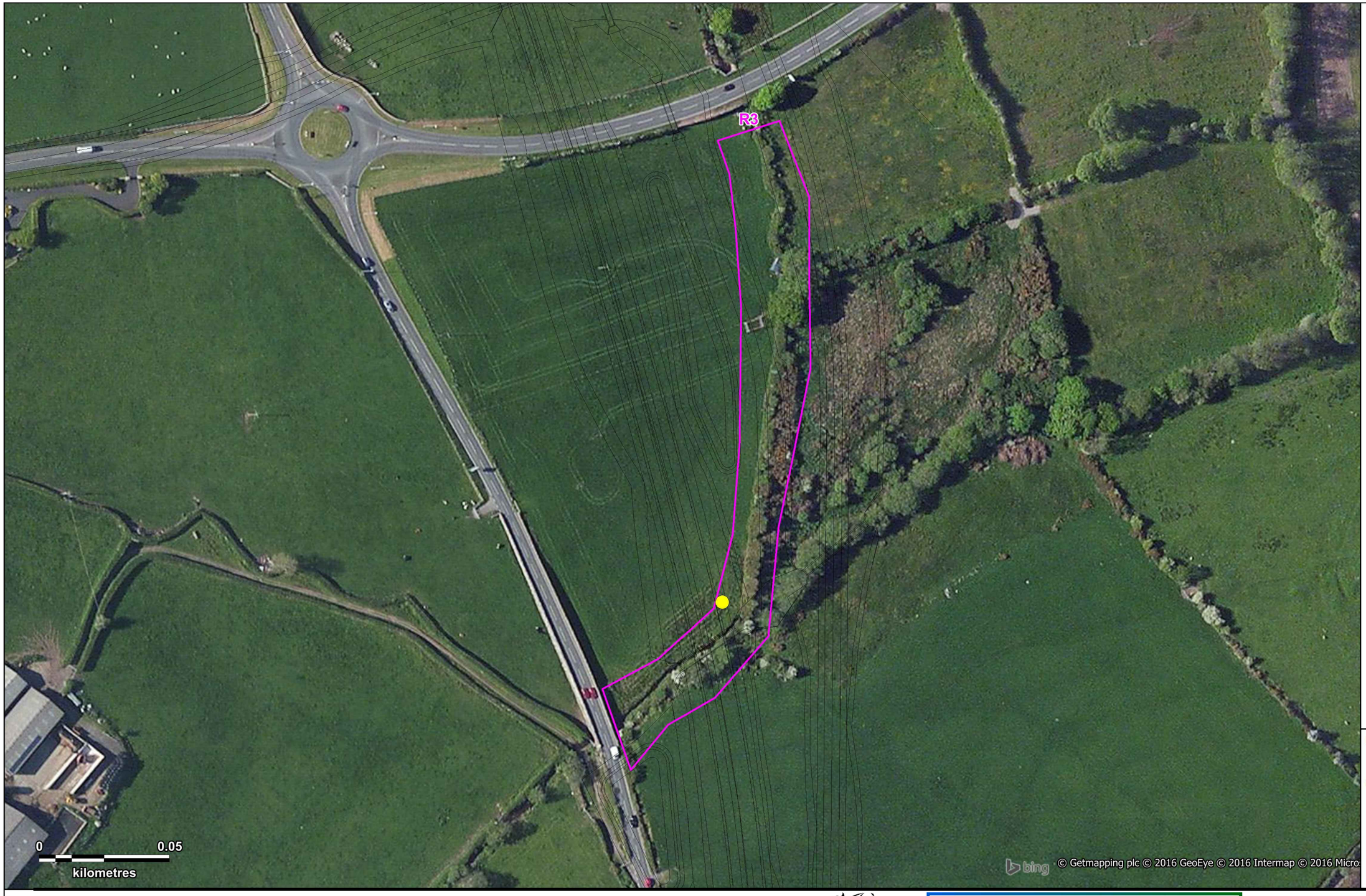

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
- July 2015 LHB Events (Walked Transect)
- September 2015 LHB Events (Walked Transect)
- Static Detector (Anabat) Location and Number of LHB Events Recorded

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Lesser Horseshoe Bat Events & Transect R3

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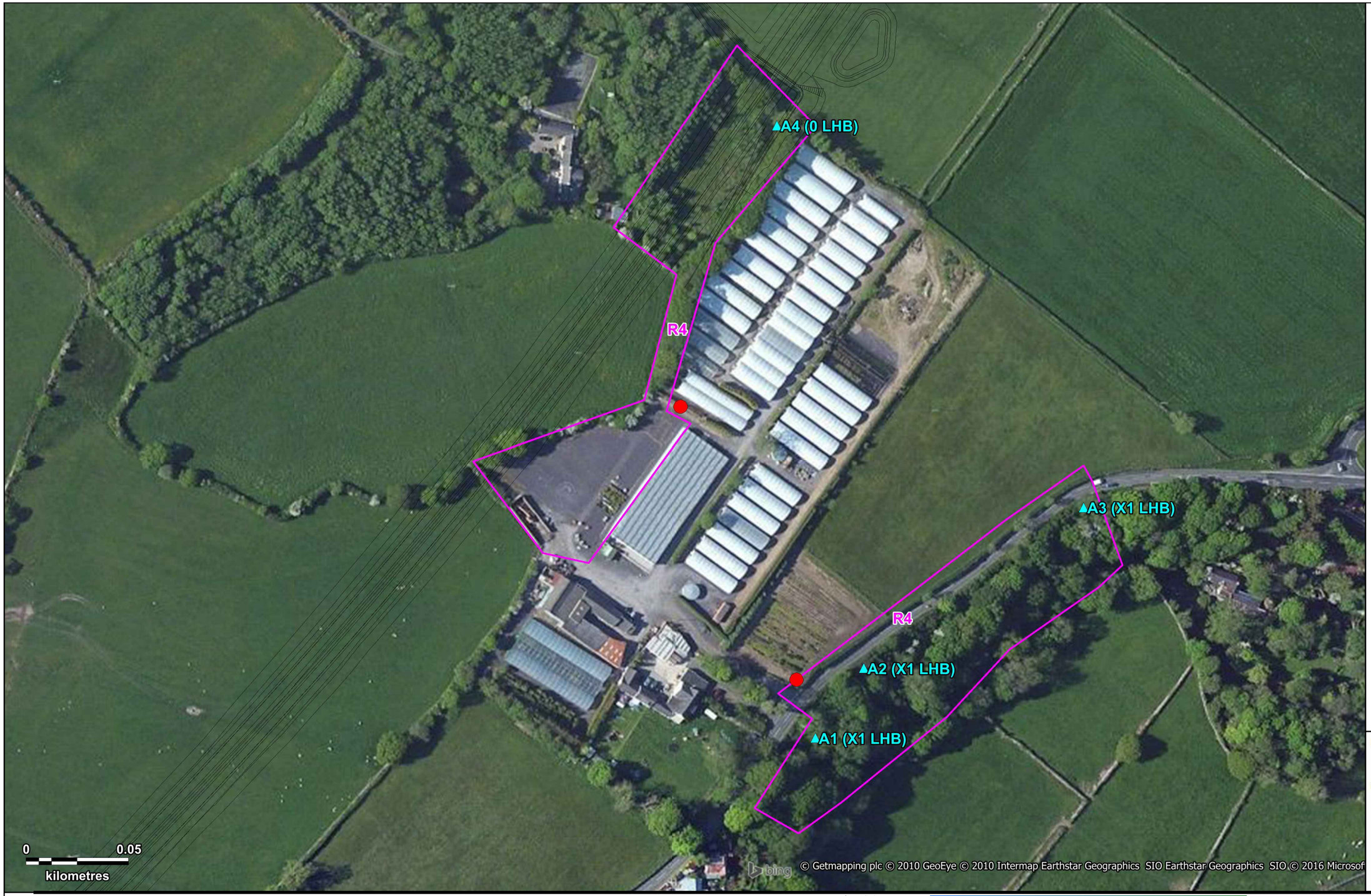

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
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- September 2015 LHB Events (Walked Transect)
- Static Detector (Anabat) Location and Number of LHB Events Recorded

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Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
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Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

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- September 2015 LHB Events (Walked Transect)
- Static Detector (Anabat) Location and Number of LHB Events Recorded

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Bat Survey Report

Lesser Horseshoe Bat Events & Transect R6

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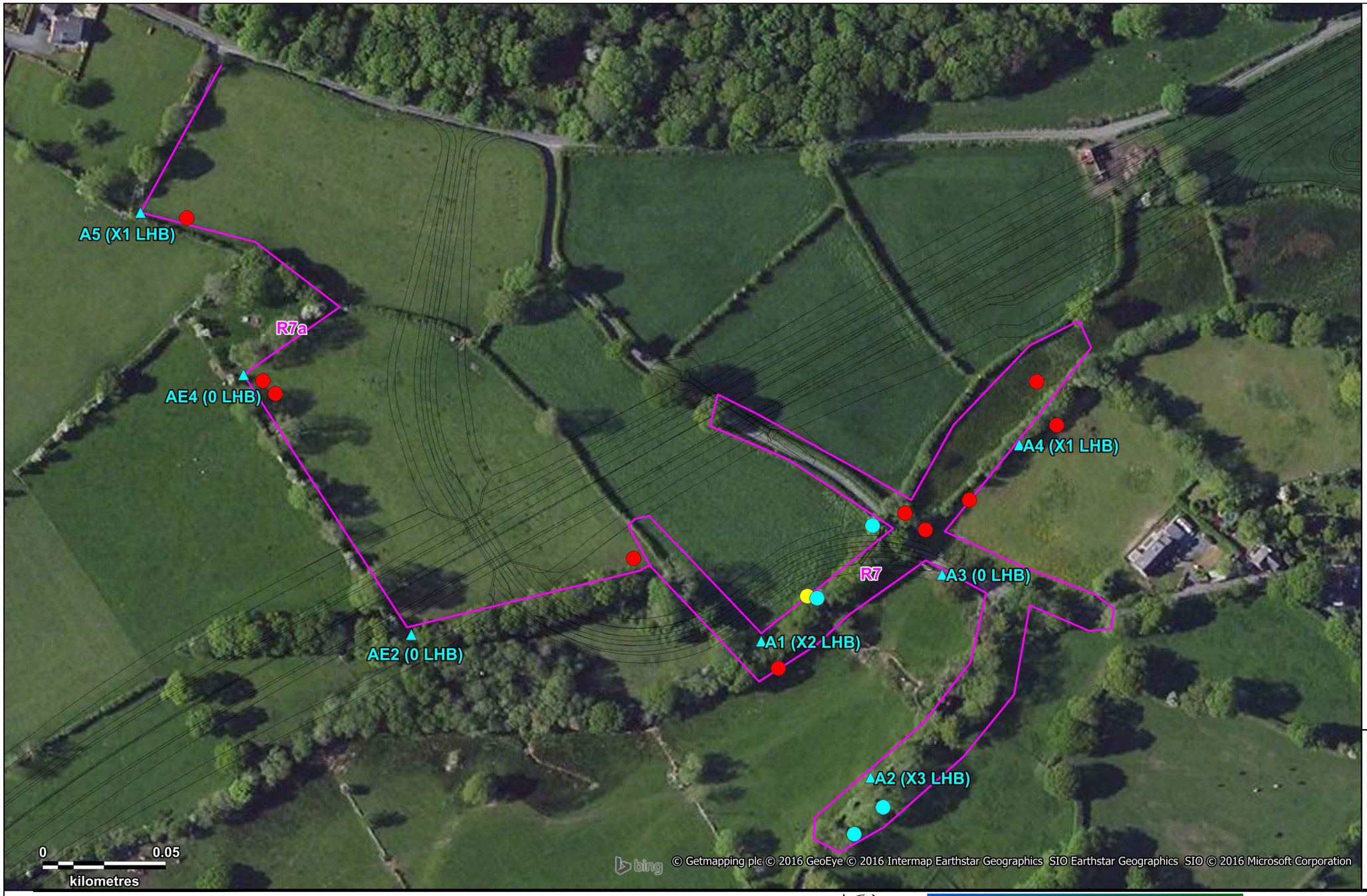

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Bat Survey Report

Lesser Horseshoe Bat Events & Transect R7-7a

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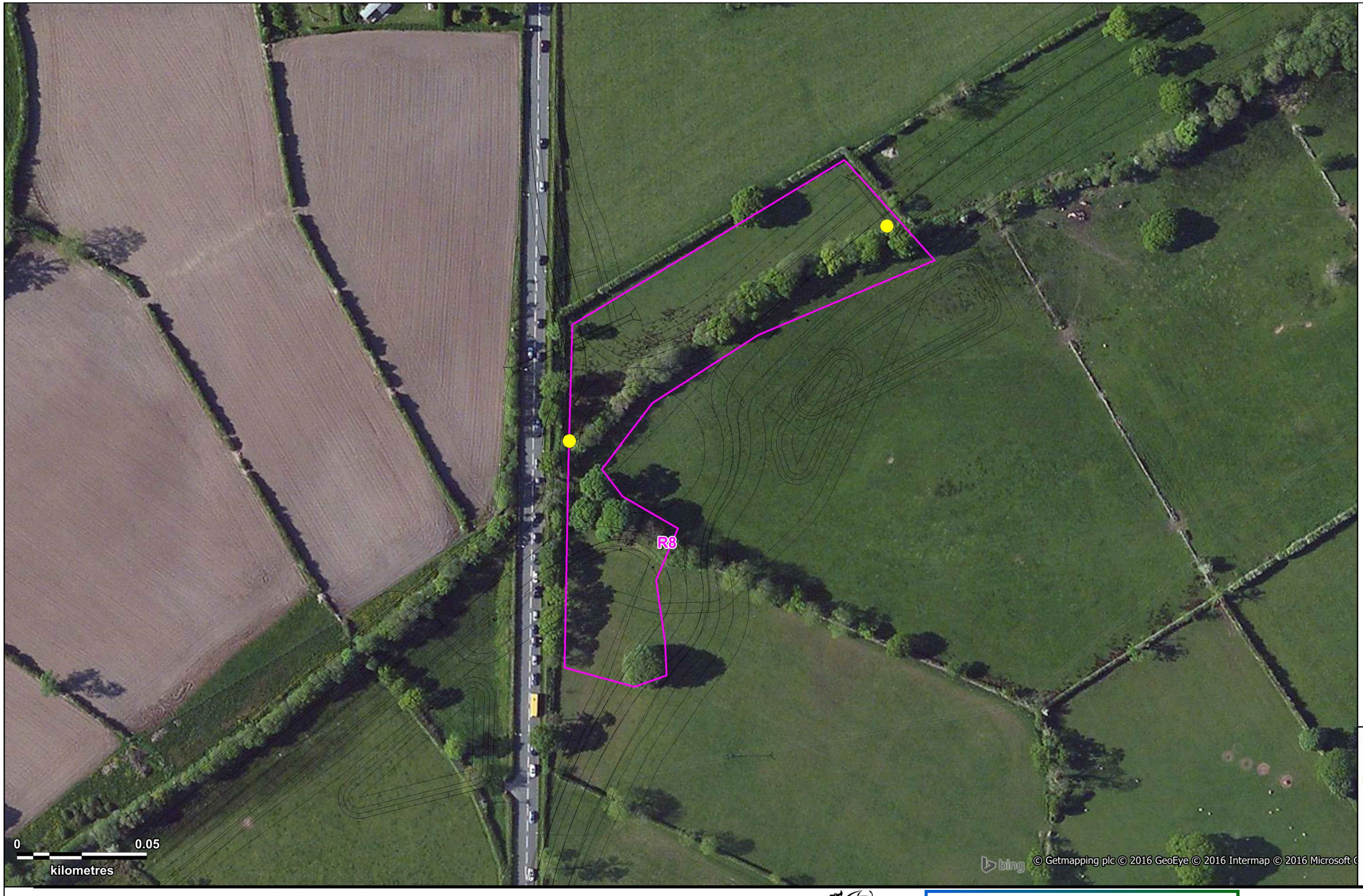

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

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- September 2015 LHB Events (Walked Transect)
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Bat Survey Report

Lesser Horseshoe Bat Events & Transect 8

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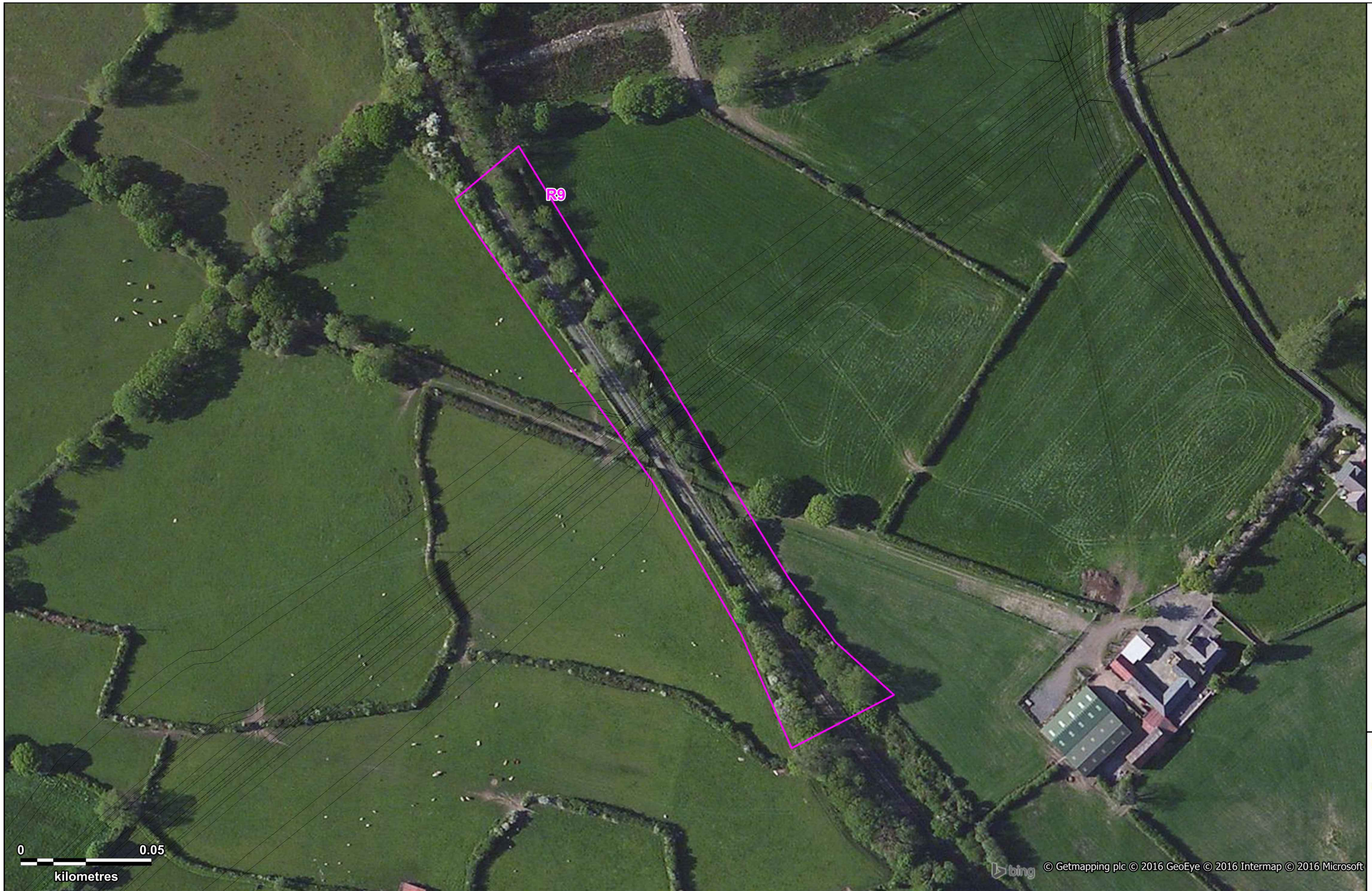

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

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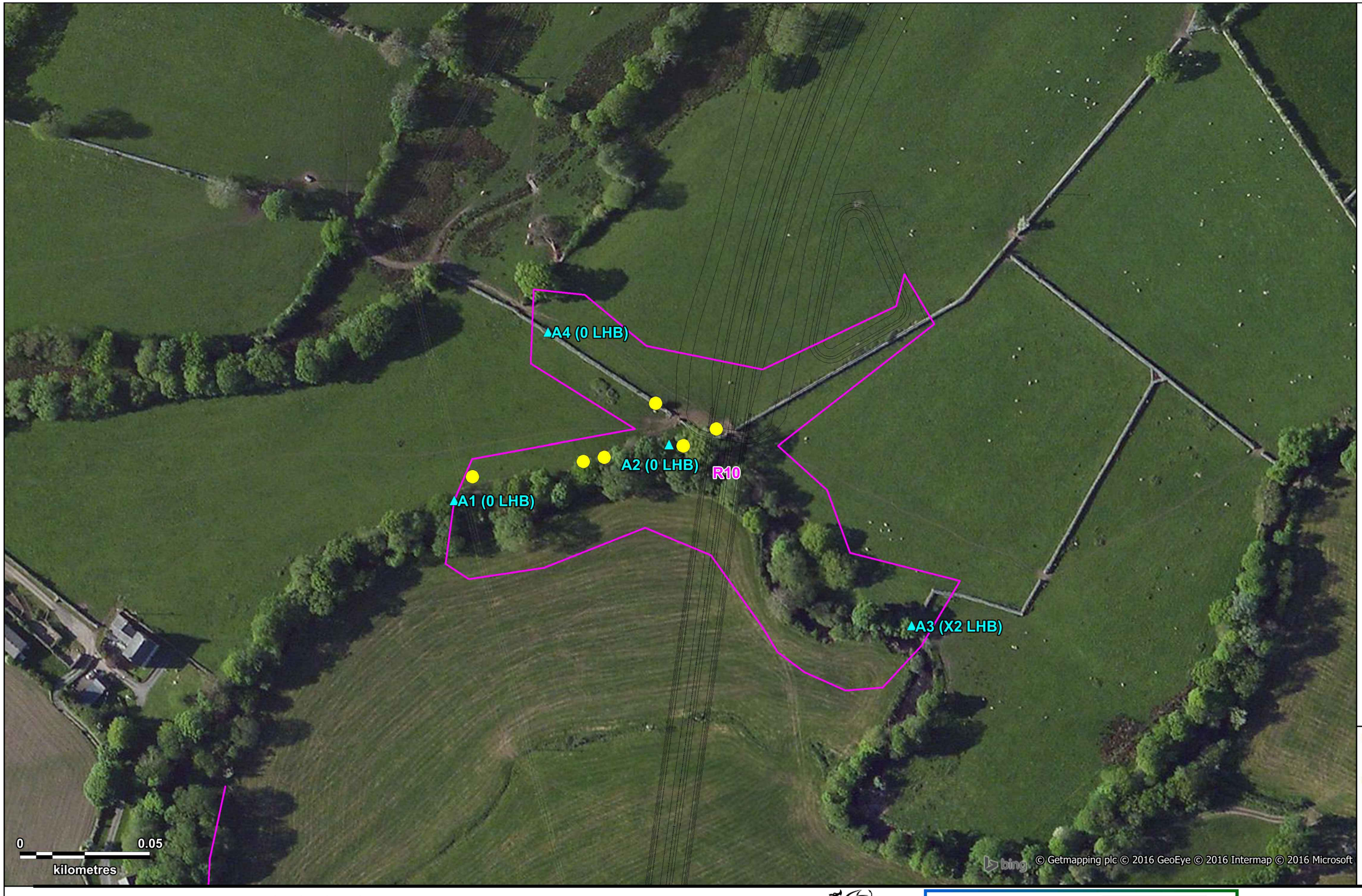

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Bat Survey Report

Lesser Horseshoe Bat Events & Transect R10

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Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
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- Static Detector (Anabat) Location and Number of LHB Events Recorded

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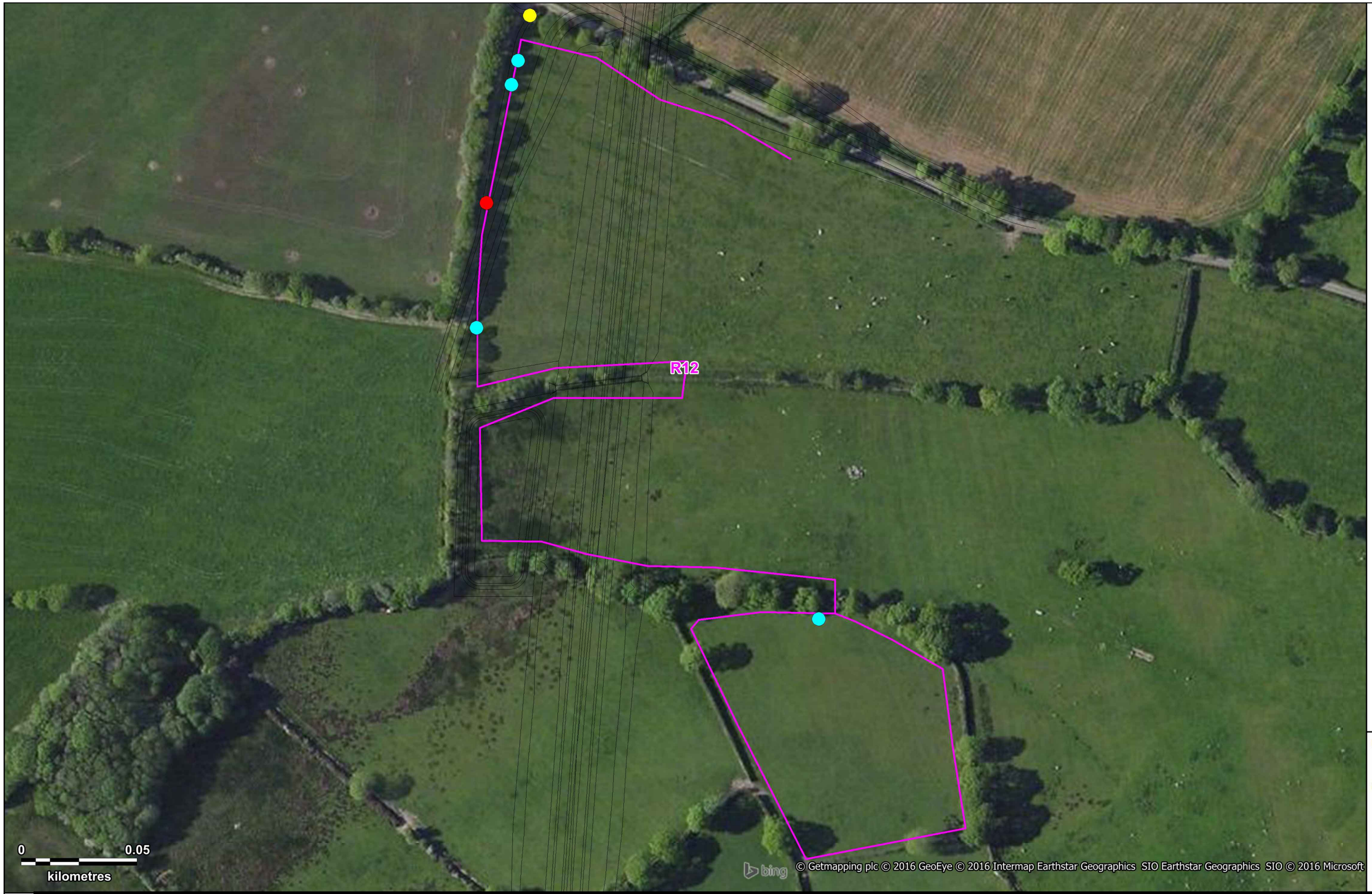

Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
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Bat Survey Report

Lesser Horseshoe Bat Events & Transect R12

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Legend

- Bat Transect
- Scheme

Lesser Horseshoe Bat Records

- May 2015 LHB Events (Walked Transect)
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- Static Detector (Anabat) Location and Number of LHB Events Recorded

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• FIGURE NUMBER
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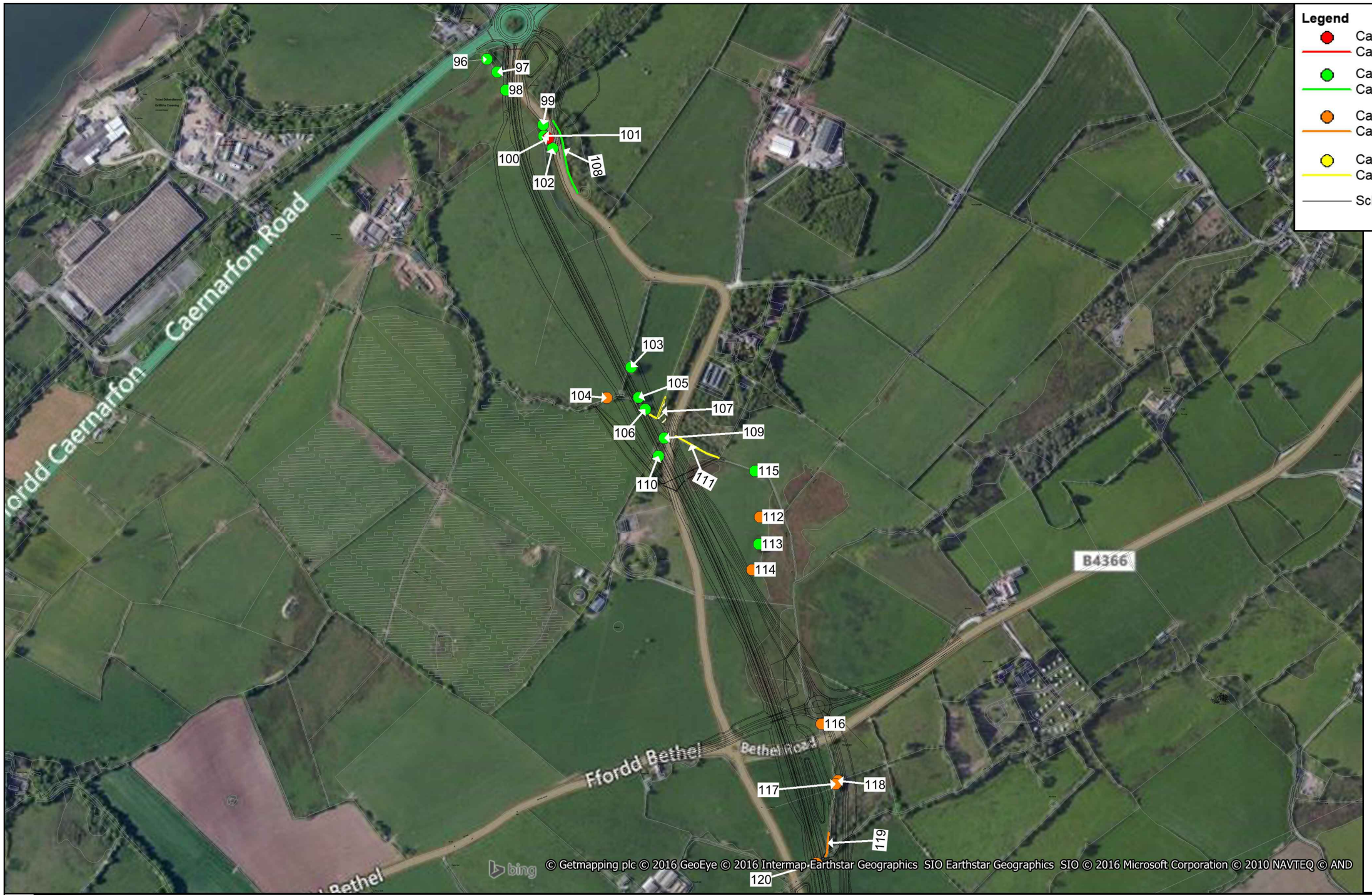
FIGURE 3.0 (A – F) – PRELIMINARY ROOST ASSESSMENTS



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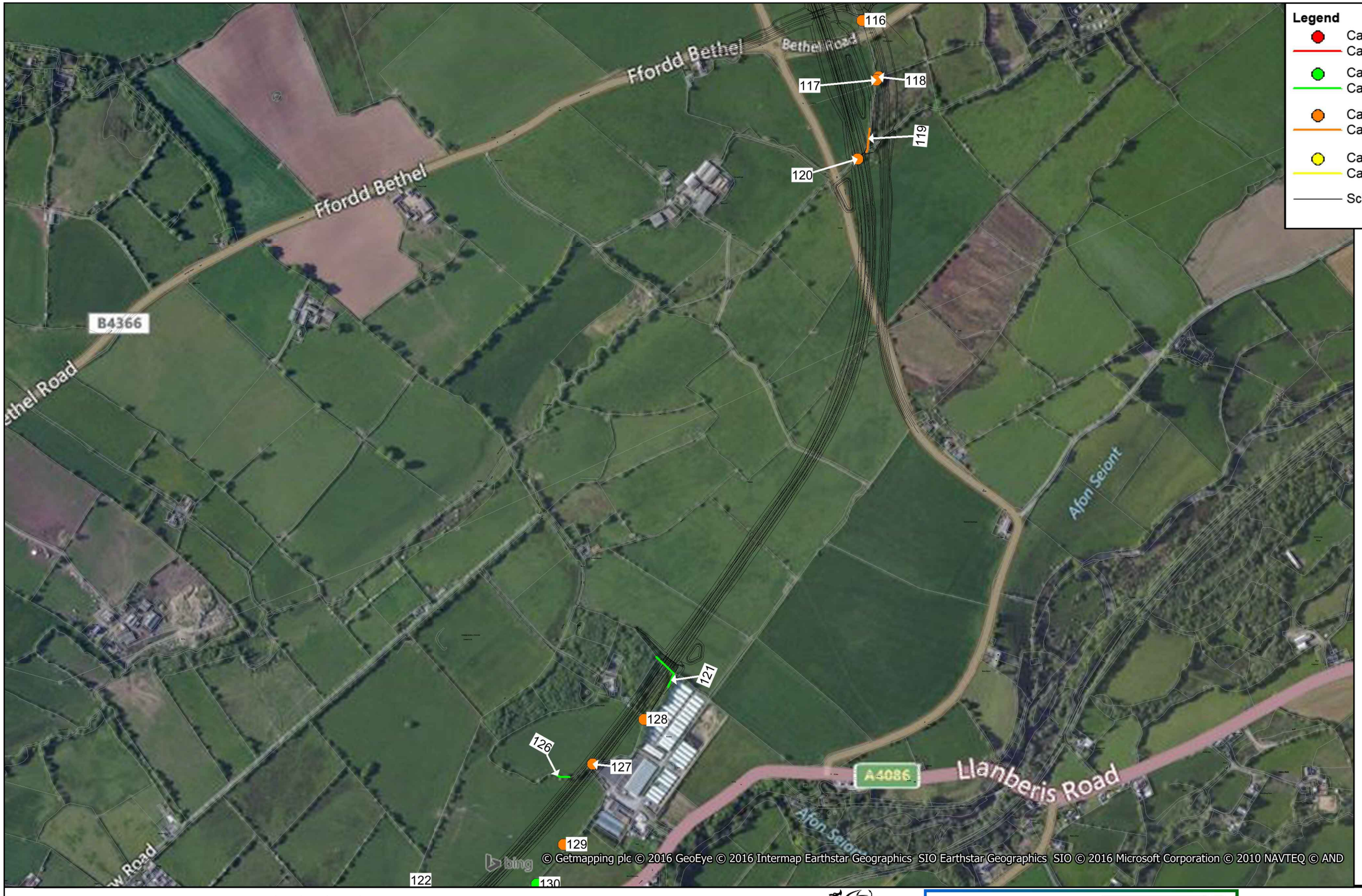
3a



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DATE 01/03/2016
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FIGURE NUMBER
3c



Legend

- Category 1 Star Trees
- Category 1 Star Tree Lines
- Category 1 Trees
- Category 1 Tree Lines
- Category 2 Trees
- Category 2 Tree Lines
- Category 3 Trees
- Category 3 Tree Lines
- Scheme

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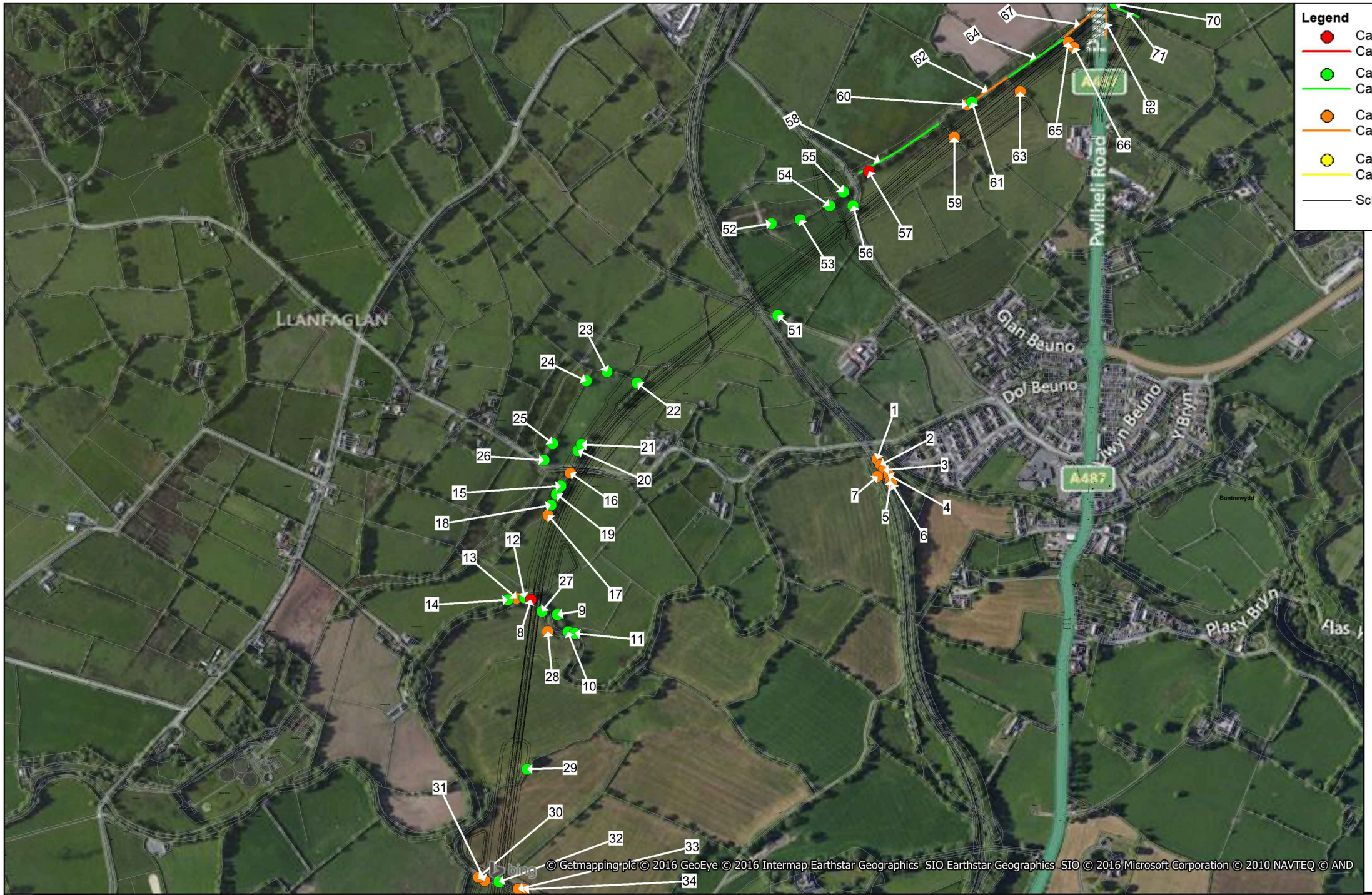

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• FIGURE NUMBER
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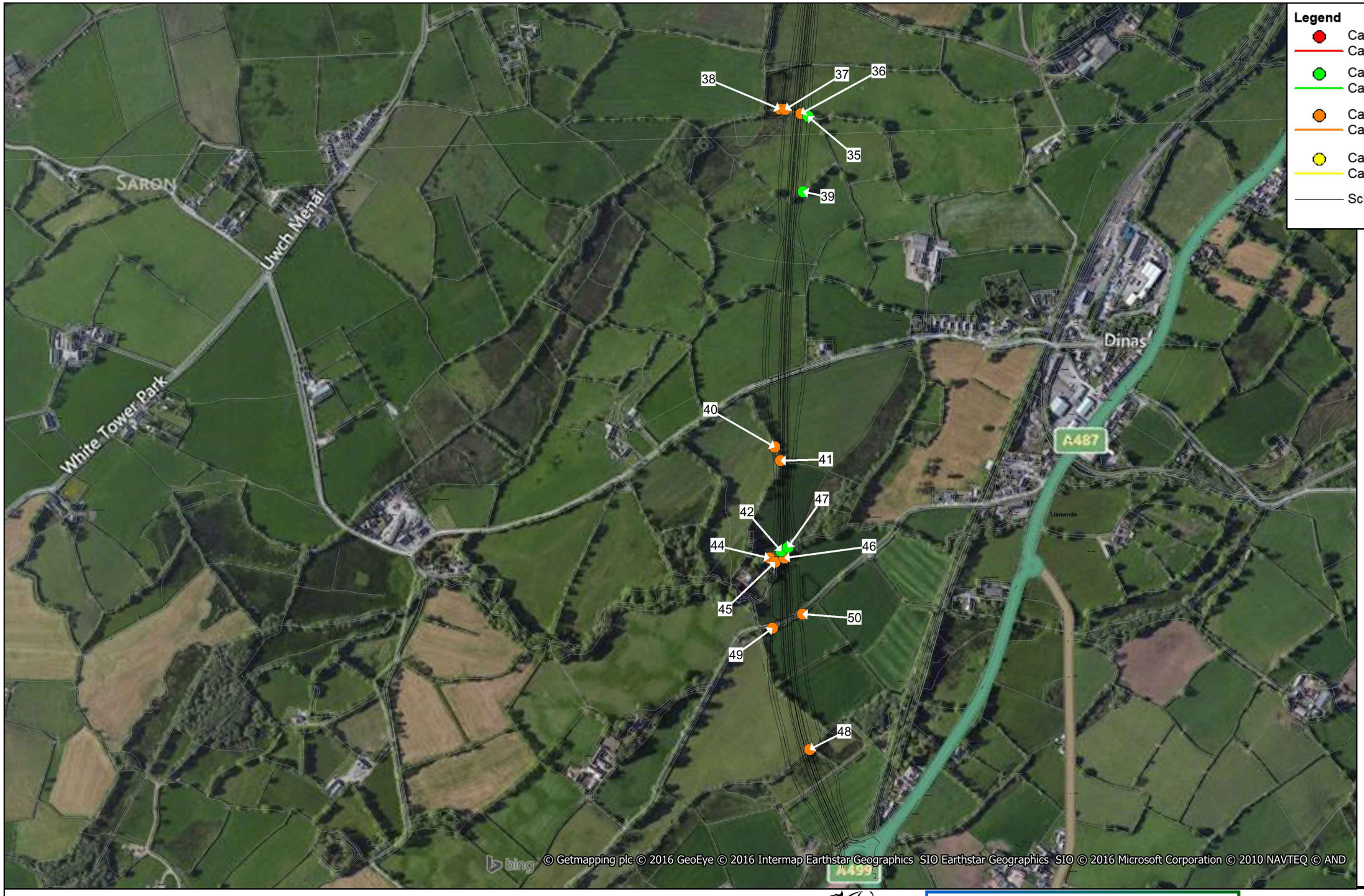

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• FIGURE NUMBER
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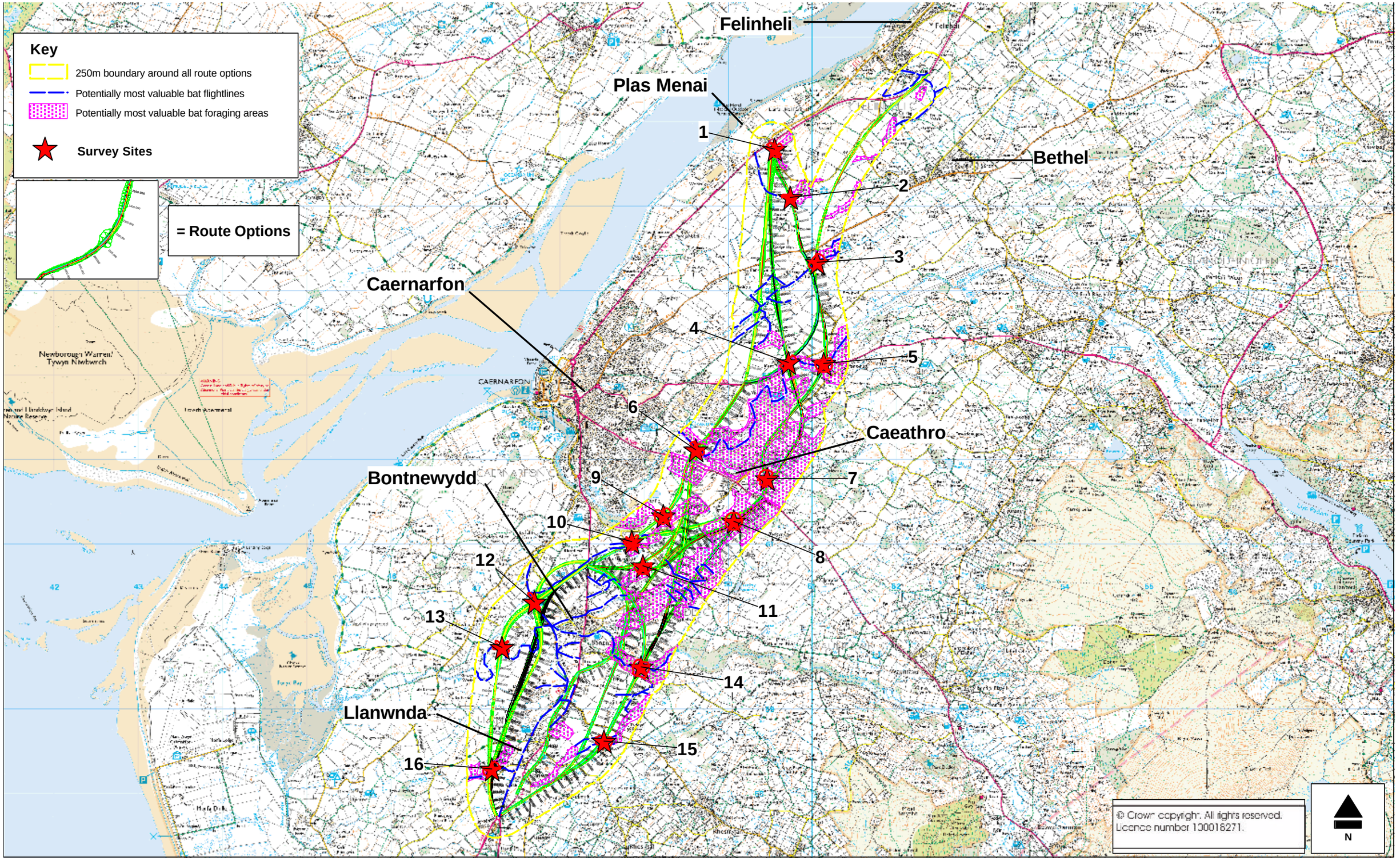
APPENDIX A – 2009 BAT SURVEY LOCATIONS



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29 Cathedral Road, Cardiff CF11 9HA
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TACP
10 Park Grove
Cardiff
CF10 3BN
Tel: 029 20228896
Fax: 029 20 384796

A487 CAERNARFON TO BONTNEWYDD

Survey areas

DATE	25TH JULY 2009	DRAWN BY	AK
SCALE	SCALE 1:40000	CHECKED	LAJ

FIGURE NO.	SHEET NO.	REV
2.1 (BATS)	1 OF 5	A

APPENDIX B – 2014 BAT SURVEY LOCATIONS



Key

- Proposed Bat survey locations 2014
- Bat Survey Area
- Yellow Option

N

0 65 130 260 390 520 650 Metres

Client

Project Title
A487 Caernarfon to Bontnewydd

Project Number
61032651

Figure Title
2014 Bat Survey Area

RAMBOLL
Tel: 01244 311855
Fax: 01244 314560
chester@ramboll.co.uk
www.ramboll.co.uk

Date	Prepared By
19/08/2014	HN
Figure No. Sheet 1	Revision -



Key

- Proposed Bat survey locations 2014
- Bat Survey Area
- Yellow Option

N

0 65 130 260 390 520 650 Metres

Client

Project Title
A487 Caernarfon to Bontnewydd

Project Number
61032651

Figure Title
2014 Bat Survey Area

RAMBOLL
Tel: 01244 311855
Fax: 01244 314560
chester@ramboll.co.uk
www.ramboll.co.uk

Date	Prepared By
19/08/2014	HN
Figure No. Sheet 2	Revision -

APPENDIX C – PRELIMINARY ROOST ASSESSMENTS

Ref Number	Location	Tree Species
On railway line - potentially not on route		
1	50m from pedestrian crossing	Ash
2	75m from pedestrian crossing	Sycamore
3	Over pedestrian bridge	Ash
4	Opposite ash above, at base of slope	Sycamore
5	30m from bridge, about halfway down embankment	Sycamore
6	75m from bridge	Ash
7	East of Railway (no access) 30m from bridge	Ash
From E of R. Gwrfai to other side of current road		
8	At river crossing point of R. Gwrfai (Eastern bank)	Ash
9	20m east of R. Gwrfai	Oak
10	East bank of R. Gwrfai	Sycamore
11	East bank of R. Gwrfai	Sycamore
12	East bank of R. Gwrfai	C. Oak
13	East bank of R. Gwrfai	C. Oak
14	East bank of R. Gwrfai	C. Oak
15	Field boundary E of R Gwrfai, 10m from hedge	C. Oak
16	In hedge line on roadside	Ash
17	Among group of oak trees in field	C. Oak
18	Among group of oak trees in field	C. Oak
19	Among group of oak trees in field	C. Oak
20	In hedgerow, in field across the road	C. Oak
21	In hedgerow, in field across the road	C. Oak
22	In top corner of field, in hedge	Ash
23	In hedge at top of field	C. Oak
24	In northern field hedge	C. Oak
25	In northern field hedge, towards road	C. Oak
26	In northern field hedge, towards road	Ash
From W of R. Gwrfai to roundabout at southern end of route		
27	West bank of R. Gwrfai	Dead Tree
28	South of proposed route, W bank R Gwrfai	Ash
29	In hedge at top of field, south of proposed route (PR)	Sycamore
30	2 adjacent trees in hedge line, north of PR	C. Oak x2
31	In hedge line, north of PR	C. Oak
32	In hedge line towards corner of field, on PR	C. Oak & dead stump
33	Along farm track	C. Oak
34	4 adjacent trees along farm track	C. Oak
35	In W hedge of field, on PR	C. Oak
36	In W hedge of field, on PR	C. Oak
37	In hedge, south of PR	C. Oak
38	In hedge, south of PR	C. Oak
39	In hedge, south of PR	Sycamore
40	In hedge on edge of PR	C. Oak
41	On bank in field (old hedge line), on PR	C. Oak
42	Next to stream, on PR	C. Oak

43 (building 1)	Small tiled building! In corner of field next to stream	N/A
44	Next to stream, north of PR	Sycamore
45	On west side of stream	C. Oak
46	On west side of stream	C. Oak
47	On west side of stream	C. Oak
48	In hedgerow on PR	C. Oak
49	In hedgerow on PR	C. Oak
50	In hedgerow east of PR	C. Oak
From railway crossing to caravan park		
51	In field, east side of railway crossing	C. Oak
52	In hedge, north of PR	C. Oak
53	In hedge, north of PR	Ash
54	In hedge, north of PR	Ash x 2
55	In hedge, north of PR	C. Oak x2
56	In hedge, on PR	C. Oak
57	In field, about 2m from hedge	C. Oak
58	Trees in hedgerow, north of PR	Oak/Ash
59	In hedgerow on PR	C. Oak x4
60	In hedge, north of PR	C. Oak
61	In hedge, north of PR	Alder
62	Hedge line, north of PR	Oak/Ash/Sycamore
63	In hedge, on PR	C. Oak x2
64	Hedge line of trees, on/north of PR	Oak/Ash
65	In hedge, on PR	C. Oak
66	In hedge, on PR	Ash x 2
67	Hedge line, on PR	Oak/Ash
68	Hedge line on roadside, on PR	Oak/Ash
69	Hedge line on roadside, on PR	Oak x3
70	In field, on PR	Sycamore
71	Hedge line, on PR	Sycamore/Ash
72	Hedge line, on PR	C. Oak x7
73	In field, south of PR	C. Oak
74	In old hedge line, on PR	C. Oak
75	In old hedge line, on PR	C. Oak x2
76	In hedge line, north of PR	C. Oak x6
77	Hedge line and small wooded trees, south of PR	Oak/Sycamore
78	In hedge line on PR	Ash
79	In hedge line on PR	Ash
80	Tree line on PR	Oak
81	In hedge line on PR	Ash
82	In hedge line, north of PR	Ash
83	In hedge line on PR	Ash
84	Tree line, south of PR	Oak/Beech
85	In hedge line on PR	C. Oak

86	In hedge line on PR	C. Oak
87	In hedge line on PR	C. Oak
88	In hedge line on PR	Ash x 2
89	In hedge line, north of PR	C. Oak
Between caravan park and industrial estate		
90	South of industrial estate on roadside	Sycamore/Ash
91	Hedge line, on PR	Sycamore
92	Wooded area, on PR	Oak/Sycamore
93	In hedge line on PR	Oak
94	In hedge line on PR	Sycamore/ dead trees
95	In hedge line on PR	Sycamore
From roundabout at Northern end of Route		
96	At edge of field, near to current road, on PR	Sycamore x3
97	At edge of field, near to current road, on PR	Sycamore
98	Edge of field, on PR	Sycamore
99	Edge of field, on PR	C. Oak
100	In field, east of PR	C. Oak
101	In field, east of PR	C. Oak
102	In field, east of PR	C. Oak
103	In hedge line, on PR	Ash
104	In hedge line west of PR	Sycamore
105	In hedge line on PR	Ash
106	In hedge line on PR	C. Oak
107	Tree line/small wooded area on PR	Ash/Alder/Birch/Beech
108	Broadleaf wooded area, west of PR	Sycamore/Ash
109	On PR	Ash
110	On PR	C. Oak
111	Tree line west of PR	Birch
112	In field, on PR	C. Oak
113	In field, on PR	C. Oak x2
114	In field, on PR	C. Oak
115	In field, west of PR	Ash
116	In hedge line, east of PR	C. Oak
117	In field, east of PR	C. Oak
118	In field, east of PR	Alder x2
119	Tree line in PR	Spruce
120	On PR	Alder/Hazel
121	Tree line and scrub/wooded area on PR	Oak/Hawthorn
North of Industrial Estate		
122	In hedge line on roadside	C. Oak
123	In hedge line on PR	Ash
124	Roadside tree line on PR	Sycamore/Ash/Oak
125	Roadside tree line on PR	Young sycamore/hawthorn
126	In hedge line on/west of PR	C. Oaks x3
127	In hedge line on PR	C. Oak x2
128	In hedge line, east of PR	C. Oak x2

129	In hedge line, east of PR	C. Oak
130	In hedge line, east of PR	Ash
131	In hedge line, east of PR	Ash
132	In hedge line, east of PR	Ash
133	Hedging on roadside, potentially on PR	Ash/Oak
Holiday Park between river and main road		
Treeline	Along river bank, near BH 55	Sycamore/ash/oak/alder/whitebeam
134		Sycamore
135		Oak
136		Alder
137		Ash
138		Whitebeam
139		Ash
140	On top of bank along main road	Sycamore x8
Cibyn Industrial Estate		
141	On slope between industrial and holiday park	Sycamore/blackthorn/hawthorn/alder
142	On slope between industrial and holiday park	Sycamore
Treeline	In land by corner of Cibyn industrial estate on top of embankment. Trees stand in a line on a raised bank	Sycamore x2 & Ash
143		Sycamore
144		Sycamore
145		Ash
Treeline	A junction of two tree lines by corner of industrial estate. Trees stand on a raised bank forming a hedge	Oak/willow/Ash
146		Oak sp
147		Goat willow x 4
148	Trees in wooded area at the bottom of small feild	Ash
149		Ash
150		Oak sp
151	Right on corner of security fencing	Oak sp
Building 2	In farm land adjacent to industrial estate and main road, close dome like building.	N/A
152		Ash
153		Oak sp
154		Oak sp
Quarry		
155	Hedge seperating field from line of electric pilons	Oaks, willow, alder
156		Ash
157	A line of mature broad leaf trees along the top of grassy slope beside footpath near BH 44	Various
158		Oak
159		Oak
160		Sycamore
161		Oak
162		Ash
163		Oak

Features Observed	Bat Potential
A few holes low down	Category 2
A few crevices facing path	Category 2
A few holes facing wood strip/grassland	Category 2
Dead stump with large crevice at edge of grassland	Category 2
Holes towards base of tree	Category 2
Holes and Crevices	Category 2
Knot hole in limb - mature tree, may be further holes, peeling bark	Category 2
Thick ivy covering, several holes	Category 1*
Mature tree - holes in trunk and limbs	Category 1
Ivy covering and a few holes	Category 1
Ivy covered mature tree	Category 1
Knot holes, ivy covering	Category 1
Holes in branch over river	Category 2
Holes and crevices	Category 1
Holes in trunk, crevice in branch	Category 1
Knot holes half way up trunk and in higher branches	Category 2
Potential hole where branch fallen	Category 2
Crevices in trunk	Category 1
Knot hole in higher branch	Category 1
Ivy covered, potential holes	Category 1
Ivy covered, potential holes	Category 1
Hole in branch, ivy covering	Category 1
Hole in trunk, ivy covering	Category 1
Potential crevice in branch	Category 1
Hole in tree limb	Category 1
Potential holes and crevices	Category 1
Holes and crevices, thin ivy covering	Category 1
Holes in trunk	Category 2
Ivy covered mature tree, a few holes	Category 1
Potential hole/crevice	Category 2
Potential hole/crevice in broken branch	Category 2
Ivy covered, potential crevice in stump	Category 1
Thin ivy covering, crevice forming in broken branch	Category 2
Ivy covered, some potential for roost	Category 2
Ivy covering, many holes/cracks	Category 1
Holes/cracks	Category 2
Holes/crevices	Category 2
Holes/deadwood in trunk	Category 2
Thick ivy covering, holes	Category 1
Holes/dead wood at height	Category 2
A few holes/ crevices	Category 2
Ivy covering, dead wood	Category 1

Limited potential, internal structure exposed to elements	-
Peeling bark, holes	Category 2
Dead wood, holes and crevices	Category 2
Holes in trunk	Category 2
Dead wood, potential holes and crevices	Category 1
Knot holes and crevices in trunk	Category 2
Potential holes and crevices	Category 2
Mature tree, low potential	Category 2

Large crevice in trunk, holes in canopy	Category 1
Ivy covered, holes in canopy	Category 1
Ivy covering, dead wood and holes/crack	Category 1
Ivy covering, dead wood and holes/crack	Category 1
Mature trees, a few potential holes	Category 3
Ivy covering, dead wood and holes/crack	Category 1
Lots of holes/crevices, hollow trunk	Category 1*
Many mature trees, ivy covering, potential holes/crevices	Category 1
Mature trees, a few potential holes	Category 2
Mature tree - no visible holes/crevices	Category 2
Holes/crevices/dead wood	Category 1
Hedge line of mature trees - holes/crevices/dead wood	Category 2
Holes/crevices	Category 2
Mature trees - holes/crevices	Category 1
Split in branch	Category 2
Ivy covering	Category 2
Potential holes/crevices	Category 2
Potential holes/crevices	Category 2
Thin ivy covering, potential holes/crevices	Category 2
Crevice, peeling bark, some ivy covering	Category 1
Mature Ash, Mod potential - few holes. Sycamore - dense foliage, potential holes	Category 1
Holes and Crevices	Category 1
Hole in trunk, deadwood	Category 1
Mature tree, potential holes/crevices (limited access due to livestock)	Category 1
Mature tree, potential holes/crevices (limited access due to livestock)	Category 1
Mature tree, potential holes/crevices (limited access due to livestock)	Category 1
Mature trees, dead wood, holes/crevices	Category 1
Ivy covering, crevices and holes	Category 1*
Ivy covering, crevices and holes	Category 1
Mature trees, holes and crevices	Category 2
Many holes	Category 2
Broken branch, crevices	Category 1
Crevices, dead wood, hole, hollow trunk	Category 1
Holes/crevices	Category 2
Holes/crevices	Category 1

Holes/crevices, crack in limb	Category 1
Holes and crevices	Category 1
Mature tree, no obvious holes and crevices	Category 2
Some ivy covering	Category 2

Hedge line - a few holes	Category 1
Mature, holes, dead wood, curled bark	Category 1
Crevices/holes, deadwood	Category 1
Large mature tree, large crevice in limb	Category 1*
Holes/crevices	Category 1
Large crevice	Category 1*

Thin-moderate ivy covering, potential holes	Category 1
Fairly thin ivy covering, no visible holes	Category 1
Ivy covering, peeling bark	Category 1
Mature tree, dead wood, potential holes	Category 1
Hole in main branch, dead wood and holes in canopy	Category 1*
Dead wood, hole in trunk, crevices	Category 1
Dead wood, holes	Category 1
Ivy covered, holes, deadwood, crevices	Category 1
Few holes	Category 2
Hole in main trunk, potential holes in canopy	Category 1
Ivy covering, crevices and holes, dead wood	Category 1
Young trees - low potential	Category 3
Mature trees , peeling bark, a few holes	Category 1
Mature/die back, ivy covered	Category 1
Dead wood, holes and crevices	Category 1
Young trees - low potential	Category 3
Mature tree, dead wood, potential crevices	Category 2
Mature tree, dead wood, crevices	Category 1
Mature tree, crevice/hole in trunk	Category 2
Ivy cover	Category 1
Semi mature, potential crevices, dead wood	Category 2
Cracks/crevices, holes, dead wood	Category 2
Holes, crevices, dead wood	Category 2
Young trees - low potential	Category 2
Young trees - low potential	Category 2
Older trees in hedge line - ivy covering, dead wood	Category 1

Mature tree, potential holes and crevices and top of trunk, deadwood	Category 1
Few holes, possibly too shallow	Category 3
Some deadwood, ivy covering, potential holes/crevices	Category 2
Some ivy covering, mostly too thin, no holes/crevices, young trees	Category 2
Ivy covering, few holes/crevices, dead wood	Category 1
Mature, dead wood, some ivy	Category 2
No visible holes, but cant get access to tree, some dead wood	Category 2

Mature tree, dead wood, crevices	Category 2
Holes, ivy	Category 1
A few small holes, low potential	Category 2
Ivy covering, no holes visible	Category 2
Ivy covering, potential crevices	Category 2

Ivy covering and some dead wood, semi mature, some potential	Category 1
With ivy covering trunk and limbs, dead wood.	Category 1
Some ivy, broken limb, crevices	Category 1
Lots of die back, thick ivy covering trunk, deadwood	Category 1*
Some ivy on limbs, broken limb.	Category 2
Broken rotting limb, some peeling bark, die back.	Category 1
Ivy, knot holes, crevices, broken limbs.	Category 1 & 1*

Immature trees with little or no no bat potential	Category 3/2
Holes and crevices	Category 1*
Holes, peeling bark, crevices	Category 1*
Crevices, peeling bark	Category 1*
Knot holes, broken limbs, large crevice	Category 1*
Broken limbs, dead wood	Category 1
Cracks, holes, crevices where stems merge	Category 1*
Dead wood, broken limbs	Category 1
Dead tree, cracks and crevices dropped limbs, holes	Category 1*
Thick ivy covering	Category 1
Ivy, crack in stump of limb, dead wood	Category 1
Maybe crevices where branches merge	Category 2
Crevice on low limb	Category 1
No features can be seen from the ground	Category 2

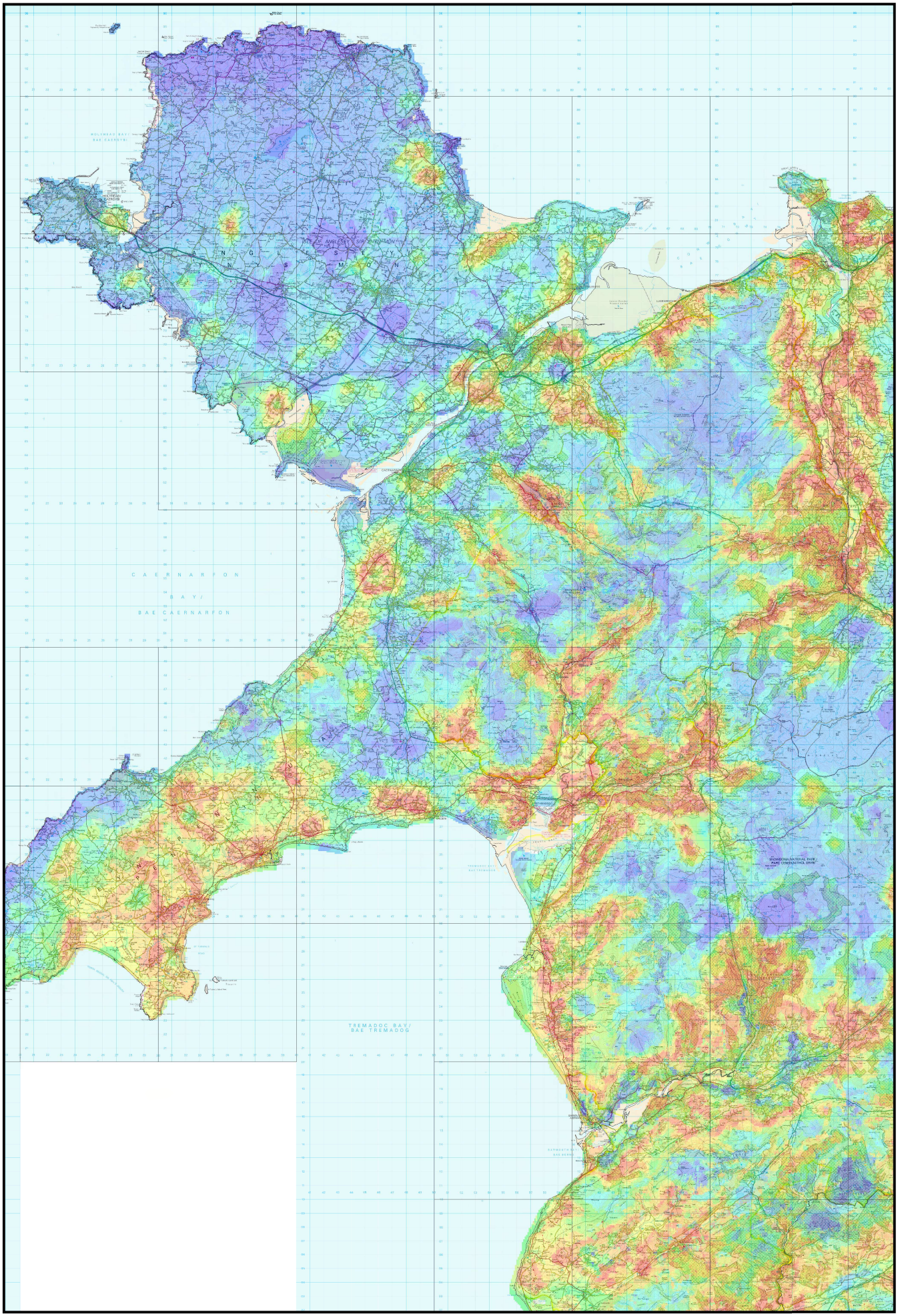
Some with ivy covering little or no potential	Category 2 & 3
Dropped limbs, die back	Category 2
	Category 1 & 1*
Hole on lower limb, dead wood.	Category 1
Splits and tears, ivy	Category 1*
Some holes	Category 1
Holes, splits, deadwood, crevices, base of truck split	Category 1*
Ivy on trunk, broken limbs	Category 1
Holes, broken limbs	Category 1

APPENDIX D – SURVEY DATES AND WEATHER CONDITIONS

Survey Date	Sunset	Sunrise	Weather
11/05/2015	21:05	N/A	Dry, gusty wind increasing after 23:00, cloudy, c11 deg C
12/05/2015	21:05	N/A	Mild, c10 deg C, light breeze, dry, cloudy
13/05/2015	21:05	N/A	Dry,
14/05/2015	21:05	N/A	Cloudy, c11 deg C,
13/07/2015	21:39	N/A	Dry, no wind, warm around 21 deg C start temp, cloudy
14/07/2015	21:38	N/A	Dry, little cloud, no wind
15/07/2015	21:37	N/A	Dry, little cloud, warm
15/09/2015	19:35	N/A	Dry, some cloud, c14 deg C at start
16/09/2015	N/A	06:51	Dry, clear skies, c7 deg C at start
16/09/2015	19:35	N/A	Dry, mild start getting cold, scattered cloud
17/09/2015	N/A	06:52	Dry, cold, c6 deg C, scattered cloud

APPENDIX E – NRW LESSER HORSESHOE HABITAT SUITABILITY MODEL OUTPUT

LHB NW Hibernation



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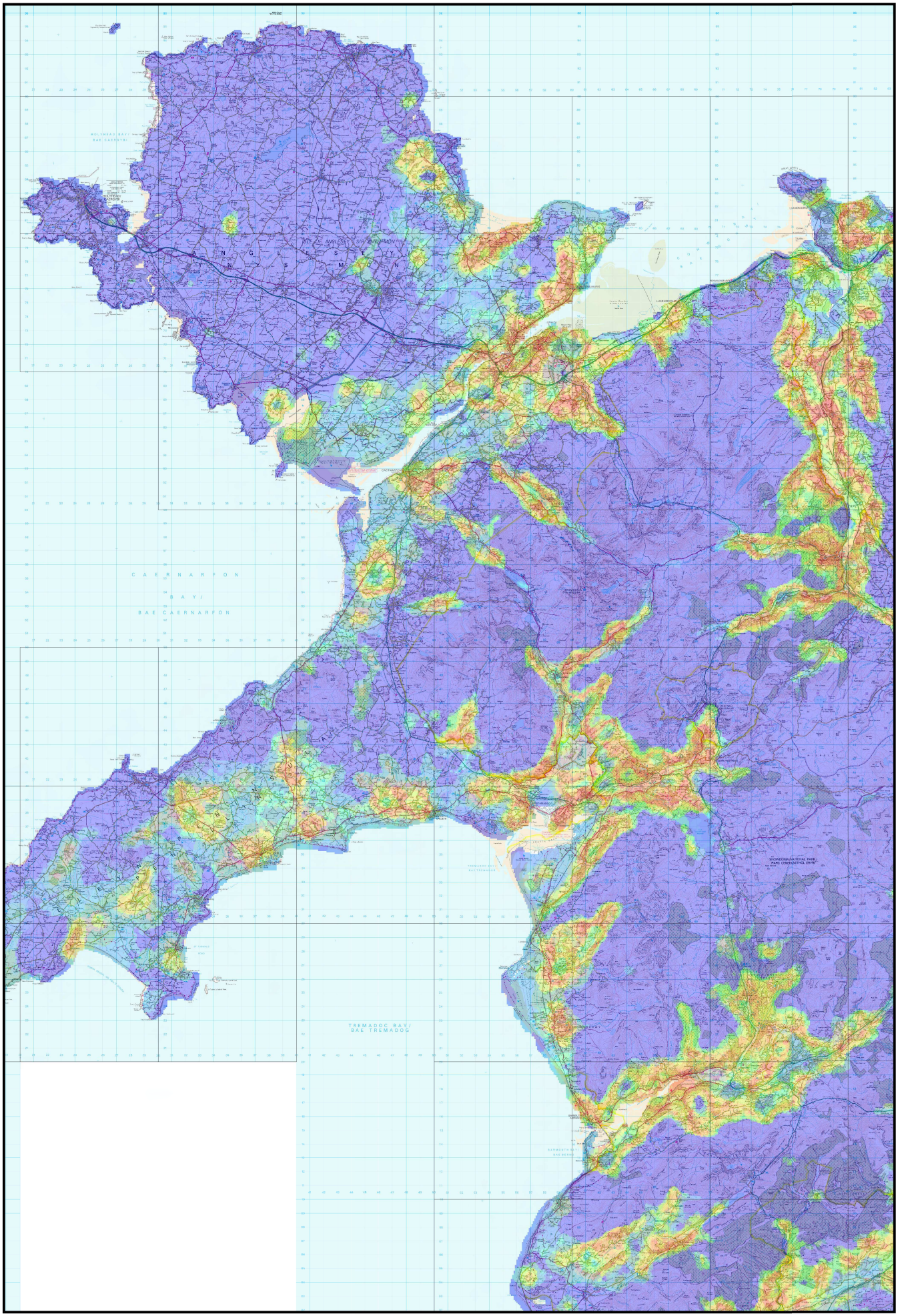
LHB NW Maternity



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APPENDIX F – LESSER HORSESHOE SURVEY DATA TABLES

		June/July 09	Sept/Oct 09	Aug / Sept 14	May-15	Jul-15	Sep-15	Total	Activity Index
Transect 1 / R1	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	2	1	0	0	1	4.00	20.0
Transect 2 / R2	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	0	1	1	0	3	5.00	25.0
Transect 3 / R3	Survey effort	4	4	0	2	2	4	16.00	
	LHB events	0	1	0	1	0	0	2.00	12.5
Transect 4	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
R4	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	2	0	0	2	4.00	33.3
Transect 5	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	1	0	0	0	0	1.00	12.5
Transect 6 / R5	Survey effort	4	4	8	2	2	4	24.00	
	LHB events	0	1	2	0	0	2	5.00	20.8
Transect 7	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	6	3	0	0	0	0	9.00	112.5
Transect 8	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
Transect 9 / R6	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	4	0	0	1	5.00	41.7
Transect 10 / R7	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	6	5	11	1	4	6	33.00	165.0
Transect R7a	Survey effort (h)	0	0	0	0	0	4	4.00	
	LHB events (be)	0	0	0	0	0	4	4.00	100.0
R8	Survey effort	0	0	0	2	2	4	8.00	
	LHB events	0	0	0	2	0	0	2.00	25.0
Transect 11	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	1	1	0	0	0	0	2.00	25.0
Transect 12 /R9	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	0	1	0	0	0	1.00	5.0
Transect 13 / R10	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	1	0	6	0	0	7.00	35.0
R11	Survey effort	0	0	0	2	2	4	8.00	
	LHB events	0	0	0	0	0	0	0.00	0.0
R12	Survey effort	0	0	4	2	2	4	12.00	
	LHB events	0	0	1	1	4	1	7.00	58.3
Transect 14	Survey effort	4	4	0	0	0	0	8.00	
	LHB events	2	0	0	0	0	0	2.00	25.0
Transect 16 / R13	Survey effort	4	4	0	2	2	4	16.00	
	LHB events	2	2	0	0	0	0	4.00	25.0

	Not surveyed 2009
	Only surveyed 2009
	Surveys not undertaken in 2014
	Only surveyed Sept 2015

Ivy covering and some dead wood, semi mature, some potential	Category 1
With ivy covering trunk and limbs, dead wood.	Category 1
Some ivy, broken limb, crevices	Category 1
Lots of die back, thick ivy covering trunk, deadwood	Category 1*
Some ivy on limbs, broken limb.	Category 2
Broken rotting limb, some peeling bark, die back.	Category 1
Ivy, knot holes, crevices, broken limbs.	Category 1 & 1*

Immature trees with little or no no bat potential	Category 3/2
Holes and crevices	Category 1*
Holes, peeling bark, crevices	Category 1*
Crevices, peeling bark	Category 1*
Knot holes, broken limbs, large crevice	Category 1*
Broken limbs, dead wood	Category 1
Cracks, holes, crevices where stems merge	Category 1*
Dead wood, broken limbs	Category 1
Dead tree, cracks and crevices dropped limbs, holes	Category 1*
Thick ivy covering	Category 1
Ivy, crack in stump of limb, dead wood	Category 1
Maybe crevices where branches merge	Category 2
Crevice on low limb	Category 1
No features can be seen from the ground	Category 2

Some with ivy covering little or no potential	Category 2 & 3
Dropped limbs, die back	Category 2
	Category 1 & 1*
Hole on lower limb, dead wood.	Category 1
Splits and tears, ivy	Category 1*
Some holes	Category 1
Holes, splits, deadwood, crevices, base of truck split	Category 1*
Ivy on trunk, broken limbs	Category 1
Holes, broken limbs	Category 1

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Survey Date	Sunset	Sunrise	Weather
11/05/2015	21:05	N/A	Dry, gusty wind increasing after 23:00, cloudy, c11 deg C
12/05/2015	21:05	N/A	Mild, c10 deg C, light breeze, dry, cloudy
13/05/2015	21:05	N/A	Dry,
14/05/2015	21:05	N/A	Cloudy, c11 deg C,
13/07/2015	21:39	N/A	Dry, no wind, warm around 21 deg C start temp, cloudy
14/07/2015	21:38	N/A	Dry, little cloud, no wind
15/07/2015	21:37	N/A	Dry, little cloud, warm
15/09/2015	19:35	N/A	Dry, some cloud, c14 deg C at start
16/09/2015	N/A	06:51	Dry, clear skies, c7 deg C at start
16/09/2015	19:35	N/A	Dry, mild start getting cold, scattered cloud
17/09/2015	N/A	06:52	Dry, cold, c6 deg C, scattered cloud

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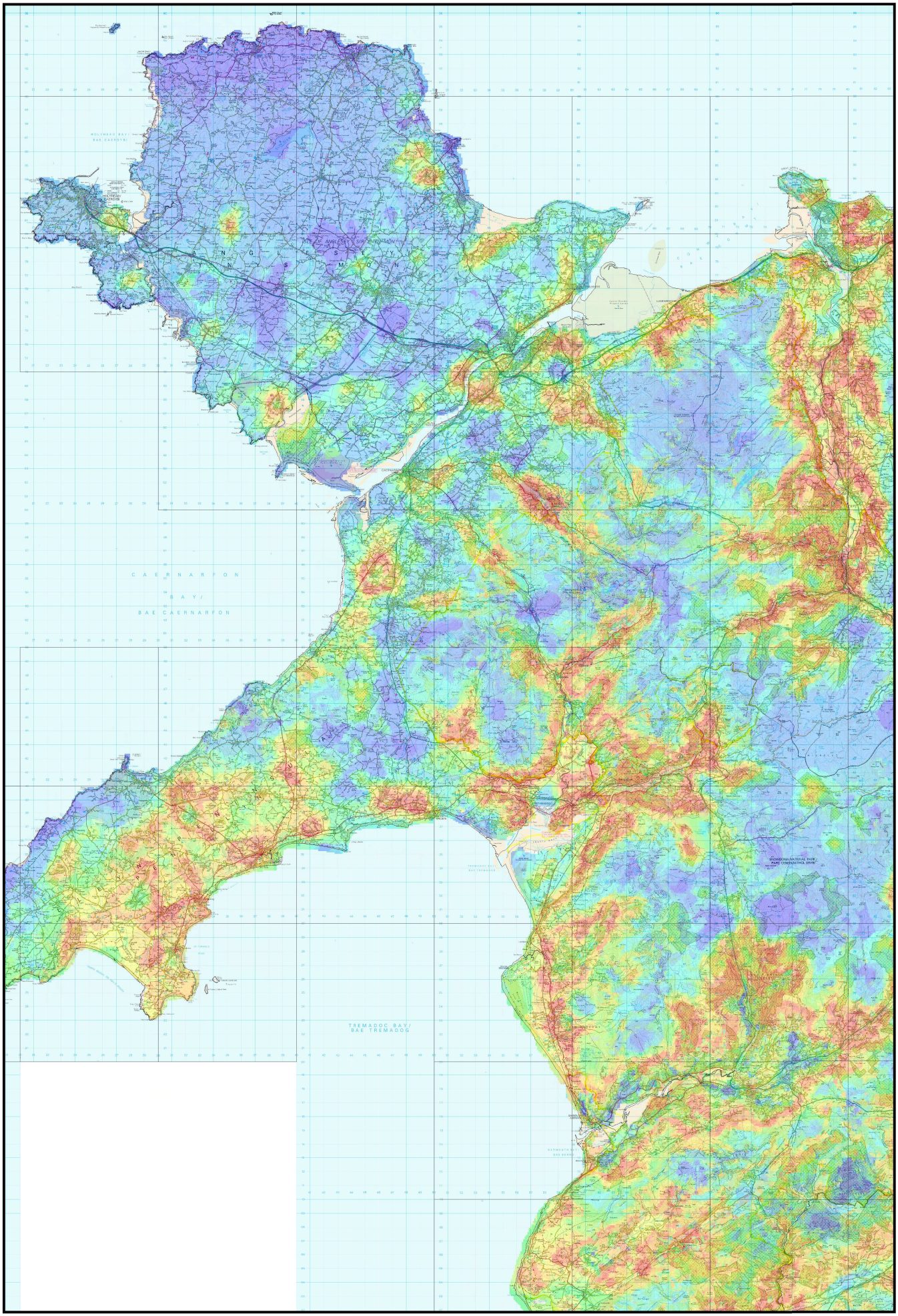
LHB NW Hibernation



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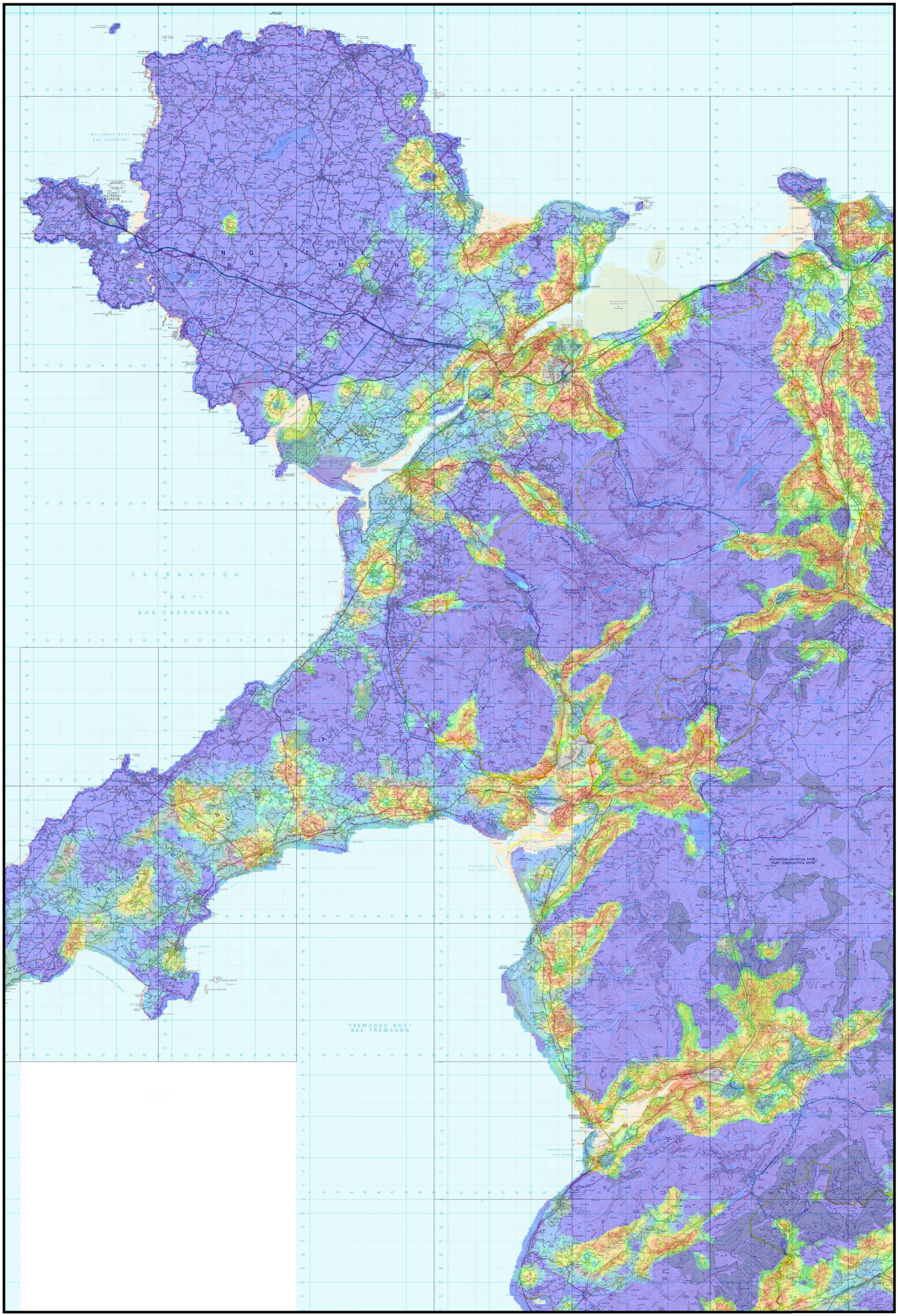
LHB NW Maternity



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		June/July 09	Sept/Oct 09	Aug / Sept 14	May-15	Jul-15	Sep-15	Total	Activity Index
Transect 1 / R1	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	2	1	0	0	1	4.00	20.0
Transect 2 / R2	Survey effort	4	4	4	2	2	4	20.00	
	LHB events	0	0	1	1	0	3	5.00	25.0
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	LHB events	0	0	0	0	0	0	0.00	0.0
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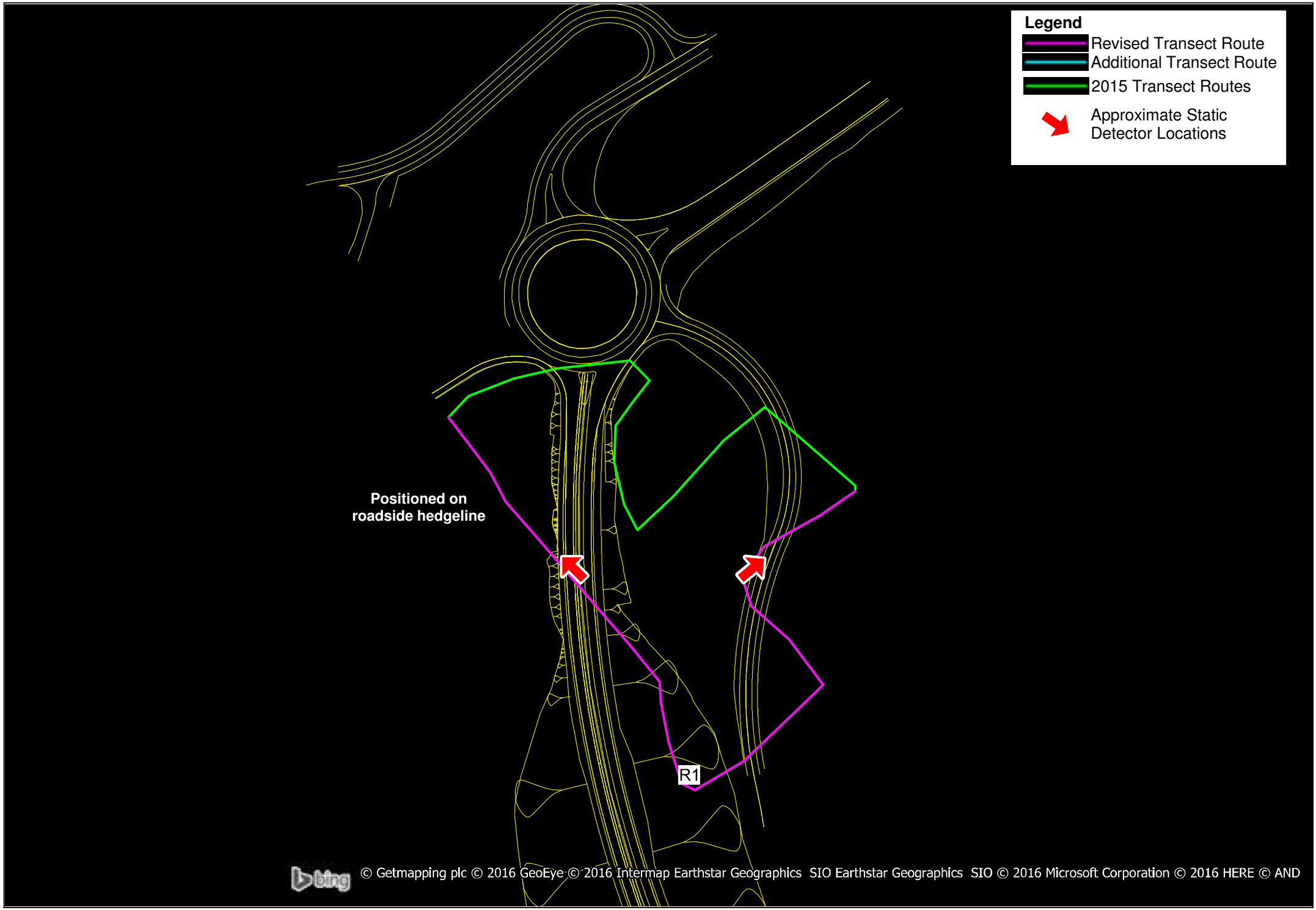
	Not surveyed 2009
	Only surveyed 2009
	Surveys not undertaken in 2014
	Only surveyed Sept 2015

Appendix E.6 – 2016 Bat Survey Locations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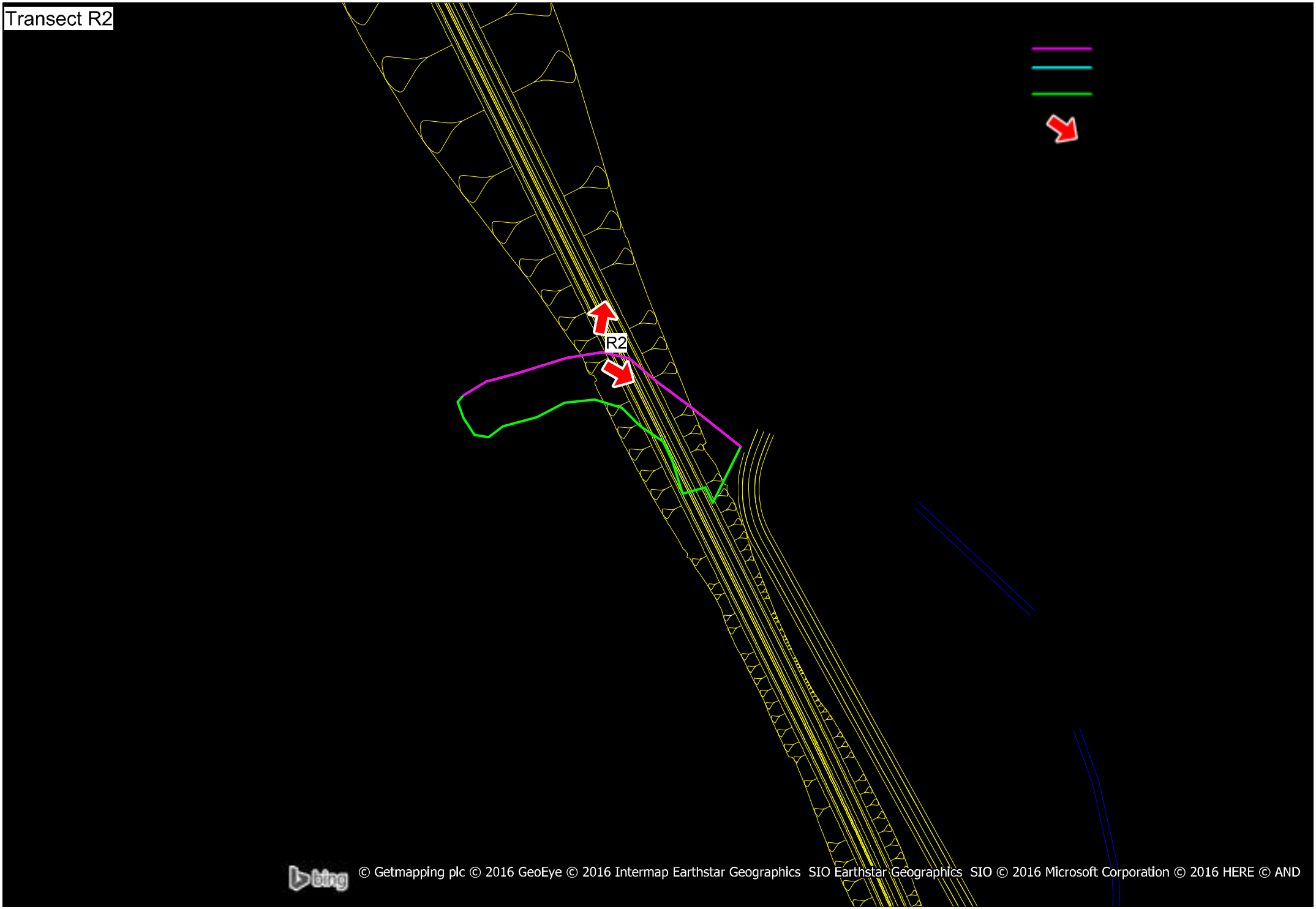
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R2
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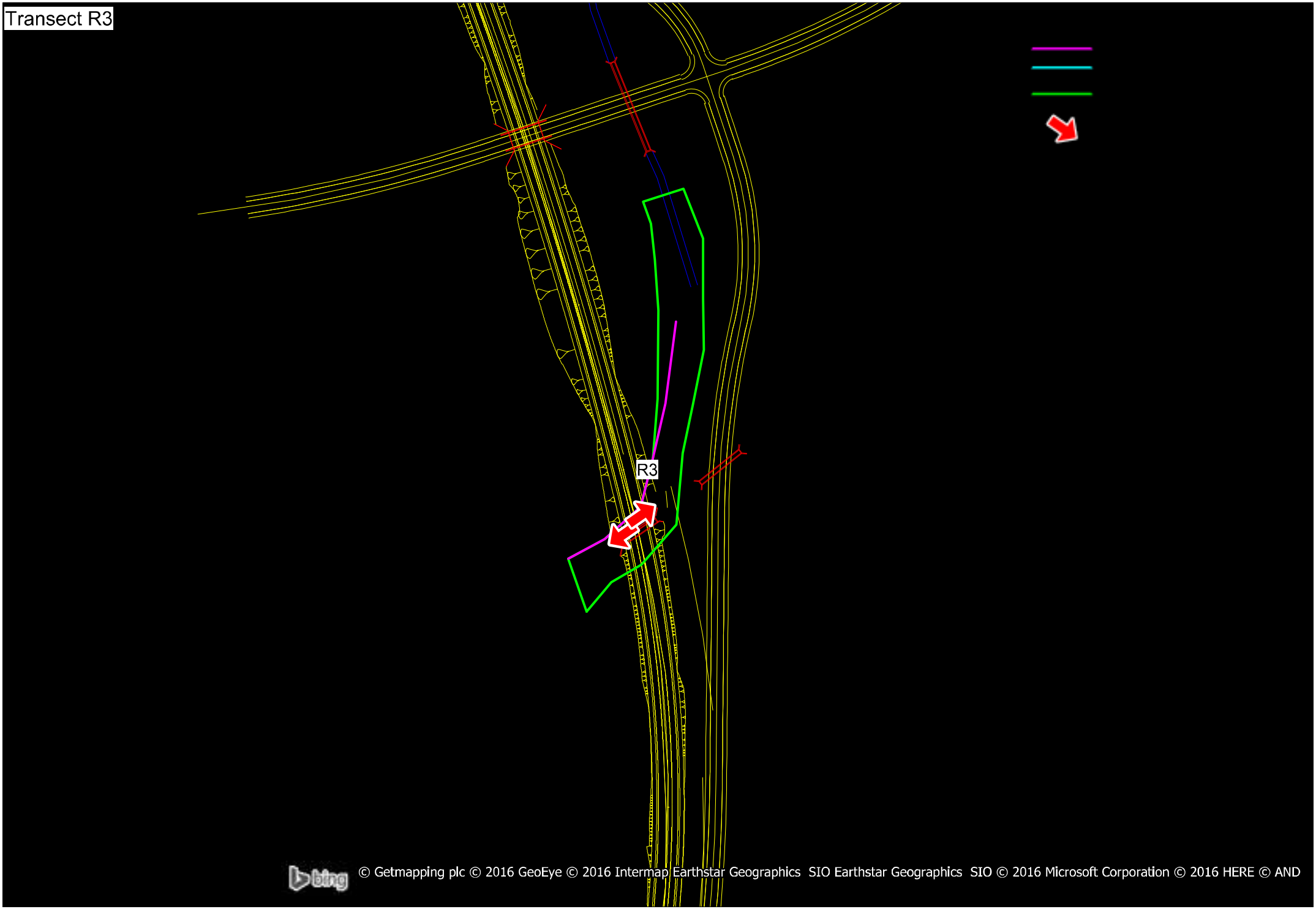
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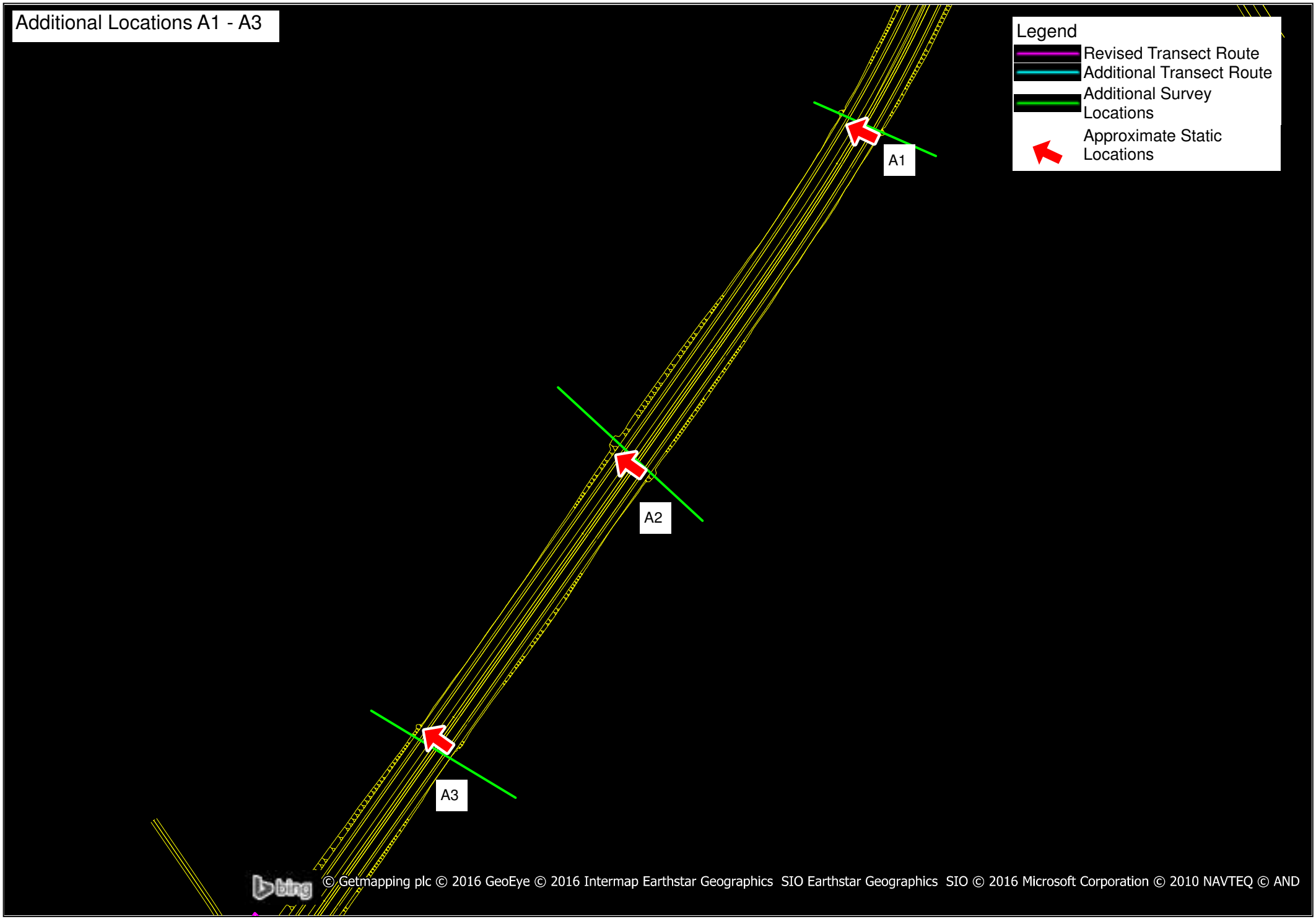
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A3
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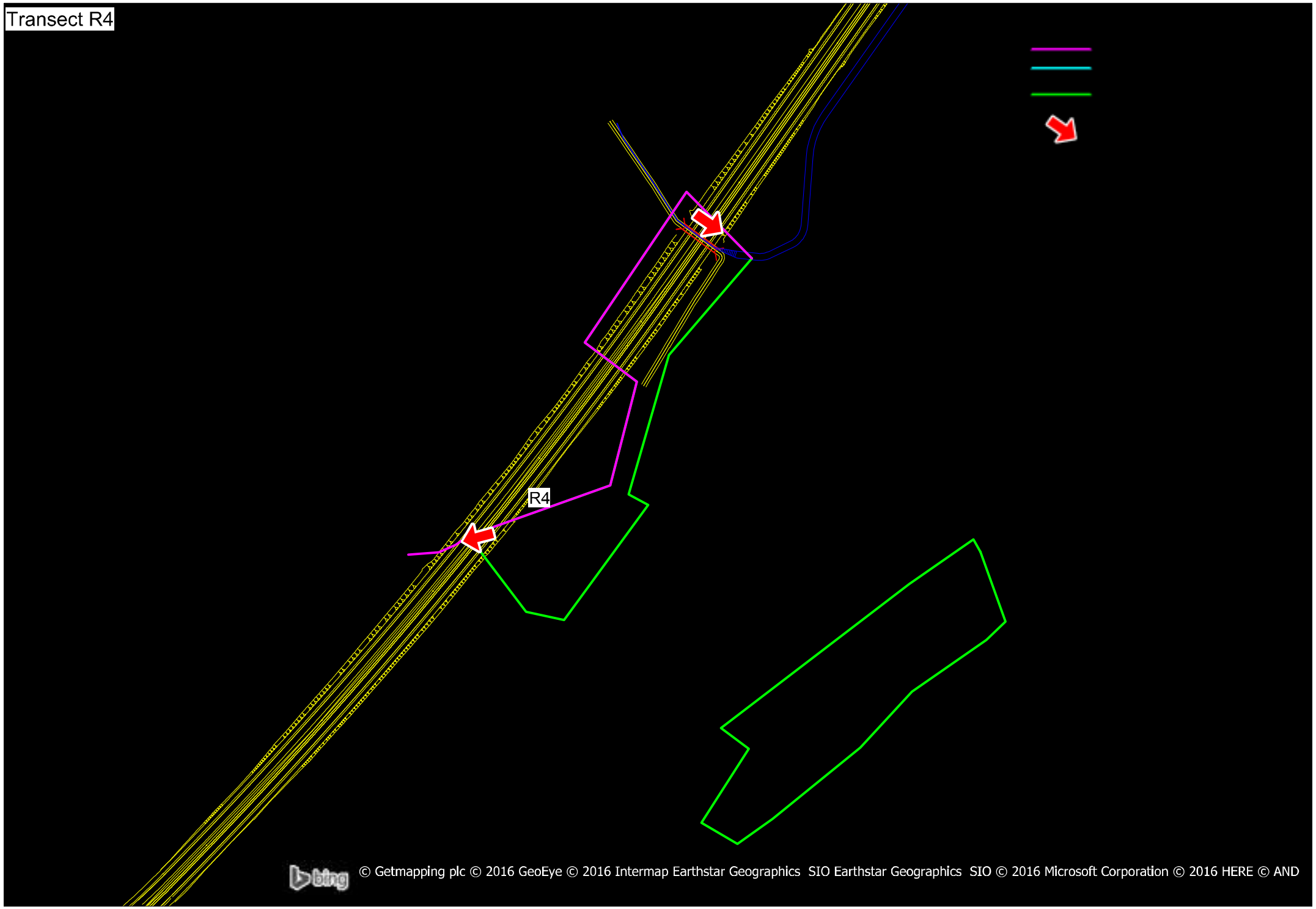
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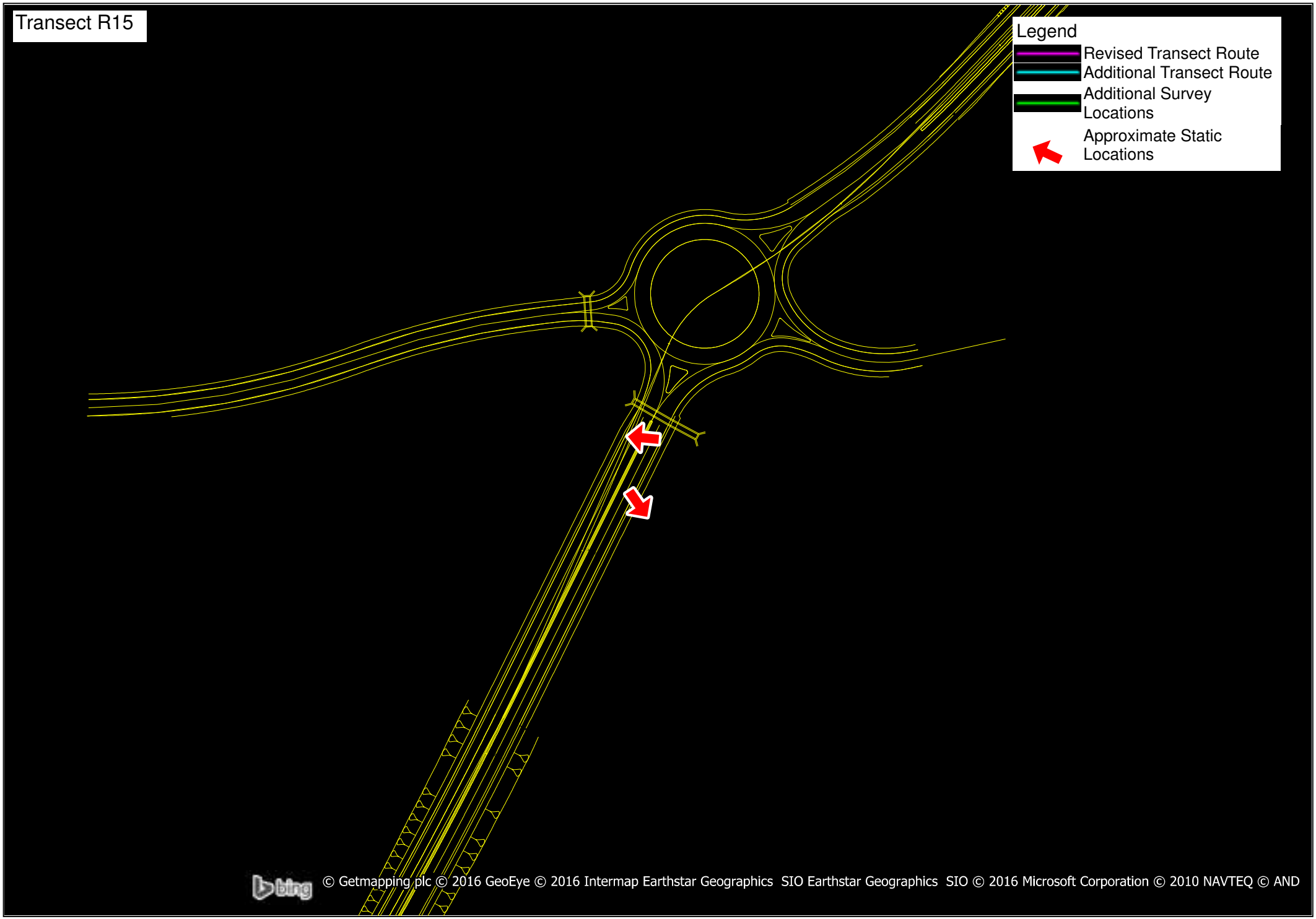
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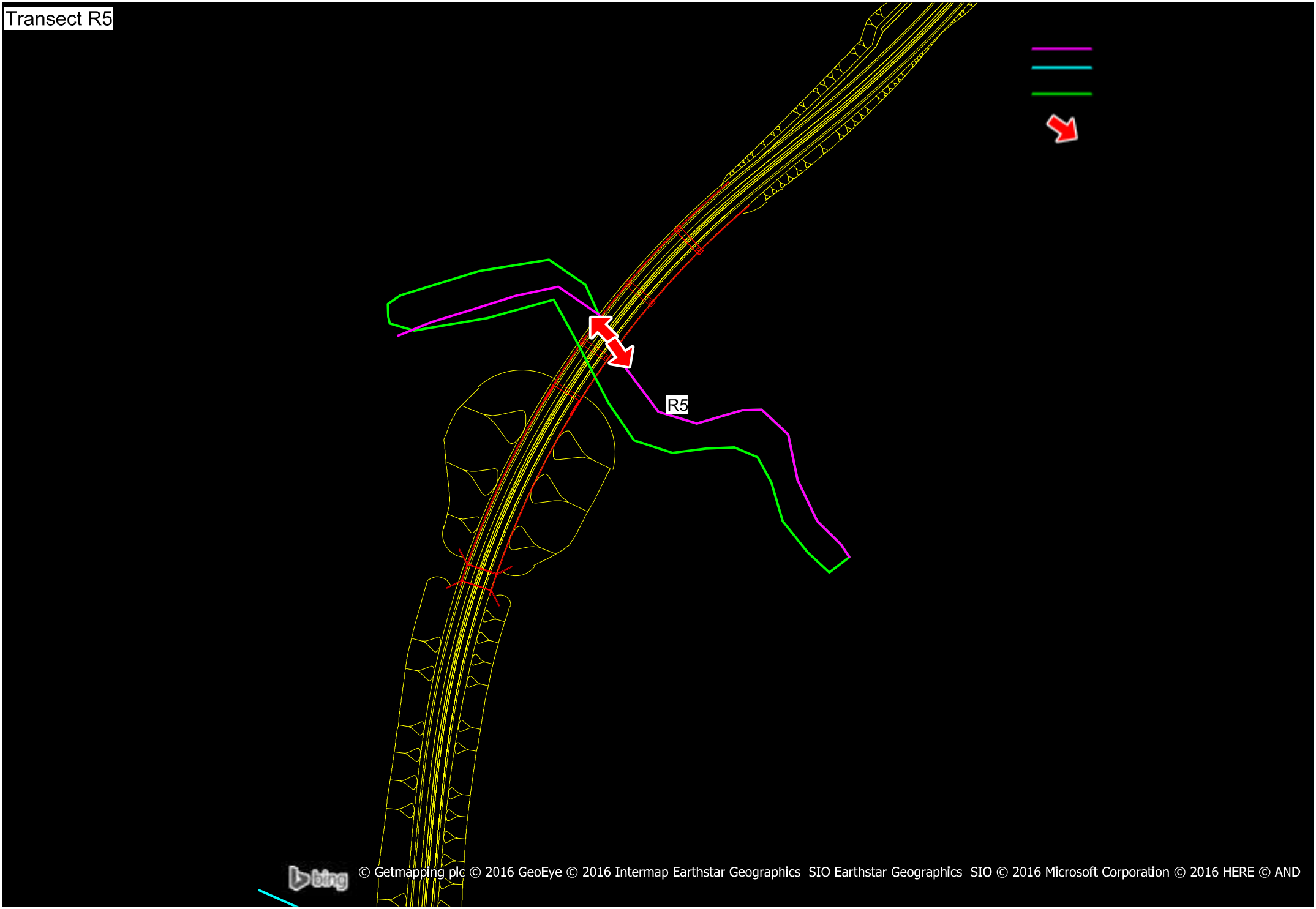
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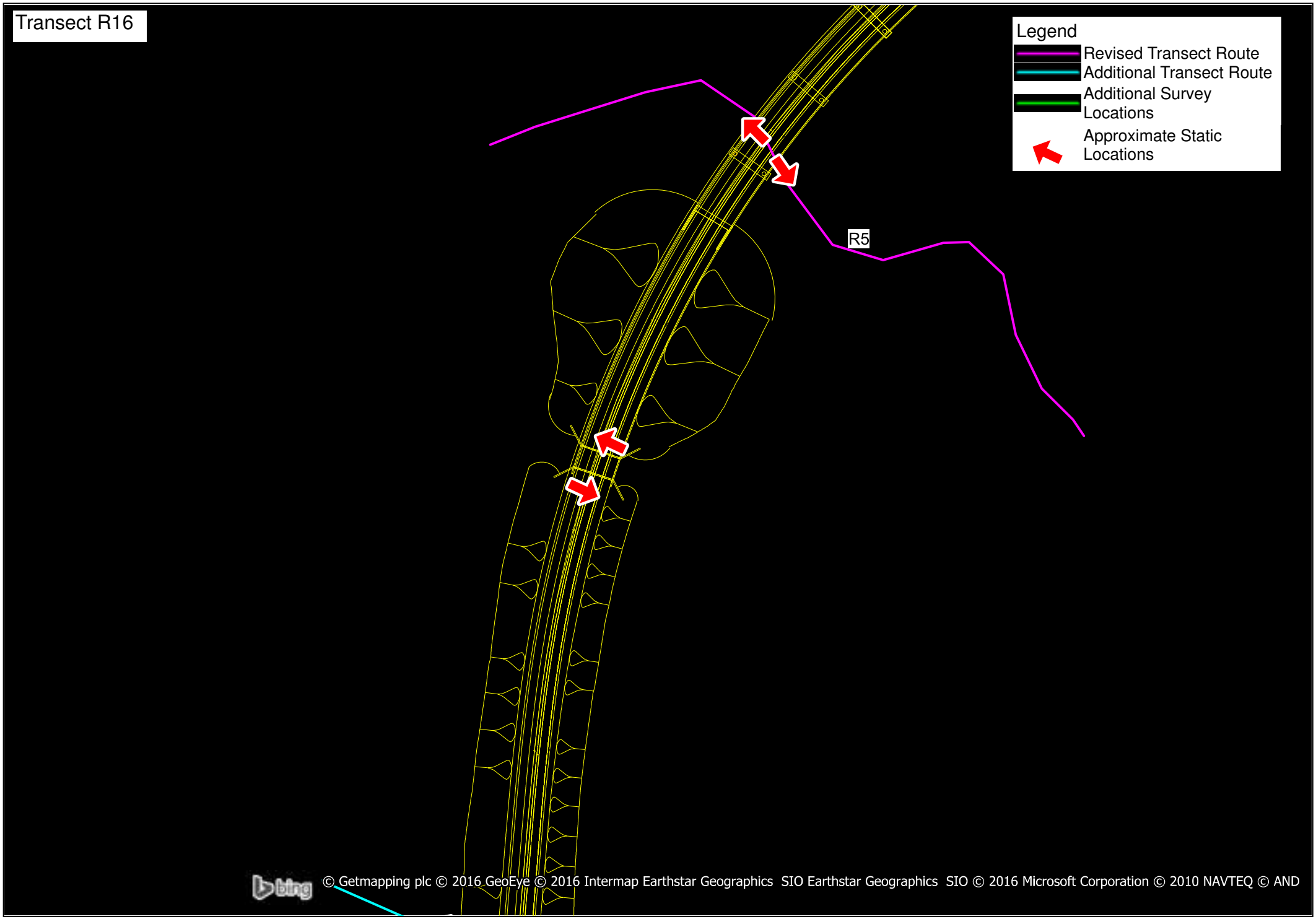
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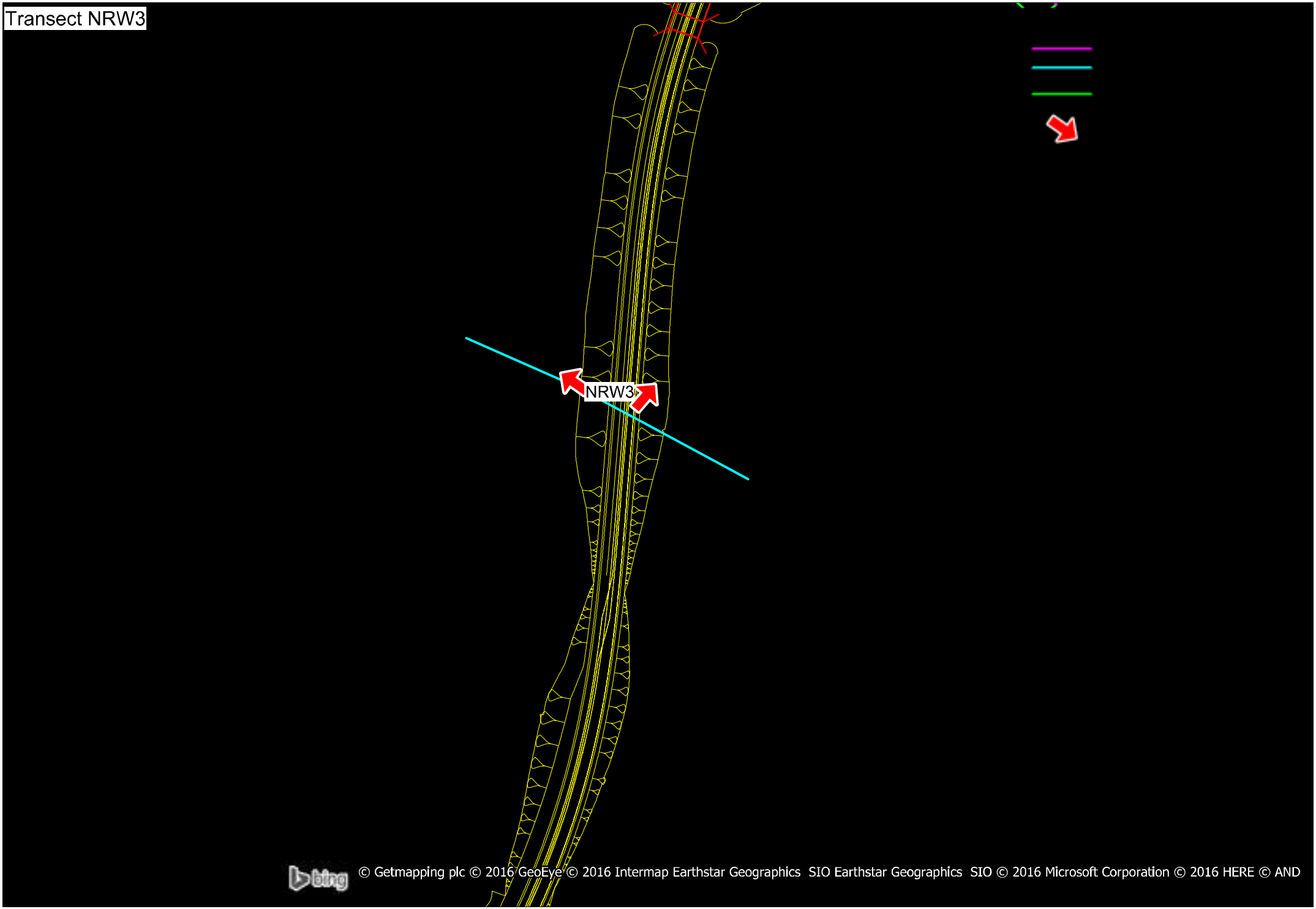
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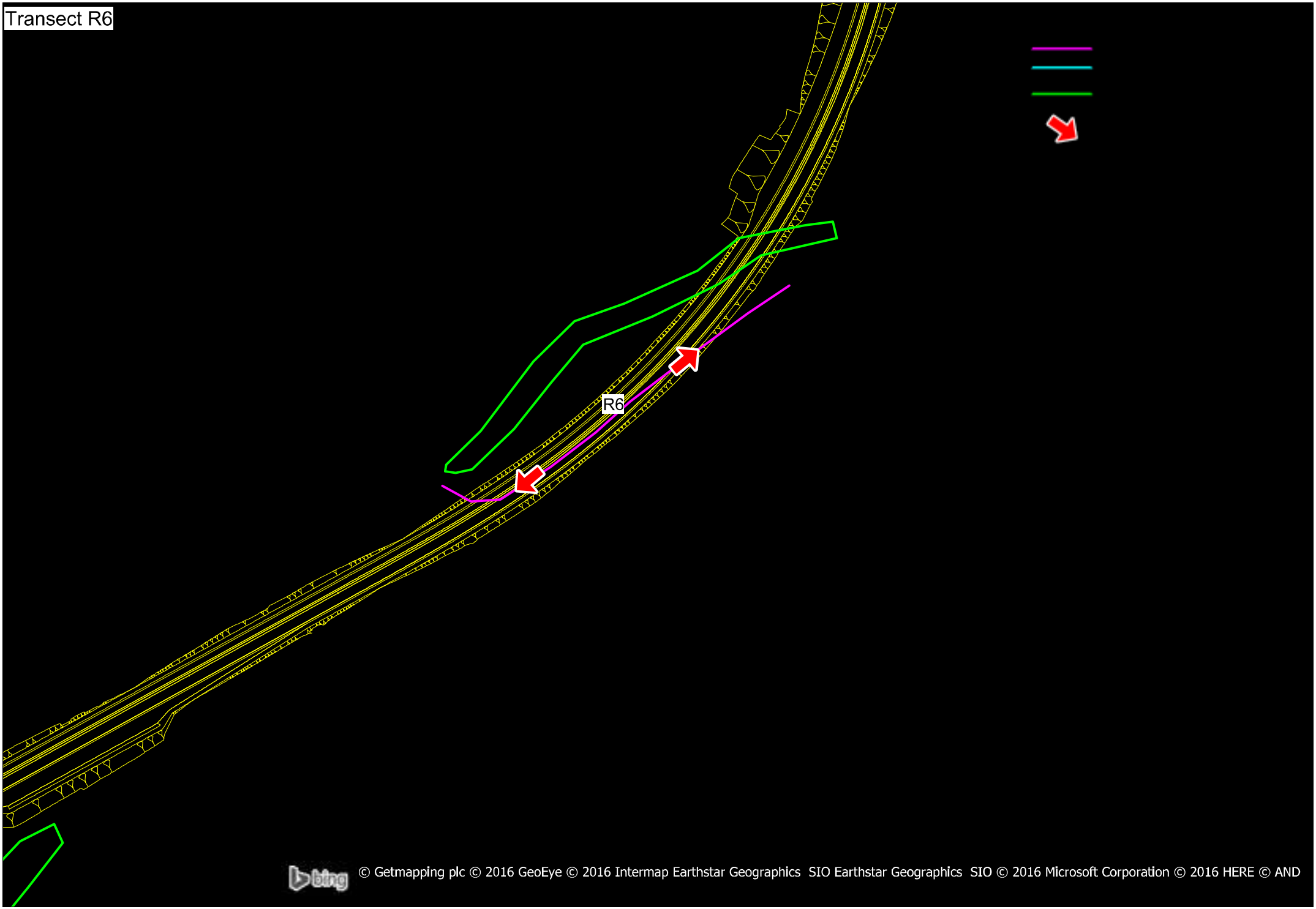
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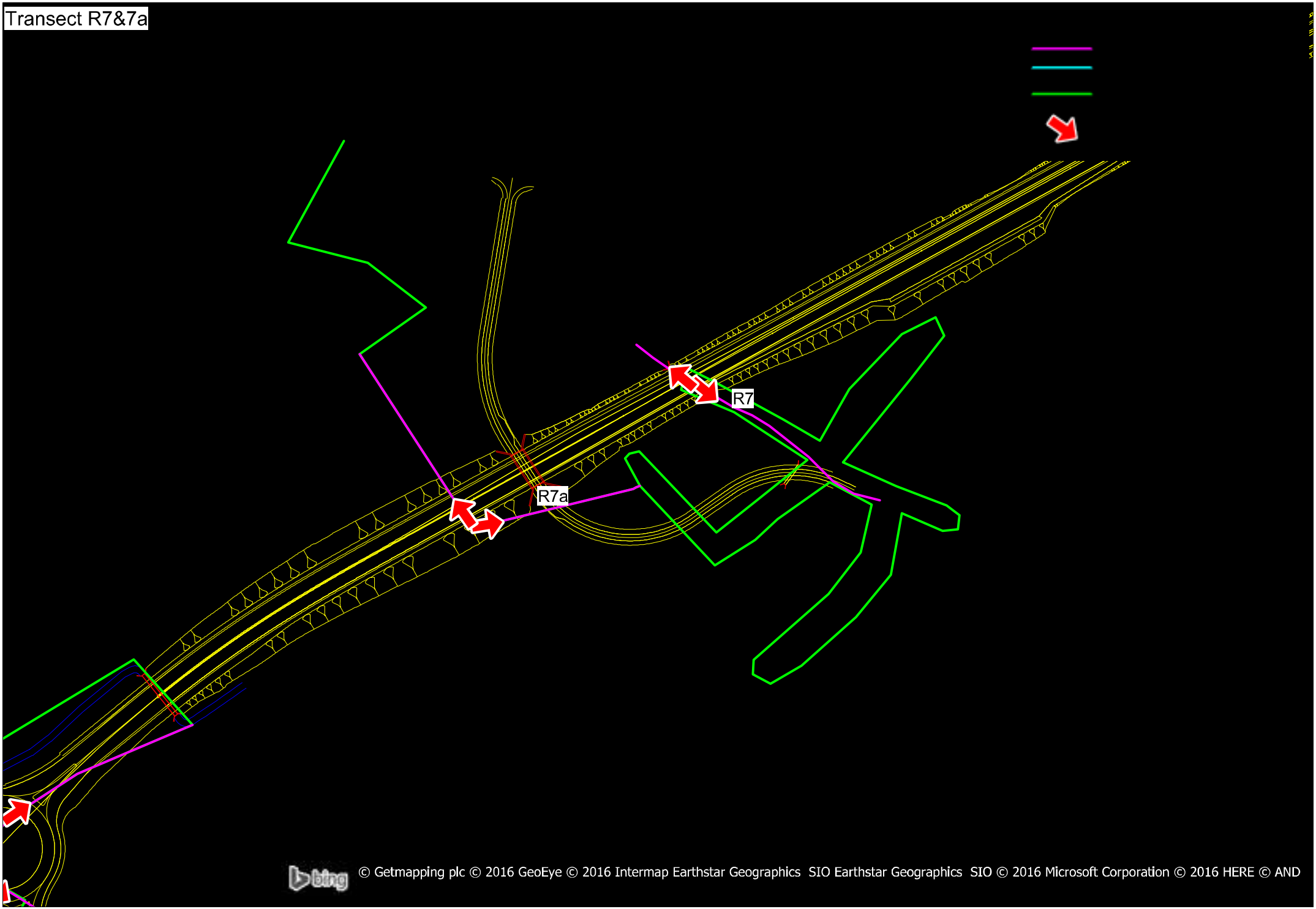
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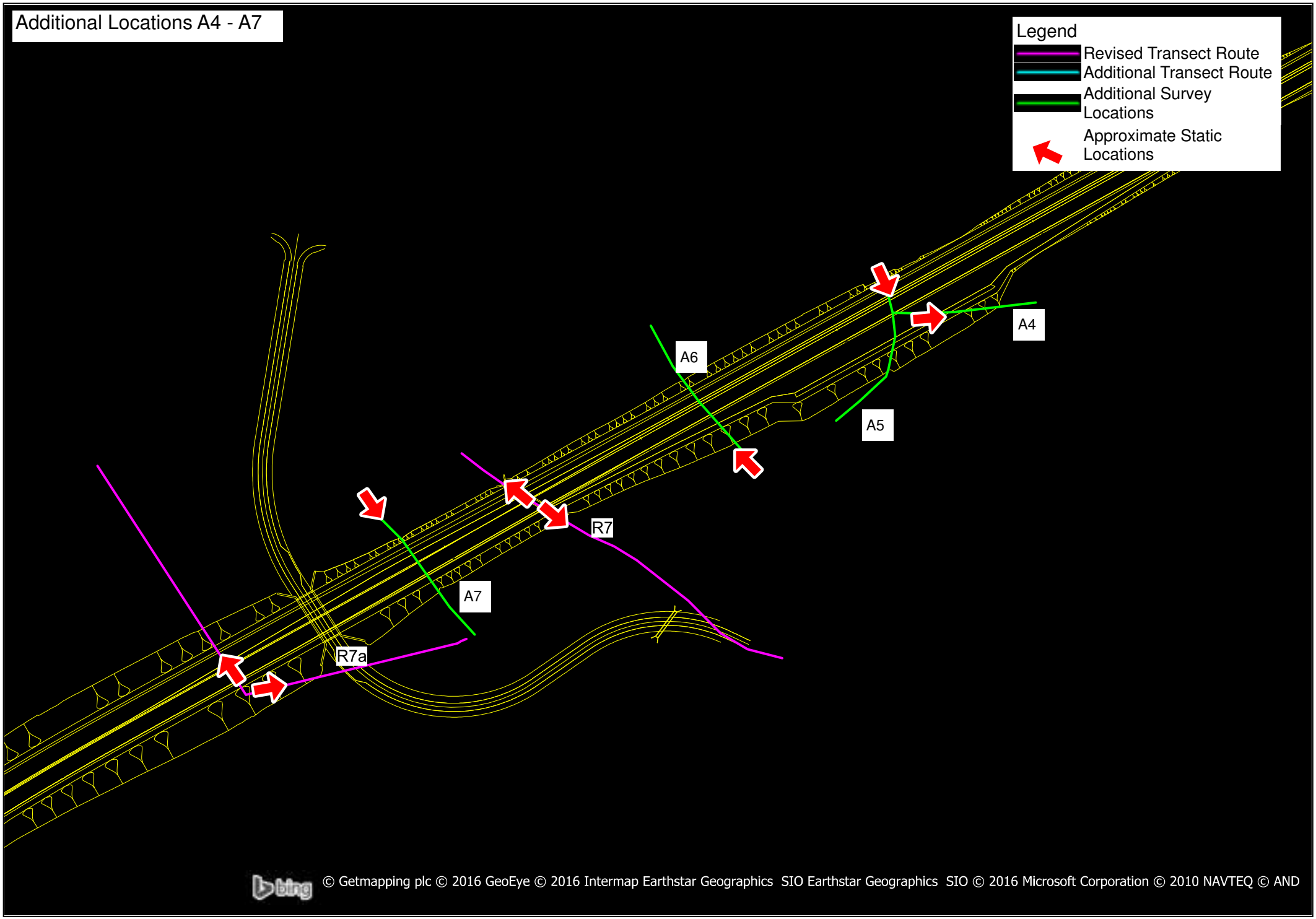
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A6
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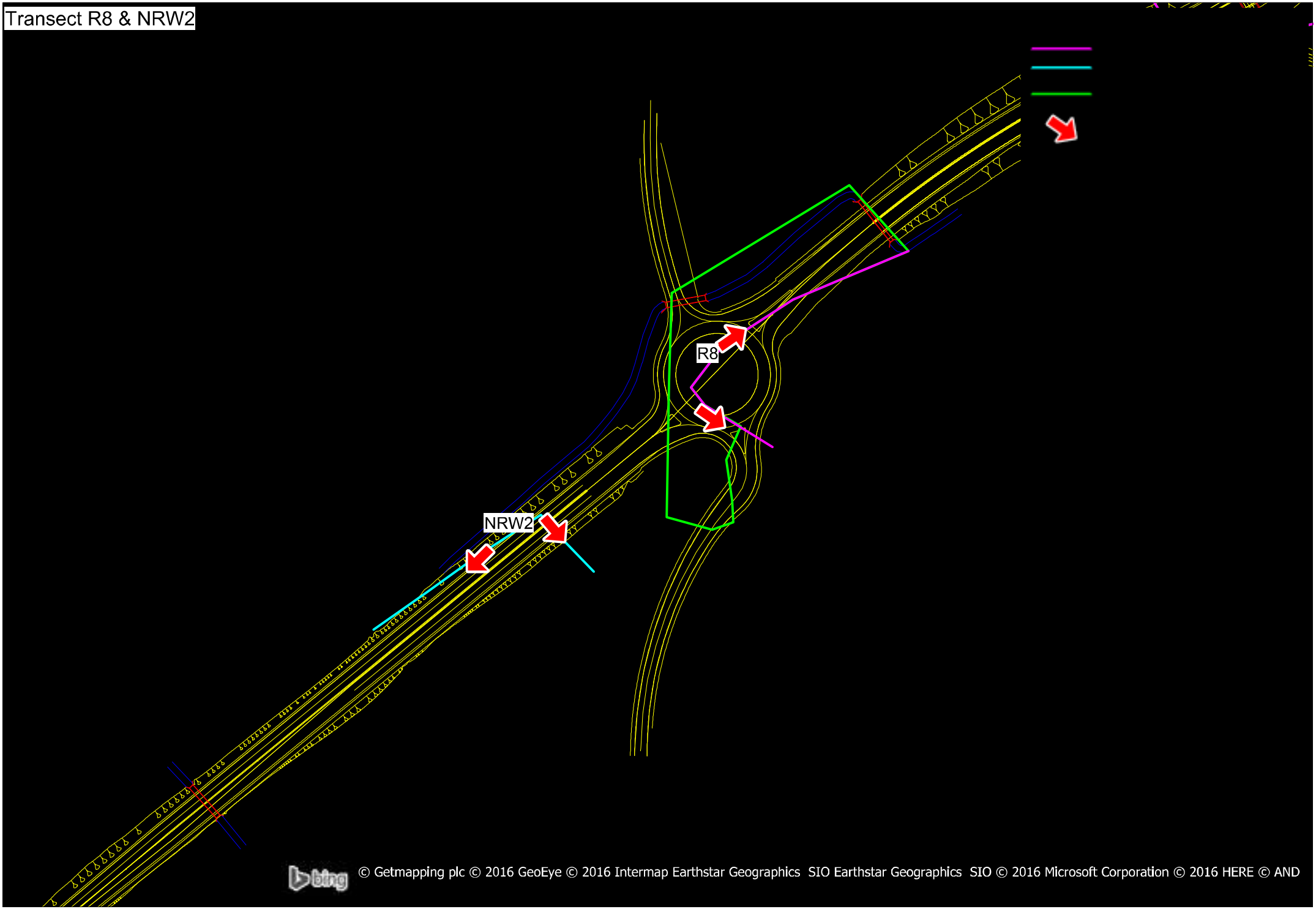
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R8
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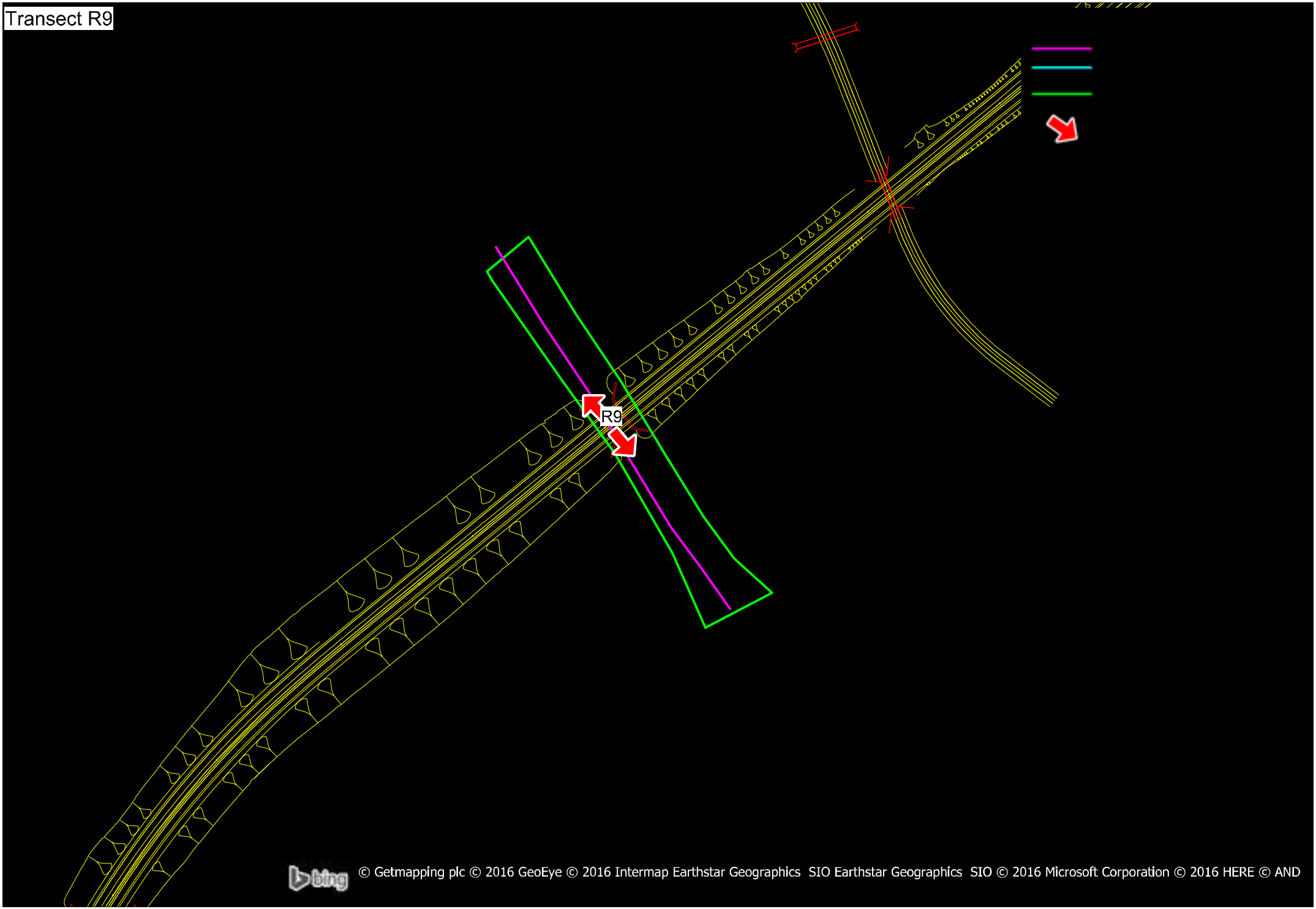
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Transect R17
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Additional Survey Locations
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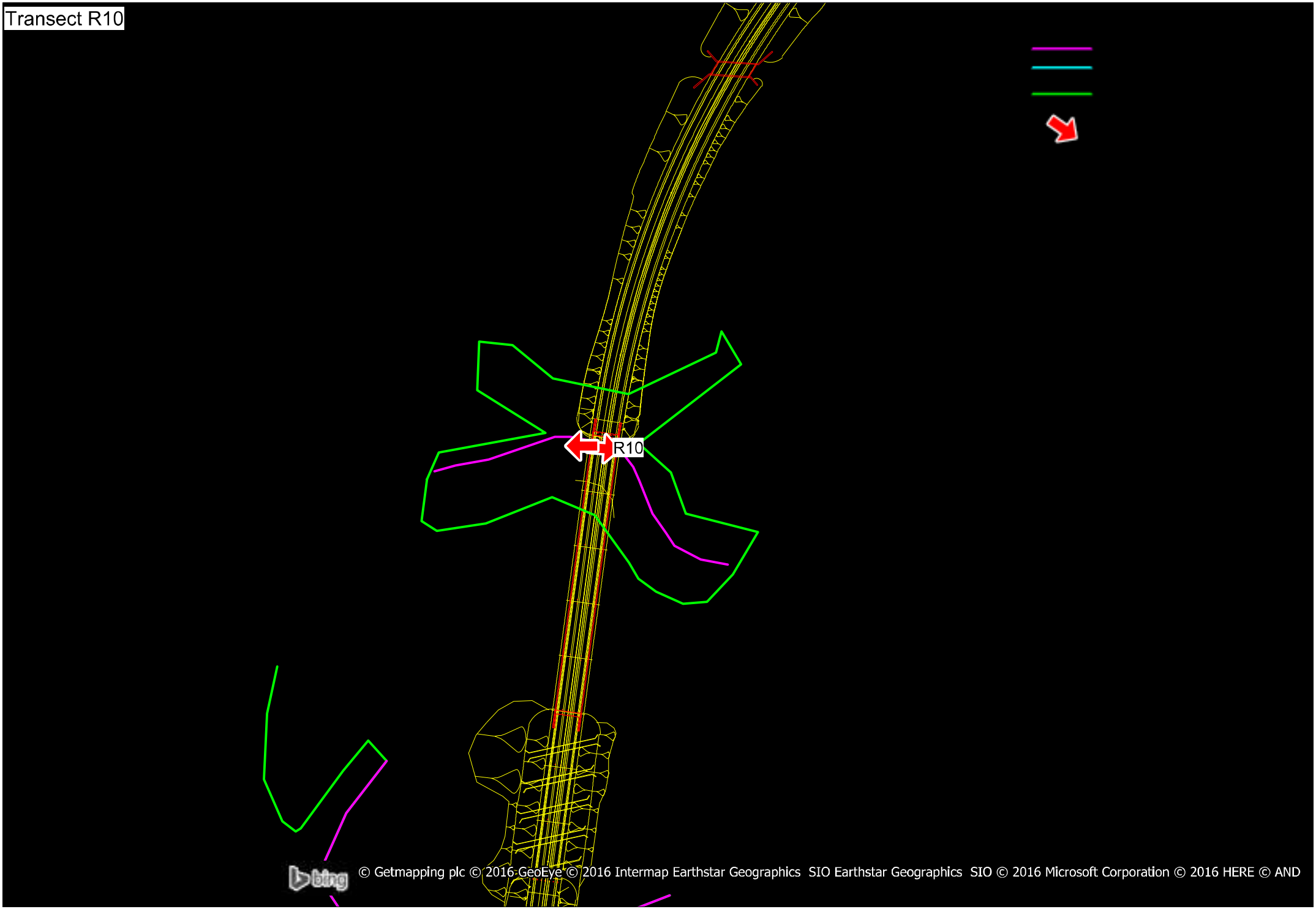
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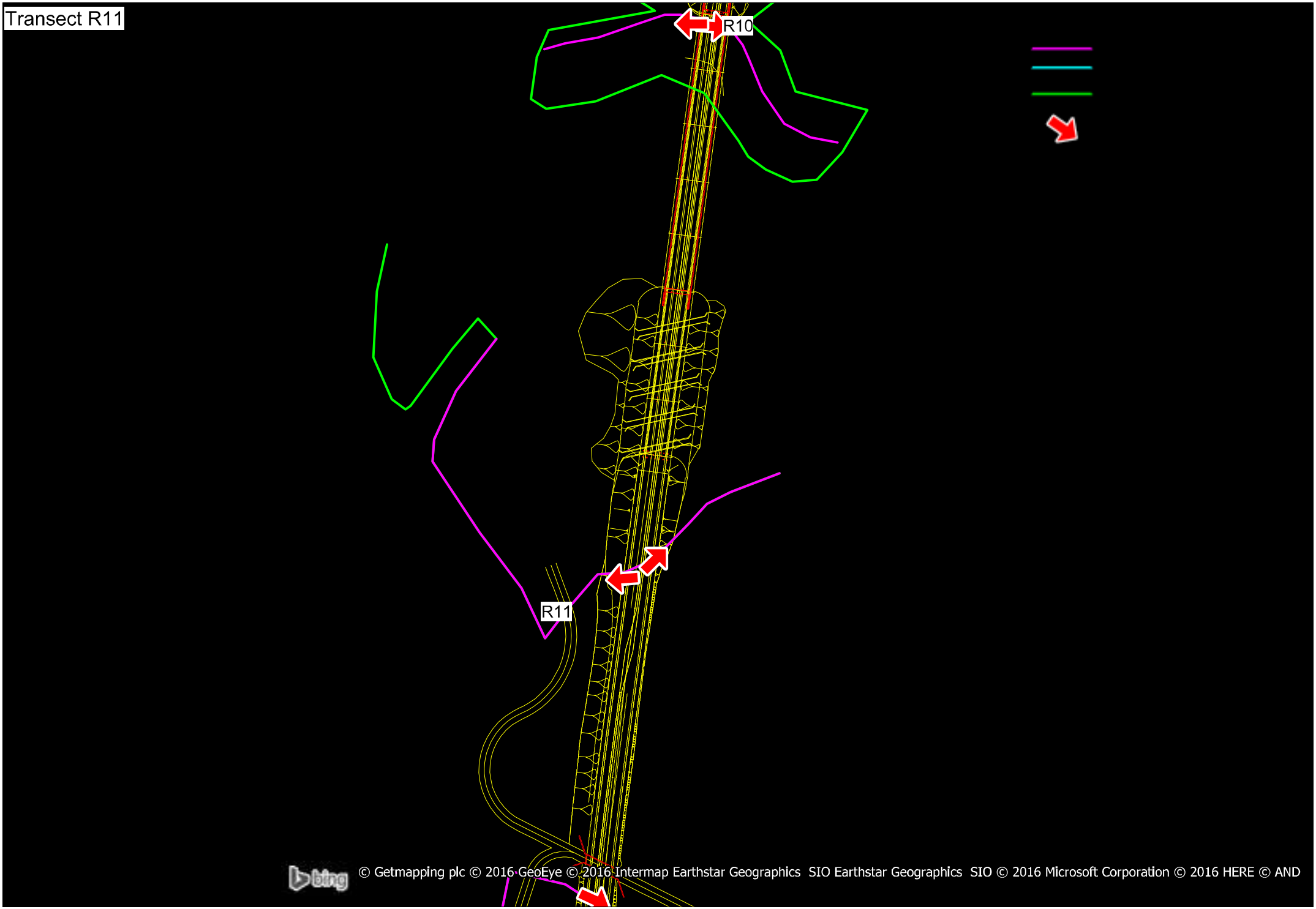
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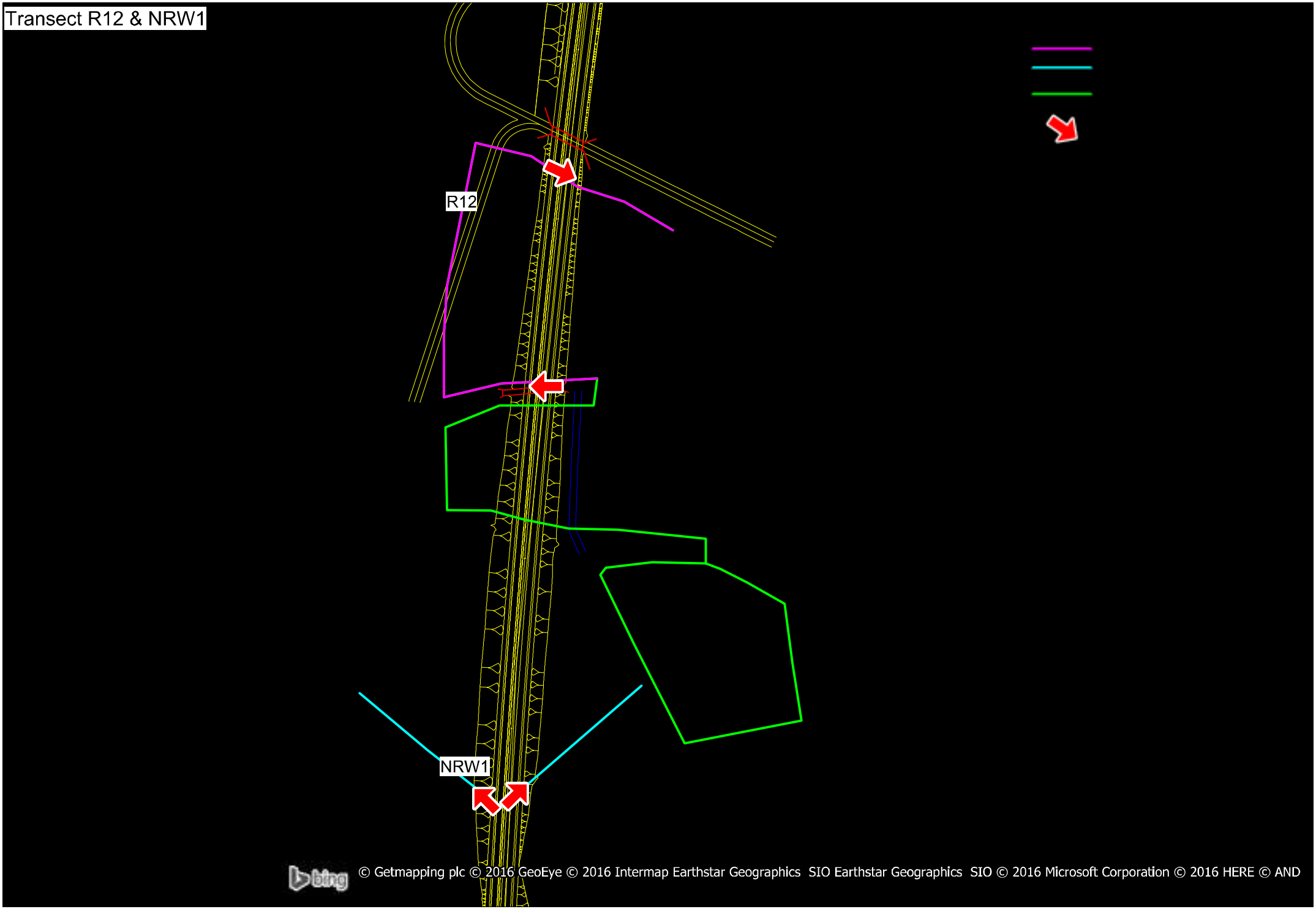
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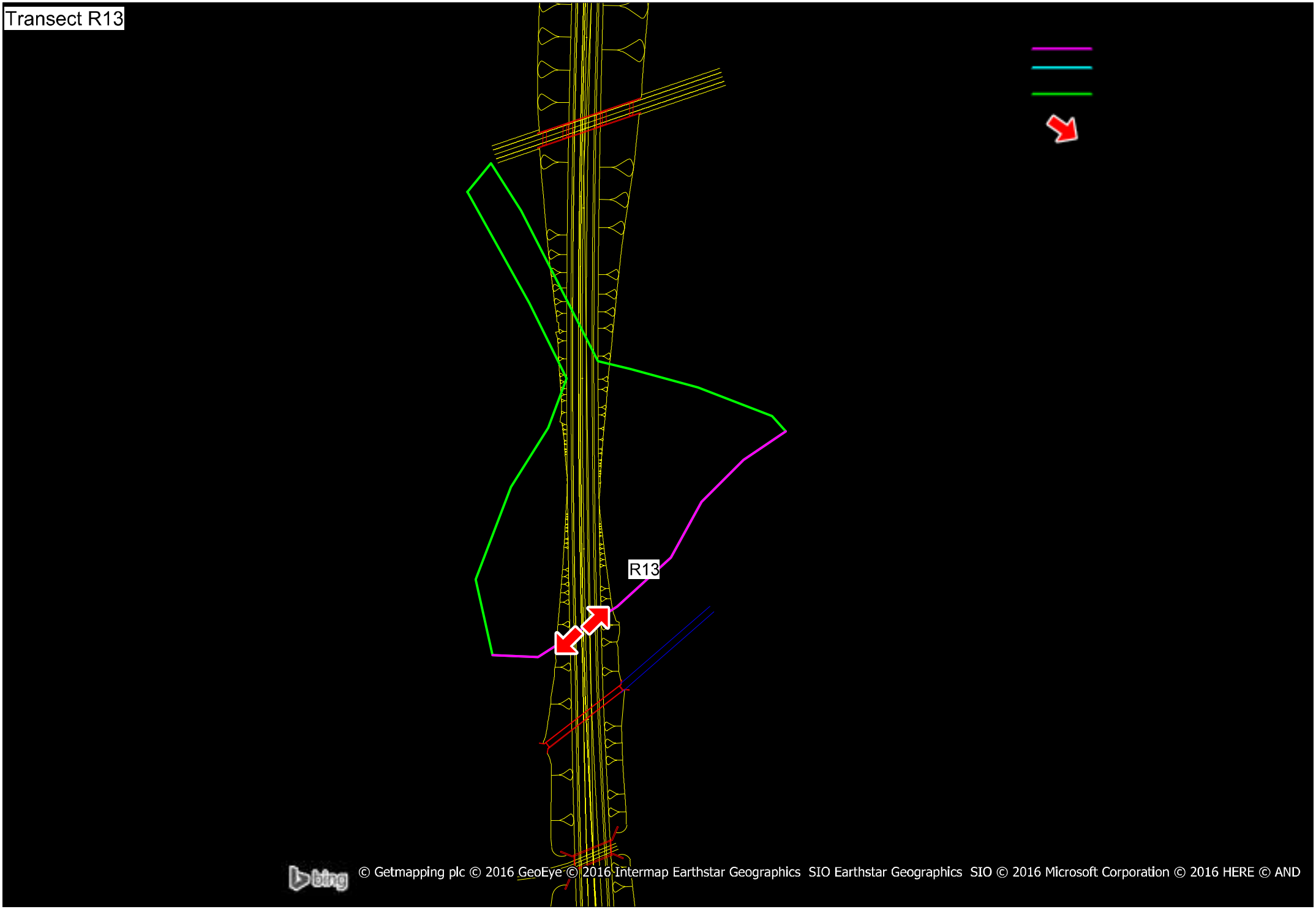
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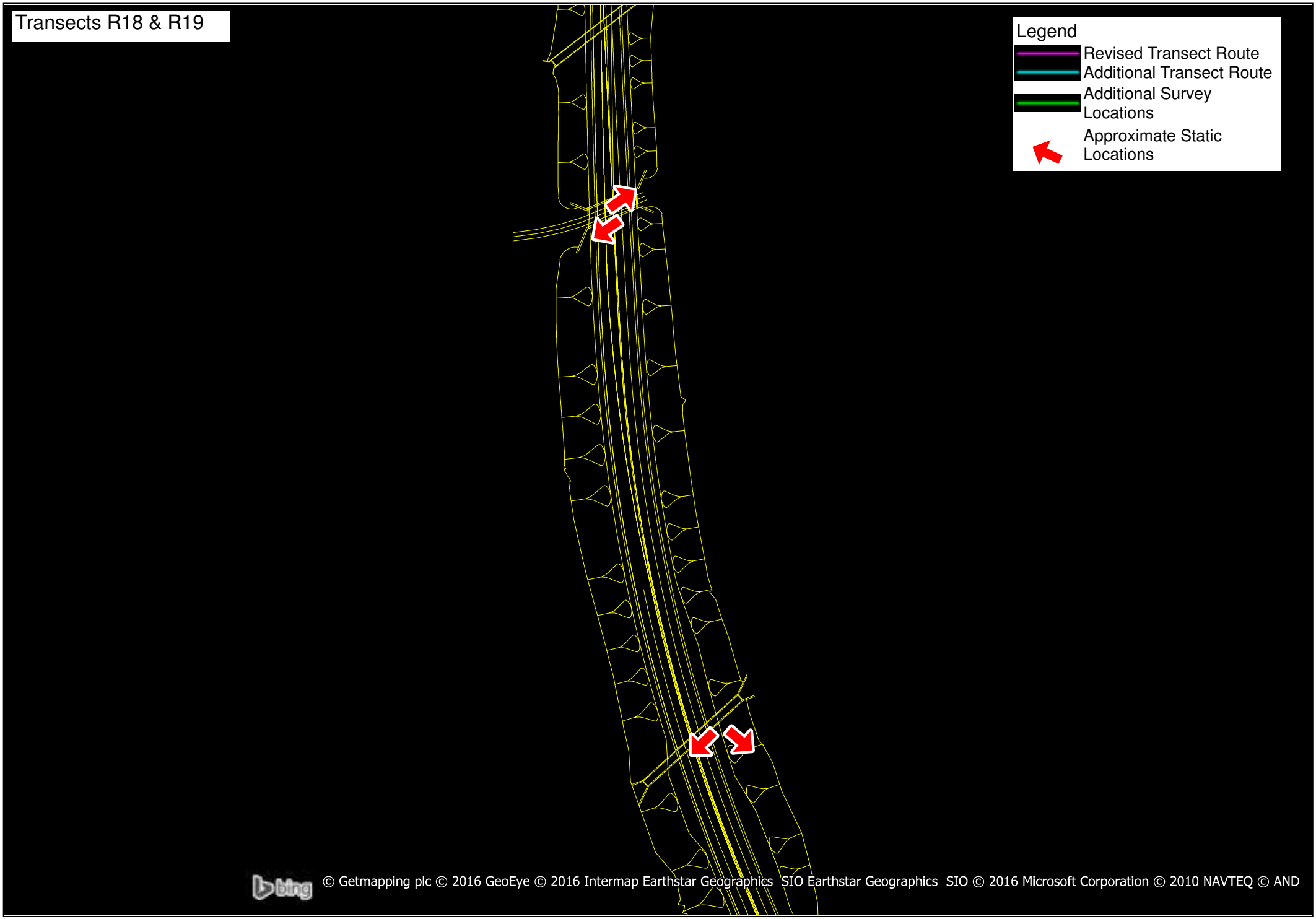
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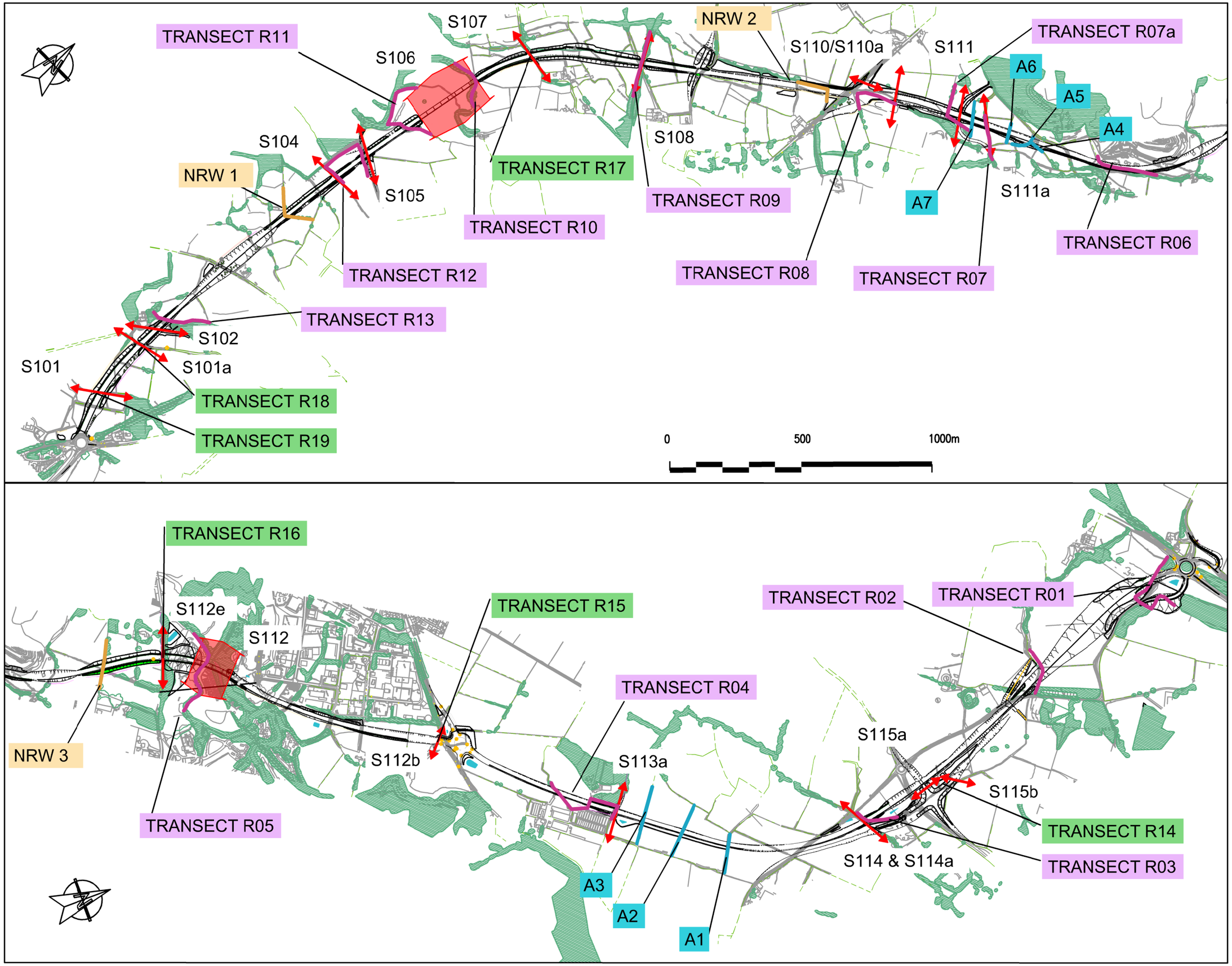

NOTES

1. THIS IS A C.A.D. DRAWING AND SHOULD NOT BE AMENDED BY HAND.
2. ALL DIMENSIONS IN METRES UNLESS OTHERWISE STATED.

Crossings suitable for Lesser Horseshoe Bats, as well as other bat species and otters

Existing bat survey transect. R01-R13

New survey transect NRW1-NRW3

Structure surveys R14-R19

Additional survey locations A1-A7

Detailed transect and static detector locations are set out in Bat Survey Strategy, Appendix B

Rev	Date	Description	By	Chk	App

Initial Status or WIP

EC HARRIS BUILT ASSET CONSULTANCY
Llywodraeth Cymru Welsh Government
RAMBOLL
Balfour Beatty
JONES BROS CIVIL ENGINEERING UK
WSP | PARSONS BRINCKERHOFF
TACP
Ty Glyn, Canol Y Dre, Ruthin Denbighshire Tel: 01824 703661

Site/Project:
A487 CAERNARFON AND BONTNEWYDD BYPASS

Title:
BAT SURVEY STRATEGY PRE CONSTRUCTION 2016 - 2017

Drawn: SS		Checked: PMcC	
Designed: ---		Approved: PMcC	
Date: March 2016	Scale: NTS	A1	Sheet: 1 of 1
Container Number:			Revision:
Figure 01			P05

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Appendix E.7 – Bat Ghost License

A487 CAERNARFON AND BONTNEWYDD BYPASS

BAT GHOST LICENCE

Welsh Government

3513874-PB-XXX-XX-XX-XX-XXXXX

Draft

A487 Caernarfon and Bontnewydd Bypass

Bat Ghost Licence

3513874-PB-XXX-XX-XX-XX-XXXXX

Prepared for
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Sarn Mynach
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Report Title	**:**	**A487 Caernarfon to Bontnewydd Bypass Bat Ghost Licence**
Doc Number	**:**	**3513874-PB-XXX-XX-XX-XX-XXXXX**
Report Status	**:**	**Draft**
Job No	**:**	**3513874A-HHC**
Date	**:**	**May 2016**

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APPENDICES 18

Appendix A – Trees to be felled with Bat Roost Potential

Appendix B – Ecological Compliance Audit

Appendix C – Biosecurity Risk Assessment

1 INTRODUCTION

1.1 Purpose of this Report

This document has been prepared as the construction and operation of the Scheme is likely to affect the resting places (i.e. roosts) of bat species, which are protected under the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations). A detailed explanation of the requirements of the legislation is provided in Section 1.6 below.

In accordance with these regulations a European Protected Species (EPS) Licence must be granted by the licencing authority, Natural Resources Wales (NRW), in order to construct the Scheme.

In the case of the Scheme, a licence may be granted by NRW as its construction and operation constitute '*imperative reasons of overriding public interest including those of a social or economic nature*' and '*there is no satisfactory alternative*' and '*the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range*'.

The prefix 'ghost' is used in this document as the actual EPS licence would not normally be considered by NRW until the formal permission for a scheme or project had been granted. In the case of a trunk road, under the Highways Act 1980 (as amended), this formal permission would be the Welsh Minister's Decision following a Public Inquiry (if one was required). Therefore, the Welsh Government advises that ghost licences be prepared during scheme development as a means to demonstrate that due consideration of mitigation measures for EPS species has been made and agreed with NRW. Therefore, the preparation of ghost licences in tandem with the ES provide reference sources to inform the decision making process for the Scheme during the statutory process leading up to the Minister's Decision.

This ghost licence has been prepared in relation to the potential tree roosts that may be lost or disturbed by the Scheme.

1.2 Description of the Project

1.3 History of the Scheme

In the early 1990s Parkman Consulting was commissioned by the Welsh Office Highways Directorate to undertake studies in the Caernarfon area to determine if a bypass of Caernarfon was feasible. A report was published in 1992 confirming that there were potentially feasible routes to bypass Caernarfon.

From 1992 to the present a number of trunk road and major transport infrastructure projects were undertaken in the area, namely; A487 Felinheli Bypass, A487 Point Seiont, A487 Llanllyfni to south of Llanwnda, A487 Porthmadog Bypass together with A499 Llanelhaearn to Aberdesach and A497 Abererch to Llanystumdwy on the Llyn.

Arup was commissioned in February 2007 by WG to undertake a WelTAG Planning Stage and Stage 1 Study to consider transport issues and options in the Llanwnda to Plas Menai corridor using the draft version of WelTAG. A number of options were identified and a combination of these and online measures were recommended for further testing under the WelTAG Stage 1 Appraisal process.

In 2009 the WG commissioned a study to address transport problems on the A487 Fishguard to Bangor Trunk Road through Caernarfon and Bontnewydd. This study utilised the earlier work undertaken separately. The more recent WelTAG Stage 2 study included an initial public consultation that took place between March and May 2010 and a supplementary public consultation that took place between November 2010 and January 2011.

The Scheme, with the objectives to reduce journey times, accidents, and the number of vehicles passing through residential communities and improve network resilience forms part of the WG's main transport policy aims. The A487 trunk road is an important part of the WG's strategic road network and it serves as the major north/south route along the west Wales coast linking Fishguard, Cardigan, Aberystwyth, Machynlleth, Dolgellau, Porthmadog, Caernarfon and Bangor.

The Key Stage 2 Study for the Scheme was carried out by WSP/Parsons Brinckerhoff. Following the investigation of route options and two public consultations, a Preferred Route (Purple Route) was recommended. This Preferred Route was announced by the Minister for Local Government and Communities in July 2012.

As a result of budgetary constraints the Minister for Economy, Science and Transport decided to review the options and in May 2013 adopted the Yellow Option as the preferred route.

The Balfour Beatty/ Jones Brothers Joint Venture (hereinafter referred to as the JV Team) was commissioned in December 2014 to develop the Scheme and prepare draft Orders and accompanying information during Key Stage 3 (KS3). The JV Team will support the Welsh Government (WG) through the Statutory Process in Key Stage 4 (KS4) and would proceed to construction in Key Stage 6 (KS6) on the award of a separate contract between the Contractor and the Welsh Government.

1.3.1 Why the Scheme is needed

The problems that the Scheme is attempting to address include:

- Traffic congestion;
- A lack of high quality road infrastructure hindering economic development of the area;
- Community severance and quality of life for settlements along the A487;
- A high risk of collisions in urban areas; vehicles using county roads to bypass the A487; and
- Difficulty in maintaining the trunk road due to high traffic levels and lack of suitable alternative routes.

1.4 The Project Objectives

1.4.1 Welsh Government's Objectives

The Wales Transport Strategy sets out the policy framework for transport investment decisions across Wales. The National Transport Finance Plan published in July 2015 sets out the timescale for financing and delivery of schemes. The A487 Caernarfon and

Bontnewydd bypass (Scheme Ref R17) is identified for delivery at between 2015/2016 and 2018/2019'

The Welsh Government's objective for the Scheme is to provide an improvement to Caernarfon and Bontnewydd in accordance with the findings of the Key Stage 2 study, and to include the commitments made at the Public Consultation undertaken as part of this study. This is to be carried out through appointment of a design and build Contractor under an Early Contractor Involvement (ECI) contract to be managed following the principles of PRINCE2 project management system and to deliver the works to programme, budget, and with due regard to the Welsh Ministers policies.

1.4.2 Scheme planning objectives

The following five specific Transport Planning Objectives for the Scheme have been developed:

Objective 1

- Reduce journey time (between Llanwnda and Plas Menai) and improve journey time reliability to within +/- 3 minutes of the average journey time throughout the day.

Objective 2

- Reduce journey time (between Llanwnda and Caernarfon) and improve journey time reliability to within +/- 3 minutes of the average journey time throughout the day.

Objective 3

- Reduce the number of vehicles passing through residential communities; including Llanwnda, Dinas, Bontnewydd and Caernarfon.

Objective 4

- Scheme to contribute to the Welsh Government casualty reduction targets:
    - 40% reduction by 2020;
    - 255 reduction in motorcyclists by 2020; and
    - 40% reduction in the number of young children killed or seriously injured by 2020.

Objective 5

Improve network resilience – Increase the amount and/or capacity of alternative routes to improve the resilience of the network.

1.4.3 Specific Environmental Design Objectives

Key aims are;

- to avoid or to mitigate adverse effects of the Scheme upon designated features, sites and species
- to reflect the landscape character through which the Scheme passes
- to maintain the connectivity of vegetation and to allow permeability within the Scheme to sustain the Lesser Horseshoe Bat population
- to maintain linkages and provide routes for non-motorised users (NMU)

1.5 Outline of the Scheme

The Scheme would be 10.35km in length and would comprise of a Wide Single 2+1 Road. (WS2+1) This would provide two lanes in one direction and one lane in the opposite direction throughout the Scheme. The Scheme would provide a total of 4.60km of overtaking length in the northbound direction and 4.57km of overtaking length in the southbound direction. This route would be made up of three sections of WS2+1 standard carriageway separated by new at-grade roundabouts at Meifod and Cibyn. All the proposed alignment would be offline from the existing A499/A487(T) Goat roundabout to the existing A487(T) Plas Menai roundabout.

For the proposed alignment there would be two significant river crossings over the Afon Gwyrfai and the Afon Seiont.

New or diverted Public Rights of Way and Private Means of Access would be provided to replace those affected by the scheme.

Road drainage would be provided through 'over the edge' drainage which would discharge into attenuation ponds along the Scheme. The attenuation ponds would be provided for each of the carriageway drainage sub-catchments to mitigate for the increased rates and volume of run-off that would arise post-scheme construction. These ponds would attenuate and treat the collected surface water prior to discharging it into existing watercourses.

The drainage of both the Afon Seiont and Afon Gwyrfai viaducts would be via combined kerb and drainage bridge-deck compatible units.

The majority of the Scheme would be fenced with stock proof fencing. Otter fencing and Bat fencing would also be provided at appropriate points on the Scheme.

The general arrangement plans when prepared are shown in Volume 2, Figure 2.1, long sections in Volume 2, Figure 2.2 and indicative cross sections in Volume 2 Figure 2.7. Detailed description

Ch.0 – 1650 Goat Roundabout to Dinas Accommodation Underpass (S105)

The Scheme would commence at its southern connection from a new arm on the A499/A487(T) Goat Roundabout and would provide two lanes in the southbound direction and one lane in the northbound direction. The Scheme would be on an embankment of up to 7m high for a short length, passing over Pont Parc Underpass (S101A) before entering a cutting of up to 10m deep, where a minor road would cross on the Ty'n Llan Overbridge (S103).

A treatment/attenuation pond (Pond 1) would be located to the east of the bypass at the Pont Parc Underpass. The existing Lon Eifion cycleway that currently crosses the

A449 would be diverted around Goat Roundabout, crossing the proposed de trunked A487. The existing footpaths FP 19 and FP10 would be diverted along the proposed structures, Pont Parc Underpass (S101A) and Ty'n Llan Overbridge (S103) respectively.

Geufron Culvert (S104) would be located at CH.1400 with two treatment/attenuation ponds (Pond 2 and Pond 3) located to the west of the Scheme.

Dinas Accommodation Underpass (S105) is located at Ch. 1550.

Ch.1650 – 3460 Dinas Accommodation Underpass (S105) to Meifod Roundabout

The Scheme would provide a non-conflicting changeover after Dinas Accommodation Underpass (S105) to provide two lanes in the northbound direction and one lane in the southbound direction. It would cross the Afon Gwyrfai floodplain on a long viaduct that would be known as the Gwyrfai Viaduct (S106), which would be around 6m above the adjacent landscape. An attenuation pond (Pond 4a) would be located to the east of the Scheme north of the northern abutment of the Gwyrfai Viaduct (S106).

Between Ch. 2050 and 3000, the Scheme would be on embankment, between 1 and 10m high. The Scheme would cross over the Pont Llydiart Gwyn (S107) box underbridge.at Ch. 2250 and a layby would be located in the northbound direction at Ch. 2450. Pont Cefnwerthyd (S108) underbridge would accommodate the crossing over the Welsh Highland Railway. The existing side road would be stopped up to vehicles and equestrians and the Pont Ceriw Non-Motorised User overbridge (S109) would provide access over the Scheme. The bridge would not be suitable for equestrian use. Access for equestrians and vehicles would be maintained through a diversion along existing alternative side roads.

A treatment/attenuation pond (Pond 4) would be located to the east of the Scheme adjacent to the section of the Scheme that would connect to the existing A487 via the new Meifod Roundabout.

Ch. 3460 – 4950 Meifod Roundabout to Caernarfon Quarry

On leaving the Meifod Roundabout the road would be on embankment of up to 6m high, providing two lanes in the southbound direction and one lane in the northbound direction. At Ch. 3900 the proposed Penybryn Road crossing would be made by way of an underbridge, Pont Bryn Mafon box underbridge (S111) and at Ch. 4000 the existing Penybryn Road would be replaced by a box culvert for bats (S111A). A layby would be provided at Ch.4200 in the southbound direction.. As the Scheme skirts the eastern side of Caernarfon Quarry, it would be on a small embankment of around 1.5m high. At Ch. 4800 the road then would enter a cutting approximately 5m deep.

There would be two treatment/attenuation ponds (Pond 5 and Pond 6) located to the north-east of the proposed Meifod Roundabout and east of the existing Penybryn Road.

Ch. 4950 – 6490 Caernarfon Quarry to Cibyn Roundabout

A non-conflicting crossover would be provided at Ch. 4950 to provide two lanes in the northbound direction and one lane in the southbound direction. The Scheme would approach the Afon Seiont floodplain on embankment up to 8m high and cross by means of a large viaduct, the Seiont Viaduct (S112), approximately 20m above the valley floor. The road would lie to the north of the Glan Gwna Holiday Park and would be in cutting

approximately 3m deep until the A4086. This section would then terminate at the proposed Cibyn Roundabout, which connects with the existing A4086.

There would be three attenuation ponds (Pond 7, Pond 8 and Pond 8a) located to the west of the southern embankment of the Seiont Viaduct (S112), north-east of the northern abutment of the Seiont Viaduct (S112) and south of Cibyn Industrial Estate respectively.

Ch. 6490 – 7910 Cibyn Roundabout to Bethel Road

There would be two treatment/attenuation ponds (Pond 9 and Pond 10) located at Cibyn Roundabout. The road would be at grade for a short distance before entering another embankment, which would cross an existing minor road (Bethel Road), which would be diverted to the east of the proposed bypass including a new Bethel Road Roundabout.

Another treatment/attenuation pond (Pond 11) would be located to the south west of Bethel Roundabout and Pond 12 would be located between the proposed Scheme and the proposed diverted Bethel Road Roundabout.

Ch. 7910 – 9710 Bethel Road to Plas Menai Roundabout

A conflicting crossover would be provided at Ch. 7910 to provide two lanes in the southbound direction and one lane in the northbound direction.

The route then would lower slightly into cutting and the B4366 is accommodated with an overbridge at Ch. 8420. The existing Bethel Road Roundabout would be relocated to the eastern side of the Scheme. On the approach to the existing A487 there would be a gradient of 6% which would be a cutting.

The connection at Crug Lane with Plas Menai Roundabout would maintain a two-way access. The access would be provided by constructing a new section of carriageway between the existing land and would tie in at Crug Farm Nurseries.

Between Ch.8900-9600 the Scheme would enter a deep cutting of up to 19m on the approach to Plas Menai Roundabout. The existing Outdoor Centre access would be relocated from a direct link to Plas Menai Roundabout to join Caernarfon Road. The existing bus layby on the Caernarfon Road approach would also be relocated approximately 100m away from the new Yacht Club access junction.

1.6 Requirements of the Legislation

Under the Conservation (Natural Habitats &c.) Regulations 2010 (and 2011/2012 amendment regulations), Regulation 41(1): '*a person who:*

a) Deliberately captures, injures or kills any wild animal of a European Protected Species,
b) Deliberately disturbs wild animals of any such species,
c) Deliberately takes or destroys the eggs of such an animal, or
d) Damages, destroys a breeding site, or resting place of such an animal

Is guilty of an offence'.

However, under Regulation 53 (1&2), '*the relevant licensing body may grant a licence for the purposes specified*' below:

a) Scientific or educational purposes;
b) Ringing or marking, or examining any ring or mark on, wild animals;
c) Conserving wild animals or wild plants or introducing them to particular areas;
d) Protecting any zoological or botanical collection;
e) Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequence of primary importance for the environment;
f) Preventing the spread of disease; or
g) Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber or any other form of property to fisheries'.

Under Regulation 53(9) '*the relevant licensing body must not grant a licence under this regulation unless they are satisfied*:

a) That there is no satisfactory alternative; and
b) That the action authorised will not be detrimental to the maintenance of the population of the species concerned at a favourable conservation status in their natural range'.

1.7 Guidance Documents Used

The contents of this ghost licence is based on the requirements for full licence applications from the licensing authority (NRW). This includes NRW's '*Information to be provided in European Protected Species Licence Application*' and '*Application for a Licence – Bat Method Statement*'.

Guidance has also been sought from the Bat Conservation Trust's '*Good Practice Guidelines (3rd Ed.)*' and English Nature's '*Bat Mitigation Guidelines*'.

1.8 Detail of the Work Covered by the Licence

In order to construct the Scheme a number of trees will need to be felled. No bat roosts have been confirmed in any of the trees affected, however climbing inspections and emergence/re-entry surveys are yet to be undertaken. Preliminary roost inspections have indicated that a number of the trees affected have bat roost potential (refer to Figure 1.0). It is proposed to fell trees during the winter/spring months to avoid the breeding season although this would be within the hibernation period.

2 SURVEY AND SITE ASSESSMENT

2.1 Existing Information of the Bat Species at the Survey Site

Surveys for bats have taken place in the vicinity of the entire Scheme length since 2009. This established a good level of understanding regarding the distribution of bats in the wider area and the potential effects the Scheme may have on them. In summary the surveys which have taken place are as follows:

- A review of existing records of bats within 100m of all the Scheme options (2009);
- Activity transects along all the Scheme options (2009);
- Activity transects along the Scheme option being taken through Key Stage 3 (2014);
- A review of existing records of all bat species within 5km, Noctule bats within 10km and Lesser Horseshoe Bats within 30km of the Scheme;
- Activity transects along the Scheme alignment (2015);
- Preliminary roost assessments of all trees within 50m of the Scheme alignment (2015)

The 2015 activity surveys and preliminary roost assessments will be described further in this ghost licence.

2.2 Further Surveys and Other Possible Licence Applications

Survey work to date has identified a number of high potential (previously Category 1 and 1*) trees that are to be affected by the Scheme. Further surveys (climbing inspections) of these trees will take place during spring/summer 2016, with additional climbing inspections and/or emergence/re-entry surveys undertaken if evidence of bat activity is found. A formal licence application would be made should any roosts be found during these surveys.

2.3 Statutory Sites Notified for the Species within 10km

There are three Special Areas of Conservation (SAC) within 30km of the Scheme, which have been designated primarily for Lesser Horseshoe Bats (LHB). These include:

- Glynllifon SAC – approximately 1.2km to the south of the Scheme's southern end (Goat Roundabout)
- Meirionnydd Oakwoods and Bat Sites SAC – approximately 14.7km to the southeast of the Scheme's southern end (Goat Roundabout)
- Gwydir Forest Mines SAC – approximately 25km east of the Scheme (Cibyn Roundabout)

2.4 Methodology

2.4.1 Activity Surveys

Bat activity surveys were undertaken along the thirteen transects (identified in 2014) in May, July and September (refer to Figure 2.0). The location and frequency of survey had been agreed with NRW. Following a request from the Welsh Government, an

additional transect (Transect R7a) was surveyed during September 2015. The transect was along a mature hedgerow and the south-western end joined Transect R7.

Each transect was surveyed for two hours at dusk (commencing at sunset) with additional two hour dawn surveys included during September, finishing at sunrise. The walked transect surveys were undertaken using AnaBat frequency division, Elekon Bat Scanner and Bat Box Duet heterodyne bat detectors. The Bat Box Duets were set at 110kHz specifically to audibly detect Lesser Horseshoe Bats, while the Elekon Bat Scanner scanned all frequencies so other bats species were audible in the field. Notes were made of bat activity and behaviour to help understand how the bats were using the surrounding habitats (e.g. foraging, commuting, roosting etc.). This informs the understanding of how the Scheme may affect the local bat population.

Bat calls were recorded and analysed using AnalookA software, with reference to Russ (2012) to aid identification. Recorded bats were identified to species level where possible.

Constraints

The surveys were generally undertaken in suitable weather conditions. However, during some of the September surveys (particularly at dawn), temperatures were lower than forecast. Bats were recorded during these surveys and this is not considered a significant constraint.

The July survey at Transect R8 was limited to the verge along the existing A487 due to landowner access restrictions.

It was not always possible to observe all bat's behaviour in the field due to poor light levels. Therefore, it was not always possible to say whether bats recorded were foraging or commuting to a feeding area.

Surveys which rely on species identification from interpretation of bat calls have a number of limitations. Species with quiet calls, such a Brown Long-eared (*Plecotus auritus*) are often underrepresented as their calls are not always picked up by bat detectors. Conversely, bats with louder calls, such as Noctules (*Nyctalus noctula*) can be detected at a much longer distance, so may be over-represented.

There are also limitations identifying bats from interpretation of their calls using sound analysis software and identification to species level is not always possible. This is particularly true of the '*Myotis*' genus and 'large bat species' (i.e. Noctule, Leisler's (*N. leisleri*) and Serotine (*Eptesicus serotinus*). There are often overlaps in call parameters of the 'frequency modulated' parts of large bat species calls, particularly when they are flying in a cluttered environment. Identification has been made through examination of call parameters with reference to Russ (2012) and using professional judgement and experience. In many cases it has not been possible to identify to species level with reasonable surety and so the genus or possible species have been stated.

Plecotus species recorded and observed during the surveys were presumed to be the Brown Long-eared Bat as the very rare Grey Long-eared (Plecotus austriacus) is not known in the area.

2.4.2 Preliminary Roost Assessments

Preliminary tree roost assessments were undertaken in accordance with 'the protocol for visual inspection of trees due to be affected by arboricultural work' (Hundt, 2012)

with trees inspected from the ground with the aid of close-focusing binoculars and a high-powered torch. Each tree was categorised for its value to bats based on the presence of features commonly used by bats to roost and field signs that may indicate use of trees by bats.

2.5 Survey Results

2.5.1 Activity Surveys

The species recorded at each transect during the surveys undertaken in May, July and September 2015 are listed below:

- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- Nathusius Pipistrelle (*Pipistrellus nathusii*)
- *Pipistrellus* species
- Noctule (*Nyctalus noctula*)
- Serotine (*Eptesicus serotinus*)
- 'Large bat' (i.e. *N. noctula, N. Leisleri* or *Eptesicus serotinus*)
- Brown Long-eared (*Plecotus auritus*)
- *Myotis* species
- Lesser Horseshoe (*Rhinolophus hipposideros*)

A minimum of eight species were recorded across all sites. As Myotis were not recorded to species level, it is highly likely these represent more than one species (e.g. Whiskered (*Myotis mystacinus*), Daubenton's (*Myotis daubentonii*) or Natterer's (*Myotis nattereri*).

The most common species recorded at all transects were Common and Soprano pipistrelles, which are the two most common British species. One pipistrelles recorded at Transect R7 could not be determined to species level. One Nathusius pipistrelle was recorded at Transect R12.

Bats of the Myotis genus were widespread and were recorded at all but one of the transects. Noctules were also widespread and recorded at all but three transects. Less widespread were Brown Long-eared, which were recorded at four of the transects. A Serotine was recorded on one occasion at Transect R13. 'Large bat' species (i.e. Noctule, Leislers or Serotine), which could not be determined to species level were recorded at Transects R3, R6, R9 and R12. Lesser horseshoe bats were recorded at all but three of the transects. The highest number of Lesser Horseshoe encounters (eleven) were recorded at Transect R7, towards the middle of the Scheme. The next highest number of encounters (six) were recorded at Transects R10 and R12 towards the south of the Scheme.

2.5.2 Preliminary Roost Assessments

The preliminary roost assessments identified 15 Category 1* trees, 79 Category 1 trees and 2 tree clusters of Category 1 & 1* trees out of the 162 trees and tree clusters surveyed. The remaining trees were generally Category 2 with some Category 3. None of these trees showed visible evidence of bat activity or have been confirmed as roosts.

2.6 Interpretation/Evaluation of Survey Results

2.6.1 Scheme Activity

The 2015 surveys identified good activity across much of the Scheme with Soprano Pipistrelle recorded at all 14 transects, Common Pipistrelle at 9 of the transects and Noctule and Myotis species at 10 of the transects. Lesser Horseshoe Bats were recorded at eight of the transects, generally to the southern and central transects. No obvious commuting routes were identified during the surveys with activity spread throughout the survey routes however it is suspected that the hedgerows to the south of the quarry are frequently used given the level of activity noted in survey area 7 and 7A and the presence of a known LHB roost within the quarry area.

The 2015 surveys did not identify any buildings along the line or within proximity of the Scheme with bat roosting potential.

2.6.2 Trees

The 2015 preliminary roost assessments highlighted a number of trees with bat roost potential. Although none of these had any visible signs of roosting activity these trees may still be used by roosting bats. It is considered that any roost would most likely be an occasional summer roost for Soprano or Common Pipistrelle bats. However it should be noted that the presence of Noctules along the Scheme allows for the possibility of tree hibernation roosts. The tree climbing inspections and further surveys described within Section 2.2 above would provide more definitive information on the status of the trees on site.

3 IMPACT ASSESSMENT

3.1 Short-term and Long-term Impacts

As no buildings are to be directly affected by the Scheme and no confirmed tree roosts have been identified, no roost impacts were identified within the overall Ecological Impact Assessment carried out for the entire Scheme. This assessment was undertaken in accordance with DMRB (HA205/08) and CIEEM guidelines and is reported within Section 8 Nature Conversation in Volume 1 of the ES. This provides information on assigning values to the ecological receptors and magnitudes and significance of impact.

If roosts are confirmed within any of the Category 1 or 1* trees identified during the preliminary roost assessment, it is likely that the Scheme would result in the loss and/or disturbance of these given their location on or within proximity to the proposed route.

The magnitude and significance of these impacts can be assumed to be '*slight to moderate negative*' and '*slight to moderate adverse*' in the absence of mitigation, although this would vary depending on the species and number of bats present.

It is considered unlikely that these impacts would have implications on the favourable conservation status of bat populations in the area given the remaining potential for tree roosts in the wider area.

4 MITIGATION, COMPENSATION AND MONITORING

4.1 Works to be Undertaken

Despite bat roosts not being confirmed during the preliminary roost assessments, there are a number of trees that have roost potential that may need to be felled as part of the Scheme works. These include those that have been identified as Category 2 trees and those subject to aerial inspections and potentially dusk emergence / dawn re-entry surveys during 2016. These are shown on Figure 3.0 and detailed in Appendix A will be felled taking reasonable avoidance measures. Trees with bat roost potential will be retained wherever possible.

Felling is programmed to take place during winter 2016/2017. Should there be a change to this, the same methods described below would be carried out prior to the tree felling.

Prior to felling, trees identified as Category 2 or above during the preliminary roost assessments and those having high bat potential during the surveys described in Section 2.2 will be marked up and inspected from the ground by a licenced bat worker and Environmental Clerk of Works to assess any changes in roost potential. If any trees that require felling have recently developed potential roost features or which were previously thought to be retained, further climbing inspections will be carried out by a suitably qualified ecologist to ensure no bats are present.

The licenced bat ecologist(s) must be present to oversee the felling work of those trees with bat roost potential.

Operatives undertaking the tree felling work must attend a tool box talk given by the Environmental Clerk of Works or overseeing licenced bat ecologist prior to undertaking the work. The talks should cover features bats most commonly used for roosts in trees, what to do if bats are encountered, methods for felling the trees and why the work is being carried out using the proposed methods (i.e. the conservation and legislative context).

Felling shall take place taking reasonable avoidance measures to avoid harm to possible roosting bats. Methods may include re-inspection of potential roost features by a licenced bat worker prior to felling, soft felling certain sections of the tree which have good potential roost features or allowing the tree to be brought to the ground in a controlled manner (e.g. by winching a tree on a hinge or gently pushing/pulling it over with plant). The methods used should be at the discretion of the licenced bat worker as some trees have a greater potential than others for roosting bats.

Trees that have been soft felled or brought down in a controlled manner and on inspection have confirmed possible bat roost potential should be left for 48 hours before being sectioned.

Potential roost features in felled trees should be inspected by the licenced bat worker immediately following felling. Any bats found would be released into bat boxes, which will be provided as described in Section 4.2 below. If any bats are discovered, NRW will be contacted at the earliest opportunity.

4.2 New Roost Creation

Mitigation for the loss of potential tree roosts would be provided using bat boxes positioned on retained trees close to the Scheme. The design and number of the boxes

used will depend on the results of the surveys detailed within Section 2.2 and will be agreed and installed prior to the loss of the roosts.

Additional Schwegler 1FS bat boxes will also be provided as contingency into which any torpid bats found during the felling of trees can be houses. These will be provided prior to tree felling and in numbers and locations to be agreed. They will be positioned in an easterly or northerly direction to help achieve a stable temperature suitable for hibernating bats.

Sections of hollow limbs which offer suitable roosting features will be retained and installed within retained trees, where possible. This would offer a natural alternative to bat boxes.

4.3 Mechanisms for Delivery

Under the terms of the contract, the JV Team are required to produce and implement a Construction Environmental Management Plan (CEMP) throughout the construction phase of the Scheme.

Central to the CEMP is the Register of Commitments (ROC), which lists the obligations made in documents such as this EPS ghost licence (e.g. the measures listed in Sections 4.1 and 4.2 above) and the overall ES. The JV Team's Environmental Co-ordinator and Environmental Clerk of Works will be responsible for the implementation and monitoring of the CEMP and thus the obligations made in this ghost licence and overall ES.

The CEMP will also contain an Ecological Compliance Audit for the entire Scheme along with evidence to support this audit such as copies of licences, evidence of tool box talks, permits to work, photographic records etc. An Ecological Compliance Audit which relates specifically to this ghost licence is provided in Appendix B.

The JV Team would monitor, measure and review the environmental performance against the commitments, objectives and targets/performance indicators identified in the CEMP. The CEMP shall contain procedures for checking, auditing and corrective action.

4.4 Bio-security Risk Assessment

The CEMP will also contain a Bio-security Risk Assessment for the entire Scheme (refer to Appendix C). Activities covered under this licence that might pose a risk in terms of bio-security include the following:

- Plant used in demolition and tree felling work could spread invasive, none-native species (INNS) e.g. Japanese Knotweed, from outside the site or contaminated areas within the site,
- Tools used in tree felling and site clearance work could spread disease to healthy trees or water bodies onsite and adjacent areas,
- The discovery of bats onsite which show the characteristics of infection with White Nose Syndrome or Bat Lyssavirus.

4.5 Post Development Site Safeguards

4.5.1 Site Management/Maintenance

As part of the ECI contract, there would be a five-year post construction maintenance period, which would include management and monitoring of the effectiveness of mitigation measures such as those put forward in Sections 4.1 and 4.2.

Requirements during this post construction maintenance period would be set out in the Environmental Landscape and Ecology Aftercare and Management Plan (ELEAMP). This would be developed during the construction phase and would include biannual monitoring of bat boxes and procedures for repairing or replacing boxes that are damaged. This would form part of the ecological compliance audit (refer to Appendix B). The monitoring and maintenance of other mitigation measures such as habitat replacement would also be addressed within the ELEAMP.

Following the five-year post construction maintenance period, a Maintenance Environmental Management Plan (MEMP) would set out a proposed strategy for the future maintenance and management of all environmental areas (including landscape and ecology areas) for a ten-year period. This would be produced in consultation with NRW during the five-year post construction maintenance period and would be implemented by the North and Mid-Wales Trunk Road Agency (NMWTRA), who have the long-term responsibility for the management and maintenance of the north and mid-Wales trunk road network.

5 PROGRAMME

5.1 Programme of Work

A summary of the current work programme in relation to this ghost licence is provide below:

Date	Task
Spring/Summer 2016	Climbing inspections of Category 1 and 1* trees
Spring/Summer 2016	Additional climbing inspections and/or emergence/re-entry surveys if required
Winter 2016/2017	Installation of bat boxes (number and locations to be agreed)
Winter 2016/2017	Tree felling in accordance with Section 4.1
Five-year post construction maintenance period (2020-2024)	Biannual monitoring and reporting of condition and use of bat boxes. Remedial measures to be undertaken as necessary by the contractor in accordance with the ELEAMP and Ecological Compliance Audit
Long-term management following post-construction maintenance period (2024 onwards)	Monitoring, management and maintenance of bat boxes to be undertaken by the trunk road agent (NMWTRA) in accordance with the MEMP

6 REFERENCES

NRW (2013). Information to be provided in a European Protected Species Licence Application. Natural Resources Wales

NRW (2013). Application for a Licence – Bats Method Statement. Natural Resources Wales.

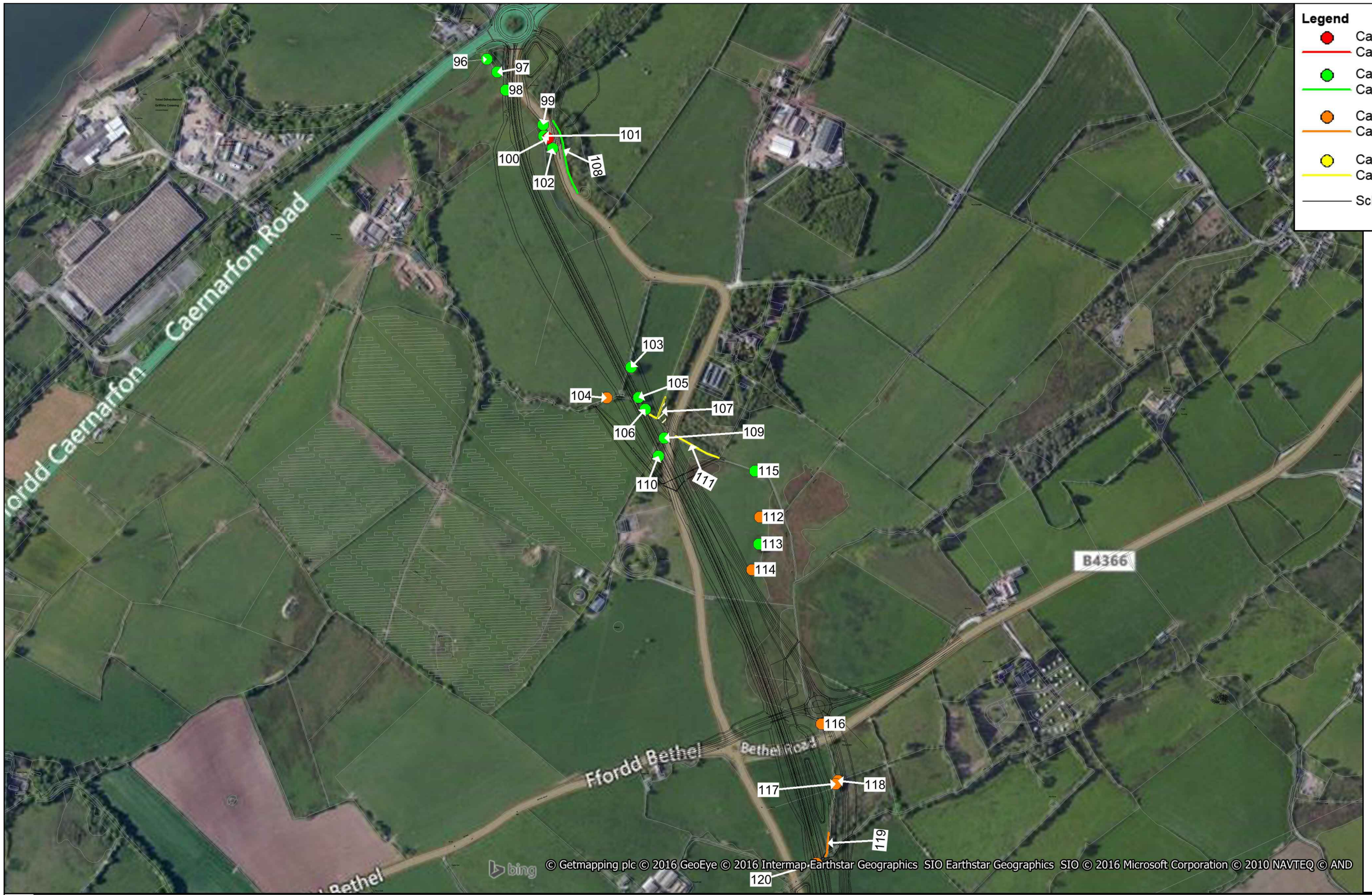
Hundt, L. (2012). Bat Surveys: Good Practice Guidelines (2nd Edition). Bat Conservation Trust ISBN-13:9781872745985

Mitchell-Jones, A. J. (2004). Bat Mitigation Guidelines. English Nature – ISBN 1 85716 7813

Russ, J. (2012). British Bat Calls – A Guide to Species Identification. Pelagic Publishing

FIGURES

Figure 1 (a-f) - Primary Roost Assessments



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• TITLE

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Bat Ghost Licence
Preliminary Roost Assessments

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Llywodraeth Cymru
Welsh Government

Balfour Beatty | Jones Bros Civil Engineering UK

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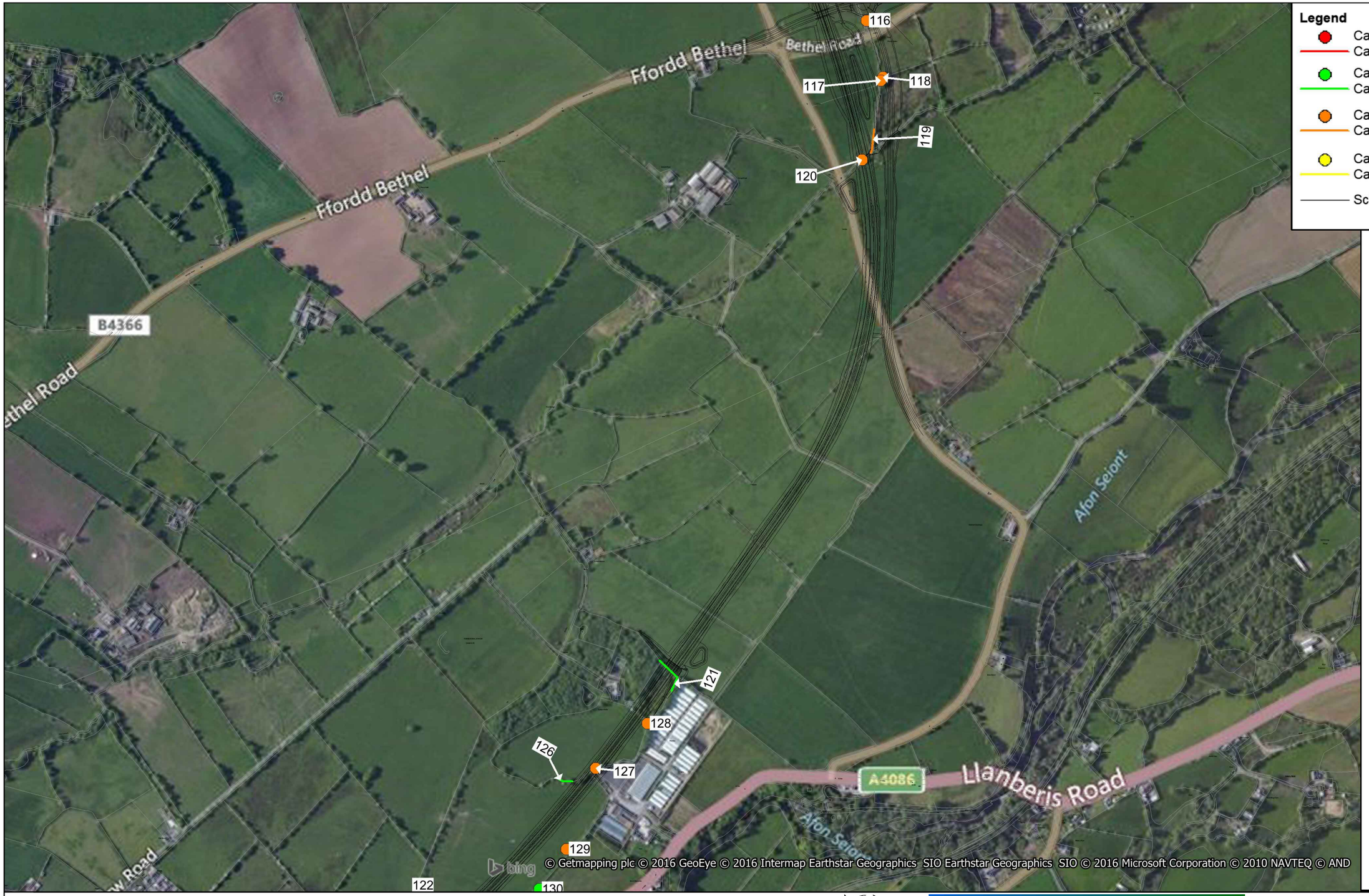

Legend

- Category 1 Star Trees
- Category 1 Star Tree Lines
- Category 1 Trees
- Category 1 Tree Lines
- Category 2 Trees
- Category 2 Tree Lines
- Category 3 Trees
- Category 3 Tree Lines
- Scheme

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Balfour Beatty JONES BROS CIVIL ENGINEERING UK

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Preliminary Roost Assessments

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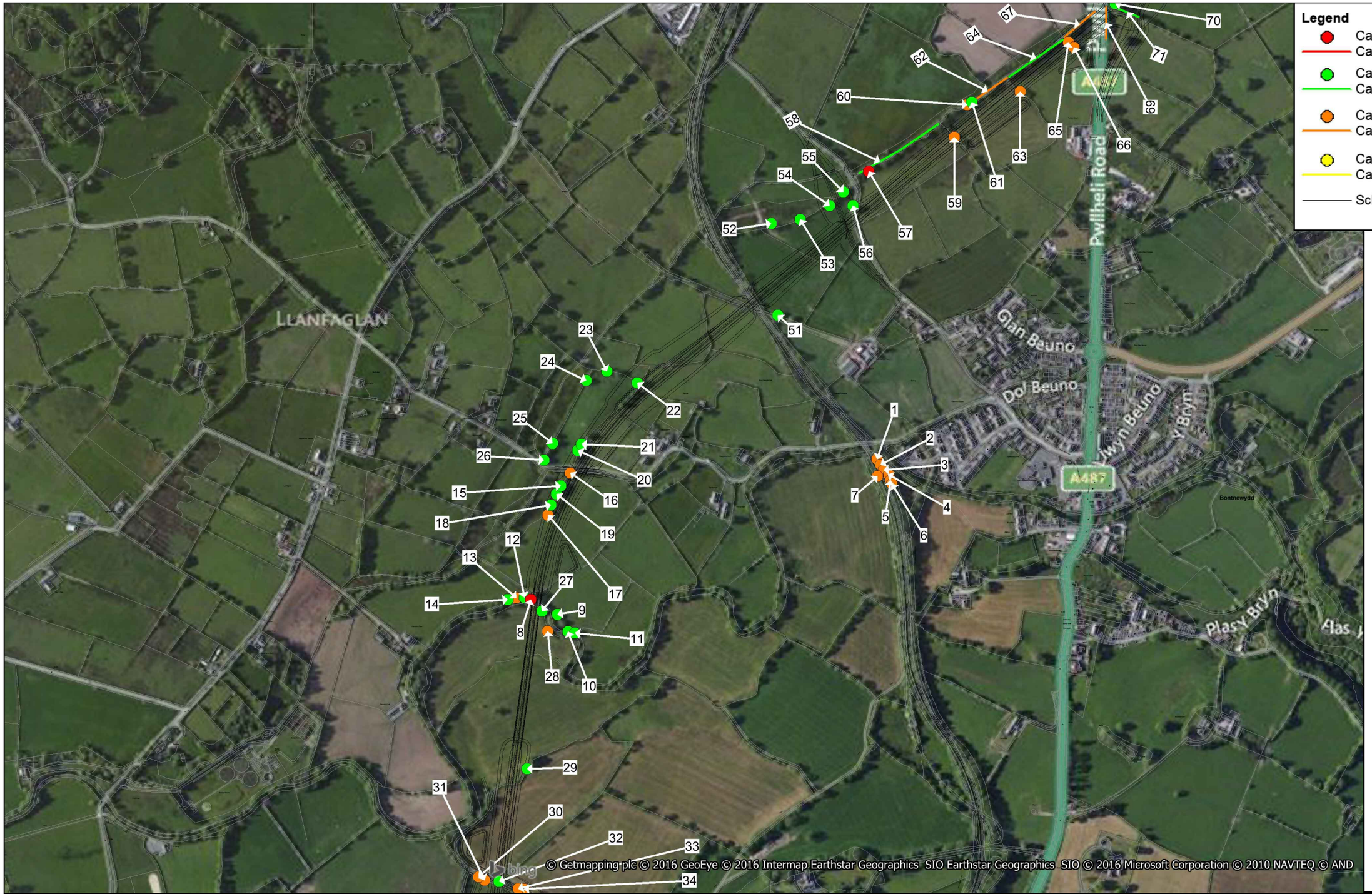

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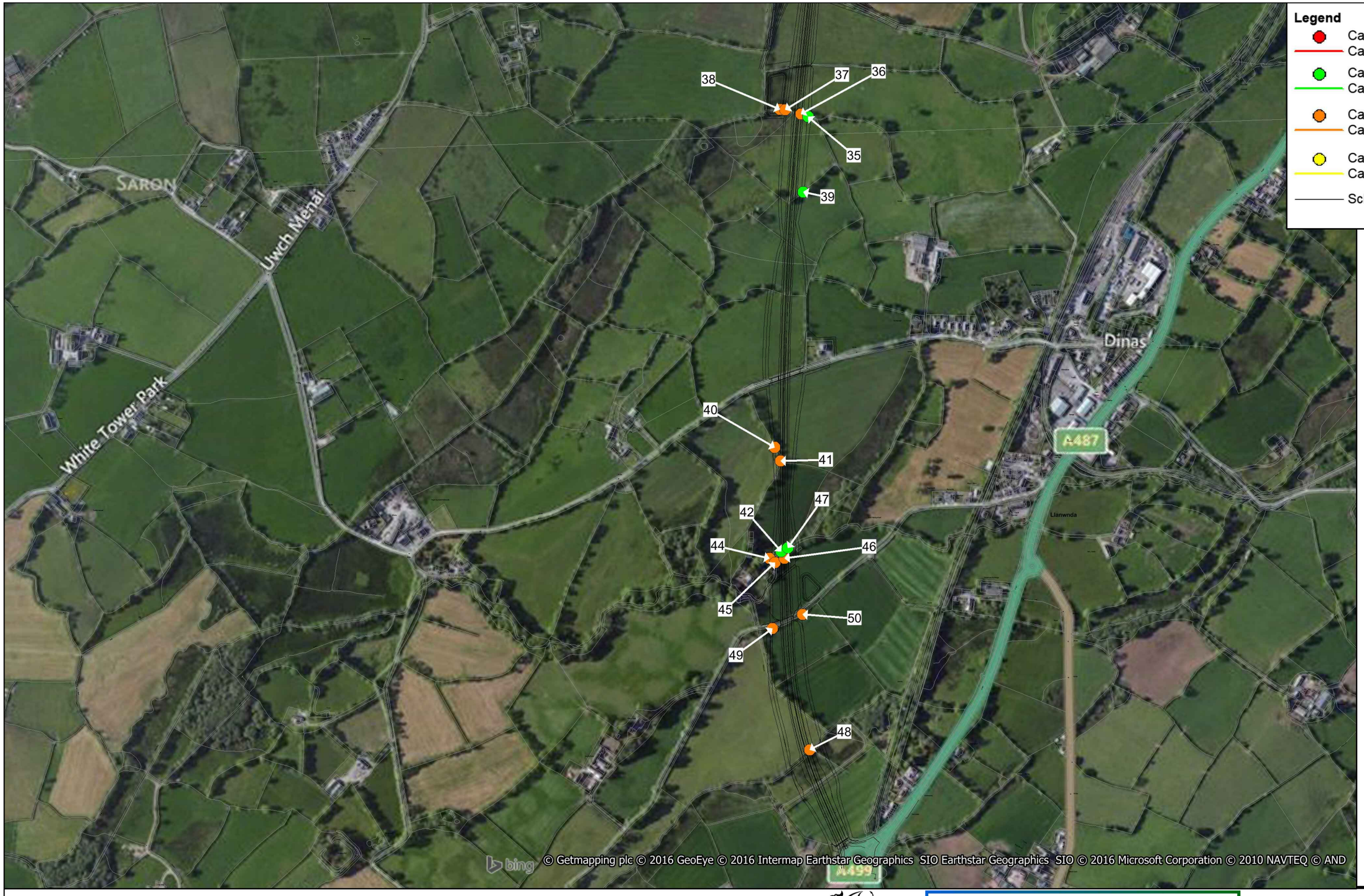

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Figure 2 (a-b) - Transect Locations



Legend
- Bat Survey Transect 2015
- Scheme Alignment

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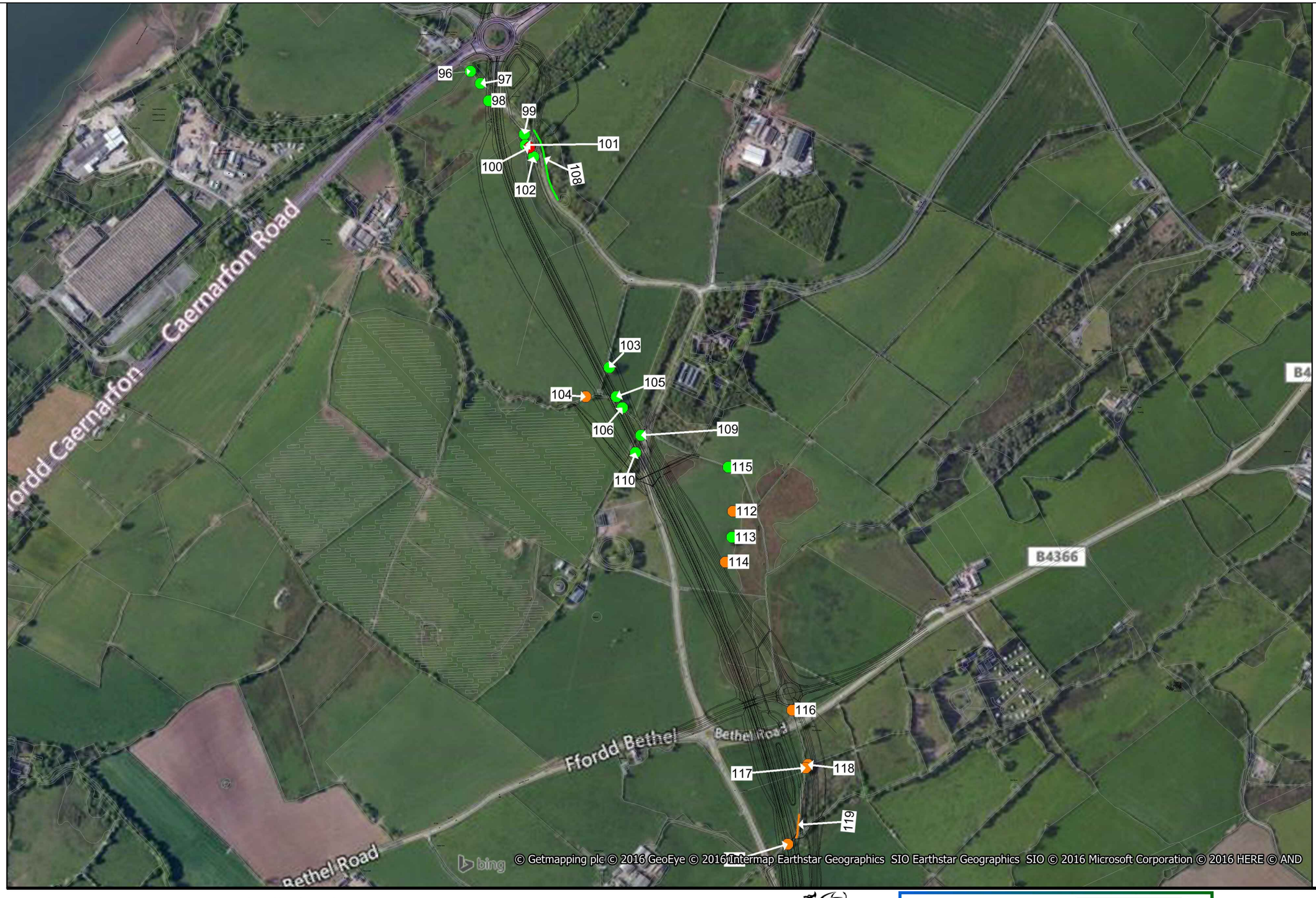
Figure 3 (a-f) - Felling of Bat Roost Potential Trees



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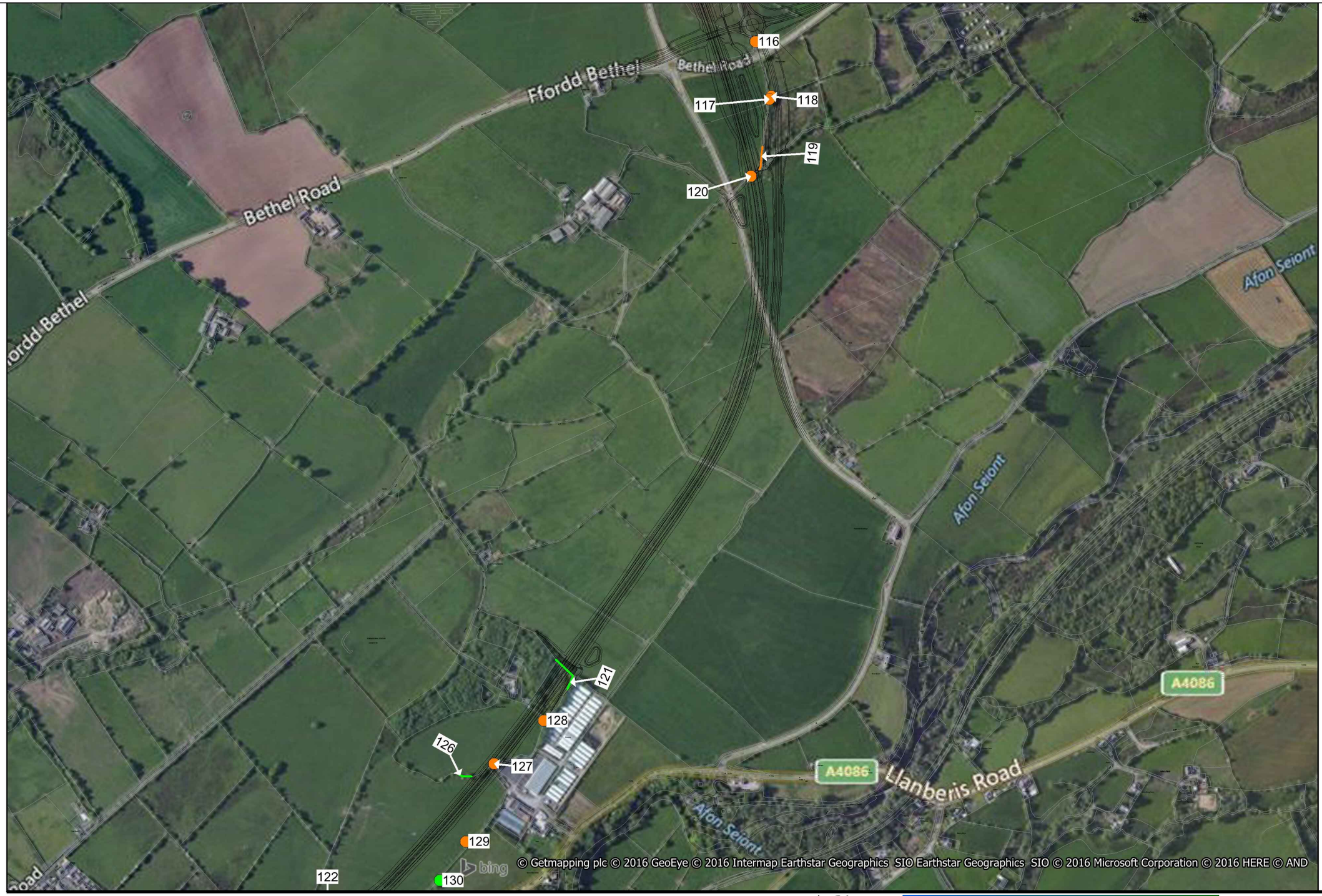

Legend

- Category 1 Star Trees
- Category 1 Star Tree Lines
- Category 1 Trees
- Category 1 Tree Lines
- Category 2 Trees
- Category 2 Tree Lines
- Scheme

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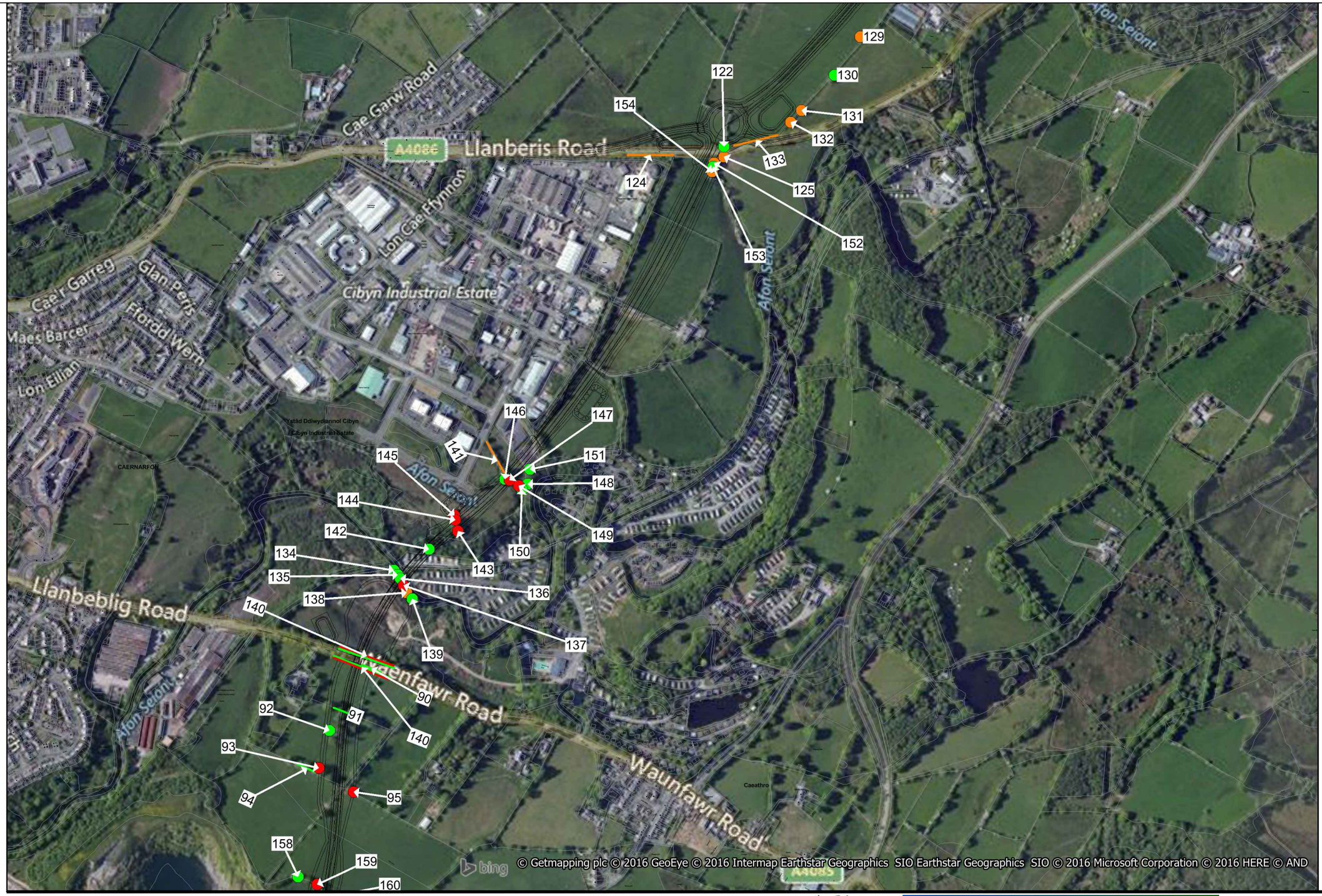

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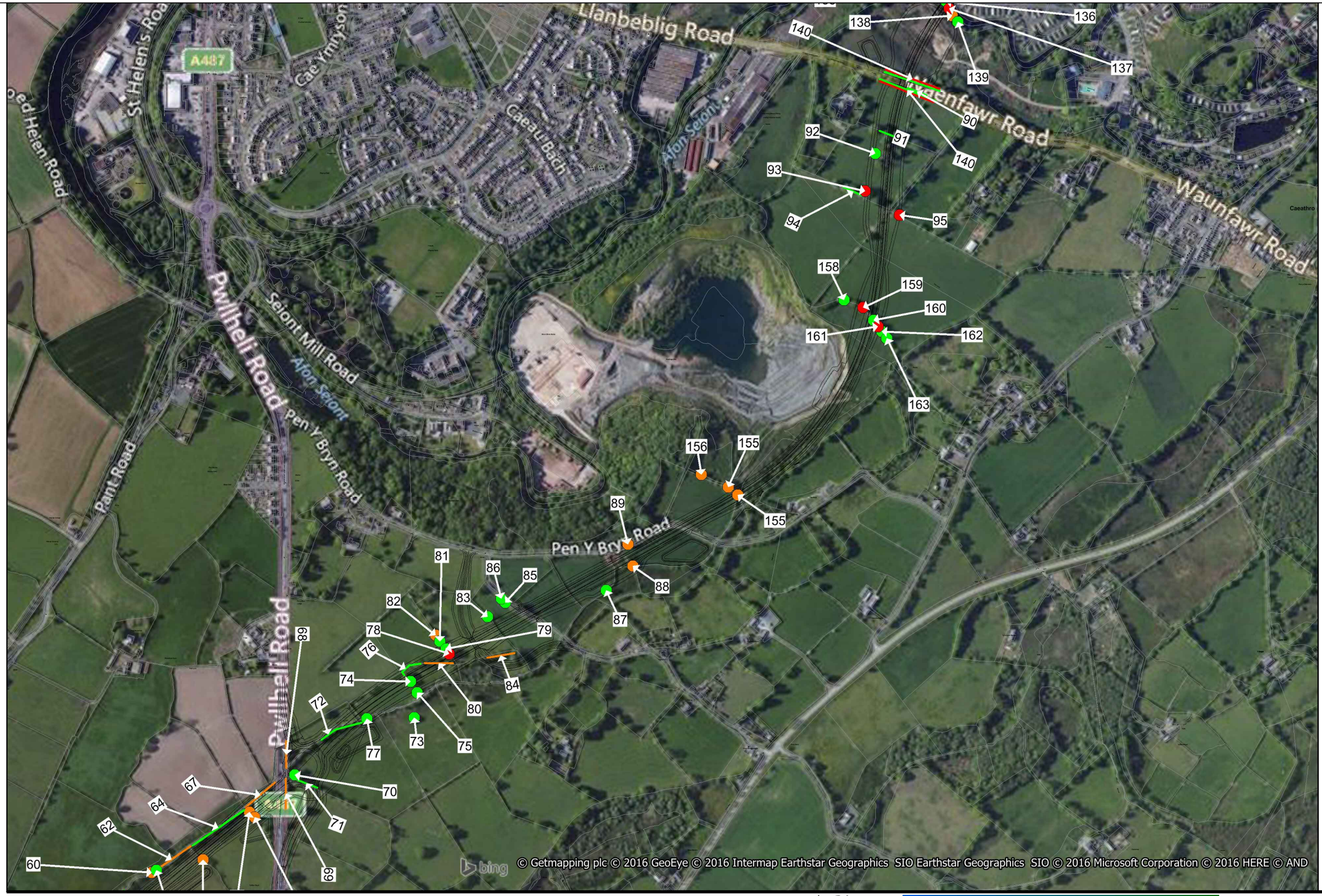

Legend

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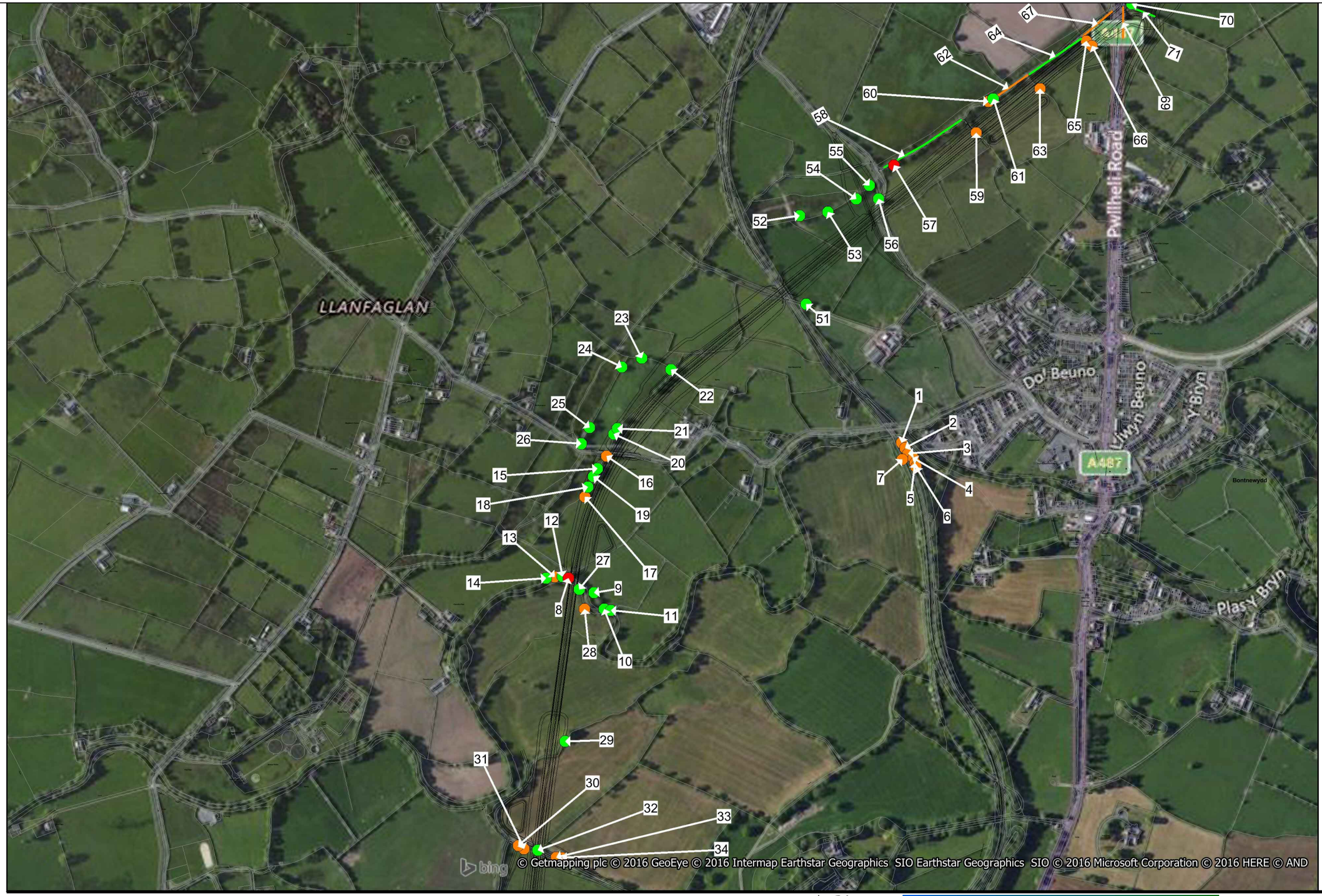

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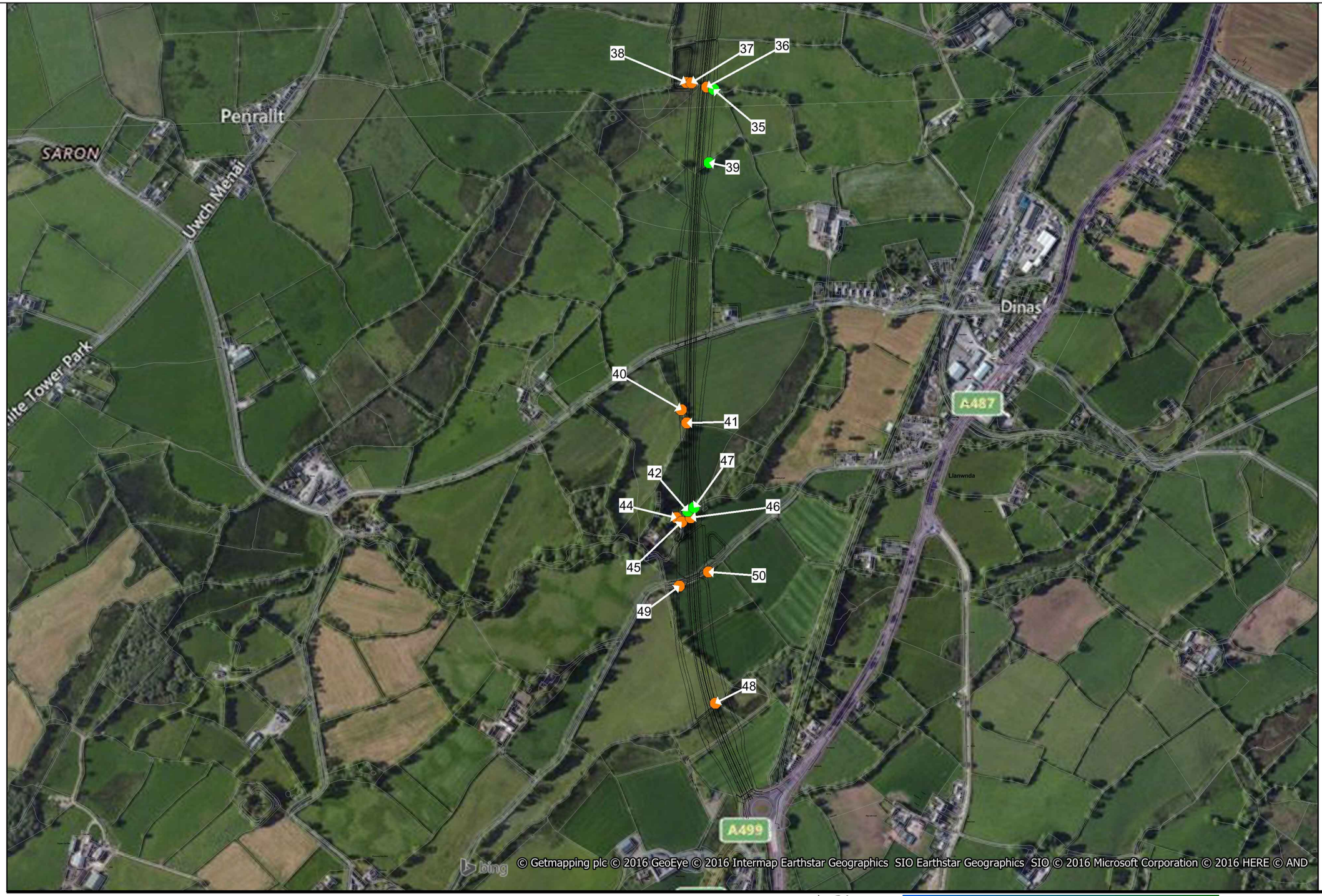

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APPENDICES

Appendix A – Trees to be felled with Bat Roost Potential

Appendix A – Trees to be felled with Bat Roost Potential

This will be completed once the additional climbing inspections and emergence and re-entry surveys have been undertaken. The potential roost features for each tree will be fully described and the tree locations will be shown on Figure 3.0.

Tree number	Notes/Comment
e.g. 105	e.g. Ash, present in hedgeline, west of Proposed route, hole present in main trunk, potential holes in canopy

Appendix B – Ecological Compliance Audit

Appendix B – Ecological Compliance Audit Form

No	Performance indicator	Evidence required	Notes	Pass (Yes)	Pass (No)
1	Licence available for inspection by any police constable, employee of the Welsh Government or employee of the NRW or authorised persons on demand.				
2	Before starting work the licensee will advise NRW Species Officer of the date the works will start.				
3	No agent of the licensee shall act under licence unless they are in possession of a letter signed by the licensee appointing them by name as the duly accredited agent of the licensee for the purposes of this licence, and shall carry with them the said letter and a copy of this licence and shall produce them to any police constable or employee of NRW or other authorised person on demand.				
4	A suitably experienced licensed ecologist will be appointed and retained during the lifetime of this licence to provide on-site advice.				
5	Prior to the start of felling of trees with bat roost potential, toolbox talks would be given to site staff undertaking the work. This will cover the legal status of the species, the method of working, and action to be taken if a bat is discovered.				
6	Prior to felling, trees with bat roost potential will be marked up and inspected from the ground by a licenced bat worker and Environmental Clerk of Works to assess any changes in roost potential. If any trees require felling that have recently developed potential roost features or which were previously thought to be retained, climbing inspections will be carried out by a suitably qualified licenced ecologist to ensure no bats are present.				
7	The licenced bat ecologist(s) must be present to oversee the felling work of trees with bat roost potential.				
8	Felling shall take place taking 'reasonable avoidance measures', to avoid harm to possible roosting bats. This might include soft felling certain sections of the tree, which have good potential roost features. It may also include allowing the tree to be brought to the ground in a controlled manner (e.g. by winching a tree on a hinge or gently pushing or pulling it over with construction plant). The methods used should be at the discretion of the licenced bat worker overseeing the work as some trees have greater potential than others for supporting roosting bats.				
9	Trees that have been soft felled or brought down in a controlled manner and on inspection have confirmed possible bat roost potential should be left for 48 hours before being sectioned.				

10	Potential roost features in felled trees should be inspected by the licenced bat worker immediately following felling.				
11	In the event of bats being discovered, NRW will be notified at the earliest opportunity. Any bats found would be released into nearby bat boxes.				
12	Bat boxes provided for contingency, as specified in the Bat Licence Method Statement before felling of trees with bat roost potential.				
13	Bat boxes present on trees to be felled should be removed prior to felling and relocated in an appropriate position on a tree that is to be retained within the Scheme fence line. A licenced bat worker will provide guidance on the relocation of the bat box.				
14	Sections of hollow limbs which offer suitable roosting features will be retained and installed within retained trees, where possible. This would offer a natural alternative to bat boxes.				

Appendix C – Biosecurity Risk Assessment

Appendix C Bio-security risk assessment

1. Introduction

1.1. Purpose of this Document

This document relates to the A487 Caernarfon / Bontnewydd Bypass, hereinafter referred to as the "Scheme". It has been produced to help avoid and minimise the risk of spreading Invasive Non-native Species ("INNS") within the site and to the wider environment. The document is an annex to the following documents:

a) The Scheme's Construction Environmental Management Plan ("CEMP"); and
b) The Scheme's Environment, Landscape, Ecology Aftercare Management Plan ("ELEAMP").

For the construction phase the Bio-security Risk Assessment will also be used to discharge the Scheme's commitments pertaining to INNS (as detailed within the Register of Commitments within the CEMP), and to inform detailed ecological and environmental Method Statements. As such relevant sections of the detailed Bio-security Risk Assessment will be submitted as part of the final CEMP. This document examines the pathways that could potentially result in the transmission or introduction of INNS, as a result of the pre-construction, construction and post construction maintenance of the Scheme. It provides details of mitigation measures proposed to reduce the risks of INNS transmission.

2. Scheme environment

2.1. INNS present within the Scheme

2.1.1. Invasive Plant Surveys

The presence of invasive plants was noted during the Phase 1 Habitat survey during 2015, and was noted also in the Local Record Centre data.

2.1.2. Invasive Plant Surveys Results

Japanese knotweed has been recorded in one location on the route of the Scheme: at the southern end of the scheme, within an area of Broadleaf plantation beside the A487. Other species noted in the wider area include: Himalayan Balsam, Giant Hogweed, Cherry Laurel and New Zealand Willow herb.

2.1.3. Receiving environment

The Scheme's construction site is the primary receiving environment. However, as the Scheme already hosts INNS, it is appropriate to also take account of movements within the Scheme and between the Scheme and off site locations.
There would be numerous transport movements within and between on and off site locations every day during both pre-construction and construction periods. Consequently, the Scheme, is classified as 'source' and 'receiving environment' with potential high risk prior to mitigation.

2.2. Pre-construction survey

Prior to any construction activities, a pre-construction survey will inform of any INNS that have colonised the site since the previous surveys. The results of this survey will inform and update this bio-security risk assessment.

3. Risk Assessment Methodology

The methods for assessing the severity and likelihood of spreading INNS / diseases are detailed below (adapted from Scottish Natural Heritage[1]).

Section A provides a description of the location, reason for the assessment, details of any INNS or diseases known to be onsite and highlights vulnerable species, habitats or other assets that may be affected.

Section B (Activity Risk Assessment) lists the activities which may spread INNS or diseases. For each activity, the severity (S) and likelihood (L) of spreading INNS / diseases was calculated using Tables 1 (severity) and Table 2 (Likelihood). Overall risk (R) for a particular activity was calculated by multiplying S x L, as shown in Table 3.

Table 1. Severity of impact (S)

1	Minimal very local and /or very short term
2	Minor changes at a local level
3	Moderate large change at local level
4	Major long term changes to local area with possible impact at wider level
5	Massive widespread and long term changes

Table 2. Likelihood of spread (L)

1	Very unlikely - theoretically possible but not expected to occur 1 in 10,000 years
2	Unlikely – has not occurred anywhere in living memory 1 in 1,000 years
3	Possible – has occurred at least once somewhere but not locally 1 in 100 years
4	Likely – has happened on several occasions elsewhere, or at least once locally 1 in 10 years
5	Very likely – happens continually and expected to occur Once a year

[1] Scottish Natural Heritage, available at: www.snh.gov.uk/docs/A1134866.pdf

Table 3. Overall risk (R)

Severity of Impact (S)						
	5	5	10	15	20	25
	4	4	8	12	16	20
	3	3	6	9	12	15
	2	2	4	6	8	10
	1	1	2	3	4	5
		1	2	3	4	5
	Likelihood of spread (L)					

The risk was first calculated prior to consideration of any control measures. A risk score of 4 or below (as shown in Table 3) is considered acceptable and a score of 5 or above is considered unacceptable without the provision of control measures (refer to Table 4 – risk acceptance criteria).

Table 4. – Risk Acceptance Criteria

Through the identification of control measures, the aim of the bio-security risk assessment was then to reduce the risk rating of INNS / diseases transmission to as low as is reasonably practicable. After control measures have been accounted for, residual risk (Rr) was calculated by multiplying S x RI. Acceptance criteria for residual risk (Rr) is also shown in Table 4.

Table 4. – Risk Acceptance Criteria

0 – 4: Risk are considered acceptable.
4 – 12: If no further options for reducing risk are available, proceed with caution.
12 +: Risk is too high; do not proceed until further consideration of control options has been taken into account

Through the identification of control measures, the aim of the bio-security risk assessment was then to reduce the risk rating of INNS / diseases transmission to as low as is reasonably practicable. After control measures have been accounted for, residual risk (Rr) was calculated by multiplying S x Rl. Acceptance criteria for residual risk (Rr) is also shown in Table 4.

Biosecurity Risk Assessment

A. Description of location, work being assessed, risk species / diseases, and vulnerable species / habitats

Ref No		Organisation	

Assessment Type		Assessment Date	Assessment carried out by
Initial			
Review			

Location	Reason for Assessment	INNS or diseases known to be on or near site	Vulnerable species, habitats or assets that could be affected by INNS or disease

B. Activity Risk Assessment

No	Activity	Hazard description	Risk Rating			Control Measures	Rr after controls		
			S	L	R		S	Rl	Rr